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## Contact Information:

### Publication Head:

Dr. A. Jose Sagade

Mr. J. Prakash

Editor: [editor@ijsrp.org](mailto:editor@ijsrp.org)

Website: <http://www.ijsrp.org>

Editorial Board: <http://ijsrp.org/editorial-board.html>

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# Best Practice of Individual Competences in Strategic Leadership among Principals of Excellent Secondary Schools, Malaysia

Assoc Prof Dr Mohamad Johdi Salleh, & Nazifah Alwani Mohamad

International Islamic University Malaysia (IIUM)

**Abstract-** The aim of the study is to investigate the best practice of Individual Competences in strategic leadership among principals of excellent secondary schools. The Model of Individual Competences of Strategic Leadership have been developed by Davies and Davies (2005, 2010), Preedy, Glatter & Wise (2007), Quong & Walker (2010), Nazifah (2012). The respondents of the study were thirty-six principals of excellent secondary schools in Selangor, Malaysia. The principals were asked to rate their practices using a five-point Likert scale ranging from 1 - not at all, and, 5 - frequently. It is interesting to discover that the most frequent practices for the component of 'Restlessness' were represented by two items 'I always motivate members of the school organisation to continuously work hard for school excellence' and 'I always enlighten my desire to continuously increase my school development together with all members of the school organisation towards better level of excellence' with same mean score of 4.7778. The most frequent practice of Absorptive Capacity was 'I am always concerned with the latest information to increase my school excellence' with mean score 4.6111. The component of Adaptive Capacity highest score was item 'I am always ready to receive new ideas that can enhance the school excellence' with the mean score of 4.7222. The most frequent practice of Wisdom item 'I can tolerate the implementation of period of strategy but I am strict towards its achievement' with mean score of 4.7222. It is hope that the research conducted amongst the excellent secondary schools principals would provide valuable insights into the strategic development processes and approaches towards the realization of Vision 2020 and Malaysian Education Blueprint 2013-2025.

**Index Terms-** principals of excellent schools - organizational ability

**Brief Biodata:** The researcher is an Associate Professor at the Kulliyah of Education, International Islamic University Malaysia, Kuala Lumpur. He possessed BA Hons. (Malaya), MA Education (London), and, PhD Education (Birmingham). His area of specialization and interest are Educational Leadership & Administration, Teacher Professionalism, and, History Education.

## I. INTRODUCTION

In the recent years of globalization, most of the developed and the developing countries have put a deep focus in enhancing the education systems and institutions as these are seen to be the main contributor to their nation's development and wellbeing. The enhancement plays a pivotal role not only in allocating adequate and continuous manpower to different sectors of businesses and industries but more importantly in nurturing human capital with a wide range of knowledge and skills contributing to a quality output and productivity in every sector of the country. This is evident from the fact that educational institutions and system around the world continue to play significant roles in providing people with knowledge and skills through various academic programmes, modules, courses and curriculum with the objective of preparing sufficient workforce to support their nation's development agenda.

## II. MODEL OF INDIVIDUAL COMPETENCES OF STRATEGIC LEADERSHIP

The dimensions of Individual Competences in Strategic Leadership have been developed by Davies and Davies (2005, 2010), Preedy, Glatter & Wise (2007), Quong & Walker (2010), Nazifah (2012). The model suggests a framework for identifying the components of the strategic dimension for leadership development towards the successful programmes, activities, and, behaviours.

The following discussion identifies characteristics of individuals who are successfully undertaking a strategic leadership role or skill, based on individual competences:

### 2.1 Restlessness

Senge (1990) describes 'restlessness' as 'creative tension' which emerges from seeing clearly where one wishes to be, one's vision and facing the truth about one's current reality. Strategic leaders are able to envision the 'strategic leap' that an organisation wants to make, while acting as passionate advocates for change. Besides, strategic leaders have the ability to live with the reality that the organisational culture may not be as forward-thinking as they are. They have the ability to live with the ambiguity of not being able to change the organisation fast enough, with the ability to maintain the restlessness for change and improvement. In addition, individuals who are able to do this challenge current ideas and processes to seek better ideas and processes.

## 2.2 Absorptive capacity

According to Cohen and Levinthal (1990), absorptive capacity can be defined as the ability to absorb new information and assimilate it, learn from it and importantly, to apply it to new ends. Meanwhile, Hambrick (1989) argues that strategic leadership occurs in an environment embedded in ambiguity, complexity and information overload. It is important therefore for strategic leaders to recognise new information, analyse it and apply it to new outcomes; leaders need the ability to learn. In other words, strategic leaders should create an organisational context in which learning can take place. It is also important for the strategic leaders to filter out the unimportant and make sense of the important for themselves and their organisations. The critical nature of their position often means that their interpretation of reality determines patterns of action within the organisation.

## 2.3 Adaptive capacity

The 'adaptive capacity' has been defined by Black and Boal (1996) as the ability to change. Furthermore, Sanders (1998) supports this view that strategic leaders need the ability to change and learn through asserting that 'mastering chaos, complexity and change' requires new ways of 'seeing and thinking'. At the same time, Whittington (2010) suggests that 'leaders need an enduring sense of purpose and a continuous sense of motivation'. In an era of innovation and continuous learning, this is particularly important and may favour the emergent strategy or strategic intent approach. In addition, leaders position themselves to take significant opportunities as they adapt to new information in a responsive and proactive way. Leaders can adapt and lead new strategic directions for the organisation if they have cognitive flexibility linked to a mindset that welcomes and accepts change.

## 2.4 Leadership wisdom

Wisdom can be defined as the capacity to take the right action at the right time. Stenberg (2002) articulated that leaders need wisdom because they need creative abilities to come up with ideas and analytical abilities to decide whether ideas are good ideas. Apart from that, they need practical abilities to make their ideas functional and to convince others of the value of their ideas. In addition, they need wisdom to balance the effects of ideas on themselves, others and institutions in both the short and long run. Further, he established that for successful intelligence there is a need to combine practical intelligence, analytical intelligence and emotional intelligence. This provides an insightful and challenging set of criteria for leaders to develop in order to deploy strategic choices with wisdom and effectiveness. The quality of strategic leadership in the school is the central activity that facilitates and drives the strategic cycle of a strategically focused school. The framework that comprise of nine factors above is the pre-requisite for the development and enhancement of strategic leadership in schools (Davies & Davies, 2005).

Mohd. Bustaman (2007) in his paper sees a strategic leader as an individual who has organizational leadership responsibility and needs to represent that organization in the interaction with other organizations and individuals that compose the external environment. Strategic leaders must envision a desired future for

their organization and then direct the flow of internal and the influence of external events towards the goals or vision. For him, once the vision and mission has been clearly identified by the strategic leaders, the mission and vision must be communicated and transmitted accordingly to the rest of the organizations or the followers by persuasion and inspiration and not merely by the directive and policy statements. As presented by Leithwood et al. (2006), the National College for School Leadership has identified a set of four core leadership practices such as building vision and setting directions, understanding and developing people, redesigning the organisation, and managing the teaching and learning programme.

Soucie (1994) viewed that the development and success of a school is in the hands of the school's principals, leader or administrator. In this sense, whatever they offer in terms of leadership will determine the level of success and accomplishment of the organisation. In other words, leadership is possibly the most important and essential skill that leaders in any organisation should have because they are perceived to be the causal agent for the success or failure of the organisation or educational setting.

In fact, the realization of the development plan was initiated and intimately related to the leadership competency of the schools' principals. Their roles are very complex because the changes which will be applied are various and difficult. They are required to be professional leaders who take appropriate strategies and action. In this study, the focus is on the analysis of principals' best practice on Individual Competences of Strategic Leadership.

## III. RESEARCH QUESTIONS

The study aims to seek answer to the following questions:

1. What is the best Practice of Restlessness among Principals of Excellent Secondary Schools Malaysia?
2. What is the best Practice of Absorptive Capacity among Principals of Excellent Secondary Schools Malaysia?
3. What is the best Practice of Adaptive Capacity among Principals of Excellent Secondary Schools Malaysia?
4. What is the best Practice of Wisdom among Principals of Excellent Secondary Schools Malaysia?
5. What is the best practice of Individual Competences in Strategic Leadership among Principal of Excellent Secondary Schools, Malaysia?

## IV. RESEARCH METHODOLOGY

In this study, questionnaires have been used as a [research](#) instrument for the data collection purpose. Questionnaire was chosen because of its ability to survey a large sample in a short period of time at a lower cost is possible. Apart from that, this survey method is suitable for sensitive questions because the respondents' identity will be kept confidential and thus encouraging them to give honest responses (Sekaran, 2000). The questionnaire consists of two sections; Section A on the demographic profile of the respondents (type of school, gender, ethnic, age, position and experience) and Section B on the items

of individual competences of strategic leadership styles based on the model developed by Davies et al. (2005).

This study involves thirty-six principals as respondents who are educational leaders in the government excellent secondary schools. Prior to the data collection process, the application for permission to conduct the research was forwarded to the Director of Education, Planning and Research Division (EPRD), Ministry of Education, Malaysia by submitting a complete application form BPPDP 1 with the research proposal and survey instrument. Another application was also forwarded to the Selangor State Education Division upon receiving the approval letter from EPRD. Basically, it is very important to have these approvals as this study involves data collection from the selected government secondary schools.

The data collected from the survey was analysed using the most commonly used statistical software package in the social sciences which is the Statistical Package for Social Science

(SPSS) version 17.0. The data has been analysed using the descriptive analysis in order to discover the Individual Competences in strategic leadership practices among principals as perceived by themselves. The principals were asked to rate their practices using a five-point Likert Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently.

The results of the study are presented in the sections below.

## V. RESULT OF THE STUDY

### 5.1 Best Practice of Restlessness among Principals of Excellent Secondary Schools Malaysia

Table 1 details out the answer scales given by the principals in responding to the practice of restlessness.

**Table 1:**  
**Principals' Practice of Restlessness as Perceived by the Principals (n=36)**

Item	Mean SD	Scale	n	Percent (%)
<i>I always motivate members of the school organisation to continuously work hard for school excellence.</i>	4.7778	Fairly-often	8	22.2
	.42164	Frequently	28	77.8
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always enlighten my desire to continuously increase my school development together with all members of the school organisation towards better level of excellence.</i>	4.7778	Fairly-often	8	22.2
	.42164	Frequently	28	77.8
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always open room to all members of the school organisation to put forward their suggestion and comment in order to develop and increase efforts for school excellence.</i>	4.6944	Sometimes	1	2.8
	.52478	Fairly-often	9	25.0
		Frequently	26	72.2
		<b>Total</b>	<b>36</b>	<b>100.0</b>

**SD:** Standard Deviation

Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently

It is interesting to note that two items have similar score of mean, 4.7778 with the same value of standard deviation, 0.42164. In addition, the rating as identified by the principals also had no difference; with 77.8% (28) of them opted for 'frequently' and 22.2% (8) of them chose 'fairly-often'. From the result, it can be declared that the most frequent practices for the

component of restlessness are represented by both items *I always motivate members of the school organisation to continuously work hard for school excellence* and *I always enlighten my desire to continuously increase my school development together with all members of the school organisation towards better level of excellence*.

### 5.2 Best Practice of Absorptive among Principals of Excellent Secondary Schools Malaysia

Table 2 presents the best Practice of Absorptive among Principals of Excellent Secondary Schools Malaysia.

**Table 2:**  
**Principals' Practice of Absorptive Capacity as Perceived by the Principals (n=36)**

Item	Mean SD	Scale	n	Percent (%)
<i>I am always concerned with the latest information to increase my school excellence.</i>	4.6111	Fairly-often	14	38.9
	.49441	Frequently	22	61.1
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always analyse the latest information received from various sources to increase my school achievement.</i>	4.4167	Sometimes	2	5.6
	.60356	Fairly-often	17	47.2

		Frequently	17	47.2
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always attempt to learn from previous mistakes.</i>	4.5833	Sometimes	1	2.8
	.55420	Fairly-often	13	36.1
		Frequently	22	61.1
		<b>Total</b>	<b>36</b>	<b>100.0</b>

**SD:** Standard Deviation

Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently

Table 2 shows that the most frequent practice was *I am always concerned with the latest information to increase my school excellence* with mean score of 4.6111 and standard deviation of 0.49441. 61.1% (22) of principals perceived this practice as ‘frequently’ and 38.9% (14) as ‘fairly-often’. The second most frequent practice was *I always attempt to learn from previous mistakes* with mean score of 4.5833 and standard deviation of 0.55420. It was rated as ‘frequently’ by 61.1% (22) of the principals and ‘fairly-often’ by 36.1% (13) of them. In addition, there were 2.8% (1) principals who identified the practice as ‘sometimes’.

### 5.3 Best Practice of Adaptive Capacity among Principals of Excellent Secondary Schools Malaysia

Table 3 presents the Best Practice of Adaptive Capacity among Principals of Excellent Secondary Schools Malaysia.

**Table 3:**  
**Principals’ Practice of Adaptive Capacity as Perceived by the Principals (n=36)**

Item	Mean SD	Scale	n	Percent (%)
<i>I am capable of making important changes on strategies to enhance the school excellence.</i>	4.3333 .63246	Sometimes	3	8.3
		Fairly-often	18	50.0
		Frequently	15	41.7
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I am always ready to receive new ideas that can enhance the school excellence.</i>	4.7222 .45426	Fairly-often	10	27.8
		Frequently	26	72.2
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I am always flexible in enhancing the school excellence.</i>	4.5833 .60356	Sometimes	2	5.6
		Fairly-often	11	30.6
		Frequently	23	63.9
		<b>Total</b>	<b>36</b>	<b>100.0</b>

**SD:** Standard Deviation

Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently

Table 3 reveals the result for the component of adaptive capacity, the item *I am always ready to receive new ideas that can enhance the school excellence* is the best to be considered as the most frequent practice of this component. With the mean score of 4.7222 and standard deviation of 0.45426, the item was also discovered to have been rated with two answer scales by principals. There were 72.2% (26) of them who perceived the practice as ‘frequently’ and 27.8% (10) agreed with ‘fairly-often’. This is in contrast to the other two items which were rated by the three answer scale including ‘sometimes’. Such scenario gives an extra point of strength for the item as mentioned above to be declared as the most frequent practice of adaptive capacity among principals.

### 5.4 Best Practice of Wisdom among Principals of Excellent Secondary Schools Malaysia

Table 4 presents the Best Practice of **Wisdom** among Principals of Excellent Secondary Schools Malaysia.

**Table 4:**  
**Principals' Practice of Wisdom as Perceived by the Principals (n=36)**

Item	Mean SD	Scale	n	Percent (%)
<i>I always demonstrate my intellectual wisdom.</i>	4.2500 .69179	Sometimes	5	13.9
		Fairly-often	17	47.2
		Frequently	14	38.9
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I am reasonable in balancing the individual interest of all members of the school organisation with school interest.</i>	4.5833 .55420	Sometimes	1	2.8
		Fairly-often	13	36.1
		Frequently	22	61.1
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I can tolerate the implementation of period of strategy but I am strict towards its achievement.</i>	4.7222 .45426	Fairly-often	10	27.8
		Frequently	26	72.2
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always hold on the values created together with the members of the school organisation.</i>	4.5833 .55420	Sometimes	1	2.8
		Fairly-often	13	36.1
		Frequently	22	61.1
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I always apply my knowledge for the benefit of the members of the school organisation and for school as a whole.</i>	4.5833 .55420	Sometimes	1	2.8
		Fairly-often	13	36.1
		Frequently	22	61.1
		<b>Total</b>	<b>36</b>	<b>100.0</b>

**SD:** Standard Deviation

Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently

Table 4 identifies, the component of wisdom is obviously supported by more number of items. If others are provided with three items, the component of wisdom is represented by five items. As shown in Table 4, there are three items which share similar mean score of 4.5833 with different value of standard deviation. However, those items were not perceived by the

principals as their most frequent practice of wisdom. The highest mean score of 4.7222 was contributed by the item *I can tolerate the implementation of period of strategy but I am strict towards its achievement*. This item was rated as 'frequently' by 72.2% (26) of the principals and perceived as 'fairly-often' by 27.8% (10) of them.

### 5.5 Best Practice of Outcome and Conformation among Principals of Excellent Secondary Schools Malaysia

Table 5 presents the best practice of Outcome and Conformation among Principals of Excellent Secondary Schools Malaysia.

**Table 5:**  
**Principals' Practice of Outcome and Conformation as Perceived by the Principals (n=36)**

Item	Mean SD	Scale	N	Percent (%)
<i>I am confident that the school development depends most on the good collaboration among members of the school organisation and leaders.</i>	4.8333 .37796	Fairly-often	6	16.7
		Frequently	30	83.3
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I am confident that roles played by members of the school organisation help the leaders to guide towards the school development.</i>	4.8056 .40139	Fairly-often	7	19.4
		Frequently	29	80.6
		<b>Total</b>	<b>36</b>	<b>100.0</b>
<i>I am confident that collaboration among members of the school organisation at present has brought my school towards excellence for now and the future.</i>	4.7778 .42164	Fairly-often	8	22.2
		Frequently	28	77.8
		<b>Total</b>	<b>36</b>	<b>100.0</b>

**SD:** Standard Deviation

Scale: 1-Not at all, 2-Once in a while, 3-Sometimes, 4-Fairly-often, 5-Frequently

With the purpose to give additional information on the principals' practice of strategic leadership, there were three other items rated by the principals as provided in the research instrument. As indicated in Table 5, the items are listed under 'Outcome and Conformation'. These items represent the level of confidence as practised by the principals on certain outcomes of strategic leadership towards school. As shown in Table 5, the highest mean score of 4.8333 was contributed by the item *I am confident that the school development depends most on the good collaboration among members of the school organisation and leaders*. With standard deviation of 0.37796, this item was rated by the principals as 'frequently' by 83.3% (30) and perceived as 'fairly-often' by 16.7% (6) of them.

## VI. SUMMARY

From the analysis that has been presented, it can be concluded that the principals agreed that they have demonstrated all the nine components of strategic leadership with certain different levels of practice. In terms of individual characteristics, the most frequent practice is the component of restlessness with the highest mean score of 4.75. The mean scores of other components ranged from 4.537 to 4.5463. Taking the mean score as the comparison point, it is very clear that the component of restlessness can be represented as the most frequent principals' practice of strategic leadership as perceived by the principals. With more than 4.5 mean score, this is a strong indication that the component of restlessness was the most highly practised among the principals. In addition, the principals' practices are focused on motivating members in the school organisation to continuously work hard for the schools' excellence. Meanwhile, they expressed their desire to continuously increase the school development together with all the school members towards a better level of excellence. Apart from that, they were consistent in opening room to all members to put forward their suggestion and comment in order to develop and increase efforts for the school excellence.

In this regard, it is also worth to highlight that the findings of the study will trigger for further research in the field of strategic leadership, especially in discovering the component of restlessness which has been classified as the most outstanding element in this research. This is because restlessness has dominated not only most of the result of the principals' practices as perceived by the principals and senior assistants, but also in terms of the principals' effectiveness as indicated by both groups of respondents in the study.

Furthermore, for greater impact to the nation (especially in terms of NKRA for the education system) as indicated in the preceding section of the study, it is hoped that the findings of the study will serve as a crucial impetus for further research on the same subject but perhaps with a bigger sample of population such as selecting respondents from the secondary schools all over Malaysia. Likewise, for a more holistic view on the findings of the issue at hand, it is also recommended that further examination should be made in discovering the dominant components of strategic leadership practice and effectiveness among the principals in the different types of regular schools as well as the various excellent schools nationwide.

## VII. CONCLUSION

The facts and the findings in the foregoing sections have brought to the conclusion that the principals' practice Individual Competences of strategic leadership in excellent secondary schools in Selangor are indeed at a very high level. The feedback given by the principals have indicated that all the components of the individual characteristics are already in place and this has contributed to the mean scores of above 4.0. It is true to say that the success of the education system, the school and the students are contributed by various parties such as the teachers, the parent-teacher association, the students efforts etc, it is still valid to say that the key success factor is also due to the strategic leadership upheld and practiced by most of the educational leaders in this field. The role of the principal is widely regarded as central for school improvement and enhanced student outcomes as a milestone towards the realization of Vision 2020 and Malaysia Education Blueprint 2013-2025.

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## AUTHORS

**First Author** – Assoc Prof Dr Mohamad Johdi Salleh,  
International Islamic University Malaysia (IIUM) ,  
johdi@iium.edu.my  
**Second Author** – Nazifah Alwani Mohamad,  
International Islamic University Malaysia (IIUM)



# The Magic Art of Witchcraft and Black Magic

Ms Happy Baglari

Postgraduate student, Department of Psychology

**Abstract-** The belief in and the practise of magic has been present since the earliest human cultures and continues to have an important religious and medicinal role in many cultures today. The present study investigated about social representation regarding societal beliefs of witchcraft and black magic in North Eastern state of India. The study was conducted with the following objectives-

(A) What are the social representation of North Eastern youth of India on Witchcraft and Black Magic.

(B) How the amalgamation of Witchcraft and Black Magic affect the traditional and cultural life of North Eastern India.

For comprehensive understanding a questionnaire consisting of 11 questions relating to the practises of Witchcraft and Black Magic was formulated and conducted on 20 North East college students (10 males and 10 females) with the age group of 20-30 years. The participants were required to give their ideas regarding various practices like Voodoo, Mayong and Exorcism etc. also their suggestions regarding the abolition or continuation of such practices. Thematic analysis has been employed in data analysis. Interesting findings were revealed from the current study and the result indicated that the participants had negative perspective towards such practices. The study has implication for social psychology, which plays a major role in representing one's old tradition of their ancestors and cultural life.

**Index Terms-** Black Magic, Social Psychology, Social Representation, Witchcraft

## I. INTRODUCTION

**S**ocial Representation was introduced by Mascovici (1973) with a study on the entry and diffusion of psychoanalysis within the French public of 1950s. Theory of Social Representation is adopted from Durkhheim's notion of knowledge of representation as collective (or social) phenomena, from the Piaget the aspect of social construction of reality and meaning from Freud the process whereby external realities / either objects, concepts or theories used in a person's environment / internal world views.

The theory of Social Representation is not a psychology of cognition about social life, but rather a theory in which psychological activities are located in social life. For Social Representation, attitudes and attribution arise as consequences of participant in social life; their form, as it was the visible tip of an iceberg whose submerged portion comprises the various structure which enable the subject to construct meaningful attitudes and attribution.

*Witchcraft and Black Magic in North-East India – an overview*

The North-Eastern part of India comprising of eight states- Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim harbour more than 130 major tribal communities out of a total 427 tribal communities found in India (Dutta and Dutta,2005; Ramakrishnan,1992). Tribal people are the ecosystem people who live in harmony with nature and maintain a close link between man and environment. Animism, symbolism, superstitious beliefs etc. plays an important part in a tribal culture. They have deep faith in their traditional method of healing which often involves superstitions.

These practices are considered as a part of culture, there are folktales on it since time immemorial. However with coming Christianity many of such practices, had been discontinued yet it's still prevalent, such practices of northeast states are; Therii usually practice in Nagaland, it's an old practice basically by womenfolk which can be inherited from mother to daughter. It is believed that the substance in powder form which is invisible to naked eye. It is spread through directly to indirectly such as physical contact or air respectively. The poison is lethal it can cause death if not removed in time. The victim of therii suffer severe headache, nausea and death in prolong cases, medical cure has been rare yet there are people who has the power to remove the poison through prayer. The culprit is not accepted by the society, send to exile or amputate their hand if caught.

Another practice is the divination whenever people in problematic situation need insight, they go the diviners who would perform certain rituals and gave insight, and they go to the diviners who would perform certain rituals and gave insight who would sought them.

Postam Jadoo, is one of the most common and oldest black magic practice in Manipur. This particular Witchcraft is performed by Maiba (males who perform good or bad rituals for the community / shaman) or Maibis (females who perform the same). They perform this practice when a person seeks for something which would benefit with their lives. Another practice is MingselKanglonYengba, here a Maibi uses a mirror and chants mantras in order to find a thief or someone has lost something / goods, and then she will inform them the place where the goods may be kept. ThaodaYenga is again a different practice performed by Miabis. They uses oil, chant mantras and during this she can describe physical features of the culprit and can also tell the thief / place where the things have been lost would be found.

In Meghalaya, there is myth of 'menshohnoh' (cut-throat's) who worshiped supernatural being UThlen (a huge serpent that one can propitiate with human sacrifice). This sacrifice is made in hopes of acquiring wealth. The myth is quite commonly retold in the Khasi-Jantia hills. Many tribe communities practices indigenous faiths, and resort to mythical beliefs and related rituals for treating ailments too.



Witch-Hunts, occult practices are old-aged traditional practices of Assam. Black Magic Practitioners are called Bez or Ojha, still hold sway in white swatches of tribe-dominated areas in the states. The Assamese dictionary define Bez as faith healer (chikitsok) who heals by incantation and medicine. There is also a place in Assam, a prominent place is known as Mayong, a land of black magic.

WITCHCRAFT, Witchcraft (also called Witchery or Spell Craft) is the use of magical faculties, the art or practices of a witch, sorcery, magic. Most commonly for religious, divinatory or medicinal purposes. This may take many forms depending on cultural context. The belief in and the practice of magic has been present since the earliest cultures and continues to have an important religious and medicinal role in many cultures today. In the practice of Witchcraft, ordinary consciousness is suspended, and the witch experiences rapture, trance or ecstasy. The more spectacular variants of these states, such as wild dances and hypnotic chanting, have become predominant in popular perception, and exaggerated tales of naked rituals, orgies and licentiousness abound. Yet your average witch is far more likely to prefer quieter sorts of trance.

“Magic is central not only in ‘primitive’ societies but in ‘high cultural’ societies as well...”

BLACK MAGIC, has traditionally referred to the use of supernatural power or magic for evil and selfish purposes. With respect to the left hand path and right-hand path dichotomy, black magic is the malicious counterpart of benevolent white magic. Like its counterpart white magic, the origins of black magic can be traced to the primitive, ritualistic worship of spirits (Robert M. place 2009 book, Magic and Alchemy). Black Magic was designed to invoke spirits to produce beneficial outcomes for the practitioners. Place also provides a broad modern definition of both black and white magic, preferring instead to refer to them as high magic (white) and low magic (based) primarily on intentions of the practitioner employing them. During Renaissance, many magical practices and rituals were considered evil or irreligious and by extension, ‘Black Magic’ in the broad sense.

In particular though, the term was most commonly reserved for those accused of invoking demons and other evil spirit, those hexing or cursing their neighbours, those using magic to destroy crops and those capable of leaving their earthly bodies and travelling great distances.

SATANISM AND DEVIL-WORSHIP, the influence of popular culture has allowed other practices to be drawn in under the broad banner of “Black Magic” including the concept of Satanism. While the invocation of demons or spirits is an accepted part of black magic, this practice is distinct from the worship or deification of such spiritual beings.

White magic is supposedly utilized only for good or unselfish purposes, and black magic, we are told, is used only for selfish or “evil” reasons. Satanism draws no such dividing line. Magic is magic, be it used to help or hinder. The Satanist, being the magician, should have the ability to decide what is just, and then apply the powers of magic to attain his goals. Satanism is not a white light religion; it is a religion of the flesh, the mundane, and the carnal of which are ruled by Satan, the personification of the Left hand Path.

VOODOO, Voodoo too, has been associated with modern “Black Magic”; drawn together in popular culture and fiction. However, while hexing or cursing may be accepted black magic practices, Voodoo has its own distinct history and tradition that have little to do with the traditions of modern witchcraft that has developed with European practitioners like Gerald Gardner and Aleister Crowley. In fact, Voodoo tradition makes its own distinction between black and white magic, which sorcerers like the Bokor known for using magic and rituals of both. But their penchant for magic associated with curses, poisons and zombies, and Voodoo in general, are regularly associated with black magic in particular.

Social Representation, are “a system of values, ideas and practices”, that serve (a) to establish a social order that enables individuals to orientate themselves and master the material and social world they live in, and (b) to enable communication among members of a community through a shared code for social exchange and for naming and classifying various aspects of the social world including their individual and group history (Moscovici ,1972).Witchcraft and black magic is seen that it can be used both betterment and for revenge purpose. With the emergence of Christianity along with the development of science and technology, it uses have been reduced which are discussed extensively in the latter sections.

This paper is organised in four parts. The introductory part introduces the study problem and presents the objectives of the study. The second part describes the data source and methodology of the study. While results and discussion are presented in the third part, conclusion is presented in the final part.

## II. DATA SOURCE & METHODOLOGY

*Participants-* 20 participants (Northeast college students) were selected and asked to fill a questionnaire. The number of male participants was 10and female was also 10, the age range of 20-30 years. Out of 10 male participants, 5 were from Mizoram and 5 were from Nagaland. Out of 10 female 5 were from Manipur and 5 were from Assam. All the participants are college students having middle socio-economic background.

*Research Design & Procedure-* We have used a questionnaire comprising of 11 open-ended questions. Finally after compiling all the information, thematic analysis of the data was carried out along with the interpretation and reduction. The data analysis involves understanding the raw data and then breaking them into units of practical meaning that led to emergence of themes. Further interview was conducted on selected participants then transcriptions, field notes were thoroughly studied and work with the narratives.

*Ethical Consideration-* Since it is a sensitive topic the participants were informed about the conduction beforehand and were asked to come forward without any selection process. It was also confirmed that the information provided by them will be used for study purpose and will be kept confidential in order to avoid negative impact on their lives.

*Limitation-* The study does not represent the situation of the entire population which consist of more diverse and complex groups of people. Also the participants could not be pressurized

to answer all the questions and also they don't know or are not clear about old tradition and the customs.

### III. RESULTS AND DISCUSSION

For the comprehensive study of the data, the data was read and analysed. When asked what comes to mind about Witchcraft and Black Magic, both males and females participants responded with negative connotations. From the **Table 1**, as stated earlier, from the raw data we have derived, Major broad Themes were formed from the dimensions. Most of the participants associated with *Witchcraft and Black Magic* with something evil, scary, mysterious, superstitious, which was existed since time immemorial, aiming to harm other people. Most male thought of it as stupidity, harmful, very uncomfortable and nothing good at all. Few related with it *Satanism* which inflict wounds to the innocent people. Some participant cited reasons of thinking badly due religious prohibition. When asked their thoughts on Satanism and Devil worship, most of the participant believed in the

existence of such practices and thought it to be a cult practice which is unethical, silly, bad influence, stupid, an influence of western culture, a form of temporary happiness. Most female participants associated it with evil sacrifice, self-harming, dangerous and bluffing and something which is a total wastage of time. Most male participants associated it as a form of hindrance, something illogical, bringing bad luck, bad dream, destroying one's career. Few thought of it as anti-Christian behaviour, faithless in God and hunger or thirst for power.

The participants belonging to difference states gave various names of *folk-Magic* which are prevalent in that area. Most female participants related it with folk-tales. Manipuri participants mentioned that folk magic are performed by "Shaman (Maiba)" for good of an individual when misfortunes hits. There is also "Laiwa" performed to make someone fall in love. Another participant mentioned "SanamahiSanaba" which is related to a powerful local

**TABLE 1, DATA ANALYSIS: THEMATIC ANALYSIS OF THE DATA ARE ASFOLLOWS**

DIMENSIONS	MAJOR THEMES REPRESENTED
Witchcraft & Black Magic	Evil, scary, mysterious, harmful, comfortable
Satanism	Inflicting wounds, unethical, silly bad influence
Folk Magic	Laiwa, potsam jadoo, Mayong, Ban, Seki-buhchhuak, Zawlaid, Divination, Evil eye, Healing Spell
Cure by Black Magic	Few were curious, some don't believe it
Exorcism	Casting out evil spirit, dangerous, possession
Mayong	A land of black magic
Love charm	Bogus unethical, & illusion
Voodoo	Weird and brutal

Changes regarding the practices	Reduced
Relation with science	Contrary view, illusion
Comments on abolishment of the practices	Mostly agreed, some want to respect the old tradition

deity, usually practiced by witches. In Assam “Mayong” is a place famous for the practice of black magic. However participants have only vague idea about it. Naidal community of Assam have a practice called “Ban” which acts as lungs, chest of the victims and cause instant death. Ban is send through air. Most of the participants reported about a practice where boiled-eggs are used as a means to stop someone admire a person. Mizo participants reported “Seki-buh-chhuak” which has the capability to produce anything you like. Some male and female participant also reported that by taking someone’s property and belongingness, like a strand of hair which when burnt with a magic portion while chanting mantras could make the victim sick and even be fatal. “Zawlaidi” is popular in folktales among Mizos which is used to make people fall in love. A practice names “Divination” is a common among Naga, which is used to find out inside of a problem. For such purposes people go to the, ‘diviners’. “Evil-Eye” is also a Black art used in Manipur. Certain people possess this power that causes severe stomach-ache, falling of teeth and even destruction of properties. Mizo participants also mentioned about the “healing spell”. They said that people mostly used for sacrificing evil taking revenge, hurting / destroying someone. When people suffer from ailments, they will consult the witch to perform some rituals to help by connecting with the spirit. When asked about the relationship between science and black magic, most of the participants gave contrary views between the two. As some of the participants are from science background, they believe in logic, facts and the nature of science. They believed that the practioners used chemicals during the rituals. Other participants think it is an illusion or delusional belief which disturbs the balance of nature.

Almost all the participants were against getting *cure with the help of black magic*, mainly because they do not believe in supernatural powers. Some preferred to go for religious healing. Others relied on the medicinal help. Few were curious to try new things; therefore, these participants were not against seeking cure from such practices.

In continuation with the analysis, when asked what they think about exorcism, few participants think that it exists while others did not believe in its existence. Participants reported that *exorcism* is a method of removal of evil from the body which is often performed by a priest. Some believed that it could be dangerous if not done properly while one participant reported that it is in a sense a good way to communicate with the spirit which suffered sudden death and murdered. One of the male Naga Christian participant stated that it was difficult to define

weather a person is really possessed or not. A person could have got seizure not long ago which could not see as a possession. However, if a person is truly possessed, exorcism could be helpful. He also mentioned that Catholic has special norm for performing exorcism. But they said “I’ll settle from doctor because they are well trained professional who have studied for many years relating to human health issues. The solution would not be complete cure but will pave a way from preventing occurrence of the some disease to other people.”

Most of the participants, when asked about “Mayong”, had not heard of this place or this practice. Few participants from Assam who reported of having heard of it described of it as prominent place in Assam, also known as “the Land of Black Magic”, which is used for the practice for black magic and witchcraft where some even have the power to turn human beings into animals.

*Love-charm* was the most familiar practice among the participants, where available personal case studies were found while interviewing. One such interview consists of a boy who tried but was left with a disappointing result which ended up in the boy losing trust in such practices. Most of the participants had a negative view toward the use of love charms to lure someone they admire. They considered such practices as bogus and unethical which gives mere psychological relieve but no real effect. Participants also mentioned that they would rather use their own ability rather than seeking such practices. While some participants, out of curiosity, would not mind trying out this practice.

While trying to check the prevalence of some specific practices like *Voodoo*, some participants reported having heard of it while some have not heard about it. Even among those who have heard, they did not want to use it as a method of revenge. One female **from Manipur** reported that properly that “Voodoo is done using doll, a needle and a spell. When the needle is pinned to the doll, it will directly affect to the person in the different places where the doll was pinned”. Few found it too evil to carry out this practice. They also found it weird and brutal. “Exorcism in one sense is a good way to communicate with the spirit, which are of sudden death or was murdered. But such kinds of practices can be dangerous if they are not done properly and may cause injury to the person which are intermediary”. Most of the male participants reported it as being seen movies. Some wanted to experiment but still think that it is evil. Many Christian participants did not want to take revenge, instead they believe in prayers.

And while asked participants about the *changes which has taken place regarding witchcraft and magic practices* has been reduced. Participants from Assam considered it unfortunate for having so many believers and followers of such practices. Another participant from Assam has also reported that changes has taken place though there has been many cases while reported about the witch hunting. Participant who is from Assam specially mentioned that if we are female, then we are more prone to becoming a victim of the spirit world compared to men. When woman go through their monthly cycles their auric shield weakens, if during that time period she goes near the graveyard or a river or lake or under trees, uses perfumes, drinks alcohol or take drugs, keep herself dirty, allow negative or sexual thoughts, she is inviting trouble as spirits are everywhere and can take charge of the female body anytime the circumstances are right. Some believed that changes have been brought since the *emergence and development of science*. With the advent of modernity all those practices have gradually decrease. Besides, Christianity has also played a vital role by stilling the love of god. Also people are more aware of these superstitious beliefs that they are guided by evidences.

North Eastern people have had a deeply rooted superstitious belief in their culture, which can be seen from their folktales. When enquired about the *abolishment or continuation of the practices of black magic and witchcraft*, most of the participants agreed to the abolishment of such practices. Even though they believed such practices caused hindrance to the society; they still wanted to respect the old tradition of their ancestors. Some participants wanted to abolish and save people from being tricked of money for evil games, believing these are the practices of evil-mind and would never bring improvement to the society. Also says that in this 21<sup>st</sup> century, practices such Black Magic and witchcraft are ignored by these modern society as they are mainly focussed on science. So, these practices are considered too be done on ancient medieval period and it is being told in folktales. But! In some places it is still done and passes to generation after generation.

Also from the review of literature mentioned above Vandana Goswami also found the Mayong prevalent in Assam and in her research she found some history books vaguely mentioning kamrupi and mystery. And in the other review of literature mentioned "Ethno medical Practice in Manipur: A case of Evil Eye by Loitongbam Sunita Devi" it is quite evident about various witchcraft practices in different modes. From the case study extracted through the interview two participants discloses few cases of love charm being used by others to their family members. And also they reported witnessing exorcism.

#### IV. CONCLUSION

Overall, after the conduction and analysing the study it found that both male and female participants hold negative view about Witchcraft and Black Magic.as reported by the participants, from the time immemorial, there has been numerous folk magic across different north Eastern states of India. However with the immergence of Christianity along with the development of science and technology, it has reduced. People has opted science rather than those old practices to get their work done. When enquired about the abolishment of such practices,

most of the participants inclined with the thought of abolishing them as it has caused hindrance to the people who does not believe / use it while still some wants to respect their old traditions of their ancestors. It is also seen that people continue to opt for and seek help from doctors who are professionally trained in various human health issues as they would know it better. If there is sickness there is always a way to cure / heal it without causing harm mentally and physically.

#### APPENDIX

##### Demographic status

NAME:  
AGE:  
GENDER:  
STATE:  
EDUCATIONAL QUALIFICATON:

##### Instructions

Please write your views on the following questions as it comes to your mind. Do not skip any questions. There is no right or wrong answers.

##### Questions

1. What exactly is Black Magic and witchcraft? Why is it done?
2. Can someone become a victim of spirit world without one doing any magic on the individual?
3. What kind of harm can be done to one using Black Magic or what kind of harm is inflicted on innocent people using the services of these Black Magician?
4. Can you mention any such practices that are performed in your area?
5. How do you relate it with science? Is it different or goes parallel with science?
6. If you are not well, you will prefer to go to doctor or you seek such practices for your cure?
7. Have you heard of exorcism?
8. Can you describe Mayong? And also about Voodoo?
9. Will you used "Love Charm" as an option to lure person you love?
10. What kind of changes has taken place in society regarding these practices?
11. Does these practices need to be continued or its abolishment is necessary?

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#### AUTHORS

**First Author** – Happy Baglari, M.A, Psychology, Previous Year, University of Delhi, Delhi-110007, India, <happy.baglari@gmail.com>

# Developing Winterhardy Vegetable Pea for Wyoming, USA: Description of Winter Survival in Early Generation Breeding Lines

Azize Homer, Robin W. Groose

University of Wyoming, Department of Plant Sciences

**Abstract-** In Wyoming USA, vegetable production is challenging for vegetable growers, whether home gardeners or commercial producers due to a short growing season, high elevation and a relatively cool climate. A significant limitation to local vegetable production is that virtually no vegetable varieties have been bred in Wyoming for local adaptation. As a cool season annual crop, pea has potential for vegetable production in Wyoming. The objective of this study was to produce winterhardy vegetable peas that combine the characteristics of fresh, edible peas with the winterhardiness of feed peas.

Hybridizations between winterhardy feed pea (*Pisum sativum* ssp. *arvense*) and with all three types of food peas (shell, snow, and snap; *P. s. ssp. sativum*) were accomplished in the greenhouse in 2009. Natural selection began in F<sub>2</sub> and elite, surviving lines were advanced from the F<sub>2</sub> through F<sub>4</sub> generations using pedigree selection. The best hybrid-derived lines survived the 2010-11 winter, and their selected progeny performed even better over the 2011-2012 winter. Based on a chi-square test for independence comparing F<sub>2</sub> and F<sub>3</sub> survival indicates that the F<sub>3</sub> progeny of surviving F<sub>2</sub> plants was much higher than the survival of F<sub>2</sub> progeny of F<sub>1</sub> plants at the Prob < 0.001 level. Thus, we conclude that winterhardiness was heritable from F<sub>2</sub> to F<sub>3</sub> generations; even though considerable genetic segregation would still be taking place for what is apparently a complex polygenic trait.

**Index Terms-** winterhardy pea, vegetable, breeding

## I. INTRODUCTION

A number of limiting factors makes home gardening and commercial vegetable production challenging in Wyoming. One of the limitations to vegetable production is that most areas in the state have a short growing season due to high elevation and a relatively cool climate (Panter, 2004). During the growing season, snow or frost, below freezing temperatures, low humidity, and high or steady winds in some areas can constrain vegetable production and limit the area of adaptation for many vegetables. One of the means to extend the growing season in Wyoming would be to develop locally adapted vegetable cultivars with increased cold tolerance and high yield. As a cool season annual crop, pea has potential for vegetable production in Wyoming.

There are a number of shell and edible-pod pea cultivars recommended for Wyoming in a UW extension bulletin (Panter, 2002). However, all the existing vegetable pea cultivars were

bred elsewhere, and thus there appears to be a necessity for locally bred and adapted cultivars for pea production in Wyoming and the West. Benefits of locally-adapted edible pea cultivars should accrue to both growers (ranging from home gardeners to large-scale commercial productions) and consumers (who will enjoy the contribution of locally produced healthy food to the diet).

Botanically, peas are seeds and pea pods are fruits but, overall, peas are considered a vegetable crop. In the human diet, fresh peas are a valuable source of vitamin A, C, significant amounts of B vitamins, iron and phosphorus and fiber. Shell peas are higher in protein compared to snow and snap peas; however, snow and snap peas provide twice the calcium and more iron than shell peas (Kirkland and Hedstrom, 2008).

Three types of peas used as vegetables are the shell peas (or garden pea or English pea or *P. s. ssp. s. var. sativum*), the snow pea (or Chinese pea or *P. s. ssp. s. var. saccharatum*) and the snap pea or (sugar snap pea or *P. s. ssp. s. var. sativum* var. *macrocarpon*; Myers et al., 2001). Garden peas are grown for their immature green seeds which can be used fresh or for canning and freezing. Snow pea, with thin pod walls, and snap pea, with thick pod walls, are the edible-podded peas and are grown and consumed for their tender, unripe pods that lack the parchment layer inside the pod (Sneddon, 1970; De Ron, 2005). Two independent recessive alleles at two loci, *p* and *v*, are responsible for reducing the fibrous membrane on the inside of the pod (Gritton, 1986). Modern edible-podded pea cultivars have genotype *ppvv* which is required to make the pods suitable for consumption when the pods are large and the seeds have started to form whereas shell pea cultivars usually have genotype *PPVV* (Deppe, 2000). An additional recessive allele *n*, at the *N* locus, increases pod thickness and all snap pea cultivars have genotype *ppvvn* (Gritton, 1986; Deppe, 2000).

The short-term goal of this study was to develop breeding lines of locally-adapted, fresh edible peas (as immature seeds or pods) and edible dry peas (as a pulse crop) in one or more classes of winterhardy edible pea. Specifically, our primary objective was to produce cultivars that can be seeded in late summer/early autumn such that an established stand will overwinter and reawaken in the spring to produce fresh, local vegetable produce, perhaps earlier in spring than any other product of the home garden or commercial production field. Cold hardiness of such cultivars may also prove useful for very early spring seeding.

## II. MATERIALS AND METHODS

Pea lines utilized in this study mostly involved crosses between the two subspecies, with the goal of genetically recombining edible pea traits from *ssp. sativum* with winterhardiness from *ssp. arvense*. Characteristics of twelve parental cultivars (three winterhardy feed pea and nine food pea cultivars) are summarized in Table 1. Hybridizations were accomplished in the greenhouse in Laramie (41° 18' N, 105° 35' W, elevation 2184 m) during spring-summer of 2009 and 17 cross combinations were obtained (Table 2). Common-2, Common-3, 45×C9, 47×C8, etc. are various selections within 'Common' and hybrids from *arvense* × *arvense* crosses in the early stages of the winter feed pea breeding program for Wyoming adaptation and winterhardiness, some of which gave rise to (or are related to) the Wyoming-bred winterhardy feed pea lines.

Based on parentage of crosses in this study, Table 3 shows all of the winterhardy, edible types of peas expected to segregate from hybridizations and with subsequent genetic recombination and selection in the Wyoming environment. All of the outcomes listed in Table 3 are possible because of the diverse pea germplasm used in multiple hybridizations.

The F<sub>1</sub> hybrids of 14 *sativum* × *arvense* cross combinations and 3 *arvense* × *arvense* were grown in the greenhouse to produce F<sub>2</sub> seed during the fall and winter of 2009. A large number of seeds of each F<sub>2</sub> population (ranging from 40 to 100), and twenty seeds of each parental line/cultivar, were planted 30.5 cm apart in rows spaced 46 cm apart in early September, 2010 in Laramie. Surviving F<sub>2</sub> plants were single-plant threshed at maturity to produce F<sub>2</sub>-derived F<sub>3</sub> families in the summer of 2011. Soil type in the experimental area at Laramie is classified as sandy loam. Watering was done by hand. No fertilizer was applied.

F<sub>3</sub> seeds of each line (from 50 to 100) were planted 10 cm apart in rows spaced 46 cm apart in late September at the same location and were single-plant threshed at maturity to produce F<sub>3</sub>-derived F<sub>4</sub> families in summer of 2012. Again, twenty seeds of each *sativum* and *arvense* parental line were seeded in Fall 2011.

## III. RESULTS AND DISCUSSION

In Fall 2010, a total of 1223 F<sub>2</sub> plants from 17 different cross combinations were established in Laramie, Wyoming. Three of the crosses were between winter feed peas (*arvense* × *arvense*), while the rest, 14 crosses, were derived from the crosses between spring vegetable peas and winter feed peas (*sativum* × *arvense*). Out of 1049 F<sub>2</sub> segregates from *sativum* × *arvense* crosses, 19 plants survived (1.8%) the 2010-2011 winter. Thus, natural selection for winter survival was very intense.

In contrast, survival among F<sub>2</sub> segregates from *arvense* × *arvense* crosses was higher, 77 out of 174 plants (44.3%), confirming that crosses between more winterhardy parents will produce more winterhardy progeny (Liesefeld et al., 1986). None of the vegetable type parental cultivars survived. The percent survivals for three winterhardy parents, 'Common', 'Specter' and 'Windham' were 35%, 65% and 70%, respectively.

The very low survival of *sativum* × *arvense* F<sub>2</sub> progenies (1.8%) suggests that winterhardiness is a complex, polygenic trait, with only a small percentage of F<sub>2</sub> plants segregating for a combination of alleles at numerous genetic loci that condition winterhardiness. Moreover, we might speculate that winterhardiness is a mostly a recessive trait in pea.

In Laramie, the winter of 2010-2011 was severe and pea plants were subjected to long lasting freezing temperatures, wind, and inadequate snow protection which might have caused the considerable attrition due to winterkill, especially in the F<sub>2</sub> progeny of *arvense* × *sativum* crosses. The minimum temperature was -39°C on February 2, 2011. Moreover, there was no cereal stubble or furrow to protect seedlings from freezing temperatures and desiccating winds.

Among the *sativum* × *arvense* crosses, the largest number of survivors (7) was obtained from the cross made with the *sativum* parent 'Oregon Sugar Pod II' (snow pea) and *arvense* parent 'Common' (Table 2). 'Oregon Sugar Pod II', a snow pea with short vines and excellent flavor, is known to be cold hardy and overwinters in maritime Oregon (Deppe, 2000).

In Fall of 2011, 500 F<sub>3</sub> plants from *sativum* × *arvense* crosses were established and populations were still segregating for winter survival. The number of survivors in Spring 2012 was 116, or 23.2%, much larger than the 1.8% of F<sub>2</sub> plants that survived the previous winter. Of the 116 survivors, 39 were white flowered. Again, none of the vegetable type parental cultivars survived.

A chi-square test for independence (a contingency test) comparing F<sub>2</sub> and F<sub>3</sub> survival indicates that the 23.2% of F<sub>3</sub> progeny of surviving F<sub>2</sub> plants (as evaluated in 2011-2012) was much higher than the 1.8% survival of F<sub>2</sub> progeny of F<sub>1</sub> plants (as evaluated in 2010-2011) with chi-square = 186.56, 2df, and significant at the Prob < 0.001 level (Prob = 1.38 x 10<sup>-40</sup>). This indicates that winterhardiness was heritable from F<sub>2</sub> to F<sub>3</sub> generations, even though significant genetic segregation would still be taking place for this quantitative trait.

**Table I. List of parental pea cultivars and their characteristics**

<b>Cultivars</b>	<b>Characteristics*</b>
<b>Early Alaska (Shell Pea)</b>	Round seeds. Green cotyledon. Cold and wet tolerant. Standard early canning pea. 1 to 2 pods per node. White flowers.
<b>Maestro (Shell Pea)</b>	Round seeds. Early, widely-adapted and vigorous. Sweet and tender, tolerant to powdery mildew, pea enation mosaic virus, bean yellow mosaic virus. White flowers.
<b>Spring (Shell Pea)</b>	Round seeds. Freezer, extra early, vigorous, determinate, sweet flavored pea, very productive. White flowers. Resistant to Fusarium wilt.
<b>Dwarf Gray Sugar (Snow Pea)</b>	Round seeds, yellow cotyledon. Purple flowers with edible leaves and stems. This is the standard flat podded pea for oriental cooking.
<b>Oregon Sugar Pod II (Snow Pea)</b>	Round seeds, short vine and green cotyledon. Pods are broad and very tender in very early stage. Excellent quality and flavor. Commercial freezing. White flowers. Resistant to powdery mildew. Two pods per node. Overwinter in maritime Oregon.
<b>Snowbird (Snow Pea)</b>	Round seeds, yellow cotyledon. Very early, dwarf-erect, sweet pods. White flowers. Highly double podded with 3" pods.
<b>Sugar Ann (Snap Pea)</b>	Wrinkled seeds, yellow and green cotyledons. Short vines, small, medium green, very sweet pods. Early maturity, stringy. Freeze well. White flowers.
<b>Sugar Daddy (Snap Pea)</b>	Wrinkled seeds, yellow and green cotyledons. Medium vine; medium size, dark green and stringless pods. Full season maturity. Resistant to powdery mildew, tolerant to Bean leafroll virus (BLRV). White flowers.
<b>Sugar Snap (Snap Pea)</b>	Wrinkled seeds, yellow and green cotyledons, tall vine, medium stringy pods, excellent flavor, late maturity. Two pods per node. Susceptible to powdery mildew. White flowers. Overwinter in maritime Oregon.
<b>Common (Landrace, Feed pea)</b>	Round and mottled seeds. Austrian winter pea, winter hardy, purple flower, normal leaf type, seed are mottled, tall growth habit. Yellow cotyledons.
<b>Specter (Feed pea)</b>	Winter feed pea, winter hardy, tall growth habit, <i>af</i> for semi-leafless tendrilled leaf. Seeds are round with yellow cotyledons. Pods are straight, blunt-ended, and medium green
<b>Windham (Feed pea)</b>	Winter feed pea, winter hardy, semi-dwarf, <i>af</i> for tendrilled leaf. Seeds are round with yellow cotyledons. Pods are straight, blunt-ended, and medium green

\*(Gritton and Myers, 1996; Wehner; 2002; McPhee and Muehlbauer, 2007; McPhee et al., 2007; Deppe, 2000).

During the 2011-2012 growing season, the minimum temperature was observed in December (-33.9 °C). Because the 2011-2012 winter was similarly severe as the previous winter, 2010-2011, and with even less snow cover, we believe that we can attribute much of the increased winter survival rate in 2011-2012 (23.2% for the F<sub>3</sub> generation) over the 2010-2011 (1.8% survival for the F<sub>3</sub>

generation) to genetics and natural selection for winterhardiness. It might also be speculated that the earlier planting in 2010-2011 might be partly responsible excessive winterkill compared to 2011-2012 growing season, an environmental effect. Murray and Swensen (1991) noted that early-planted pea is usually poorly acclimated when frost occurs. However, survival of parental *sativum*



lines was 0% in both 2010-2011 and 2011-2012 winters, providing no evidence that later planting, by itself, could have been responsible for higher

survival of the F<sub>3</sub> generation relative to the F<sub>2</sub> generation.

**Table II. Parentage of 17 cross combinations (♀ × ♂) between advanced lines of Wyoming-selected winterhardy field pea (*P. s. ssp. arvense*) and food pea (*P. s. ssp. sativum*) cultivars, and the number of F<sub>2</sub> plants survived the winter during 2010-2011 growing season**

Crosses	# of F <sub>2</sub>	# of F <sub>2</sub> plants	# of F <sub>2</sub> plants
<i>sativum</i> × <i>arvense</i> crosses			
<u>Early Alaska (Shell)*</u> × Common-3	100	90	3
Windham × <u>Early Alaska (Shell)</u>	100	90	0
<u>Maestro (Shell)</u> × (47×C8)	50	30	0
<u>Maestro (Shell)</u> × Common-3	49	38	1
Windham × <u>Maestro (Shell)</u>	20	9	0
<u>Spring (Shell)</u> × (45×C9)	100	88	0
<u>Dwarf Gray Sugar (Snow)</u> × (47×C8)	100	94	0
Specter × <u>Dwarf Gray Sugar (Snow)</u>	100	95	2
<u>Oregon Sugar Pod II (Snow)</u> × Common-2	100	93	7
Windham × <u>Oregon Sugar Pod II (Snow)</u>	100	86	4
<u>Snowbird (Snow)</u> × Common-3	100	95	0
<u>Sugar Ann (Snap)</u> × (45×C9)	100	82	1
<u>Sugar Daddy (Snap)</u> × (45×C9)	100	78	0
<u>Sugar Snap (Snap)</u> × (58×C3)	100	87	1
<i>arvense</i> × <i>arvense</i> crosses <sup>‡</sup>			
Specter × (45×C9)	54	40	0
Specter × Common-3	50	44	33
Windham × Common	99	86	44

\*Edible type parents are underlined. <sup>‡</sup>The last three cross combinations are *arvense* × *arvense* hybridizations involving white-flowered *arvense* cultivars, 'Specter' and 'Windham', that could produce dry edible pea segregates.

One observation from the Laramie F<sub>3</sub> nursery in the 2011-2012 growing season, similar to the statement from the WAES (1910) report, is that peas do actually remain green on the vine and keep producing new flowers and new pods in late summer and early fall which is most probably desired for home gardening and commercial vegetable production due to extended harvest season into the fall. Late rains, cold nights and warmer days are most probably the reason for peas to stay green longer period of time.

#### IV. CONCLUSIONS AND FUTURE RESEARCH

We were able to combine winterhardiness from *arvense* lines/cultivars with traits of edible *sativum* cultivars and advance

the F<sub>3</sub> materials to the F<sub>4</sub> generations in the Laramie, WY growing environment. However, due to small numbers of F<sub>4</sub> seeds produced by some of the F<sub>3</sub> plants, another year of selection and seed increase would be appropriate before evaluating this advancing material in replicated trials.

We are aware of that with the intense selection for winter survival occurred in F<sub>2</sub> generation in this study, some of the desirable characteristics might have been eliminated from resulting F<sub>2</sub> populations. With plenty of F<sub>2</sub> remnant seeds, it would be appropriate to test these progenies in different locations at lower elevations where winter survival most likely to be higher. This could potentially increase the likelihood of getting the desired recombinant genotypes.

**Table III. Types of edible peas that are expected to segregate from hybridizations between winterhardy field pea (*P. s. ssp. arvense*) and food pea (*P. s. ssp. sativum*) lines used as parents in this study**

<u>Market Class</u>	<u>Genotypes*</u>	<u>Type</u>	<u>Use</u>
Garden (English, Shell)	PPRRVVNN	immature green seed	fresh, frozen, canned
Snow (Chinese)	ppRRvvNN	immature pod, thin pod walls	fresh, frozen
Snap (Sugar)	pprrvvnn	immature pod, thick pod walls	fresh, frozen
Yellow split pea	PPRRVVNN	dry seed, yellow cotyledon	pulse
Green split pea	PPRRVVNN	dry seed, green cotyledon	pulse

\*R= round, r =wrinkled seeds; P and V= presence of fibrous membrane on the inside of the pod, p and v = absence of fibrous membrane on the inside of the pod; N= thin pod wall n= thick pod walls.

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#### AUTHORS

**First Author** – Azize Homer, PhD in Agronomy, University of Wyoming, Laramie, WY, USA

**Second Author** – Robin W. Groose, PhD, As Associate  
Professor of Genetics, Agroecology and Plant Breeding,  
Department of Plant Sciences, University of Wyoming, Laramie,  
WY, USA

**Corresponding Author** – Azize Homer, **Email address:**  
ademirbas @ hotmail.com

# Clinical Study of Complicated Malaria

Dr. A. Madhav, M.D\*, Dr. K.V.L. Sudha Rani, M.D\*, Dr. B. Sudarsi, M.D\*, Dr. S. Manohar, M.D\*\*, Dr. Nallamaddi Nanditha\*\*\*

\* Asst Prof. of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

\*\* Prof & HOD of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

\*\*\* MBBS Osmania General Hospital, Hyderabad , Telangana State, India.

**Abstract-** Complicated malaria remains a major cause of morbidity and mortality worldwide this is a prospective study of clinical presentation, biochemical profile, prognosis and mortality of complicated malaria, in relation to severity of the disease, Age, Sex, and system involvement.

75 patients of complicated malaria diagnosed by peripheral smear examination admitted in Osmania General Hospital, were selected for the study. Detailed history, clinical examination, biochemical profile, blood tests and radiological studies were done to identify systemic involvement and severity of Malaria. In this study 66 patients (88%) of complicated malaria were due to plasmodium falciparum, 9 cases (12%) were due to mixed infections with plasmodium falciparum and plasmodium vivax. Among 75 patients 63(84%) were males and 12 females (16%) in the age group 12 to 66 years with mean age of 39 years.

Out of 75 patients 60% had jaundice, 60% had acute renal failure, 60% had anemia, 37% had cerebral malaria, and 37.33% had hypoglycemia.

Overall recovery rate was 82.6% while mortality was 17.35%. High case fatality was seen with acute respiratory distress syndrome (ARDS) (100%).

**Index Terms-** Complicated Malaria, Plasmodium Falciparum, Cerebral Malaria, Acute Respiratory Distress Syndrome.

## I. INTRODUCTION

Malaria is the most important protozoan parasitic diseases of humans, transmitted by the bite of infected Anopheles

## W.H.O. GUIDELINES FOR CLINICAL DIAGNOSIS OF COMPLICATED MALARIA

Severe Falciparum malaria is defined as:

One or more of the defining criteria below

Defining Criteria	Finding
Cerebral malaria (unarousable coma)	Unarousable coma not attributable to any other cause in a patient with falciparum malaria. Coma should persist at least 30 minutes after a generalized convulsion to make the distinction transient post-ictal coma.
Severe normocytic anemia	Normocytic anaemia with hematocrit < 15% or haemoglobin 5 gm/ dl in the presence of parasitemia 10.000 parasites per ml.
Renal failure	Urine output < 400 ml in 24 hours in adults, or 12 ml per kg in 24 hrs in children, failing to improve after rehydration, and with serum creatinine > 3 mg dl.

mosquitoes. It is transmitted in 108 countries containing 3 billion people and causes nearly 1 million deaths each year. Five species of the genus Plasmodium cause nearly all malarial infections in humans. These are P. Falciparum , P. Vivax , P. Ovale, P. Malariae, and—in Southeast Asia—the monkey malaria parasite P. Knowlesi , Malaria occurs throughout most of the tropical regions of the world P. Falciparum predominates in Africa, New Guinea, and Hispaniola (i.e., the Dominican Republic and Haiti); P. Vivaxis more common in Central America. The prevalence of these two species is approximately equal in South America, the Indian subcontinent, eastern Asia, and Oceania. P. Malariae is found in most endemic areas, especially throughout sub-Saharan Africa, but is much less common. P. Ovale is relatively unusual outside of Africa and where it is found, comprises <1% of isolates<sup>1</sup>

According to Unicef, in India 80.5 per cent of people reside in malaria-prone areas 22 per cent population lives in areas with high transmission and approximately 30 per cent of disease burden is reported from children.<sup>2</sup>

According to National Vector Borne Disease Control Program, there were 10,67,824 malaria cases in 2012 and in 2013, the figure was 8,36,916 A Lancet report of 2010 said that malaria may be causing about 200,000 deaths a year in India among people below the age of 70<sup>2</sup>. Most cases of complicated malaria are due to P. Falciparum. Almost all deaths are caused by falciparum malaria.<sup>1</sup>

Pulmonary edema. ARDS	Radiological evidence of pulmonary oedema (Bilateral infiltrates in the lungs on chest film).
Hypoglycaemia	Whole blood glucose < 40 mg/dl
Circulatory collapse, shock	Hypotension (systolic blood pressure < 50 mm Hg in children < 5 years old: < 70 mm Hg in adults) with cold, clammy skin
Spontaneous bleeding	Spontaneous bleeding from gums, nose, GI tract or other sites, with laboratory evidence of Disseminated Intravascular Coagulation (DIC).
Repeated generalized Seizures	>3 observed seizures within 24 hours despite cooling
Acidemia or acidosis	Arterial ph < 7.25, plasma bicarbonate < 15 mmol/lit
Hemoglobinuria	Dark red or black coloured urine with lab evidence of Hemoglobin in urine.

<b>The 2000 WHO recommendations also include the following:</b>	
<b>Additional Criteria</b>	<b>Finding</b>
<i>Impaired consciousness</i>	Impaired consciousness less marked than unrousable coma, can
<i>but arousable</i>	localize a painful stimulus
<i>Prostration and extreme Weakness</i>	Patient unable to sit or walk, with no other obvious explanation
Respiratory distress	Tachypnoea/deep breathing/nasal flaring /intercostal in drawing
Jaundice (Combined with evidence of other vital organ dysfunction)	Total bilirubin > 2.5 mg/dl
Hyperpyrexia	Rectal temperature > 40 <sup>0</sup> C <sup>3</sup>

## II. MATERIAL AND METHODS

75 cases of complicated malaria, diagnosed by peripheral smear examination, were studied in Department of Medicine at Osmania General Hospital.

Detailed history was recorded followed by thorough clinical examination to evaluate clinical status of the patient. Complete Blood Picture, Smear for MP, Liver Function Tests, Renal Function Tests, radiological studies were done. Both male and

female above 12 years, Cerebral malaria / un arousable coma, Severe anemia, Renal failure, Pulmonary edema / ARDS, Hypoglycemia, Hypotension, shock, Bleeding, DIC, Acidosis, Macroscopic. haemoglobinuria, severe Prostration or weakness, Jaundice, Hyper pyrexia were included in the study. Known cases of chronic systemic illness involving Central Nervous System, renal, haematological, and respiratory and hepatobiliary systems were excluded. Patients with history of alcoholism and those taking hepatotoxic drugs were excluded.

### III. RESULTS

**Table: 1 Sample Composition**

Total Number of Patients	75
Age Group	12 - 66
Male : Female	63 : 12
P. falciparum	66
Mixed Infections	9

Among the 75 cases of complicated malaria studied 63 were Males (84%) and 12 Females (16%) in the age group from 12 to 66 years with mean age of 39 years. 66 cases were due to P.falciparum, 9 cases (12%) were mixed infections with P.falciparum and P.vivax. Maximum number of cases (35) was falling in the age group of 31 to 40 years.

**Table : 2 VARIOUS PRESENTATIONS IN COMPLICATED MALARIA**

SI. No.	Presentation	No. of Cases	Percentage
1	Fever + Chills & Rigors	100	100
2	Jaundice	68	90.66
3	Oliguria	45	60
4	Altered Sensorium	34	45.33
5	Seizures	19	25.33
6	Abdominal Pain	11	14.66
7	Vomiting	18	24
8	Breathlessness	13	17.3
9	Myalgias	10	13.34
10	Loose Motions	3	4
11	Tremors	18	24
12	Bleeding gums	2	2.66
13	Unconsciousness	4	5.33
14	Epistaxis	1	1.33

All cases presented with moderate to high grade fever with chills and rigors. Jaundice was present in 68 patients (90.66%). Mean duration between fever and appearance of Jaundice was 5 days. Presentation with Oliguria was a frequent occurrence seen in 45 patients (60%). Neurological complaints like altered sensorium were seen in 34 patients (45.33%) and Seizures in 19

patients (25.33%). Tremors were seen in 18 patients (24%). Gastro intestinal symptoms like abdominal pain occurred in 11 cases (14.66%) and vomiting were seen in 18 patients (24%). Myalgias were seen in 10 patients (13.34%). Breathlessness was noticed in 13 cases (17.3%). 2 patients had bleeding gums and 1 patient had epistaxis.

**Table : 3 Complications in Complicated Malaria**

Sl.No	Complications	No. of cases	Percentage
1	Cerebral Malaria	28	37.33
2	Anemia	63	84
3	ARF	45	60
4	ARDS	4	5.33
5	Thrombocytopenia	45	60
6	Hypoglycaemia	28	37.33

Complications noticed in this study were, 63 (84%) had anaemia. 45 patients (60%) had oliguria with renal failure. Cerebral malaria and hypoglycaemia were noticed in 28 cases

(37.33%). Thrombocytopenia was present in 45 patients (60%). ARDS was noticed in 4 cases (5.33%)

**Table No. 4 Liver Function Tests**

Sl.No	LFT (Unit)	Range	Mean
1	Sr. Bilirubin (mg%)	0.8 – 22	6.34
2	SGPT (Iu%)	60 – 227	130.81
3	Alkaline Phosphatase (KA)	6.22	12.41
4	SGOT (Iu%)	60 – 215	128.44

Sr. Bilirubin levels ranged from 0.8 to 22 mg.% with a mean of 6.34mg% . SGPT levels ranged from 60 - 227 u% with a mean of 130.81 u%. The mean SGPT for the expired patients was 131.46 u% and 127.12 u% in survivors. Mortality was low in patients with Sr. Bilirubin levels ranging from 2-10 mg% with a percentage of 5.66. Mortality with Sr.Bilirubin ranging from II - 20 mg% was 25% and from 21 - 30 mg% was 100%

Thrombocytopenia was detected in 45 patients (60%). Platelet count ranged from 0.6 3.1 lakhs in number, there was no mortality in these patients.

#### IV. DISCUSSION

Complicated malaria presents with protean manifestations and is associated with variety of complications. The processes of cytoadherence, rosetting, and agglutination are central to the pathogenesis of falciparum malaria. They result in the sequestration of RBCs containing mature forms of the parasite in vital organs (particularly the brain), where they interfere with microcirculatory flow and metabolism.<sup>1</sup>

In this study jaundice was noticed in 68 cases. Sr Bilirubin levels > 10 mg% were seen in 15 (22%) cases .7 patients with Sr bilirubin > 10 mg% expired and had associated multi organ involvement. 3 patients had associated cerebral involvement. 2 patients had ARDS with anemia and renal involvement was seen in 2 patients. SGOT elevation was seen but not more than 3 times of normal. In Mishra et al (1992) study 66% of patients had unconjugated hyperbilirubinemia with mild elevation of Sr. Transaminases. Similar observation was made by Wilairatana et al (1994) study.<sup>12,14</sup> Severe jaundice is associated with *P. falciparum* infections is more common among adults than among children and results from haemolysis, hepatocyte injury, and cholestasis. When accompanied by other vital-organ dysfunction (often renal impairment), liver dysfunction carries a poor prognosis. Hepatic dysfunction contributes to hypoglycaemia, lactic acidosis, and impaired drug metabolism<sup>1</sup> 45 patients in this study had oliguria and acute renal failure accounting to 60% of total cases. This is similar to the trends reported in Chawla et al (1989) study where 78% had oliguria with renal failure<sup>6</sup>. Similar observation was made in Dash et al (1991) study<sup>7</sup>. Out of 45 cases 8 patients expired (17.77%). All these patients had multi organ involvement like cerebral malaria, ARDS, anemia and high Sr. Bilirubin levels. 28 Patients had features of cerebral malaria accounting to 37.33%. 4 patients of cerebral malaria had neck stiffness and CSF was normal with clear fluid, normal proteins and WBC less than 10 / micro liter. Out of 28 patients 5 patients expired with a mortality rate of 17.85%. Multi organ involvement was observed with Cerebral Malaria. In Bags et al

(1993) study the mortality rate due to Cerebral malaria was 22%.<sup>5</sup>

5.33% Patients in this study developed ARDS with associated complications like renal failure. Anemia and Jaundice. Mortality was 100%. Similar observations were made in Murthy et. al study (1989).<sup>13</sup>

Anemia was noticed in 63 cases (84%) with 12 deaths (19.04%) Mortality was more in association with cerebral involvement, renal failure, ARDS and markedly raised Sr. Bilirubin levels. Similar observations were made in 120 patients by Mathur et. al (1992) study.<sup>10</sup>

Thrombocytopenia was present in 45 cases. None of them had severe bleeding manifestations and none required transfusion, this study revealed that asymptomatic thrombocytopenia is a common manifestation of complicated malaria. Similar observations were made by Jadhav et al (2004) study were normal platelet count was present only in 21.6% cases.<sup>8</sup>

In this study 28 patients (37.33%) had hypoglycemia and Majority of patients had blood glucose levels of 40 to 50 mg% In this study out of 75 patients 62 recovered (82.6%) and 13 expired (17.35%). This mortality rate was comparable to the findings of Chawla et. al (1989) study, where it was 21% 7. In Anand et al (1992) study the mortality rate was 30%.<sup>5</sup> all the expired patients had higher incidence of cerebral involvement, ARDS and renal failure. Many of them were having associated Jaundice and Anemia. Severe falciparum malaria constitutes a medical emergency requiring intensive nursing care and careful management In acute renal failure or severe metabolic acidosis, hemofiltration or haemodialysis should be started as early as possible. Parenteral antimalarial treatment should be started as soon as possible.<sup>1</sup>

#### V. CONCLUSION

Complicated malaria presents with Protean Manifestations. Jaundice, acute kidney in jury, cerebral malaria, Anemia when associated with multiple complications has high mortality. Retinal hemorrhages indicate poor prognosis. ARDS has bad prognosis and high mortality in association with other complications. Old age is found to be a poor prognostic factor. Delayed diagnosis and delayed treatment is another cause for poor prognosis.

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#### AUTHORS

**First Author** – Dr. A. Madhav, M.D Asst Prof. of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

**Second Author** – Dr. K.V.L. Sudha Rani, M.D Asst Prof. of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

**Third Author** – Dr. B. Sudarsi, M.D., Asst Prof. of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

**Fourth Author** – Dr. S. Manohar, M.D Prof & HOD of Medicine, Osmania General Hospital, Hyderabad , Telangana State, India.

**Fifth Author** – Dr. Nallamaddi Nanditha, MBBS Osmania General Hospital, Hyderabad , Telangana State, India.



# Role of Narrow Band Imaging in Early Detection of Upper GI Malignancy

Dharmendra Dugar\*, Sagar Khadanga, M.D\*\*, Shakti Satapathy\*\*\*, Deepti Sureka Mummidi\*\*\*\*, Ramji Khetri, M.S\*\*\*\*\*

\* Assistant professor, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

\*\* Assistant professor, Department of General Medicine, AIIMS, Bhopal, M.P, India.

\*\*\* Consultant radiologist, Care Hospital, Bhubaneswar, Odisha, India.

\*\*\*\* PG, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

\*\*\*\*\* Professor, Department of General surgery, Hi-Tech Medical college and Hospital, Bhubaneswar, Odisha, India.

**Abstract- Introduction:** Gastrointestinal cancer is the second most common cancer in Asia and second leading cause of death worldwide. It is a leading cause of cancer associated mortality. Hence, there is a need for early detection of GI cancer. Narrow band imaging (NBI) is a novel technology that enhances visualization of the vascular network and surface texture of mucosa, thereby assisting in tissue characterization, differentiation and diagnosis. NBI is used in early detection of inflammatory and neoplastic lesions of esophagus, stomach and large intestine.

**Material & method:** We conducted a prospective interventional type of hospital based study of 40 patients at Hitech medical college. All patients of any ethnicity presenting to Hitech medical college and hospital, Bhubaneswar, for upper GI endoscopy regardless of indication (screening, surveillance or symptoms) were included in this study.

**Result:** Fourty patients were included in this study with no macroscopic lesion on normal white light endoscopy. But, when subjected to narrow band imaging, significant findings were observed. In our study, it was observed that out of 40 cases suspected to be malignant, 13 cases reported positive for esophageal cancer, 9 cases reported positive for gastric cancer and 1 case reported to be positive for duodenal dysplasia. 1, 13 and 3 cases reported to be esophagitis, gastritis and duodenitis respectively

**Conclusion:** It is thus concluded that narrow band imaging is a good modality for early detection of upper GI malignancies and requires further expertisation. On the basis of the study result, the use of NBI technology is recommended for routine upper GI endoscopy.

**Index Terms-** Narrow band imaging [NBI], Early gastric cancer [EGC], Gastrointestinal [GI].

## I. INTRODUCTION

Gastrointestinal cancer is the second most common cancer in Asia and second leading cause of death worldwide. It is a leading cause of cancer associated mortality. Hence, there is a need for early detection of GI cancer. The incidence of GI cancer is high in Japan but the mortality due to it is significantly low. This all owes to the available boon of advanced scientific technology for early detection of GI cancer. Comparatively, there is low incidence but very high mortality in India. This is because of delay in detection of malignancies at an earlier stage.

Early gastric cancer (EGC) which is defined as a lesion confined to the mucosa or submucosa regardless of presence of lymph node metastasis and has a good prognosis with surgical treatment. Before 2005, patients were subjected to white light endoscopy and biopsies were taken from gross pathological abnormality. Thirty six percent of biopsy reports were suggestive of malignancy at an advanced stage, 58% required repeat biopsies. These patients were posted for repeat upper GI endoscopy and biopsy. These might be the cause for delay in diagnosis of malignancy<sup>1</sup>. Year 2005 has been a boon to endoscopic sciences with invent of narrow band imaging. Narrow band imaging (NBI) is a novel technology that enhances visualization of the vascular network and surface texture of mucosa, thereby assisting in tissue characterization, differentiation and diagnosis. This technology involves placement of narrow band filters in front of a conventional white light source to obtain tissue illumination at selected narrow wave length bands. NBI has primarily been applied for analysis of the surface architecture i.e. pits pattern and analysis of vascular network. Small capillary vessels on the mucosal surface can be seen most clearly at 415nm which is the wave length that corresponds to the hemoglobin absorption band, while large collecting vessels can be observed at 540nm<sup>2,3</sup>. NBI is used in early detection of inflammatory and neoplastic lesions of esophagus, stomach and large intestine. It is useful to distinguish between adenomatous and non-adenomatous polyps. NBI is also used for surveillance of Barrett's oesophagus and patients at high risk for squamous cancer of oropharynx, oesophagus and stomach<sup>1</sup>.

## II. AIMS AND OBJECTIVES

The aim of the study is to determine the efficacy of narrow band imaging in early detection of upper GI malignancy.

## III. MATERIALS AND METHODS

The study was conducted in the department of general surgery, Hitech medical college and hospital, Bhubaneswar during the period July 2013 to March 2015.

## INCLUSION CRITERIA

All patients of any ethnicity presenting to Hitech medical college and hospital, Bhubaneswar, for upper GI endoscopy regardless of indication (screening, surveillance or symptoms).

#### EXCLUSION CRITERIA

- 1) Macroscopic lesions
- 2) Pregnant patients
- 3) Inability to take biopsy due to anti-coagulation therapy, varices etc.

#### IV. OBSERVATIONS

The study was conducted in department of surgery, Hitech medical college and hospital, Bhubaneswar. 40 patients were included in this study. These patients had no macroscopic lesion on normal white light endoscopy. But, when subjected to narrow band imaging, significant findings were observed. Biopsy were taken from suspected lesions and sent for histopathological reporting. 23 cases were suggestive of malignancy, while 17 cases suggestive of inflammatory pathology (Table-1). In our study the mean age for upper GI malignancy in males is 57.3 years and in females it is 52.4 years. The overall mean age for upper GI malignancy observed is 54.8 years (Table-2). In our study, it was observed that out of 40 cases suspected to be malignant, 13 cases reported positive for esophageal cancer, 9 cases reported positive for gastric cancer and 1 case reported to be positive for duodenal dysplasia. 1, 13 and 3 cases reported to be esophagitis, gastritis and duodenitis respectively (Table-3)

#### V. DISCUSSION

Gastric cancer is the second most common cancer among men and third most common among females in Asia and Worldwide. Gastric cancer is the fifth most common cancer among males and seventh most common among females in India. The aggressiveness of the disease and need for improvement in therapeutic options is discerned by the fact that gastric cancer is the second most common cause of cancer death globally<sup>4</sup>. Cancer is a word which has become a night mare for relatives of the patients. There are different modalities for treatment of advanced cancer but none has been able to significantly improve the 5 year survival rates. Hence there is a need for early detection of upper GI malignancy. White light endoscopy has been observed to be helpful in cases with macroscopic lesion. There is a need to identify and cure the cancer at an earlier stage i.e. before appearance of macroscopic lesion. Thanks to advent of narrow band imaging, NBI describes the microvasculature and micro-structure of the GI tissue. There is no requirement for introduction of additional dye or stain in NBI.

In this study, 40 cases have been observed. These 40 cases were missed for their significant lesion on white light endoscopy. Significant vascular and surface architecture changes were observed in these cases on NBI. We have been able to diagnose 23 cases at an earlier stage. These cases thus would be treated with proper surgical resection, while only palliative procedure would have been possible if they were diagnosed at an advanced stage. Remaining 17 cases have been diagnosed at chronic inflammatory stage. These 17 cases have been thus diagnosed at

pre- cancerous stage. This has proved to be useful for starting necessary prophylactic treatment for the patients. Follow up endoscopy every year has been advised to these 17 cases. Equal number of cases of both genders have been included in this study. In our study, it has been observed that most of the cases have presented in 50-70 years of age group. The vascular and cellular changes in these study cases were detected by this novel technology of narrow band imaging and not by routine white light endoscopy. This proves sensitivity of narrow band imaging to be 100% as compared to white light endoscopy on basis of our study observations. This finding is consistent with study conducted by Yasuo Hamamoto et al, Mannath et al and Raghunath for higher sensitivity of narrow band imaging in comparison to white light endoscopy<sup>5,6</sup>.

#### VI. CONCLUSION

The present study of 40 patients was conducted at Hitech medical college and hospital, Bhubaneswar and patients were subjected to upper GI endoscopy with white light imaging followed by Narrow Band Imaging. These patients had no macroscopic lesion like ulcer, polyp, mass etc but significant finding on narrow band imaging. Biopsies were taken from lesion suspected to be malignant in these 40 cases and sent for histopathological confirmation. In 57.5% cases malignancy has been proved on histopathological reporting. NBI has proved to be a fruitful technology for all the case study patients. Thus, it is concluded that narrow band imaging is a good modality for early detection of upper GI malignancies and requires further expertisation. On the basis of the study result, the use of NBI technology is recommended for routine upper GI endoscopy.

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#### AUTHORS

**First Author** – DHARMENDRA DUGAR, M.S. Assistant professor, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

**Second Author** –SAGAR KHADANGA, M.D. Assistant professor, Department of General Medicine, AIIMS, Bhopal, M.P, India.

**Third Author** – SHAKTI SATAPATHY, Consultant radiologist, Care Hospital, Bhubaneswar, Odisha, India.

**Fourth Author** –DEEPTI SUREKA MUMMIDI, PG, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

**Fifth Author** – RAMJI KHETRI, M.S. Professor, Department of General surgery, Hi-Tech Medical college and Hospital, Bhubaneswar, Odisha, India.

**Correspondence Author** – Dr.DharmendraDugar M.S. Assistant professor, Department of General surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

**TABLE-1**  
**Findings of narrow band imaging**

CANCER	NUMBER	PERCENTAGE
Positive	23	57.5%
Negative	17	42.5%
Total	40	100%

Narrow band imaging detected 57.5% malignancy with normal white light endoscopic finding

**TABLE -2**  
**The overall mean age for upper GI malignancy**

SEX	MEAN	SD	MINIMUM	MAXIMUM
MALE	57.3	13.98	32	80
FEMALE	52.4	17.24	15	75
OVERALL	54.85	15.69	15	80

GI malignancy are more common in age group 50-60 years

**TABLE -3**  
**Malignancy detected in narrow band imaging**

Sr. No	HISTOPATHOLOGY	MALE CASES	FEMALE CASES	TOTAL
1	OESOPHAGITIS	1	0	1
2	OESOPHAGEAL CANCER	4	9	13
3	GASTRITIS	7	6	13
4	GASTRIC CANCER	6	3	9
5	DUODENITIS	1	2	3
6	DUODENAL DYSPLASIA	1	0	1
	TOTAL	20	20	40

Table shows early detection of carcinoma in 23 cases and inflammatory lesion in rest.

# Agricultural Land Decline in Kerala; an Investigation

Shaharban KP ( Student ) \*, Shabana T.P (Assistant lecturer) \*\*

\* Post Graduate and Research Department of Zoology, Farook College , Kozhikode, Kerala- 673632

\*\* Post Graduate and Research Department of Zoology, Farook College , Kozhikode, Kerala, 673632

**Abstract-** Industrialization and urbanization affect agricultural land and lead to its scarcity. This change in turn affects the biodiversity, ecosystem and socio-economic conditions. In this context, changes in land use pattern, productivity, food security are matter of major concern. The agricultural sector is facing the most serious threats from overexploitation and conversion of land into other uses which results in degradation and depletion of agricultural land. The growth trend in agricultural sector has not been consistent in Kerala with a decline in the contribution to the state income. Agricultural land conversion, especially which of paddy fields, has been a burning issue in recent times both from the perspective of food security and its environmental impacts.

**Index Terms-** Biodiversity, Ecosystem, Food security, Degradation.

## I. INTRODUCTION

Majority of people in Kerala depend on agriculture and related activities for their living. Paddy cultivation was part of the proud culture of Kerala state. But now the picture has is n changing. Agriculture in Kerala has passed through many changing phase. Land reduction occurs widely, mainly land use change hence agricultural land declined dramatically. Biodiversity in agricultural fields has now become history of past. The firm attachment of farmers with land has been lost in Kerala. Paddy farms and rice fields are fast disappearing and diminishing from Kerala that creates threat to food security of the state. Paddy fields are being converted and residential and commercial buildings are being constructed.

According to the "Land reforms Survey" conducted in 1966-1967, there were 19.06 lakhs agricultural holding in Kerala, of which one percent was above 10 hector in extent. At the lower extreme, nearly 55% of the holdings were below 0.4 hector. The average size of holding was only 0.72 hector. By 1971, the number of holdings increased to 20.22 lakhs. In the years that followed the holdings were divided further quite rapidly. Agricultural census (1990 -1991) shows that there were over 54.18 lakh holding in Kerala of which nearly 84% were of less than half a hector in size with population growth and increasing pressure on limited land resources, the holding continue to get progressively sub divided leading to the emergence of still smaller holdings. At this juncture an investigation regarding agricultural land decline in kerala is highly significant.

## II. METHOD OF STUDY

The major objective of the study is to identify the reasons for the reduction of Agricultural land in North Kerala. The

investigation was undertaken during the year 2012-2013 at 4 districts of North Kerala (Kannur, Kasarkode, Kozhikkode, Malappuram).By purposive sampling method the samples were selected for the study. A structured questionnaire was used to collect data from farmers by personal interview method. The data collected were statistically analyzed by calculating frequency, percentage, and mean. The reasons for land decline have been analyzed and also an attempt has been made to study the changes that have occurred in the agricultural practices of people.

## III. RESULT AND DISCUSSION

**Table1 The farmers were categorized into different subdivision according to distribution of their land in the following:**

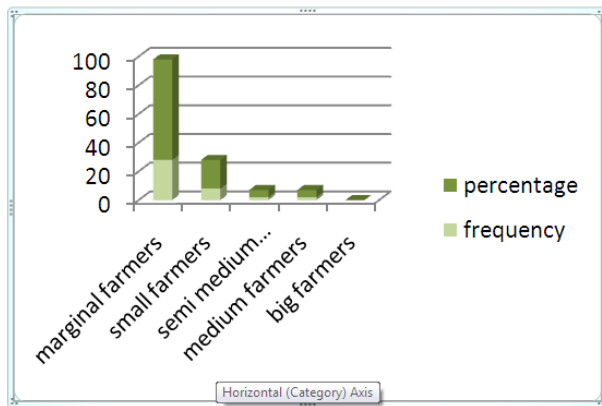
Category	Land holding
Marginal Farmers	Up to 2.50 acre
Small Farmers	2.50 to 5.00 acre
Semi- Medium Farmers	5.01 to 10.00 acre
Medium Farmers	10.01 to 25.00 acre
Big farmers	>25.00 acre.

From the table it is clear that on the basis of their land holdings farmers are categorized in to five division viz; Marginal Farmers ,Small Farmers ,Semi- Medium Farmers ,Medium Farmers and Big farmers. Data were collected from each category of farmer and is presented below in table.

**Table2 Frequency distribution of different categories of farmers is presented below in table: (n=40)**

	Frequency	Percentage
Marginal farmers	28	70
Small farmers	8	20
Semi-Medium farmers	2	5
Medium farmers	2	5
Big farmers	-	-

**Figure1 Frequency distribution of different categories of farmers is presented below in figure:**



The above given table2 and figure1 show that, about 70% of respondents belong to marginal farmers category, followed by 20% belong to small farmers category. Only 5% of farmers belong to semi – medium farmers and none of them are categorized as big farmers.

One of the main reasons for land decline in agriculture is population pressure. The rapid development of tertiary sector and growing pressure from population growth has led to the situation where, agricultural lands throughout the state are being used for residential buildings, roads, and commercial establishments which reduce the areas under cultivated crops. “Yet another way of looking at the situation with respect to the population pressure is examining the changes in land use pattern. Increase in population pressure can lead to expansion of agricultural land and intensification of cultivation and after a stage it can cause conversion of agricultural land into residential and industrial area.”(D.Radha Devi and N.Ajith Kumar-2011).

The cultural transformation of the population in the state also has contributed to the land decline of agricultural land in the state. The land lords found better social status in government services. The gulf boom also made visible changes in the outlook of the average Keralait. Younger generation access to better education and blue and white collar job (many of them low-paid) found agriculture and related jobs strenuous and menial. This self denial of the land-related by the youngsters in the state has added a sociological elimination to the land decline of agriculture in Kerala. “The younger generation had developed a sort of aversion to take up paddy cultivation and they prefer white collar jobs. They are better educated than old generation, younger generation in the study area are attracted towards gulf countries because of higher learning job opportunities and they considered it as symbol of their social status” ( Ms.Sheeba Abraham).

Decline in the profitability of agricultural product leads to the conversion of agricultural land. The material and labor cost have been high in Kerala in nearby years. Price of fertilizers has increased manifold. The decline in farm price, in the absence of any north worthy increase in farm productivity, adversely affected the profitability of major crops of Kerala.

Climate also seems to be a playing role. Traditional monsoon and Njattuvela have been abnormally dry and changed nowadays. It is really bad for farmers as traditional crops such as

coconut and areca nut has trouble growing in dry and hot condition.

Uneconomic size of holding deters the young people from traditional farmer households to take up cultivation as fulltime occupation. The land reforms in Kerala thus inhibited free capital formation in the sector and restricted the scope of large –scale scientific farming. The agrarian structure of Kerala is dominated by the large –scale presence of marginal holdings.

Another reason to be discussed is the loss of skilled labors. The employment opportunities, for the semi -skilled and skilled members of farmers in other sectors have given them more profit. The large scale migration of rural youth to foreign countries and other states in industrial or other sectors also add to the shortage in supply of rural labor willing to contribute human power to the cultivation of crops here.

According to Kerala Conservation of paddy land and Wetland act (2008) which eventually prevents land holders from converting wetland to other uses. Even if the land is sold, it remains wetland and cannot be used for anything aside from rice cultivation. Land value of wetland must have dropped dramatically after this bill was introduced. But widely bribe way out wetlands status. There is loop hole in the act. It says” you can build on wetland if the structure, with in which one’s family may live is classified as the pump house. In Kerala land is not treated as a means of production but as an asset and for speculative exchange. The speculative investors and real estate developers who have no interest in farming have already entered the land market as buyers.

According to pre amble of the Kerala conservation of paddy land and wetland act (2008) it has come to the notice of the government that indiscriminate and uncontrolled reclamation and massive conversion of paddy land wetland is taking place in the state. And there is no existing law to restrict effectively. The conversion or reclamation of paddy land and government are satisfied that it is expedient, is public interest to provide for the conservation of paddy land and wetland and to restrict the conservation or reclamation thereof, in order to promote agricultural growth, to ensure food security, and to sustain the ecological system in state of Kerala.

Reduction in land also causes the depletion of biodiversity and productivity. The area conversion of paddy fields leads to ecological impacts also. It depletes the small fishes, creature etc from paddy land. It also depletes the ground water in the study area. Therefore, the ecological system loss its quality irrecoverably forever and the entire society is the loser. (Ms Sheeba Abraham.)

#### IV. IMPLICATIONS

1. 70% of the respondents belong to marginal farmers category. , followed by 20% belong to small farmers category. Only 5% of farmers belong to semi – medium farmers and none of them are categorized as big farmers.
2. One of the main reasons for land decline in agriculture is population pressure.
3. Climate also seems to be a playing role. Traditional monsoon and Njattuvela have been abnormally dry and changed nowadays

4. Decline in the profitability of agricultural product lead to the land reform of agricultural land.
5. The cultural transformation of the population in the state also has contributed to the land decline of agricultural land in the state.

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#### AUTHORS

**First Author** – Shaharban KP ( Student ), Post Graduate and Research Department of Zoology, Farook College , Kozhikode, Kerala- 673632 , shaharbankp26@gmail.com

**Second Author** – Shabana T.P (Assistant lecturer), Post Graduate and Research Department of Zoology, Farook College , Kozhikode, Kerala, 673632, tpshabana2000@gmail.com

# Immediate Constituent Analysis (ICA)

Badri Abdulhakim.D.M.Mudhsh, Ayman Hamid Al-Takhayinh, Othman Aref Al-Dala'ien

Research scholars, Department of linguistics, Aligarh Muslim University, AMU

**Abstract-** This paper gives a concise study of I.C. Analysis. Moreover, this is a method of sentence analysis which was first mentioned by Leonard Bloomfield and developed further by Rulon Wells. As we know, the practice of I.C. Analysis is now widespread. This paper starts with a brief introduction of I.C. Analysis and explores what is I.C. Analysis. It also gives illustration of how sentences are analyzed and divided into constituents in the large construction. Then it discusses what is ICA, and its approach and frame. In this paper we also know how to analyze the ICA and how we analyze ICA sentences and it also discusses what are the limitations of ICA.

**Index Terms-** Immediate Constituent Analysis (ICA)

## I. INTRODUCTION

ICA (Immediate Constituent Analysis) and the traditional sentence analysis during the 1950s. It views out that both fail to provide a definite criterion for the limit of constituent segmentations. The emphasizes that the fundamental defect of ICA is that the notion of heads does not play any role therein. ICA only gives a set of binary structural patterns, but not the association patterns composed of various binary patterns. ICA also fails in producing the multi-valence semantic relations. A new method is then posited which is named Direct Constituent Analysis which asserts the unique head of the word and the layer structure centered on the head of the word.

The ICA of a sentence can be represented as a labeled bracketing of the sentence in which matched brackets enclose a constituent subparts of the sentence and label on these brackets specifies the grammatical category of the constituent.

The I.C. Analysis process reached a full blown strategy for analyzing sentence structure in the early works of Noam Chomsky. Most of the tree structures employed to represent the syntactic structure of sentences are parts of some form of I.C. Analysis. The structuralists ignored meaning and emphasized that the language should be studied in a mechanical ways, and a

linguist should therefore discover the various constituents of language as element in the larger construction which is called a sentence.

## II. OBJECTIVES OF THE STUDY

- 1- To give a brief study about ICA in general.
- 2- To highlight what is ICA.
- 3- To know how ICA is analyzed.
- 4- To illustrate examples of how ICA sentences are analyzed.

**I.C. Analysis – Definition:** is an implicit assumption that linguistic structure, especially syntactic structures are layered structures amenable to analysis by progressive dichotomous cutting.

**In another word I.C. Analysis** is that system of grammatical analysis that breakup sentences into sequential layers, or constituents until in the final layer, and every constituent consists of only a word or meaningful part of a word.

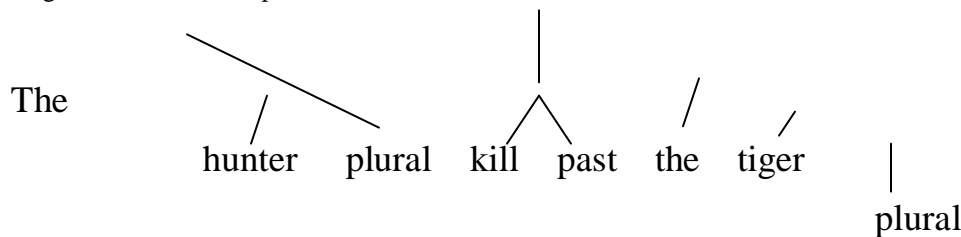
**Approach of I.C. Analysis:** The initial emphasis was upon pure segmentation, simply breakup the sentence into its constituent parts without, at first, knowing what these parts were: Generally the section is binary except in some cases where section into three or more points is allowed.

**Terms:** Ultimate, immediate, and larger construction, linear structure.

**(i) The concept of constitute and constituent:** The important thing to note here is the fact that constitute and constituent are relative terms. For example, “poor John” is a constitute when viewed in relation to “poor” and “John”, but it is a constituent when viewed in relation to the sentence as a whole.

**(ii) Morphemes as Ultimate Constituents:** The proponents of IC analysis also emphasized that the ultimate constituents of a sentence are morphemes and not words. Hockett (1958), “morphemes rather than words are the elementary building blocks of language in its grammatical aspect.”

The tree diagram will make this point clear.

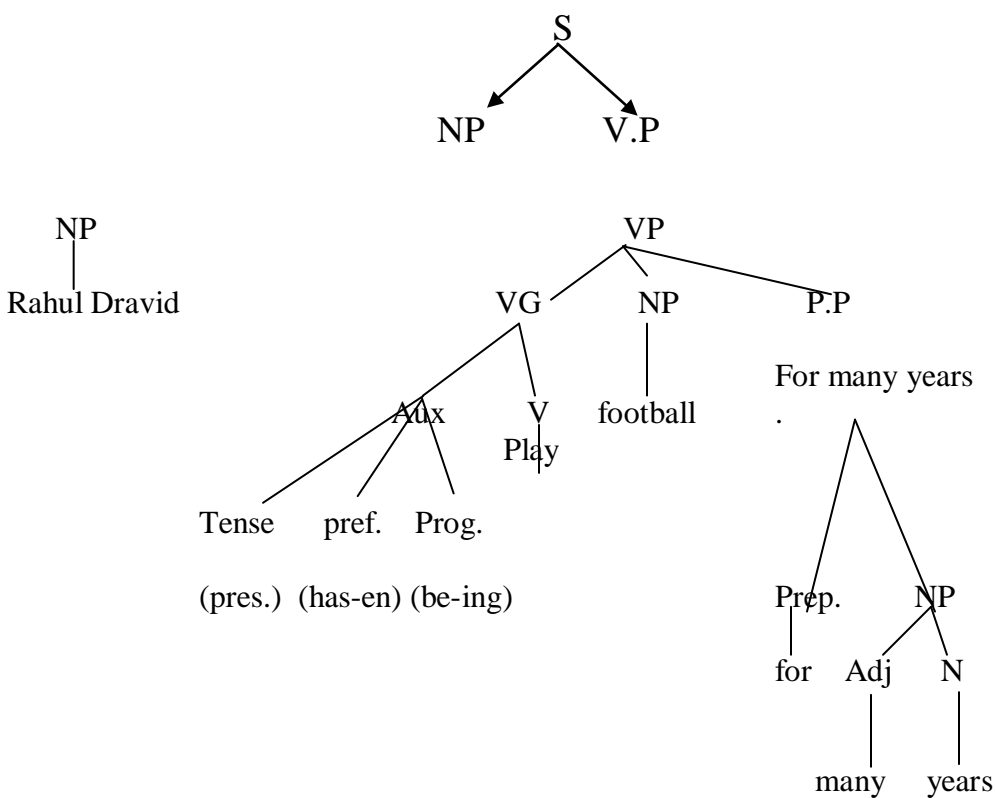


Figure(1)

That the ultimate constituents of a sentence are morphemes and not words is one of the basic assumptions of grammatical analysis these days but during the early days of linguistics it was useful to emphasize such things.

**I.C. Analysis of Sentences:** A single sentence is made up of an NP (subject) and a predicate phrase. This predicate phrase which is apart from a compulsory verbal group may optionally have one or more noun phrase(s), preposition phrase(s) and adverbial and adjective phrases. Here are a few examples:

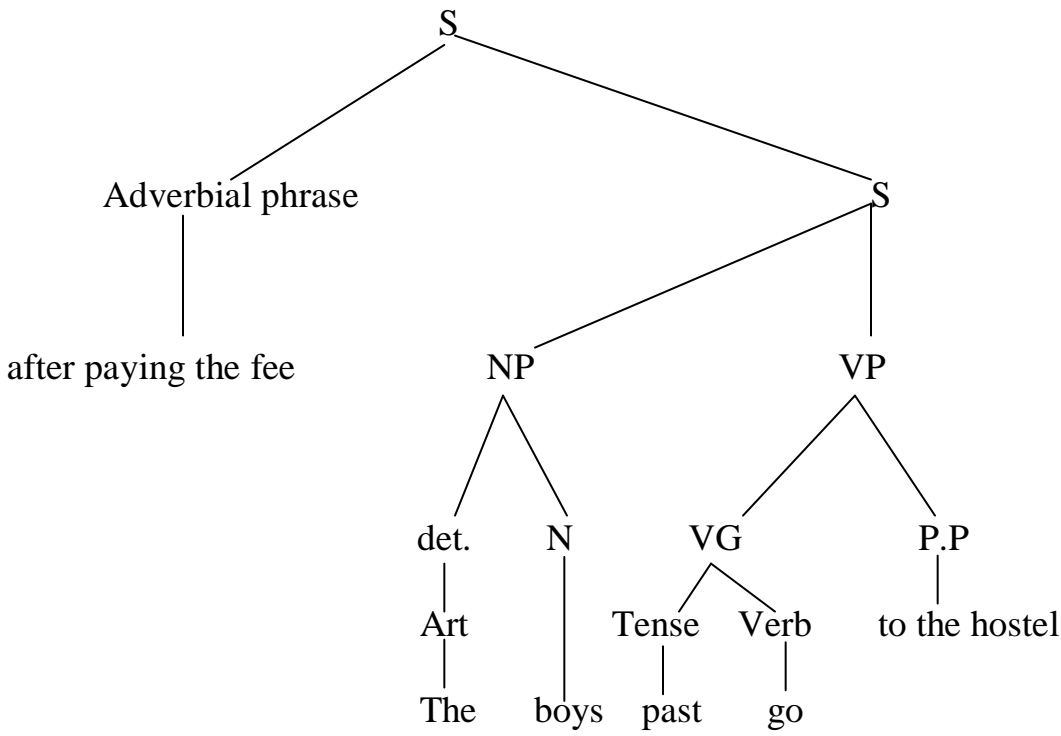
(i) Rahul Dravid has been playing football for many years.



Figure(2)

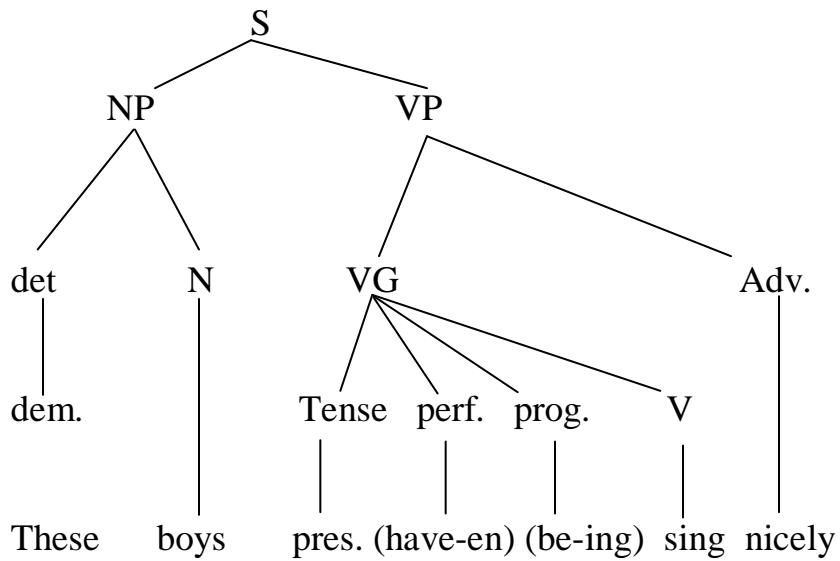


(ii) After paying the fee the boys went to the hostel.



Figure(3)

(iii) These boys have been singing nicely



Figure(4)

### III. LIMITATIONS OF IC ANALYSIS

(A) Immediate constituent analysis has its limitations: It is not constituent analysis has its limitations. It is not possible to analyze like such structures, as they do not form proper grammatical groups. For example, hence is a sentence: She is taller than her sister.

In this sentence, the sequence –er than is not covered by IC analysis.

(B) IC analysis is not below the words: In IC analysis it is tacitly assumed that there will be no division into pieces. Smaller than words (morphemes) until all the words have been divided.

(C) Unbalanced Bracketing: IC analysis does not refer to our grammatical knowledge. So it does not take us very far and without the help of labeled bracketing we cannot point out the source of ambiguity in many sentences. The labeled bracketing can be used to differentiate the two possibilities in an example that is often against IC analysis.

Flying planes can be dangerous. Here, in one case ‘flying’ is the head of the noun phrase while on the other hand is ‘planes’.

### IV. CONCLUSION

This paper briefly discusses the immediate constituent analysis and it also gives account of what is ICA by giving clear illustration and examples. It starts with the introduction of ICA and how was the ICA developed from 1950s onwards. Then it discusses what is ICA, and its approach and frame. In this paper we also know how to analyze the ICA and how we analyze ICA sentences and it also discusses what are the limitations of ICA.

### ACKNOWLEDGMENT

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### AUTHORS

**First Author – Badri Abdulhakim.D.M.Mudhsh**, Research Scholar At Aligarh Muslim University, AMU  
badrimudhsh@yahoo.com.

**Second Author – Ayman Hamid Al-Takhayinh**, research scholar, Aligarh Muslim University, AMU,  
aymantakhayinh@yahoo.com

**Third Author – Othman Aref Al-Dala'ien**, research scholar, Aligarh Muslim University, AMU, Othman.dalain@yahoo.com.

**Correspondence Author – Badri Abdulhakim.D.M.Mudhsh**, (badrimudhsh@yahoo.com) (00917060888157).

# Spectrophotometric determination of complex formation equilibria of copper (II), metformin and halides in methanol.

Monica A. Valtierra-Alvarado<sup>1</sup>, M. Pamela Solano-García<sup>2</sup>, María del Refugio González-Ponce<sup>3</sup>, José J. N. Segoviano-Garfias<sup>4</sup>

<sup>1</sup> Unidad Académica de Ciencias Químicas, Universidad Autónoma de Zacatecas, Zacatecas, Zac. México.

<sup>2</sup> Escuela de Ciencias Biológicas. Universidad Autónoma de Coahuila, Unidad Torreón. Torreón, Coah. México.

<sup>3</sup> Departamento de Ingeniería Bioquímica. Instituto Tecnológico Superior de Irapuato. Irapuato, Gto. México.

<sup>4</sup> Departamento de Ciencias Ambientales. División de Ciencias de la Vida. Universidad de Guanajuato. Campus Irapuato-Salamanca. Irapuato, Gto. México.

**Abstract-** Metformin is prescribed against Diabetes Mellitus II, nevertheless its mechanisms of action are not fully understood. Several studies suggest that mitochondrial copper is chelated by metformin and the properties of the copper-metformin complex could generate the therapeutic activity.

In this work, a spectrophotometric study was performed in order to evaluate in methanol, the stability of the species copper-metformin and copper-metformin-halides. The formation constants and the calculated electronic spectrum of each species at 298 K, are reported. According with our results and considering the mitochondrial chloride concentration reported elsewhere, we hope that these data can be correlated with possible implications in vivo.

**Index Terms-** Copper(II) complexes; equilibria; metal-based drugs; Metformin.

## I. INTRODUCTION

Diabetes Mellitus II is considered a group of syndromes affecting the carbohydrate metabolism, in which the common symptom is chronic hyperglycemia. The etiology of Diabetes Mellitus type II, which is not curable but treatable, is not well understood yet. The main symptom is usually a high glucose level; this promotes the beginning of several disorders related to the deficiency of the available insulin, manifested through the secretion, absorption and muscle resistance to insulin [1, 2], later several long-term metabolic consequences, are generated.[3] The prevalence of Diabetes around the world is alarmingly growing. The world health organization estimated that by 2030 the diabetic individuals would rise to 336 million[4] on the other hand the International Diabetes Federation (IDF), shows a higher number, they estimate that by 2035 the diabetics individuals would be about 592 millions.[5] Some risk factors, such as sedentary lifestyle and obesity, may promote Diabetes [6], on the opposite, Diabetes sometimes can be controlled by exercise.[7]

Usually, an oral hypoglycemic agent is required for an adequate blood glucose control.[1] Dimethylbiguanide or metformin(metf) is usually the first-line drug most widely prescribed as glucose-lowering agent in the treatment against

Diabetes type II. [8, 9] This prescription has been effectively used as a single drug or combined commonly with glibenclamide.[10] Globally, over 100 million patients are prescribed with this drug annually.[8] Metformin promotes several effects, usually decreases the hepatic glucose production, increases glucose disposal by insulin mediated, decreases fatty-acid oxidation and the glucose intestinal absorption.[11] Also population studies suggest that metformin exposure is associated with reduced cancer risk or an improved prognosis, possibly by their antineoplastic activity[12] Recently, is being evaluated to be incorporated in the treatment or prevention of several diseases, such as colon cancer[13], papillary thyroid cancer[14] and Alzheimer's disease.[15]

Metformin has been known since 1957, however despite the simplicity of their chemical structure and multiple detailed investigations, its cellular mechanism remains unknown. Several theories have been elaborated to explain metformin action[8]. Yet, its molecular mechanism of action remains an important area of Diabetes research.[9] Recent studies propose a relationship between mitochondrial copper and metformin, in which metformin could be related to mitochondrial respiration. These studies suggest that mitochondrial copper is targeted by metformin and cellular effects generated by metformin, are probably related to the properties of the copper-metformin species.[16, 17] A mechanism suggested of action for the metformin, is through inhibition of complex I, affecting the mitochondrial respiratory chain. However, the precise mechanism of this inhibition has not yet been established.[16, 17] This allows theorize that metformin could act in cells at least in part as a copper-binding prodrug.[17]

We are interested to contribute to the understanding of the binding properties of the metformin with copper(II), and establish a possible softness or hardness character of the complexes. In this work, we report the formation constants in methanol of the copper complexes with metformin, and their respective halogen ternary complexes.

## II. METHODS AND MATERIALS

### 2.1 Materials.

$\text{Cu}(\text{NO}_3)_2 \cdot 2.5\text{H}_2\text{O}$ , sodium chloride and sodium bromide (Fermont, México) were analytical grade and used without further purification. Metformin was obtained from tablets Predial (Silanes, México). Methanol HPLC grade (Fermont, México) was used as purchased as solvent for the determination of formation constant and for the extraction of metformin from tablets. Due to solubility problems no ionic strength was used.

## 2.2 Physical Measurements.

All spectral measurements were made in a Cary 50 UV-Vis Spectroscopy System, at 298 K (RT) using a quartz cell with 1 cm of path length. For the determination of formation constants, the spectrophotometric data were refined with the program HypSpec[18-20]. The observed spectral region was from 250 to 350 nm for all the experiments, excluding determination of the molar absorptivity coefficient for metformin, where the observed spectral region was from 200 to 800 nm. Distribution diagrams of species were calculated using the software Hyperquad simulation and speciation (HySS).[21]

## 2.3 Metformin extraction and purification

Tablets of metformin were finely powdered and homogenized with methanol. The solution was filtered in vacuum and stored at 277 K until formation of metformin crystals; these were separated with vacuum filtration.

## 2.4. Determination of the molar extinction coefficient of Metformin

A stock solution 0.00009M of metformin was prepared. Concentrations of metformin were varied from 0.00001 to 0.00009 M. A total of 10 points were used for the molar absorptive coefficient.

## 2.5. Copper(II)-metformin equilibrium studies

Experiments were performed using two different stock solutions of metformin (0.00371M and 0.00620M).  $\text{Cu}(\text{NO}_3)_2 \cdot 2.5\text{H}_2\text{O}$  was used to prepare copper stock solutions (0.00210M and 0.00348M). The metformin concentrations were varied from 0.00004M to 0.00074M and 0.00006M to 0.00124M, respectively, in each experiment. The final copper concentration was set constant at 0.00021M and 0.00035M, respectively. A total of 40 spectra were used for the refinement.

## 2.6. Copper(II)-metformin chloride and bromide equilibrium studies.

For the copper(II)-metformin-halide system, two stock solutions of metformin (0.00223M and 0.00372M),  $\text{Cu}(\text{NO}_3)_2 \cdot 2.5\text{H}_2\text{O}$  (0.00206M and 0.00344M) and sodium chloride or sodium bromide (0.00125M and 0.00202M) were prepared. For both experiments, the final copper concentration was set constant at 0.00021M and 0.00034M and metformin at 0.00022M and 0.00037M, respectively. The chloride or bromide concentrations were varied from 0.00001M to 0.00025M and 0.00002M to 0.00044M, respectively. A total of 39 spectra were used for the refining process.

## III. RESULTS AND DISCUSSION

In all the equilibrium determinations, it is required to avoid the use of ionic strength, because it promotes the precipitation of the copper complexes. Also, has been reported that copper-metformin complexes are sensitive to pH, possess a strongly hydrophilic character with a pKa within the physiological pH range.[17] Because of this, in order to obtain a clear association between copper(II) and metformin, is necessary to avoid the generation of hydroxyl- or protonated species, methanol was used instead of water. This solvent has a donor number of 19 and water of 18, yet methanol is slightly a better nucleophile than water.[22, 23]

### 3.1 Determination of the molar absorptivity of metformin

The determination of molar extinction coefficient for metformin has been reported before under several conditions, there is a few reports about the determination of the extinction coefficient of metformin in pure methanol (Table 1).

**Table 1. Molar absorbance of metformin under several conditions.**

$\epsilon(\text{L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1})$ , $\lambda_{\text{max}}(\text{nm})$	Solvent, Reference	Ionic strength (M), salt , pH
$12400 \pm 400$ , 232	Water,[31]	0.01, sodium phosphate, 7.1
13340 , 216	Water,[32]	0.1, NaOH.
12360, 237	Methanol, [33]	
13785.87, 237.5	Methanol, [34]	

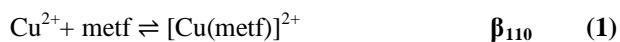
Electronic spectra of metformin at different concentrations in methanol solution are presented in Fig. 1a.

A maximum absorption value for metformin solutions was detected at 236 nm, the extinction coefficient was calculated using the Lambert and Beer Law and the value obtained is  $11302.60 \pm 275.25 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$  with a  $R^2$  of 0.9959 (Fig. 1b). In which the obtained value in this work is within the error under the conditions reported before.

### 3.2. Formation constants of the copper(II)-metformin.

Copper(II)-metformin complexes have been studied before, crystal structures of the *bis*-complexes are reported in alkaline aqueous solution as monohydrate[24], octahydrate[25] or using several counter ions such as  $\text{ClO}_4^-$ ,  $\text{CO}_3^{2-}$ , or  $\text{Cl}^-$ . [17, 26, 27]. Nevertheless, as far as we know there are no reports about equilibrium determinations of this system in pure methanol.

Electronic spectra of methanol solutions of the copper(II)-metformin system are presented in Fig. 2a. For this system when metformin concentration is increased a hyperchromic effect is observed, the spectrum of maximum concentration of metformin shows a maximum at 270 nm.



The obtained results show the formation only of the *mono* complex  $[\text{Cu}(\text{metf})]^{2+}$ . In Fig.2b is presented the calculated spectrum of the  $[\text{Cu}(\text{metf})]^{2+}$  which shows a maximum at 270 nm and  $\epsilon = 2627.8 \text{ L} \cdot \text{mol}^{-1} \cdot \text{cm}^{-1}$  with a formation constant of  $4.44 \pm 0.01$ . The conditions of the experiment and results are reported in Table 2 in APPENDIX, according to the format suggested by Tuck.[28]

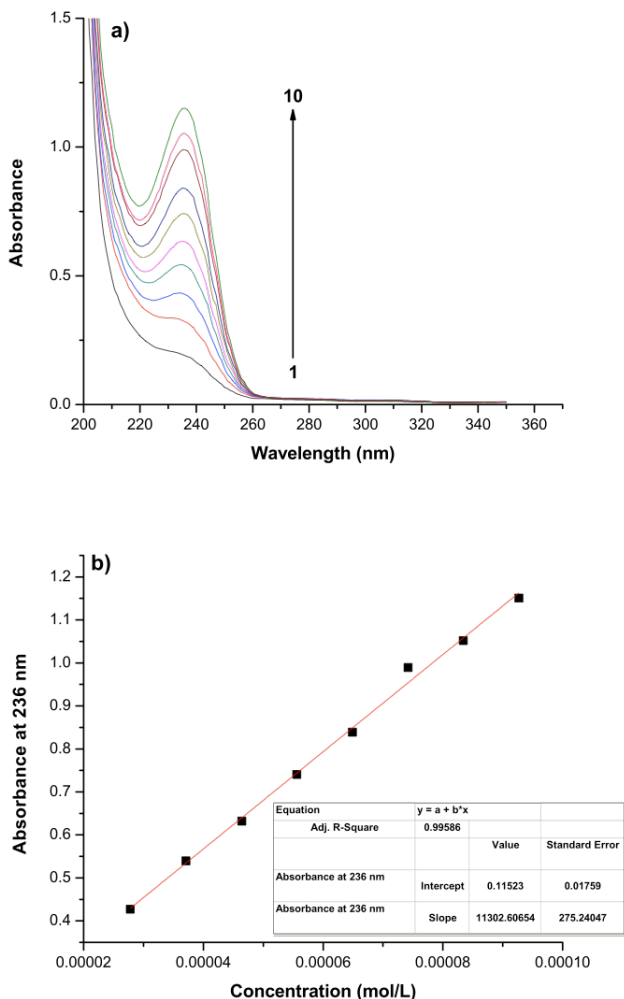


Figure 1. (a) Absorption spectra of the metformin in methanol solution: for spectra 1–10, metformin concentration (M): (1) 0.00000927; (2) 0.0000185; (3) 0.0000278; (4) 0.0000371; (5) 0.0000464; (6) 0.0000556; (7) 0.0000649; (8) 0.0000742; (9) 0.0000834; (10) 0.0000927.

(b) Linear regression using the Lambert-Beer equation for the determination of the molar extinction coefficient for metformin in methanol.

The determination of the formation constant  $\beta_{110}$ , correspond to equilibrium between  $\text{Cu}^{2+}$  and metformin. This process consist in analyze simultaneously, all the spectra of the two experiments at two different concentrations of stock solutions of copper and use different ranges of concentration of metformin for each experiment. This method involves the correlation between the spectrum obtained, the concentration of metal and ligand used and a proposal of possible colored species. The observed absorbance values at different wavelengths were recorded at 298 K. Considering that only one colored species plus  $\text{Cu}^{2+}$  and metformin were found, the formation constants determination was achieved using the next model:

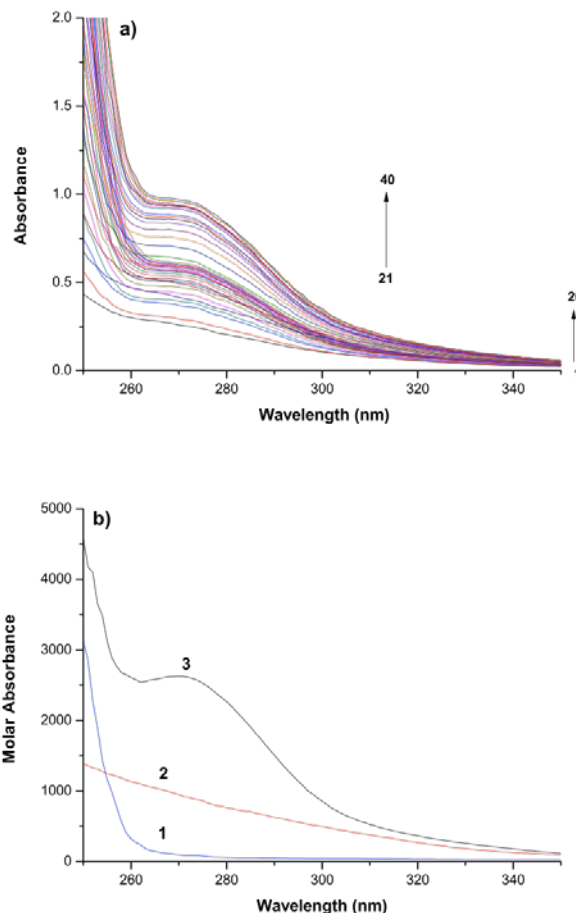


Figure 2: (a) Absorption spectra of the cooper(II)-metformin system in methanol solution: for spectra 1-20,  $[\text{Cu}(\text{II})]=0.00021\text{M}$  and metformin concentration (M): (1) 0.00004; (2) 0.00007; (3) 0.00011; (4) 0.00015; (5) 0.00019; (6) 0.00022; (7) 0.00026; (8) 0.00030; (9) 0.00033; (10) 0.00037; (11) 0.00041; (12) 0.00044; (13) 0.00048; (14) 0.00052; (15) 0.00056; (16) 0.00059; (17) 0.00063; (18) 0.00067; (19) 0.0007; (20) 0.00074. For spectra 21-40,  $[\text{Cu}(\text{II})]=0.00035\text{M}$  and metformin concentration (M): (21) 0.00006; (22) 0.00012; (23) 0.00019; (24) 0.00025; (25) 0.00031; (26) 0.00037; (27) 0.00043; (28) 0.0005; (29) 0.00056; (30) 0.00062; (31) 0.00068; (32) 0.00074; (33) 0.00081; (34) 0.00087; (35) 0.00093; (36) 0.00099; (37) 0.00105; (38) 0.00112; (39) 0.00118; (40) 0.00124.

(b) Calculated electronic spectra of the copper(II)-metformin complexes in methanol. (1) Metformin; (2)  $\text{Cu}^{2+}$ ; (3)  $[\text{Cu}(\text{metf})]^{2+}$ .

Nevertheless, as far as we know there are no reports about of equilibrium determinations of this complex in methanol or other solvent. Copper(II)-metformin complexes have been studied before in aqueous systems, in which only the *bis* species was isolated, but not the *mono* species. Also, the crystal structures of the *bis*-complexes has been reported in alkaline aqueous solution, where is confirmed that every metformin molecule is bind through two nitrogen atoms in a square-planar geometry.[25]

chloride concentration (M): (1) 0.00001; (2) 0.00003; (3) 0.00004; (4) 0.00005; (5) 0.00006; (6) 0.00008; (7) 0.00009; (8) 0.0001; (9) 0.00011; (10) 0.00013; (11) 0.00014; (12) 0.00015; (13) 0.00016; (14) 0.00018; (15) 0.00019; (16) 0.0002; (17) 0.00021; (18) 0.00023; (19) 0.00024; (20) 0.00025. For spectra 21-40, [Cu(II)]= 0.00034M, [metformin]= 0.00037M and chloride concentration (M): (21) 0.00002; (22) 0.00004; (23) 0.00007; (24) 0.00009; (25) 0.00011; (26) 0.00013; (27) 0.00015; (28) 0.00018; (29) 0.0002; (30) 0.00022; (31) 0.00024; (32) 0.00026; (33) 0.00029; (34) 0.00031; (35) 0.00033; (36) 0.00035; (37) 0.00037; (38) 0.0004; (39) 0.00042; (40) 0.00044.

(b) Absorption spectra of the copper(II)-metformin-bromide system in methanol solution: for spectra 1-20, [Cu(II)]= 0.00021M, [metformin]= 0.00022M and sodium bromide concentration (M): (1) 0.00001; (2) 0.00003; (3) 0.00004; (4) 0.00005; (5) 0.00006; (6) 0.00008; (7) 0.00009; (8) 0.0001; (9) 0.00011; (10) 0.00013; (11) 0.00014; (12) 0.00015; (13) 0.00016; (14) 0.00018; (15) 0.00019; (16) 0.0002; (17) 0.00021; (18) 0.00023; (19) 0.00024; (20) 0.00025. For spectra 21-40, [Cu(II)]= 0.00034M, [metformin]= 0.00037M and bromide concentration (M): (21) 0.00002; (22) 0.00004; (23) 0.00007; (24) 0.00009; (25) 0.00011; (26) 0.00013; (27) 0.00015; (28) 0.00018; (29) 0.0002; (30) 0.00022; (31) 0.00024; (32) 0.00026; (33) 0.00029; (34) 0.00031; (35) 0.00033; (36) 0.00035; (37) 0.00037; (38) 0.0004; (39) 0.00042; (40) 0.00044.

(c) Calculated electronic spectra of the copper(II)-metformin-halide complexes in methanol: (3) [Cu(metf)]<sup>2+</sup>, (4) [Cu(metf)Cl]<sup>1+</sup>, (5) [Cu(metf)Br]<sup>1+</sup>.

Differing from the reported studies in aqueous systems, in this work, the copper(II)-metformin *bis* complex cannot be identified. The *mono* species copper-metformin found could be explained considering the nucleophilic character of methanol. Metformin should compete with the solvent molecules bound to the metal ion. Also, has been reported that in general for copper complexes with simple diamine ligands, stability constants are higher in aqueous systems than in methanol.[29] Is conceivable that the nucleophilic environment promoted by methanol could create intramolecular interactions of several nitrogen atoms of the metformin to the copper center, increasing the chelate effect and in consequence, the stability and formation of the *mono* species.

This may decrease the probability of the formation for the *bis* species. In order to evaluate this theory, a crystallographic study should be done to isolate and characterize the *mono* species, using water at different pH values.

### 3.3. Formation constants of the copper(II)-metformin-halogen complexes.

With the purpose to study the hardness or softness character of the copper-metformin complex, the interaction of halides with the copper center in the complex was studied by generating the ternary complex with metformin and halides. Nevertheless, interaction of the copper(II)-metformin complexes with chloride has been studied before and the structures of *bis*(*N,N*-dimethylbiguanide) copper(II) dichloride dihydrate and di-□-chloro-*bis*-[chloro-(*N,N*-dimethylbiguanide)copper(II)] have been reported.[30] Also, as far as we know, there are no reports about

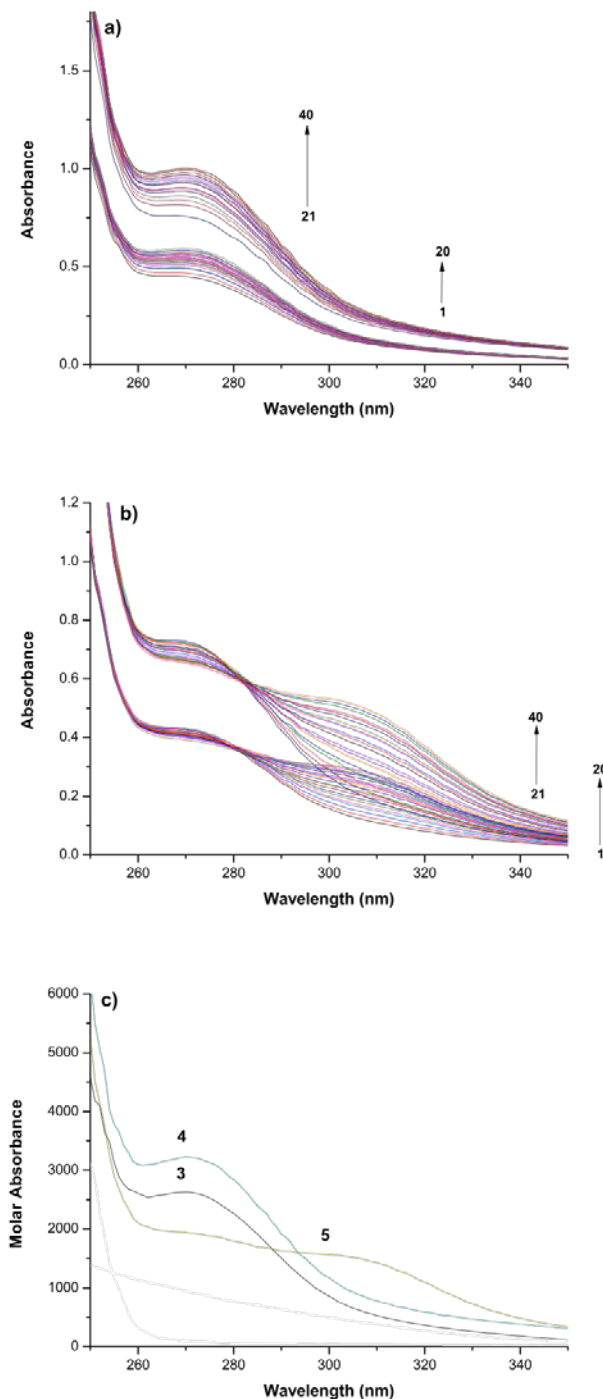


Figure 3 (a): Absorption spectra of the copper(II)-metformin-chloride system in methanol solution: for spectra 1-20, [Cu(II)]= 0.00021M, [metformin]= 0.00022M and sodium

the equilibrium determinations of the copper– metformin ternary complexes.

For this purpose it was employed an equimolar concentration of copper and metformin and was maintained as constant, in each experiment is varied only the concentration of chloride or bromide. The observed electronic spectra of the copper(II)-metformin-halide solutions are shown in Fig 3. For the chloride system, it can be shown that increasing the chloride concentration generates a hyperchromic effect (Fig. 3a), with a maximum absorption at 270 nm, which indicate the formation on the chloride complex.

On the other hand, increasing the bromide concentrations promotes a hyperchromic and a bathochromic effect to (Fig. 3b); this variation could be related to a slight change in the geometry of the complex.

The determination of the formation constants  $\beta_{jkl}$  corresponds to a successive equilibria between copper(II), metformin and each halide, were made using the same methodology as described above. The observed absorbance values at different wavelengths were recorded at 298 K. Considering that only one colored species plus complex  $[\text{Cu}(\text{metf})]^{2+}$  were found, the formation constants determination was achieved using the next model:



Only the complexes  $[\text{Cu}(\text{metf})\text{Cl}]^{1+}$  or  $[\text{Cu}(\text{metf})\text{Br}]^{1+}$ , were found. The formation only of the *mono* halide complexes is probably related to a steric effect generated by the metformin when is bonded to the metal ion; also the nucleophilic character of methanol could contribute. The calculated electronic spectrum of the  $[\text{Cu}(\text{metf})\text{Cl}]^{1+}$  and  $[\text{Cu}(\text{metf})\text{Br}]^{1+}$  complexes are presented in Fig.3c. For the  $[\text{Cu}(\text{metf})\text{Cl}]^{1+}$  shows an absorption maximum at 270 nm and  $\epsilon=3176.9 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$ . Meanwhile for the  $[\text{Cu}(\text{metf})\text{Br}]^{1+}$  shows an absorption maximum at 296 nm with  $\epsilon=1583.6 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$ . The obtained formation constant for the  $[\text{Cu}(\text{metf})\text{Cl}]^{1+}$  complex is  $8.88 \pm 0.01$  and for  $[\text{Cu}(\text{metf})\text{Br}]^{1+}$  is  $9.62 \pm 0.02$  (Table 2 in APPENDIX). This increase of stability and absorption of the halide complexes related to the  $[\text{Cu}(\text{metf})]^{2+}$ , can be explained considering a major charge transfer of the halide to the metal center, this increases the softness of the metal center, being bromide softer than chloride, promotes a higher stability. Also the halide ion could stabilize the geometry of the complex. According to the results presented here, copper-metformin complex might behave as a soft acid with an affinity by soft bases. Considering that mitochondrial chloride concentration is found in a very wide range[25], the results presented in this work, may show new implications. The activity of the copper-metformin-chloride species should be correlated with in vivo studies.

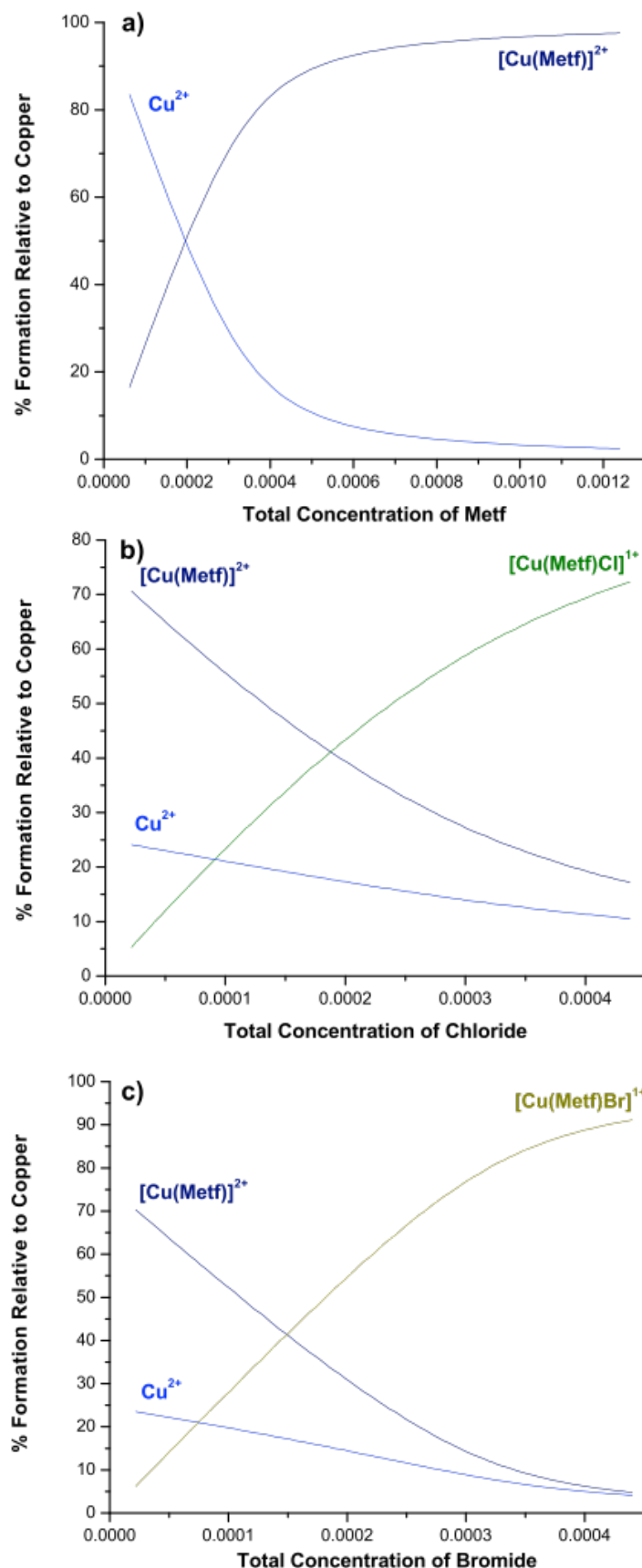




Figure. 4. (a) Formation curves of the copper(II)-metformin complex in methanol.  $[Cu^{2+}] = 0.00035M$  and metformin range from 0.00006M to 0.00124M.

(b) Formation curves of the copper(II)-metformin-chloride system in methanol.  $[Cu^{2+}] = 0.00034M$ , metformin 0.00037M and sodium chloride range from 0.00002M to 0.00044M.

(c) Formation curves of the copper(II)-metformin-bromide complexes in methanol.  $[Cu^{2+}] = 0.00034M$ , metformin 0.00037M and sodium bromide range from 0.00002M to 0.00044M.

### 3.4 Distribution curves for the complexes Copper(II)-metformin and Copper(II)-metformin-chloride and bromide.

Speciation diagrams of copper(II)-metformin, copper(II)-metformin-chloride and copper(II)-metformin-bromide are shown in Fig. 4a, b and c, respectively.

A solution with an equimolar concentration of copper(II) and metformin yields 95.65% of the complex  $[Cu(metf)]^{2+}$  and less of 5% of ionic copper. In the case of ternary systems, a solution with an equimolar concentration of copper(II), metformin and chloride generate 72% of the  $[Cu(metf)Cl]^{1+}$ , about 11% of ionic copper and 17% of  $[Cu(metf)]^{2+}$ . In the case of the experiments with bromide, a solution with equimolar concentration of copper(II), metformin and bromide yields, about 91% of the complex  $[Cu(metf)Br]^{1+}$ , 4% of ionic copper and about 5% of  $[Cu(metf)]^{2+}$ .

## IV. CONCLUSION

Because the solubility of the complexes, no ionic strength was used, the formation constants reported here should be only used in a comparative way with other systems measured in similar conditions and should not be considered as true thermodynamic equilibrium constants. For the copper(II)-metformin system was observed only the formation of the *mono* species, this differ from previously reported studies in aqueous systems in which the *bis* species was isolated, but not the *mono* species.

Further studies should be done to isolate *mono* species, also crystallographic studies could help establish analyze the structure of the species. Also, in order to evaluate the nucleophilic character of these complexes, studies in several solvents with different donor numbers, including water at different pH values, should be done. The formation constant for  $[Cu(metf)Cl]^{1+}$  and  $[Cu(metf)Br]^{1+}$  are higher than the constant for  $[Cu(metf)]^{2+}$ . Is possible that metformin increases the softness of the copper center, this promotes an affinity for a softer base. The formation constant for the bromo-species is higher than for the chloro species, considering that bromide is a softer base than chloride, copper center should work as a softer acid. This work shows that chloride possibly could be coordinated to a copper(II)-metformin species. This could generate a far more stable species:  $[Cu(metf)Cl]^{1+}$ . Considering the chloride concentration in mitochondria, this opens the possibility to theorize a new active and stable species. Hopefully, these data can be used to correlate with the in vivo studies and analyze the possible implications of these findings.

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#### AUTHORS

**First Author** – Monica A. Valtierra-Alvarado, Unidad Académica de Ciencias Químicas, Universidad Autónoma de Zacatecas, Zacatecas, Zac. México.

**Second Author** – M. Pamela Solano-García, Escuela de Ciencias Biológicas. Universidad Autónoma de Coahuila, Unidad Torreón. Torreón, Coah. México.

**Third Author** – María del Refugio González-Ponce, Departamento de Ingeniería Bioquímica. Instituto Tecnológico Superior de Irapuato. Irapuato, Gto. México.

**Correspondence Author** – José J. N. Segoviano-Garfias. Departamento de Ciencias Ambientales. División de Ciencias de la Vida. Universidad de Guanajuato. Campus Irapuato-Salamanca. Irapuato, Gto. México. Tel. (Fax) 01 (462) 624-18-89 Ext. 5262; [segovi@ugto.mx](mailto:segovi@ugto.mx); [jose.segoviano@gmail.com](mailto:jose.segoviano@gmail.com)

#### APPENDIX

**Table 2. Summary of experimental parameters for the system: copper(II)-metformin and copper(II)-metformin-halogen complexes in methanol.**

Solution composition	[T <sub>L</sub> ] range from 0.00004 to 0.00074M and 0.00006 a 0.00124M	
	[T <sub>M</sub> ] constant at 0.00021M and 0.00035M.	
	Ionic strength, electrolyte	Not used
	pH range	Not used
Experimental method	Spectrophotometric	
Temperature	25°C	
Total number of data points	Cu complexation: 39 solution spectra	
Method of calculation	HypSpec	
Species	Equilibrium	σ
Cu(metf)	$Cu^{2+} + metf \rightleftharpoons [Cu(metf)]^{2+}$	0.0131
Solution composition	[T <sub>X</sub> ] range from 0.00001 to 0.00025M and 0.00002 to 0.00044M	
	[T <sub>L1</sub> ] constant at 0.00022M and 0.00037M	
	[T <sub>M</sub> ] constant at 0.00021M to 0.00034M.	
	Ionic strength, electrolyte	Not used
	pH range	Not used
Experimental method	Spectrophotometric	
Temperature	25°C	

Total number of data points		Cu-Ligand to halide complexation: 39 solution spectra for chloride ion and 39 solution spectra for bromide ion.		
Method of calculation		HypSpec		
Species	Equilibrium	Log $\beta$	$\sigma$	
Cu(metf)Cl	$\text{Cu}^{2+} + \text{metf} + \text{Cl}^- \rightleftharpoons [\text{Cu}(\text{metf})\text{Cl}]^{1+}$	$\log \beta_{111} = 8.88 \pm 0.01$	0.0025	
Cu(metf)Br	$\text{Cu}^{2+} + \text{metf} + \text{Br}^- \rightleftharpoons [\text{Cu}(\text{metf})\text{Br}]^{1+}$	$\log \beta_{111} = 9.62 \pm 0.02$	0.0076	

# The impact of the effectiveness of the planning of the municipalities' budgets in Jordan on the preparation and implementation

Fahad Amin Falah ALkreasheh

PhD. Research scholar at Aligarh Muslim University

**Abstract-** This research aims to identify the effectiveness of the planning of municipalities' budgets in Jordan, in terms of comprehensiveness, flexibility, realism, continuity, coordination and the impact on the preparation and implementation of budgets (setup, validation, implementation, follow-up). This research is a theoretical analysis which rely on data derived from books, periodicals, previous research. The study found a range of results, highlighted by:

1. The effectiveness of planning features of the municipalities' budgets in Jordan, were not required class.
2. The lack of scientific and professional competencies in the municipalities, able to carry out proper planning methods.

In light of what has been reached from the results, the study recommends several recommendations was notably: use the best scientific methods in forecasting and assessment and planning in budget preparation and execution. Training of financial personnel working in the municipalities and the need to establish training courses for the authors of the budget to increase their efficiency and improve their financial abilities, and re-evaluate the effectiveness and efficiency of internal control in municipalities and in cooperation with the central administration, through the development of the budget preparation methods.

**Index Terms-** Planning, budget, preparation, implementation.

## I. INTRODUCTION

**B**udget is one of the main tools used by any private or public institution in management to optimize the use of available resources, in terms of the budget is the most important financial planning methods used by the service, and profitability institutions, planning tool used by most governments in the world.

The budget is a practical translation of the objectives for any organization or company. This means that effective to achieve its goals. Therefore, put a preview of all the work that will be carried out by the institution leads to the achievement of the goals in an objective and an actor that has been committed in order to estimate; what was realistic and thoughtful. Therefore, The budget planning tool is also a regulatory tool to help achieve management control. Because it will determine the required implementation on the ground, and through it are controls, on what has been achieved through the plan, and control what has been implemented and what has been accessible than planned. That is to say; a tool for follow-up activities of the institution stands over the progress of work and the extent of compliance.

The good and logical appreciation to the need of the organization in each partial during the preparation of the budget, make it easier for senior management ,the process of implementation of projects. Even though, there is no need in many cases to transfer appropriations from item, to another in order to have exceeded what is monitored or to do business supplements the budget to cover some of the excesses in items. On the other hand, is the budget regulatory activity and a means sequential and continuous systematic organization which seeks to set goals and achieve them with the means and possibilities. It also includes the study of financial resources and distribute them to all aspects of the activity within the organization; in order to be an effective guide for action and control by comparing actual results with, what is scheme according to the budget. So that it can be corrected in the future to provide the best performance and achieve positive results.

At this point, the study suggests that it is essential to study the reality of the municipalities in Jordan; in light of preparation for the budgets of the estimated and the extent to which the preparation of these budgets with plans and programs. This has intended to embark on implementation and the extent to which these budgets, and the actual follow-up and not a sham. This sorts of extent of the participation of all departments; and sections in the municipalities in the preparation of the budget or project they are limited in the setting on the Department of Finance.

### **The importance of studying:**

This study derives its importance from being a subject, that shed light on the impact of the effectiveness of planning for the budgets of municipalities in Jordan. This preparation and implementation, reflect in the end the individual and collective performance in the municipality in general. Surprisingly,, from this study to take advantage of its findings and recommendations, to increase the awareness of those in charge of the preparation and implementation of budgets in the municipalities in general, the concept of budgets as a planning tool.

It is also from being a deal with the budget as a tool to achieve, the planning function which is one of the most important management functions. And to shed light on the optimal use of the role assigned in the budget to be considered one of the most modern tools used, by the administration in drawing plans and set goals, and achieve them through the available resources most effectively and efficiently.

### **The problem of the study:**

This research seeks to answer the following research questions:

1. What are the attributes of planning the budgets of municipalities in Jordan after all of its dimensions?
2. What are the scientific bases in the preparation and implementation of the budgets of municipalities in Jordan after all of its dimensions?

**The purpose of the research:**

1-To study the impact of the effectiveness of the budgets of municipalities planning to setup, and implementation in Jordan attributes are also expected to achieve the following objectives:

2 - To Identify the effectiveness of the budgets of municipalities dimensions layout attributes (inclusiveness, flexibility, realism, continuity, coordination).

3 - To identify the scientific bases in the preparation and implementation of budgets dimensions (preparation, implementation, validation, follow-up).

**Hypotheses of the study:**

1. You may through proper planning budgets to achieve the proper preparation, and implementation of the budgets of the requirements.

2. The use of scientific bases in the preparation and implementation of budgets, positive solution to the problems of preparation and implementation of the budgets of municipalities in Jordan.

**Procedural definitions:**

Planning is the process of determining future goals, that the organization seeks to achieve within a specific period of time.

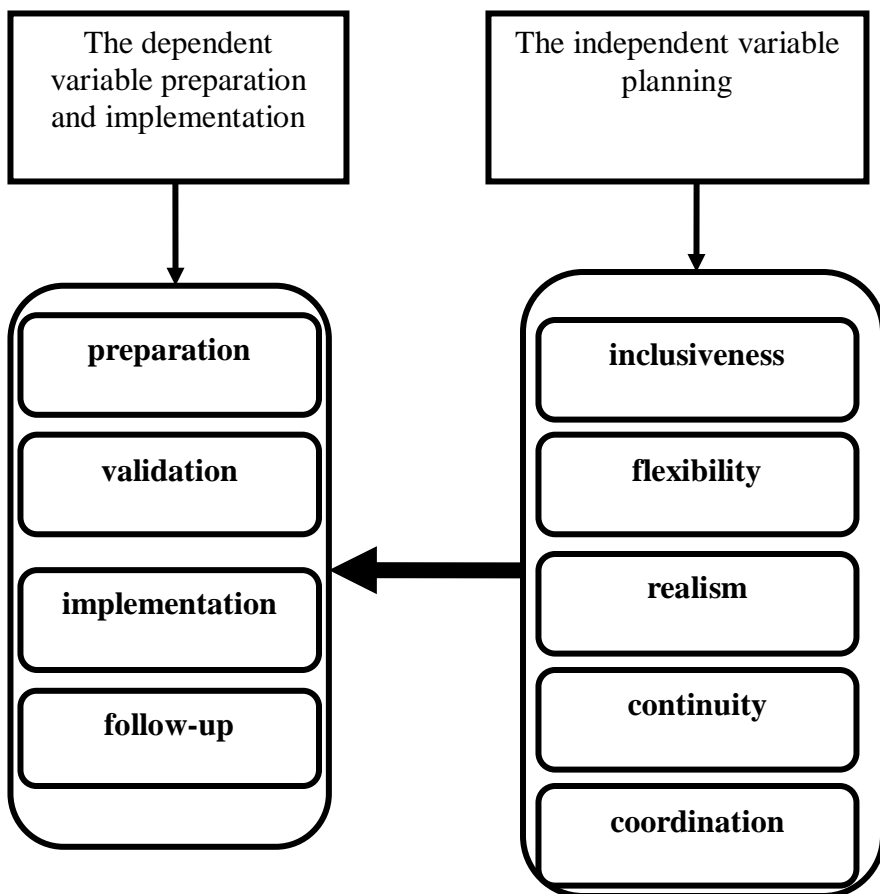
This to identify ways to be followed in order to achieve those objectives within that period by the use of the most appropriate means, and highly quality to achieve the goals with the clarity of vision. However, what could happen during the work of the developments and modernity to develop appropriate ways that to deal with all emergency.

**Preparation and implementation:**

Setting: is the administrative process and financial technical begin to receive instructions of the ministry budgets. Then, set up the present instructions on the various sections to identify needs, and proceed to estimate revenue and various expenses as needed. This should be taking into account the dependence on the actual data, for previous years (two years) in appreciation and then be taken Resolution of the Council, for adoption and submit them to the ministry for authentication. Implementation: means that the process begins with the beginning of the financial year through the implementation of exchange (expenses) operations and the collection' taxes' fees and revenues according to various laws and regulations in order to comply with all budget items, and they do not exceed the spending.

**Model study:**

Figure 1, has shown below: model study, as the independent variable planning dimensions (inclusiveness, flexibility, realism, continuity, coordination) and the dependent variable preparation and implementation dimensions (preparation, validation, implementation, follow-up) as shown in Figure (1).



**Figure (1)**  
**Model study**

**Source: prepared by the researcher based on (Ghoneim.1999; Hammad, 2005)**

**The study of methodology:**

This study is the analytical theory, based on the completion of data from books, periodicals and previous research. The study will mean a search in the commitment of the municipalities in Jordan, good planning and in the budgets of the followers of scientific bases in the preparation, and implementation of budgets.

**Theoretical study:**

**Introduction:**

Planning is an essential utility in successful organizations in the world today. With the economic life of the complexity and intensity of competition and the tempo and globalization. This it has become an urgent need to prepare budgets for future periods to plan, and manage any unexpected problems. Anyway, the closer organizations of planning, came close to success, and vice versa, and budgeting component essential in all governmental and non-governmental organizations, public and private, for-profit and non-profit (Hammad, 2005). In order to be budget an effective tool in the planning has to be that there is a link between the objectives and results. That is to say; they are not based on listed expenditure items, and items of income only. Furthermore, they are developed and implemented to reflect the priorities of any organization or society as parts integrated; so it can use the budget as a planning tool through Forecasting future activities, to ensure organizations. In order to avoid many of the mistakes and problems expected to occur in the future and which will be reflected positively on any organization. The planning is where, most of those who think the preparation of budgets when they hear the word budget it includes all stages of preparation of the budget, starting from just being a tentative ideas, and until it is approved by the higher authorities and its report, and most of the time and effort when setting up and using the budget making in the planning stage. Because good and perfect planning leads to the achievement of the set objectives efficiently, and effectively and thus this is reflected clearly when, implementing the budget on the ground and applied effectively.

**Planning:**

It is planning the first function of management functions; it is the base upon, which other administrative functions. This will be determined by the goals that seeks to achieve any organization and helps, to show the strengths and working on promotion, as well as to overcome the weaknesses in the quality of the performance of employees in the determination of the quality of training programs R & D is required to raise the levels of service and help to identify targets carefully.

Given the importance of the planning of all nations adopted the planning and work took him as a key process is indispensable to achieve development goals. The first element of the elements of the administration and is considered the foundation and principle of the administrative process.

At this point, we find that there is a clear link between the planning and the success of any management in all enterprises, whether those that aim to make a profit or not-for-profit. We also

find these departments wandering objectives, problems and even they are to come out of the problem until you fall in the other, and creates planning awareness among management. This has to sheds its sights on the future, enabling it to identify areas of imbalance and take appropriate decisions to resolve them in a timely manner. planning is needed to study the future conditions, and reduces the likelihood of surprises (the Arab Society of Certified Accountants, 2001).

It is mentioned in the definition of planning all the views of many agree that the path you specify in advance in order to achieve certain goals by the administration is committed to working under it. If we want the expansion of the previous definition could say that planning is the process of setting goals that are meant reached during a certain period of time and then mobilize the necessary resources to achieve those goals in accordance with the methods shorten costs and maximize results. (Karkhi 0.21: 2009). There are those who consider planning "predictable process for long-term and anticipate what will happen and the current allocation of resources and capabilities, but within the time specified by the plan" (Yassine, 16: 2002). Planning is the control and setting goals and developing strategies to achieve these objectives Charles, (2006)). (Alarif, 2001: 35) says that planning as a "design and insight the company mission and objectives and the main its path and identify processes and activities necessary to achieve it and the business."

The study considers that the planning: is the process of determining future goals that the organization seeks to achieve within a specific period of time, and to identify ways to be followed to achieve those objectives. The clarity of vision of what could happen during the work of the developments or developments, and to develop appropriate that, of all ways to deal with an emergency. Moreover, we find that the bulk of the previous definitions of the concept, of planning considered the backbone of the future to achieve the organization's goals. This only happened through a clear definition of the objectives of good and limited resources, the formulation, implementation and evaluation of decisions taking into account the internal and external environment analysis.

**Planning attributes:** The disparity planning success ratio of a plan to another due to the wide range of conditions and factors that can be translated into a set of features that must be provided for the planning process and the success.

1. Totalitarian means holistic planning according to opinion (Ghoneim 0.85: 1999): "overlap and integration of the different activities and at all levels. So, that each activity affects and is affected by other activities and since undergone change. So the plan will not be able to achieve the desired goals when restricted to activities certain and not others. Comprehensive plan reflection of overall planning, which is the best way to direct the affairs of the economy and development in an integrated manner."

2. Flexibility: The development objectives in the light of the study actually does not mean stability and taken for a final; because the surrounding mobile and fixed organization

circumstances may occur, unexpected changes in these circumstances, requiring a return to study results that resulted from the fact analysis and forecasts which it was built to order to make adaptations. If necessary the plans were minor differences. If the material is required make alternative plans.

These adaptations, whether simple or give large departments executing the plan sufficient flexibility for the movement in order to achieve the objectives set (Karkhi 0.31: 2009).

Stimpson (2003) confirmed that a good budget be flexible if it turns inability to achieve any goal for some reason it can work on the revision of the plans and formulation of a new form.

3. Realism: based on the goal to be accessible as possible and not something impossible and expressing needs and work directed to achieve them, and that the human and material resources necessary to achieve the objectives available. (Alian, 2007) said that the realism of the attributes of proper planning, which means that the plan be within the material and human resources available.

4. Continuity means that planning be interconnected series of overlapping operations are not interrupted, that is a planning cycle which is integrated with the beginnings endings, and all the other and connected process leading to it.

(Kafi, 2007) suggests that continuity planning comes through that the plans, are usually annual or semi-annual, and are at the end of the plan period the new plan position to be ready to work out if the expiration of the current plan, and so there will be continuity in the planning.

5. Coordination: coordination is essential to the planning process as it ensures no conflict of goals between them in terms of means and do not conflict with each other. Coordination and extends to include coordination between the trends of the planning process through successive period of time, so that the plan does not conflict with what preceded what will follow.

(Qaryouti, 2006) says that planning helps to coordinate efforts among the various departments and divisions and their employees. Because it provides the necessary guidance for those involved in terms of their knowledge of the objectives pursued so that everyone knows and at different levels role in achieving those goals. Which helps in saving time and effort and prevent the waste of resources.

### **The concept and definition of the budget:**

There were many budget definitions not hardly find a unified agreement on the definition of a particular concept of the budget agreed upon by the clerk. We find the difference in the concept of the budget through the views of interested in it. Vamahton perceive it in terms of their preparation and techniques used in the completion, while we find that the administrators and those in charge of implementing perceive it in terms of implementation.

Likely, find that these definitions to balance all of which reflect a different point of view, but they do not differ in substance, not in terms of characteristics and general principles of the budget. The mention of these definitions:

1. Is a detailed plan that specifies the level of income and expenditure for future period, and longer in advance and based on the agreed targets for the same period as well as the strategy to achieve specific goals (bacchanal 0.2003: 139).

2. (Crozier, 2004) focused on "the allocation of funds they needed to get on the agreed services during a specified period of time."

3. (Garrison and Noreen, 2003) think that "it detailed plan for financial and other resources available and used within a specified period of time, representing a future plan, expressed in a quantitative and digitally."

4. (Keller & Ferra, 1998) claims that as a coordinated plan for all the organization's operations in the budget period includes all income and expenditure elements of that organization.

The study, known as the discretionary budget plan detailed expenses and revenues for any organization or establishment to come for a period of time includes a range of on the number of services or activities or projects that are supposed be completed within a specific time programs.

Through the study of the previous definitions that address the meaning of the budget. Anyway, we find that they describe a variety of budget from the perspective of workers in the various sectors where they may differ in the definition vehicles but they agree as follows:

1. It's a certain specific time limit for the implementation of a future plan.

2. It's a tool to translate the plans and objectives of an organization that seeks to reach them.

3. It's censorship tool used to verify that the objectives and plans have been implemented through follow-up implementation of the budget.

4. It takes its final form during the financial picture of the expression of plans in quantitative terms.

### **The importance of the budget:**

The financial component has become a major cause for the success of any organization in the world, and became the maintenance of public money and good exploited requirement necessary and important. Thus, to maintain the strength of organizations and in spite of the costs to be paid by organizations for the preparation and implementation of budgets, but the positives would be greater than the cost where organizations can predict for future problems that will be faced by the organization. There is no dispute on the importance of the budget in any country and its role in the development of the performance of public organizations where, where is the budget of the main reasons behind any achievements and obstacles to the overall performance of the development so the budget and still replace the constant attention by States by and by administrators, accountants and economists by Last.

The budget as a catalyst in the process of developing and improving performance through the broadcast team spirit among workers in organizations, where the participation of all levels of management in the preparation of the budget will encourage employees to the success of the budget viewed by (Laynetworks, 2001)

### **Preparation and implementation of budgets in the municipalities:**

Municipal civil institution with financial and administrative independence occur and had to be canceled and the borders of their region and their functions and powers under the provisions of this law (the Municipalities Act 2011).

The Jordanian legislator gave the powers and authorities vested in the municipality within the limits of the municipal area exercised directly by municipal employees and users or through contractors and contractors.

In spite of that the Jordanian legislator stressed the financial and administrative independence of municipalities in Article III of the Municipalities Act (2011), the researcher finds that this independence is not absolute, but there is a kind of central control over the municipalities and can be seen through the ratification of the majority of the decisions of the municipal councils of by the ministry in order to become effective there must be approval from the ministry, whether these decisions administrative, financial or organizational.

Pass the budget in most countries of the world in four important stages: called phases of the budget, or the budget cycle begins phase of preparation, preparation and followed by accreditation or approval stage (authentication). Then the implementation phase and finally the fourth stage, a control (follow-up) implementation, and characterized by these four stages to continue and overlap, while we find that some of the administrative units on which to prepare the draft budget for the next fiscal year, we note that there are other units are still implementing the current fiscal year's budget, and other units audited balance the past and current year, and this budget gives a recipe patrol.

In the municipalities, we find that the Jordanian Municipalities Law No. (13) for the year 2011 has committed the municipality put her budget, and we find it in the text of Article (5) of the Act, which stipulates the following:

A. Placed the municipality annual budget works out after the approval of the Municipal Council and ratification of the Minister, and may be placed supplements to balance the same way.

B. Expenditure must not exceed what have been allocated from the previous year's budget to be the ratification of the new budget.

C. Provisions may be transferred from chapter to another or from one material to another decision of the Council and the approval of the Minister.

Of the things it agreed that the municipality is responsible for the implementation of the budget, so it is logical to be prepared; for they will try that this budget is realistic and accurate so that it can be implemented without obstacles or difficulties.

### **First stage of preparing the budget:**

The preparation process or the preparation of the draft budget is the first stages, and processes that control the budget cycle and also most accurate one. Because this setting results and affect its effectiveness in all stages of the subsequent budget.

Municipalities in Jordan: the preparation of the budget for each year starts at the beginning of the month of September in the previous year and the project is going through the following stages:

1. Receipt of an official letter from the Ministry of Municipal Affairs stating the budget preparation instructions and required attachments project for approval on the budget, as well as to determine the date of approval of the budget.

2. Preparation of the budget to the various municipal departments in order to project instructions distribution is determined by the needs of each department.

3. It is a meeting for all departments to discuss the needs and perceptions of each section taking into account the reality of the municipal financial.

4. The financial section work formations jobs agenda, and determine the wages for daily-paid workers in the municipality.

5. Financial section in the municipal works to determine the projected income for the draft budget and expenditure, taking into account the actual data compared to two years earlier.

6. The session of the municipal council to discuss the draft budget was held, and a decision to approve it and submit it to the ministry for authentication

### **Second: the adoption of the budget phase (validation)**

A phase which is made after the completion of the preparation of the budget where presents the draft budget in government accounting on the relevant authorities to be ratified by the legislature in the case of the state budget project, while the budgets of municipalities, the ratification of the powers of the Ministry of Municipalities (Hilali, 2002).

In the municipalities are approved budget by the Ministry of Municipal Affairs, and that after the lifting of the municipal council's decision to approve the draft budget where they are in the ministry to discuss and check each item of budget items. In addition to the schedule formations jobs, either ratified with little or reject the draft budget amendment and return to the municipality for the amendment.

### **Third, the implementation phase of the budget**

The legislature approve the budget, and the issuance of the budget law, means the beginning of the implementation phase, any transition from forecasting for future into reality in the present, and is intended to implement the budget: the processes that are of introduction collect the amounts contained in the revenue side, spending the amounts contained in the expenditure side ( Khatib, may, 2012).

In the municipal budget execution process begins after ratification, and often are completed ratification of the budget before the beginning of its fiscal year. So the actual implementation of the budget starts with the beginning of the month of January of each year, where they are opening a new financial records pertaining to the new budget through download on budget revenue and expenditure items as records of what has been approved and then begin to collect revenues from various (fees, and taxes), and spending on services, whether or capital projects.

### **Fourth: the stage of monitoring the implementation of the budget**

The follow-up implementation of the budget is originally from the jurisdiction of the legislature because they are considered control over the executive branch to ensure their compliance vacation spending, and that depends on periodic reports provided by its specialized departments in the financial control and follow-up. Follow-up of various organs and play a key role in this area in order to ensure that the implementation of the budget was in line with what has been appreciated and

customize it to various clauses, and the discovery of any deviations and processed in a timely manner. (Mohammed, 2002) confirms that the follow-up is the last stage of the budget cycle in which they are to verify that the work for which allowances allocated in the budget have been implemented as required. This has started-up with the beginning of the actual implementation and continue with him, and is the follow-up implementation and compare the actual performance of the planned performance to determine whether the actual performance is in accordance with the plans, policies and standards established, as the actual performance measure of the center of responsibility entails providing actual data are measurement through it. They are winning deviation between the actual performance of the planned performance, which may be detailed or non-detailed analysis, usually attributed occurrence of deviations to the lack of precision in planning the rates and standards of performance, or inefficiency in the actual implementation, and management to monitor deviations and seeks to identify its causes, and to hold accountable those responsible for they occur, and increase efficiency among workers, through training and supervision (Charles, 2005: 197)).

We have confirmed (Robbins and Culter, 2003) on the importance of follow-up when the implementation of the budget during the follow-up of all activities in order to make sure that what has been planned is implemented as planned, and thus the discovery of deviations in the plan up to date and work to correct them as soon as discovered.

In the municipalities After preparing the budget and begin implementation being follow up the implementation of projects on the ground and through the follow-up to the percentage of completion with what is planned, and have it follow up on what has been spent on projects including the already monitored in the budget, with the need to take into account not exceeded allocations in the budget for these projects.

It may be noted the importance of and the need for follow-up in the budgets of municipalities and that by looking at the budget user in the municipalities of Jordan model, where the income and expenditure allocated divided into four batches, a specific amount every three months and the type of follow-up and control ICs. This is in addition to the monthly follow-up which is called in the municipalities monthly summaries (monthly trial balance) to follow the municipality's financial situation, which mainly depends on the daily follow-up, which is the daily register for each tunnel or enters municipal income fund to a private budget records.

#### **Previous studies:**

(Hanini; Badran 0.2013) studies entitled: "The role of the use of budgets to improve the planning, control and decision-making to contribute to Jordan's agricultural companies." This study aims to identify the role of the use of budgets to improve the planning, control and decision-making to contribute to Jordan's agricultural companies, and the extent to which contribute to agricultural companies prepare budgets. Was reached that most contribute to agricultural companies do not prepare budgets, while the preparation helps to improve the function of planning in contributing to agricultural companies, and by improving the distribution of resources and funds between departments and the various departments within the

company and help the company's management to predict future needs of the funds needed to achieve its objectives and resources, and help budgets to improve the oversight function is to contribute to Jordan's agricultural companies, and contribute to avoid administrative crises and face the dangers before they escalate, and assist management to verify that the performance is going according to plan to achieve the company's goals through actual performance compared to the planned performance and identify deviations is favorite and who was responsible for and accountable and take the necessary corrective actions.

(Jaafar, Abdul Kader, 2012) studies entitled: "The possibility of applying budgets zero counterbalance planning in the Palestinian local councils" This study aimed to stand on an important issue concerning the budget in the local councils of the Palestinian National Authority, and that the possibility of the application of zero-basis from the standpoint of the budget those in charge of preparing the budget in local councils in the Palestinian Authority, and to identify the difficulties and obstacles that stand a barrier to the application of this type of Almoisnat. oukd study found a range of results from the most important: there is the possibility of applying ZBB as an alternative to the budget currently in force in the Palestinian local councils, and due to the presence of administrative, financial and technical capabilities, as or It recommended study overcoming difficulties and obstacles facing the process ZBB preparation, as the researchers recommended that the work of training human cadres charged with preparing budgets, and the amendment of the financial system to prepare budgets in local councils, and the most important recommendations: the need adopt a zero-budget planning counterbalance in the budgets of the Palestinian local councils.

(Boughaba, 2012) studies entitled: "The role of the estimated budget to improve the performance of economic institutions". This study aimed to identify the budgets of various dimensions by identifying the concept and its importance in the economic institution, as well as how to anticipate or predict, which is one of The most important methods in the planning process. Also it sought to highlight the importance of the process of measuring and evaluating performance in the enterprise, helping them in decision-making, and focused on studying the reality of budgets analyze deviations and know the reasons for these deviations and take corrective action in the Algerian economic enterprise, and its role in improving the financial performance and financial decision-making, and the extent of reliance in that, to ensure the continuation and growth and to achieve outstanding performance.

(Ramun, 2008) studies entitled: Activity Based Budgeting At Agricultural Holdings in Lithuania, Case study The study aimed to highlight the importance of budgeting system on the basis of activities in Lithuania as a tool for process planning, control and coordinate operations with agricultural companies. The study was headed to the analysis of information about the system efficiency by previous studies as a first step, and then see the process that focused on the harmonization of the costing system based on activities and budgets on the basis of system activities in respect of milk products, in particular studies. Results of the study have shown that through modern systems of management accounting and through integration between the two budgets on the basis of activities and costs is to ensure the



accuracy of the cost of products account, and accuracy in the preparation of budgets and control over the performance through which help reduce failed internal processes in the presence of fluctuations in the business environment.

(Moustafa, 2005) says that "An Application of Activity-Based titled) Budgeting in Shared Service Departments and Its Perceived Benefits and Barriers under Low-IT Environment Conditions ". This study aims to show the extent of the applicability of balancing activities and the benefits and obstacles that may face the preparation of this budget when applied in an environment characterized by low dependence on modern technologies in the operation of accounting information systems in Egypt level. The study relied on a test application on two sections SOA two different accounts department and the Department of Transportation, in addition to the use of a reconnaissance survey tool saw workers in the two test application on the possibility of the application store, and the most important results of the study: that the difficulties arising from the absence of accounting data running techniques can be compensated by increasing the humanitarian effort in cases available where the human element. In addition to that there is a general acceptance of the system among workers The study recommended the measurement of the human element of energy research by professionals in the fields of analysis activities.

(Wijewardena et al, 2004) studies entitled: "Impact of planning and control Sophistication on Performance of Small and Medium Sized Enterprises: Evidence from Srilanka" "the impact of planning and control advanced on the performance of small and medium-sized enterprises in Sri Lanka", which aimed to assess planning impact Modern and control through budgets on the performance of small and medium-sized companies in the city of Colombo in Sri Lanka, it has been the study by dividing the companies that represented a sample study of 168 company guestrooms into three groups as follows: Companies apply budgeting system in detail, and corporate budgeting system applied simple, and companies do not apply the budget system, the study found that there is a direct correlation between the application of budgets between the volume of sales, where sales have been growing companies that budgets system applied in detail, and modest when companies that do not apply the budget system.

## II. RESULTS

1. The effectiveness of budget planning features not required and idealism primarily as a result of weakness in estimating the true size of revenues and expenses during the planning of the budget.

2. The lack of clear instructions to follow up plans in each administrative level.

3. The lack of scientific and professional competencies capable of implementation planning methods and processes forecasting and analysis during the planning stage of the budget.

4. The lack of coordination between the requirements and needs of each region of the municipal areas.

5. lack of focus on long-term goals.

6. In some case, not to put alternatives to cope with emergency conditions when planning and this is what we see in the support operations carried out by the government to the

municipalities, especially in periods of face particular weather conditions

## III. RECOMMENDATION FOR FURTHER RESEARCH

1. The use of the best scientific methods in forecasting and assessment, planning and participation of all levels, of management in the preparation of budgets, and activate all of the functions of planning, coordination, communication, monitoring, evaluation of performance administrative levels to increase awareness of the importance of the budget.

2. Give sufficient attention to the ideas offered by the various levels of management, in the preparation of the budget, and that they have the opportunity to participate in their preparation, and hard work on the participation of the various levels of management in the preparation of the budget.

3. Working on the provision of information system that facilitates the process of preparing and implementing the budget and the work on the application of the budget when the implementation is fully and improve the preparation of budgets and work on the interest in the actual comparison with what is planned and what is done at the implementation and follow-up by having a clear strategy for the business, financial planning is placed methods before the start of the fiscal year.

4. Training of financial personnel working in the municipalities and the need to establish training courses for the authors of the budget to increase their efficiency and improve their financial abilities, and re-evaluate the effectiveness and efficiency of internal control in municipalities and in cooperation with the central administration, through the development of the budget preparation methods.

5. Focus on long-term goals in the preparation of budgets and the development of alternatives to meet the emergency conditions that require a rethinking of the system used in the preparation of budgets.

6. The need for detailed studies of all phases of the budget in detail to determine the negatives to address them and build a modern budget is the use of analysis and forecasting to better operations programs, which is uncharacteristic in the preparation of traditional budgets used.

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#### AUTHORS

**First Author** – Fahad Amin Falah ALkreasheh, PhD. Research scholar at Aligarh Muslim University, Fahad821@yahoo.com

# Clinical Profile and Complications of Hair Dye Poisoning

Dr. P. Sakuntala, M.D.<sup>\*</sup>, Dr. P. Musa Khan, M.D.<sup>\*</sup>, Dr. B. Sudarsi, M.D.<sup>\*</sup>, Dr. S. Manohar, M.D.<sup>\*\*</sup>, Dr. R. Siddeswari, M.D.<sup>\*\*\*</sup>, Dr. Kranthi Swaroop, M.D.<sup>\*\*\*\*</sup>

<sup>\*</sup> Asst Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

<sup>\*\*</sup> Professor & HOD of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

<sup>\*\*\*</sup> Prof. Of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

<sup>\*\*\*\*</sup> Osmania General Hospital, Hyderabad, Telangana State, India.

**Abstract-** This is a prospective study of 31 cases of hair dye poisoning containing paraphenylene diamine. The clinical profile is dominated by development of angioedema, rhabdomyolysis and renal failure. Inotropic support, emergency airway management, alkaline diuresis and renal replacement therapy were the treatment modalities followed.

**Index Terms-** Paraphenylene Diamine poisoning(PPD), angio edema, acute renal failure.

## I. INTRODUCTION

Suicide is a preventable public health problem, resulting in one million fatalities every year worldwide, increasing by 60% over the last 50 years especially in developing countries.<sup>10</sup> Poisoning is a preferred method of suicide and is one of the major problems encountered in emergency departments of hospitals.<sup>7</sup>

Poisoning with hair dye containing paraphenylene diamine is a new trend of intentional self harm in various developing countries of Asia and Africa,<sup>9</sup> and is associated with high mortality.<sup>1</sup>

PPD is an active ingredient of 'Kala Pathar'. It is crushed and mixed with henna and used as hair dye for enhancing its color.<sup>2</sup>

PPD ingestion causes symptoms involving different organs. Chemically, it is a derivative of para-phenylaniline, brown or black colour solid substance, easily soluble in hydrogen peroxide and not in water. It is a good hydrogen donor and metabolized by electron oxidation to an active radical by cytochrome P450 peroxidase to form a reactive compound called benzoquinone diamine. This can be further oxidized to a trimer known as Brandowaski's base, a well known compound, reported to cause anaphylaxis and mutation. Ingestion of PPD causes rapid development of edema of the face, neck, pharynx, tongue and larynx initially and rhabdomyolysis followed by acute renal failure(ARF) as renal tubular necrosis occurs due to the deposits of the toxic metabolites of PPD.<sup>8</sup>

The compound PPD is highly toxic. When taken orally death occurs within the first 6-24 hours due to angioneurotic edema.<sup>2</sup> Smaller doses cause angioneurotic edema and hepatitis while moderate doses cause acute renal failure within the first week. Despite the high frequency of cases and mortality, no antidote is available for this poisoning.<sup>6</sup>

As there has been a recent increase in frequency of hair dye poisoning, this study was done to study clinical profile of

Paraphenylene diamine containing hair dye poisoning and outcome.

## II. MATERIAL AND METHODS

This study was done in Osmania general hospital, Hyderabad during the period November 2011 – October 2013. Patients who were admitted in emergency department with alleged hair dye ingestion were taken up for study. Clinical history, complaints, physical examination, investigations, treatment modalities followed, clinical progress and outcome were recorded. Routine Investigations done at regular intervals include :

Complete blood picture, Random blood sugar, Renal function tests, Liver function tests, Serum electrolytes and Creatinine Phosphokinase(CPK) levels were done. Complete urine examination, Chest X-ray, Electrocardiogram, Arterial blood gas (ABG) analysis, Ultrasonography of abdomen and 2D-Echocardiogram (depending on patients clinical status) were done.

Gastric lavage was done in 20 patients in whom it was possible. All patients were treated with steroids, endotracheal intubation was done in 9 patients; tracheostomy in 8 patients. Mechanical ventilatory support was needed for 3 patients. In patients with hypotension, inotropic support was given. Sufficient quantities of oral fluids were given whenever possible and intravenous fluids to maintain hydration. Diuresis / alkaline diuresis was done to avoid acute kidney injury secondary to rhabdomyolysis. In patients with acute renal failure, renal replacement therapy was instituted.

## III. RESULTS

The frequency of hair dye ingestion was more in females (80.64%) than in males (18.75%). The tendency to commit suicide was more in the age group 21 -30 years in both males and females. Majority of patients (96%) had burning pain in mouth, throat and abdomen. Angioedema was seen in 48% of patients with varying severity. 80% of patients had vomiting and dysphagia. Nearly 58 % of patients had dark colour (cola colour) urine after ingestion of the dye. Almost all patients developed generalized muscle pains. Dyspnoea was seen in 74% of patients, of whom 29% had stridor and 45% had wheeze. 19% patients developed oral erythema and erosions. 16% patients developed pedal oedema, oliguria was seen in 12% of the patients. Other less frequent symptoms observed were weakness 16%, seizures

12%. Hypertension developed in 15% of patients, hypotension in 6.4% of patients.

Burning pain in mouth/throat/abdomen, vomiting were the earliest symptoms in almost all patients. Hypotension developed in duration of 6 hrs, angioedema, dysphagia, dyspnoea, dark

colour urine, myalgias developed within 6 - 24 hours, Hypertension in 4 - 5 days. Oliguria appeared within a mean duration of 5 - 6 days, Pedal oedema with or without anasarca appeared within a mean duration of 7 - 10 days.

**TABLE 01: Investigative Abnormalities**

S.No	INVESTIGATIVE ABNORMALITIES	NO. OF PATIENTS	PERCENTAGE
1	Raised total count(>11,000/cumm)	13	41.93
2	Raised blood urea(>40mg%)	11	35.48
3	Raised serum creatinine(>1.2mg%)	13	41.19
4	Raised bilirubin(>2mg%)	2	6.4
5	Raised CPK (>300)	25	80.64
6	Raised potassium(>5.5meq)	8	28.57
7	Serum calcium(<8mg%)	8	28.57
8	CUE( normal)	2	6.4
9	CUE( pigment casts)	2	6.4
10	CUE( urine proteins++)	13	41.9

Raised total count was seen n=13, elevated blood urea in n=11, raised creatinine n=13, increased bilirubin n=2, raised CPK levels above 300IU /lt n=25 patients and raised potassium in n= 8 patients respectively. Chest x ray showed features of pulmonary edema in 3%, pleural effusion and consolidation in 6% of patients.

ECG abnormalities like sinus tachycardia, non specific T wave inversions, QT<sub>c</sub> prolongation, and sinus bradycardia were seen in 38% of patients.

Renal biopsy was done in 3 cases of acute kidney injury, among 3 biopsies 2 showed acute tubular necrosis and 1 showed pigment nephrosis.

**TABLE 02 : COMPLICATIONS**

S.No	Complication	No. Of Patients	Percentage
1	Angioedema	27	87.09
2	Rhabdomyolysis (CPK>1500IU/L)	25	80.9
3	Acute Renal Failure	6	19.3
4	Ventilator associated Pneumonia, ARDS	2	6.4
5	Hypocalcemia	16	51.61

28.5% of patients with CPK levels more than 10,000 IU/L developed ARF. Hypocalcaemia was observed in 51% of patients, 2 developed carpopedal spasms which responded to calcium administration.

**TABLE 03 : AMOUNT OF DYE (> 50ml)/ ACUTE RENAL FAILURE CORRELATION**

AMOUNT OF DYE (>50ml)	ARF		TOTAL
	YES	NO	
YES	6(19.3%)	10(32.2%)	16(51.61%)
NO	0	15(48.38%)	15(48.38%)
TOTAL	6(19.3%)	25(80.6%)	31(100%)

ARF was seen in 19.3% of patients who ingested more than 50 ml of dye and was not seen in patients who ingested less than 50 ml of dye. The correlation was statistically significant.

About 58% of patients were discharged from hospital in good general health condition after nearly 10 days (ranging from 4 – 21 days). 25% patients left against medical advice. 12% patients expired due to complications like pneumonia, sepsis and ARF.

#### DISCUSSION

Super-Vasmol, a cheap, freely super

Super – vasmol, a cheap, freely super available hair dye is emerging as a major cause of suicidal poisoning in India. It contains potential toxins including paraphenylene diamine, sodium ethylene diamine tetra acetic acid and [propylene glycol](#) which can result in multiorgan dysfunction<sup>3</sup>.

Prevalence was more in the age group of 21– 30 years with female preponderance of 80.64% . Akber MH<sup>1</sup> and Anugrah Chrispal et al<sup>3</sup> identified similar age group of 20.5±4.65 years with female predominance.

The mean amount of dye consumed was found to be 52.31 ± 29.56 ml in our study (range 10 – 100 ml). The toxic effects depend on the dosage.<sup>4</sup>

Angioedema developed in 48.38% of the patients with varying severity in our study with a mean duration of 3.7 ± 1 hours (range 3 – 6 hours). In 09(28%) patients with severe angioneurotic edema and stridor emergency tracheostomy was done. Suliman et al<sup>9</sup> observed a tracheostomy rate of 15.8% in his patients, a study at Multan<sup>1</sup> showed this rate to be 60% while 87.5% of our patients required this procedure.

Rhabdomyolysis was noted in 80.9% of patients. Kallel et al also noted rhabdomyolysis in 47.4% of patients in his study.<sup>5</sup>

Acute Renal Failure (ARF) developed in 19% of our patients requiring renal replacement therapy. ARF occurred in 37.5% of patients by Akber et al).

Mortality was 12.9% in our study, as compared to Akbar et al at Multan which was 20%<sup>1</sup>

#### IV. CONCLUSION

The clinical profile of hair dye ingestion is dominated by development of angioedema rhabdomyolysis and acute kidney injury. Antihistamines, steroids , hydration along with diuresis were the mainstay of therapy. Emergency airway management in the form of tracheostomy or endotracheal intubation with or without mechanical ventilatory support, renal replacement therapy for acute kidney injury were the modalities followed for treating complications.

As there is no specific antidote for hair dye poisoning and burden of cases has been increasing, there is need for bringing awareness among the public regarding the toxic effects of this hair dye. Primary care physicians, intensive care physicians need to be aware of its clinical manifestations and management. One should be vigilant of the anticipated complications and be prompt in instituting good supportive management to minimize the morbidity and mortality.

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#### AUTHORS

**First Author** – Dr. P. Sakuntala, M.D., Asst Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

**Second Author** – Dr. P. Musa Khan, M.D., Asst. Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

**Third Author** – Dr. B. Sudarsi, M.D., Asst Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

**Fourth Author** – Dr. S. Manohar, M.D., Professor & HOD of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

**Fifth Author** – Dr. R. Siddeswari, M.D., Prof. Of Medicine,  
Osmania General Hospital, Hyderabad, Telangana State, India.

**Sixth Author** – Dr. Kranthi Swaroop, M.D., Osmania General  
Hospital, Hyderabad, Telangana State, India.

# Atypical Presentation of Cervical Lymphadenopathy in a Case of Lymphatic Filariasis

Dr R S Parihar\*, Dr Swati Duggal\*, Dr P K Khatri\*, Dr S S Rathore\*\*, Dr Saroj Meena\*, Dr Ritu Dhoundyal\*

\*Department of Microbiology, Dr S.N.Medical College, Jodhpur (Rajasthan), India

\*\*Department of Surgery, Dr S.N.Medical College, Jodhpur (Rajasthan), India

**Abstract-** Lymphatic filariasis, caused by *Wuchereria bancrofti* is an important parasitic disease included in the National vector-borne disease control programme in India to bring down the microfilariae carriage rate and disease prevalence in endemic zones in the country. Unplanned urbanization and frequent travel of people from non-endemic areas to endemic areas has increased the threat of this infection, even in non-endemic zones. We report a case of a 19 year old girl from Rajasthan (non-endemic state) who came with the complaint of cervical lymphadenopathy. Extensive follow-up of patient with various investigations such as CBC, urine complete, X-ray, CECT neck, Giemsa staining of PBF, FNAC of lymph node and AFB staining of sputum were carried out when a final diagnosis of lymphatic filariasis could be established by demonstrating live, motile microfilariae in EDTA blood sample collected in night hours. Also, Giemsa-stained PBF revealed sheathed microfilariae with cephalic space: breadth ratio of 1:1, regularly placed purple-coloured nuclei over the entire length and tail-tip free of nuclei.

**Index Terms-** eosinophilia, lymphatic filariasis, microfilariae, *Wuchereria bancrofti*.

## I. INTRODUCTION

Lymphatic filariasis (LF) is frequently encountered in the Asian, African and some of the South American countries [1] that is in the tropics and sub-tropics affecting over 73 countries [2]. WHO has given a worldwide distribution and status of preventive chemotherapy for lymphatic filariasis as shown in Figure 1 [3].

It is an important public health problem in India where about a third of the global population accounting to 300 million people live at risk of this disease [4].

The disease was recorded in India as early as in the 6th century B.C. by the famous Indian physician Susruta in his book 'Susruta Samhita'. The disease is caused by three species of nematode thread-like worms – *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*, known as filariae. Male worms measure about 3-4cm in length and female worms between 8-10cm [5].

Nocturnally periodic *W. bancrofti* (microfilariae appear in peripheral blood circulation only during night): The most widespread form transmitted by *Culex quinquefasciatus*, a ubiquitous mosquito, breeds in almost all organically polluted water bodies [6].

Several cases of lymphatic filariasis (LF) have been reported in non-endemic countries due to migration of people from endemic to non-endemic zones and international travel which facilitate the spread of this parasitic disease across non-endemic zones [7].

## II. CASE REPORT

We report a case of a 19-year old girl residing in Basni locality of Jodhpur, Rajasthan. She presented in surgical OPD of Mathuradas Mathur Hospital associated with Dr S.N.Medical College, Jodhpur with the chief complaint of swollen lymph nodes in right neck region for duration of 1 year which had started developing mild pain from last 10 days. The patient also complained of headache and cold from last 3 days. A history of stay of past 3 years duration in a local district in Uttar Pradesh was also given by her. She did not have any history of breathlessness, sore throat, malaise, lethargy, vomiting or weight loss. Also, she did not suffer from any chronic illnesses like diabetes, asthma or hypertension. No other family member suggest such type of history.

On examination, she was afebrile. The right cervical lymph nodes were palpable, 4 in number, varying in size from pinhead to pea-size; discrete, tender and non-matted (Figure 2). Enlargement in any other lymph node was not seen.

The patient was evaluated with various investigations to establish a diagnosis. Complete blood count (CBC) revealed eosinophilia with eosinophil count ranging upto 1500/cu.mm. of blood. Peripheral blood film (PBF) made from blood collected in EDTA vial did not show any parasite. Fine needle aspiration cytology (FNAC) of lymph node was unyielding. A chest X-ray was unremarkable. Urine complete was done to rule out proteinuria or haematuria due to renal involvement. Sputum for acid fast bacilli with 2 samples (on spot and early morning) was carried out to rule out the possibility of tuberculosis. A contrast-enhanced computerized tomography scan (CECT) was carried out to identify the nature and characteristics of enlarged lymph nodes. CECT showed multiple enlarged homogeneously enhancing, oval-shaped cervical lymph nodes in right neck region. A small, non-enhancing, hypodense lesion with peripheral thick enhancing rim was noted in retropharyngeal space adjacent to adenoid (6x6 mm).

Owing to eosinophilia, negative PBF findings, travel history to endemic belts of Uttar Pradesh and nocturnal periodicity of *Wuchereria bancrofti*, a night blood sample was collected again in EDTA vial at 01 a.m. Then, a wet mount was prepared from it.

Live, motile microfilariae lashing the red blood cells were observed [8].

For stained preparations, thick blood smears were first dehaemoglobinised with distilled water, fixed with methanol and finally Giemsa staining was carried out to demonstrate microfilariae; the morphology of which was confirmed as *Wuchereria bancrofti* in thin blood smears due to presence of hyaline sheath, cephalic space: breadth ratio of 1:1, regularly placed purple-coloured nuclei over the entire length with tail-tip free of nuclei (FIGURE 3) [9].

On confirmation of filarial infection, the treatment was instituted with 100 mg diethylcarbamazine, thrice a day for 21 days [10]. On a repeat CBC after 21 days, eosinophilia reached upto 2500/cu.mm. of blood and there was initial flaring of lymph node lesions at 10<sup>th</sup> day which gradually subsided in a month's time. This can be explained by the fact that alive and mobile adult worms and microfilariae do not excite any tissue reaction but dead and fixed adults and microfilariae excite severe reaction, which may include eosinophilia, eosinophilic abscess, neutrophilic abscess, necrosis and epithelioid cell granuloma [11].

There remains a possibility of low rates of infection being reported in non-endemic areas as the development of elephantiasis or lymphoedema takes 10 years to develop after infection. Therefore, it is very necessary for the physicians to be aware of the signs and symptoms of lymphatic filariasis, and infection should be considered in the differential diagnosis of people with a relevant travel history [12].

#### ACKNOWLEDGMENT

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#### AUTHORS

- First author**-Dr R S Parihar, Professor (Microbiology), Dr S.N.Medical College, Jodhpur, [drrajendraparihar@gmail.com](mailto:drrajendraparihar@gmail.com)  
**Second author**-Dr Swati Duggal, Resident doctor (Microbiology), Dr S.N.Medical College, Jodhpur, [drswatiduggal22@gmail.com](mailto:drswatiduggal22@gmail.com)  
**Third author**-Dr P K Khatri, Professor & Head (Microbiology), Dr S.N.Medical College, Jodhpur [drpkkhatri@yahoo.co.in](mailto:drpkkhatri@yahoo.co.in)  
**Fourth author**-Dr S S Rathore, Professor (Surgery), Dr S.N.Medical College, Jodhpur.  
**Fifth author**-Dr Saroj Meena, Assistant Professor (Microbiology), Dr S.N.Medical College, Jodhpur.  
**Sixth author**-Dr Ritu Dhoundyal, Senior demonstrator (Microbiology), Dr S.N.Medical College, Jodhpur.

**Correspondence author**- Dr Swati Duggal, Resident doctor (Microbiology), Dr S.N.Medical College, Jodhpur, [drswatiduggal22@gmail.com](mailto:drswatiduggal22@gmail.com) +91-9414918521, +91-8559861758



Distribution and status of preventive chemotherapy for lymphatic filariasis, worldwide, 2010

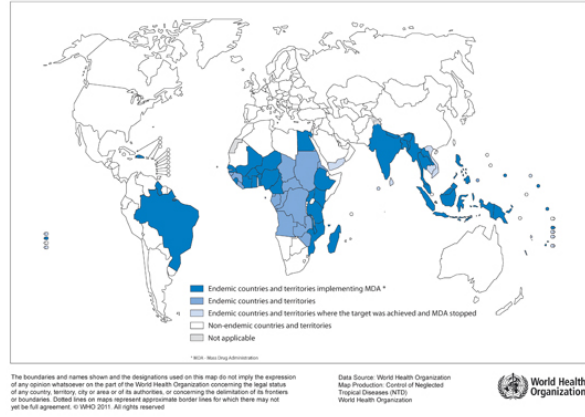


Figure 1: Distribution and status of preventive chemotherapy for lymphatic filariasis worldwide



Figure 2: Enlarged cervical lymph nodes in 19-year old girl

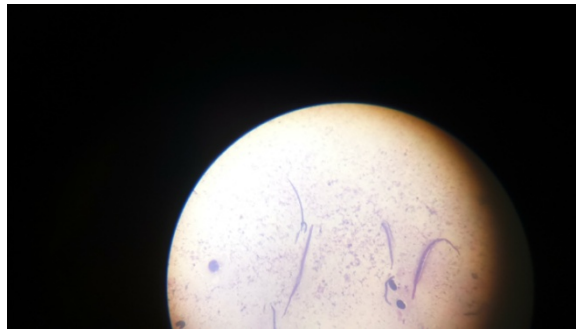


Figure 3: Giemsa-stained peripheral blood smear from night blood sample demonstrating microfilariae of *Wuchereria bancrofti* (10X)

# Determinants of Effective Logistics coordination among Humanitarian Organizations in Kenya. A Case of Humanitarian Organization in Nairobi County

Peter Njuki Karanja<sup>1</sup>, Dr. Christopher J Mairura<sup>2</sup>, Dr. Kepha Ombui<sup>3</sup>

<sup>1</sup>MSC Student: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>2</sup>Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>3</sup>Adjunct Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

**Abstract-** This study identified determinants of effective logistics coordination among Humanitarian Organizations in Kenya; A case of Humanitarian Organizations in Nairobi County. Statement problem of this study evolved in the fact of humanitarian Organizations suffers in one way or the other from lack of Logistics Coordination and are well aware of the negative impacts of lack of coordination in the provision of Humanitarian aid. The objectives of this study is to; To explore whether Information sharing among Humanitarian organization influence Humanitarian Logistics Coordination; To establish how specialized skills among Humanitarian organization affect humanitarian Logistics coordination; To establish extent to which Donor Conditions contribute to lack of Humanitarian Logistics Coordination. The Research study focused on Kenya Red Cross Society, Concern worldwide, Danish Refugee Council, Oxfam Kenya and world Vision- Kenya all identified as the main inter-related humanitarian actors with similar mandates. This study was achieved by employing descriptive survey design on a sample of 5 Humanitarian Organizations constituting 30 per cent of the population of 17 Humanitarian Organizations in Nairobi for representativeness. Using questionnaire and interview guide on a population of 92 logistics coordinators and heads of operations from the sampled HOs, the study analysed humanitarian Logistics coordination variables such as inter-organization information sharing, organizations competency or skills and Donor funding as independent variables and Effective Logistics coordination (response time, costs, accuracy, impact and number of beneficiaries) as dependent variables. The researcher maximized the use of mixed mode research design. Research data was collected using questionnaires and interviews guides. Automatic inclusion, purposive sampling and random sampling were employed sampling all Logistics workers at the selected firms in Nairobi. The data was analysed descriptively with the use of SPSS and presented through figures, tables and percentages. The study identified gaps and made various recommendations that can help prevent or reduce duplication of efforts of Humanitarian Organizations to the benefit of all stakeholders. The findings also forms the foundation for decisions and steps in formulating relevant industry and organization policies geared towards efficient and effective Logistics Coordination in the HOs in Nairobi. The overall finding of the study is that logistics coordination is poorly embraced among relief giving organizations in Nairobi. The researcher recommends that intensive sensitization should be done among humanitarian organizations so that they can embrace

Information sharing with likeminded HOs through Platforms like Clusters or disaster planning forums. Specialized skill should be substituted between organizations whenever disasters strike while donors should establish framework which will encourage humanitarian organizations Logistics coordination to enable effective lifesaving humanitarian activities.

**Index Terms-** Humanitarian Organization, Logistics Coordination, Logistics

## I. INTRODUCTION

Russell (2005) defines coordination as to resource and information sharing, centralized decision-making, conducting joint projects, regional division of tasks, or a cluster-based system in which each cluster represents a different sector area such as food, water and sanitation, and information technology.

According to Gazley and Brudney (2007), coordination can yield many benefits such as economic efficiencies, greater service quality, organizational learning, access to new skills, diffusion of risk, improved public accountability, ability to buffer external uncertainties, and conflict avoidance. The significant amount of uncertainty such as number of beneficiaries, availability of supply, conditions of supply networks, availability of human resources faced by HOs when responding to disasters can be leveraged by coordination (Thévenaz & Resodihardjo, 2010).

Coordination may also take the form of sharing equipment, assets, and resources, the humanitarian operations across Humanitarian Organizations (Hos). Samii and Van Wassenhove (2003) or the 2005 hurricane Katrina; and Cordoba (2010) for the 2010 Haiti earthquake. Thévenaz and Resodihardjo (2010) observe that in uncoordinated situations, efforts are duplicated, resources are used in an unproductive and ineffective way or are wasted, and relief efforts are slow, impeded, or obstructed. This lack of coordination results to ineffective aid distribution (Murray, 2005), congestion at local airports and roads (Fritz, 2005), injury or death of aid recipients struggling to attain services (Moore *et al.*, 2003), competition among HOs over limited resources, raised costs and increasing delays (Chang *et al.*, 2010).

In Kenya, Mweiga (2013) states that although Humanitarian organizations contribute significantly in preventing and

strengthening preparedness for the occurrence of such situations, saving lives, alleviating suffering and maintaining human dignity during and in the aftermath of man-made crises and natural disasters, the Humanitarian supply chains which are the cardinal networks to provide physical aid to beneficiaries require efficient logistical and procurement network support. This may form the basis for coordination of efforts of the Humanitarian Organizations.

According to the Kenya National Disaster Response Plan done by Office of the President Ministry of State for Special Programmes (MSSP), and Ministry of Provincial Administration and Internal Security -National Disaster Operation Centre (NDOC) dated 2009, lack of coordination in natural disasters was also identified within the government systems and this plan gives appropriate guidelines for coordination and response to all types of disasters and emergencies. It is expected that newly created devolved county governments will use the plan to develop and implement their own hazard specific plans and train the relevant personnel. The plan was developed through a consultative process among stakeholders from Government Ministries, UN agencies, NGOs, World Vision, the Kenya Red Cross and other Humanitarian partners.

The Kenya Disaster Response plan 2009 enabled the Ministry State for Special programme to come up with National Policy for Disaster Management in Kenya after the experience where it is estimated that the Government, together with development partners and other stakeholders such as the UN agencies, Civil Society and the Private Sector, spent a colossal USD 340 million to respond to the 1999-2001 drought, considered to be one of the worst droughts in Kenya where 4.5 citizens million were affected. A study entitled, “the cost of delayed response” carried out by disaster management experts in 2002 estimated that only USD 171million was required to effectively respond to this drought had there been an effective disaster management system in place. The extra amount was a cost to the national economy attributed to poor preparedness and delayed response to this drought episode. A big lesson from this is that managing disasters is expensive. But not managing disasters is even much more expensive.

According to Wafula (2012), on the challenges and opportunities for Integrated disasters and risk Management with particular reference to policy, legislation and regulations in Kenya, the HO's failures to coordinate becomes more evident since the frameworks and legislations to facilitate the coordination of disaster management activities from the central level to local level have also not been institutionalized. However, the development of the framework and bills should be guided by the nature of disasters occurring in the country. Citing the new constitutional dispensation which is implementing devolved governance, the systems should seek to delegate authority to the least centralized level, such as the village, that has the capacity to respond to needs. GoK (2003) Economic Recovery Strategy for Wealth and Employment Creation 2003-2007 also points the aid volatility which directly calls for coordinated efforts.

According to a paper by Wafula (2012) on the challenges and opportunities for integrated disaster and risk management, coordination in disaster management involves bringing together the different elements of complex activities or organizations into a harmonious and efficient relationship and to negotiate with

others in order to work together effectively for the benefit of those affected by the event. Currently, disaster management coordination is lacking resulting in gaps and duplications, inappropriate assistance, inefficient use of resources, bottlenecks and impediments, slow reaction to changing conditions, frustration of providers, officials, survivors, poor information transfer to the public and other organizations resulting in a loss or lack of confidence.

### **1.1 Humanitarian Organizations in Kenya**

There are a number of Humanitarian Organizations operating in Kenya although not all of them are based in Nairobi. This study is limited to those that operate in Nairobi as enlisted in Appendix 1. This study narrowed down to these organizations as the target population because the seventeen (17) humanitarian organizations are based in Nairobi.

The Humanitarian organizations in Kenya offers humanitarian relief aid designed to save lives and alleviate the suffering in the immediate aftermath of emergencies (GHA 2012). A situation becomes an emergency when the lives of the population are threatened beyond the local capacity to respond or cope and can be situation of a natural disaster or man-made (James 2008:2). Humanitarian organization intervenes when they are requested by the Kenyan Government or as mandated under Chapter VII of the United Nations Charter (Gillmann 2010:105).

In the past decade the humanitarian system in Kenya has had to respond to several natural disasters and complex emergencies of increasing severity like drought, post-elections violence in early 2008, the Lamu killings in Coastal Kenya, and displacement among others. Due to these experiences there has been an attempt to increase coordination amongst humanitarian actors and improve coherence in humanitarian response, where the United Nations had tried to implement a coordination mechanism called the Cluster Approach. This was encouraging humanitarian actors to consider longer term objectives into their life-saving work integrated into the work of all clusters in the humanitarian response and the Emergency Humanitarian Response Plan (EHRP) for Kenya.

### **1.2 Statement of the Problem**

Humanitarian aid in Nairobi County has not bared fruits for the last decade. This has been occasioned by the various challenges facing the HO's which have hampered their effective operations in the county. One of the major challenges that all HO's have suffered from is lack of proper coordination of their operations among themselves. The HO's in Nairobi County have one objective; to help uplift the life of the Nairobians especially in slums areas where most disasters happen. Due to lack of effective logistic coordination among HO's, there has been a lot of duplication of projects and efforts in the County. This has led to high wastage resources, delayed response to humanitarian needs and inability on the side of HO's to meet their objectives and those of the donors. Despite all these challenges very little efforts if any have been made to ensure effective logistical coordination among the HO's in Nairobi County.

The problem has been heightened first by lack of information sharing among the HO's to promote coordination of their humanitarian efforts for efficiency and effectiveness of their operations. As Currey (2003), Gordon (2001), and Gourlay (2000) would agree such coordination among the humanitarian

missions has become essential if the missions have to effectively respond to specific needs on the ground. In addition the effective logistical plan in place, coordination has been clogged by some strict conditions given by donors in disbursing their funds where they dictate the ways funds are to be utilized.

Any effort to support effective coordination among HOs that goes against the donor conditions may lead to the termination of Funds. Effective logistical coordination requires that firms have equal and constant funds to enable them participate in the shared efforts. Lack of constant flow of funds has also greatly affected this desired and necessary coordination. Finally organization staff competence driven by organization mandate may determine how and whether responds to certain disasters and emergencies.

This study therefore investigated the extent to which Information sharing, organization staff competence, donor conditions and constant flow of funds influence the effective logistical coordination among the HOs in Nairobi County.

### 1.3 General Objective

The general objective of this study was to establish the determinants of effective logistical coordination among the HOs in Nairobi County.

#### 1.3.1 Specific Objectives

The study was guided by the following objectives:

1. To establish the extent to which Information sharing among Humanitarian organizations determines effective logistics coordination.
2. To determine the extent to which organizational competent skills influence effective logistics coordination.
3. To establish the extent to which donor funding contribute to effective Logistics coordination

#### 1.4 Research Questions

The research questions for this study were -:

1. How does information sharing among Humanitarian organizations determine effective Logistics coordination?
2. How does organizational competency influence effective Logistics coordination?
3. How does donor funding contribute to effective Logistics coordination?

## II. LITERATURE REVIEW

### 2.1 Theoretical Framework

This study was based on the Social Network Theory, the Resource Based Theory and Relief Coordination Theory as discussed here below.

#### 2.1.1 Social Network Theory

Social Network Theory which is also called the Network theory, network analysis (Scott, 2001) has nodes and links as independent construct and node size, density, link strength as dependent constructs. Its proponents include Stanley Milgram (small worlds problem, six degrees of separation), Mark Granovetter (the strength of weak ties) and Barnes who was the first to study social networks. It is a theory social network theory that focuses on the many ways that people interrelate and

communicate via the various social networking platforms (Scott, 2000).

According to Haythornthwaite (1996), social network theory understands social relationships in terms of nodes and ties. Nodes are the individual actors within the networks, and ties are the relationships between the actors. There can be many kinds of ties between the nodes. The fact that these kinds of ties can vary in intensity and importance is just one of the many variables that can factor into social network theory. Often the analysis of a network will involve dots of varying sizes and colours connected by lines of differing lengths and thicknesses. A social network analyst will try changing variables and looking at the connections in various ways to discover hidden correlations and trends in the network.

Layton (2006) argues that basically there are two elements in any social network, online or offline; nodes and ties. Nodes are the elements of the network that act - whether they are organizations, small groups, or individuals - and ties are the ways these nodes relate to each other. This could be as minor as an email correspondence or as intimate as a marriage. In its most simple form, a social network is a map of all of the relevant ties between the nodes being studied. The network can also be used to determine the social capital of individual actors. These concepts are often displayed in a social network diagram, where nodes are the points and ties are the lines.

The power of social network theory stems from its difference from traditional sociological studies, which assume that it is the attributes of individual actors whether they are friendly or unfriendly, smart or dumb among others that matter. One of the defining elements of social network theory that differentiates it from other sociological sciences is the weight it gives to the relationships between the nodes, as opposed to the attributes of the nodes themselves. Social networks have also been used to examine how Humanitarian Organizations interact with each other, characterizing the many informal connections that link executives together as well as associations and connections between individual employees at different Humanitarian Organizations (Layton, 2006).

These networks provide ways for Humanitarian Organizations to gather information, deter competition, and even coordinate in setting operational policies (Layton, 2006).

#### 2.1.2 Resource Based Theory

According to Eisenhardt and Martin (2000), Resource-based theory holds that the firm can be considered as a bundle of resources that are heterogeneously distributed across it in this case, Humanitarian Organizations with enduring differences between them. This theory posits that a company must secure an efficient bundle and flow of the right type of resources from its operating environment to stay relevant and prop up its performance (Rungtusanatham *et al.*, 2003). In this theory, resources refer to physical or tangible assets that include plants, equipment; as well as intangible assets such as knowledge, expertise, and other organizational assets.

In lieu of this, competitive advantage can result from having a shared ownership of or access to, unique/expensive assets like transport, innovations, and barriers to resources. It is these resources that can enable Humanitarian Organizations to have leverage for competitiveness in the humanitarian operations

through the combination of such resources and capabilities in a way that forms the core competencies of each individual humanitarian organization.

According to Zacharia, Sanders, and Nix (2011), Research Based Theory (RBT) is critical to many firms due to its competency in logistics and that it can be expensive if a company opts to invest in it. This is because competency is a source of sustainable competitive advantage that Humanitarian Organizations can have over a period of time and whose realization is pegged on the practicability of taking advantage of the resources that a company has to achieve efficiency and effectiveness by utilizing even the resources it does not own.

Humanitarian Organizations have therefore relied on outsourcing to gain access to other firm's valuable resources in the competitive market. With the growing need for such resources, Humanitarian Organizations searching and providing such services become reciprocally adapted towards one another and more value dependent. The theory thus suggests that coordination enables firms to be accessible to complementary resources and create much more competitive resource bundles, providing them with a competitive advantage (Zacharia, Sanders & Nix, 2011).

### 2.1.3 Relief Coordination Theory

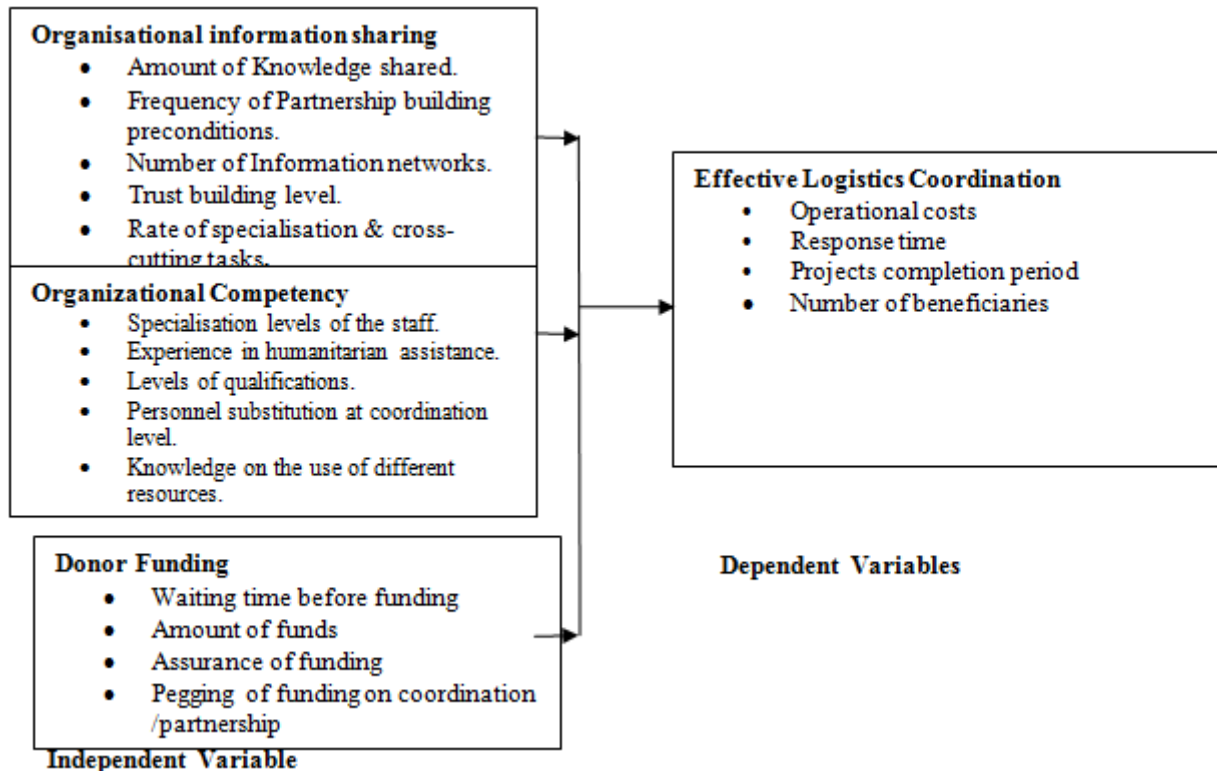
This theory posits that it is possible to orchestrate the efforts of diverse organizations and the orderly and organized direction of activities ((Seybolt, 1997; McEntire, 1997). The Humanitarianism and War Project offers a more specific and often cited definition of the concept as: managing information;

mobilizing resources and assuring accountability; orchestrating a functional division of labour in the field; negotiating and maintaining a serviceable framework with host political authorities; and providing leadership (Minear, 2002).

Analysts and scholars also often suggest that coordination is important to improve service delivery effectiveness. Indeed, while effectiveness is rarely defined, it is most often given as the reason why achieving coordination among service providing agencies is important (Minear, 2002). An effort to reduce duplication, often framed as securing or improving organizational efficiency, is also frequently offered as a rationale for why humanitarian organizations should seek to coordinate their assistance operations (McEntire, 1997).

### 2.2 Conceptual Framework

In the conceptual framework; coordination variables are the three main independent variables that influenced the efficiency and effectiveness of the operations of Humanitarian Organizations in Nairobi, Kenya. The independent variables are Inter-organization information sharing, Inter-organization competence-based specialization and Donor funding conditions. These were meant to check the core coordination areas that the Humanitarian Organization utilize or may possibly utilize and their respective extent. The independent variables were looked at against operational efficiency and effectiveness within the Humanitarian Organizations with regard to logistics coordination which is determined by savings on operational costs, quick response time, number of projects concluded, number of organizations partnering & impact on the victims.



### III. RESERCH METHODOLOGY

#### 1.1. Research Design

The research study adopted a descriptive research design that was proper to a study that uses a sample to describe the characteristics of certain groups (in this case HOs), estimate the proportion of people with distinct characteristics, and make predictions. According to Creswell (1994), the purpose of a descriptive study is normally to gather information about the present existing conditions without making amends to the actual observation. Descriptive survey, according to Best and Kahn (1998) has the ability to produce statistical information about aspects of education that interest policy-makers and researchers. This study, therefore, aims at collecting information from the Humanitarian Organizations in Kenya which present their actual picture.

#### 3.2 Target Population

The population in this study consisted of all the 17 Humanitarian Organizations in Nairobi but a representative sample of the organizations constituting 30 per cent in line with Orodho (2005) who states that a sample of 30 per cent is representative enough for a descriptive study. Thirty percent of the humanitarian organizations sampled for this study totalled five (5) organizations with all their employees totalling to 92. It is from this number of staff that the researcher used as a representative sample for this study.

**Table 3.1 Target Population**

Level	Population	Sample size no 30 percent
Humanitarian Organizations in Nairobi	17	5
<b>Total</b>	<b>17</b>	<b>5</b>

#### 3.3 Sample and Sampling Techniques

The five selected organizations using simple random sampling included Kenya Red Cross Society, Concern Worldwide, Danish Refugee Council, Oxfam Kenya and World Vision- Kenya. The target population was logistics coordinators and head of operations who are always at the centre of relief logistics management because they are more knowledgeable and therefore better placed to respond to the items regarding the issue under study.

#### 3.4 Sampling Frame

Wiersma (1995) states that an ideal sample should be large enough for validity and reliability. That is, if the same study is conducted with different sample size, the same data will be collected. For Cohen et al. (2007), there is no exact size of the sample but this depends on the purpose of the study and the nature of the population under scrutiny. In general, the larger the sample the more reliable it is. Logistics coordinators and head of operations in each organization were selected using simple random sampling technique as shown in table 3.2. The sampling frame for this study was the five sampled organizations. It is from this sampling frame that the researcher stratified the

population in the respective organizations into two strata; of logistics coordinators and head of operations.

**Table 3.2: Sample Size**

Organizations	Population(Logistics coordinators & head of operations)	Project Sample
Concern Worldwide	12	12
Red Cross	20	20
Danish Refugee Council	15	15
Oxfam Kenya	20	20
World Vision Kenya	25	25
<b>Total</b>	<b>92</b>	<b>92</b>

#### 3.5 Sampling Techniques

Mugenda and Mugenda (2003) argue that the sample must be carefully selected to be representative of the population. In this study a census data collection method was used in this study as data was obtained from few individual of the study. Since all the humanitarian organizations have their headquarters in Nairobi and that they are all accessible, the study adopted a census approach. The heads of operations and logistics of these organizations were the respondents because they are involved in all activities touching on Logistics co-ordination. This therefore means the entire population was used to get the required data for the study.

#### 3.6 Data Collection Procedures

Primary data was derived through administration of questionnaires. Secondary data was gathered from existing literature. The questionnaires were self-administered to the sampled respondents. Permission to carry out the research and authorization letter was received from the University and also the Ministry of Education. This was explained to the respondent the reason for the research and enhanced the confidentiality of the data collected from them. Thereafter, the questionnaires was self-administered by a drop and pick method. During this process, the researcher went first to the organizations sampled and introduced himself and met the top management and the employees, giving them brief information in regard to the research. Then an official date was set for the distribution of the questionnaires. The questionnaires were picked later after a grace period of one week given to the respondents to fill the questionnaires.

#### 3.7 Data Analysis

The researcher used quantitative data analysis methods comprising of both descriptive and inferential statistics. Sieber (1980) posits that a mixture of quantitative and qualitative methods often produces much more reliable results than either quantitative or qualitative method does alone. The data that was collected through questionnaires was edited, coded, entered into the Statistical Package for Social Sciences (SPSS) for analysis

and generation of frequency tables, charts and graphs. Statistical inference was drawn.

Correlation analysis was used to establish the relationship between the independent variables (inter-organization information sharing, inter-organization competency skills and Donor funding Conditions) and Logistics coordination by humanitarian organization (the dependent variable). The resulting correlation coefficient (R) gave the indication of the strength and direction of the relation between the independent and dependent variables. Consequently, coefficient of

determination ( $R^2$ ) was calculated. This has given the causal relationship between the independent and dependent variable.

#### IV. RESERCH FINDINGS AND DISCUSSION

##### 4.1 Summary of the Findings

##### 4.1.1 Information sharing

**Table 4.1 Information sharing**

Information sharing		SD	D	N	A	SA
We share high volume/amount of Knowledge	F	23	51	0	1	0
	%	31	68	0	1	0
We have a Partnership building pre-conditions	F	17	56	0	1	2
	%	23	75	0	0	3
We have a number of Information networks	F	9	65	0	1	0
	%	12	87	0	1	0
We have trust building level	F	15	57	0	1	2
	%	20	76	0	1	3
We have high rate of specialisation & cross-cutting tasks	F	12	62	0	0	1
	%	16	83	0	0	1
Summation		101	388	0	4	7
Average %		20	78	0	1	1

\*SD=strongly disagree D=Disagree N=Not sure A=Agree SA=Strongly Agree f=Frequency.

The first objective of the study sought to establish the extent to which information sharing determine logistics coordination. The responses were generated on a five point Likert scale; 1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree and 5= Strongly Agree. The respondents were required to state their level of agreement.

According to Layton (2006) networks provide ways for Humanitarian Organizations to gather information, deter competition, and even coordinate in setting operational policies. Descriptive statistics frequencies and percentages were used to summarize the study findings as shown in Table 4.6. Majority 62 respondents disagreed that there is high rate of specialisation & cross-cutting tasks. In addition, 56 respondents disagreed that there exist a partnership building pre-conditions and 51 respondents disagreed that there is high volume/amount of knowledge within the HOs while 65 respondents disagreed that they have a number of Information networks. Finally it was also noted that 57 respondents disagreed that they have trust building level among logisticians in the HOs.

On average 78% disagreed while 20% strongly disagreed that there were information sharing amongst Humanitarian organizations. The implications of these findings are that the level of information sharing is low among the Humanitarian organizations in Nairobi and hence leading to a low level of logistics coordination. A study by Peel and Rowley (2010) on Information sharing practice in multi-agency working, they found that workers recognized the importance of information sharing to their job role and are willing participants despite busy work schedules that never make this a reality.

This means that there is no knowledge-sharing platform, organizations never share high volume/amount of Knowledge, organizations have no information networks, there is low trust building level and that they have low rate of specialisation & cross-cutting tasks. Information and knowledge sharing has been recognized as being increasingly important in the public sector (Fowler & Pryke, 2003; Gorry, 2008).



### 4.1.2 Organizational competency

**Table 4.2 Organizational competency**

Organizational competency		SD	D	N	A	SA
We have specialised levels of staff	F	17	6	0	50	2
	%	22	25	0	50	3
We are experienced in humanitarian assistance	F	15	59	0	1	0
	%	20	79	0	1	0
Our staff have high levels of qualifications	F	10	25	0	40	0
	%	13	87	0	0	0
There is personnel substitution at Logistics coordination level.	F	19	54	0	1	1
	%	25	72	0	1	1
We are knowledgeable in using different resources	F	16	59	0	0	0
	%	21	79	0	0	0
Summation		102	288	0	106	4
Average %		20	58	0	21	1

\*SD=strongly disagree D=Disagree N=Not sure A=Agree SA=Strongly Agree f=Frequency.

The second objective of the study was to establish the extent to which organization competency determines logistics coordination in Nairobi. Results in Table 4.7 shows that 50 of the respondents equally agreed that they both have specialized level of staff, experienced in humanitarian assistance. Further, the results showed that 40 agreed that staff have high levels of qualifications while 54 disagreed that personnel substitution at Logistics coordination level exists. An overwhelming 59 respondents disagreed that they are knowledgeable in using different resources. According to Zacharia, Sanders, and Nix (2011), competency in logistics can be expensive if a company opts to invest in it. This is because competency is a source of sustainable competitive advantage that Humanitarian Organizations can have.

On average 58% disagreed while 20% strongly disagreed that there were requisite organizational competency for Logistics coordination amongst Humanitarian organizations. However 21% of the respondents agreed that there exist specialized and competence staff coupled with high level of qualifications. The implications of these findings are that the level of organizational

competency for Logistics coordination is moderate among the Humanitarian organizations in Nairobi and hence there is low level of coordination. Kovacs and Karen (2006) argue that in emphasizing certain levels of specialization in the provision of services, specialisation levels of the staff such as logistics professionals, health among others can be available in a humanitarian organization.

This means that HOs in Nairobi do have sizeable specialised levels of staff, who are experienced enough in humanitarian assistance, have acceptable levels of qualifications in logistics coordination but no personnel substitution at Logistics coordination level and employees have little knowledgeable in using different resources. The results of Huckman and Zinner (2008) show that specialized firms indeed outperform unfocused ones in terms of the number of enrolled clients.

### 4.1.3 Donor conditions

The third objective of the study sought to assess the extent to which donor conditions determines rate of logistics coordination in Nairobi County, Kenya.

**Table 4.3 Donor Conditions**

Donor conditions		SD	D	N	A	SA
We wait for long before funding is received	F	19	56	0	0	0
	%	25	75	0	0	0
We get enough fund to meet all our programs	F	10	25	0	35	5
	%	13	33	0	47	7
Donors give assurance of funding all the time	F	31	38	1	3	2
	%	41	51	1	4	3
We have donor funding partnership preconditions	F	5	20	0	10	40

	%	7	27	0	13	53
Summation		87	185	1	64	63
Average %		22	46	0	16	16

\*SD=strongly disagree D=Disagree N=Not sure A=Agree SA=Strongly Agree f=Frequency.

Results in Table 4.8 shows that 56 of the respondents disagreed that they wait for long before getting funding, 35 agreed that they have enough funds to cover all their programs. Further, the study showed that 31 and 38 of the respondents strongly disagreed and disagreed respectively that donors give assurance of funding all the time when there is a humanitarian crisis. 40 respondents agreed that they have partnership pre-conditions with donors ideally refers to us the proposal which serves an assurance agreement, integrity and accountability framework and commitment.

On average 46% disagreed while 22% strongly disagreed respectively that there were donor conditions that determines effective Logistics coordination amongst Humanitarian organizations. However 40 respondents strongly agreed that pre-conditions must be met before any funds are released. The implications of these findings are that the Donor Conditions on Logistics Coordination is moderate among the Humanitarian organizations in Nairobi and hence a factor that would determine effective Logistics coordination.

This means that organizations do wait for long before funding is received, that they get enough fund to meet all their programs. They also disagreed that donors give assurance of funding all the time a humanitarian crisis has been declared but strongly agreed that there are donor funding partnership preconditions to be met before funds are released. According to Swilling and Russell (2002), while some donor funding Conditions positively impact on the NGOs within the Humanitarian sector, other Conditions negatively impact on their activities and even efficiency as has been ascertained in South Africa.

#### 4.2 Correlation Analysis

**Table 4.3 Correlation analysis**

	r	R <sup>2</sup> (Coefficient of determination)	% coefficient of determination
Information Sharing	0.291	0.0853	8.53
Organizational competency	0.343	0.1177	11.77
Donors Funding	0.162	0.0262	2.62
TOTAL			22.92

This implies therefore that a change in Logistics coordination can be explained by a change in information sharing only to an extent of 8.53%. However 91.47 changes in logistics coordination is as a result of other factors. On the other hand a change in logistics coordination can be explained by a change in Organizational competency and specialized skills only to an extent of 11.77%, meaning that 88.23% changes will be as a

result of other factors. Finally a change in Logistics coordination can be explained by a change in Donor funding conditions only to an extent of 2.62%.

In summary 22.92 per cent change in Logistics coordination are as a result of the three independent variables and 77.18 per cent are as a result of other factors. According to Kombo & Tromp, (2006) data analysis refers to examination of what has been collected in order to make deduction and inference i.e. scrutinizing the acquired information and making inferences. Overall therefore means there is very low logistics coordination among humanitarian organizations in Nairobi.

## V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 Summary of Major Findings

The study aimed at assessing Logistics Coordination among humanitarian organizations in Nairobi County. The research had three specific objectives; to establish the extent to which information sharing among humanitarian organizations determines effective Logistics coordination, to determine the extent to which organization competency skills influence Logistics coordination, and to establish the extent to which donor funding conditions contribute to effective Logistics coordination among humanitarian organizations in Nairobi County, Kenya. A sample of 92 respondents was selected from the target population with similar characteristics; out of the 92 issued questionnaires 75 were filled and returned. A combination of descriptive statistics and inferential statistics were used to analyze the quantitative data.

### 5.2 Conclusion

The overall finding of the study is that logistics coordination is poorly embraced among relief giving organizations in Nairobi. The study therefore concludes that there is no knowledge-sharing platform, organizations never share partnership building pre-conditions, organizations have no information networks, there is low trust building level and they have low rate of specialisation & cross-cutting tasks. It was concluded that though organizations do have specialised levels of staff, who are experienced in humanitarian assistance, and who have high levels of qualifications in logistics coordination other aspects of lacking personnel substitution at Logistics coordination level and the little knowledgeable in using different resources availed by donors negates any meaningful logistics coordination. The study also concludes that organizations don't wait for long before funding is received for humanitarian response and that they always get enough funding to cover programs needs as per proposals. However since donors don't give assurance of funds whenever there is a humanitarian crisis and still also set tough partnership preconditions, this makes humanitarian organizations to opt for logistics planning at organizations individual level. This study's key conclusion is that there is very low coordination mechanism, and lack of it hinders effective logistics coordination

thus organizations are unable to reduce cost, have slow response time, delayed projects, constant errors or miscalculation and failure to reach needed beneficiaries.

### 5.3 Recommendations

The researcher recommends that intensive sensitization should be done among humanitarian organizations so that they can embrace Information sharing with likeminded HO through Platforms like Clusters or disaster planning forums.

According to the findings HOs in Nairobi have specialised levels of staff, have good experienced in humanitarian assistance coordination and staff have high levels of qualifications in logistics coordination. However a number of staff get promoted from low level jobs of logistics officer because of experience which build wealth of capacity in humanitarian responses. However lack personnel substitution at Logistics coordination responses between various organization employees and little knowledge and capacity in using different resources as maybe availed by donors for different humanitarian responses overrides the gains.

The relevant regulatory authority or better still major donors should develop legal framework which will encourage humanitarian organizations to embrace logistics coordination. Equally, there is need for innovative paradigm shift on logistics coordination among humanitarian organizations since it has the most significant influence their operation. From the study findings since majority of the humanitarian organizations depend on donor funding, donors should base funding on logistics coordination so as to encourage logistics coordination normally called Consortiums. The culture of cooperation within humanitarian organizations can enable value additions and cost reductions in operation cost, response times and shorter projects completion periods and be in a better position to reach more beneficiaries.

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#### AUTHORS

**First Author** – Peter Njuki Karanja is a Logistics, IT & Transport Manager with an international Non-Governmental organization. He has worked for more than 20 years in Supply Chain management in both private and humanitarian organization. He is a graduate in Bachelors of Commerce, Management science option from University of Nairobi Kenya and is now finalizing his Master of Science degree in Procurement and Logistics Management at the Jomo Kenyatta University of Agriculture and Technology. He is also a full Member of the Chartered Institute of Purchasing and Supply, UK after having completed Graduate Diploma in 1997.

Email: [pnjuki2001@gmail.com](mailto:pnjuki2001@gmail.com)

**Second Author** – Dr. Christopher J Mairura is a full time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He is a specialist in Entrepreneurship at the same University having attained a PHD in Entrepreneurship.

Email: [mairurac@gmail.com](mailto:mairurac@gmail.com)

**Third Author** – Dr. Kepha Ombui is a part time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He also works as a Human Resource Officer with a leading Agricultural research Institution. He is an expert in Human Resource Management having attained a PHD in Human Resource Management.

Email: [andrew.ombui@kalro.org](mailto:andrew.ombui@kalro.org)

# Effects of Procurement Practices on the Performance of Commercial State Owned Enterprises in Nairobi County

Walter Nyamongo Mokogi<sup>1</sup>, Dr. Christopher Mairura<sup>2</sup>, Dr. Kepha Ombui<sup>3</sup>

<sup>1</sup>MSC Student: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>2</sup>Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>3</sup>Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

**Abstract-** Procurement practices are a set of activities undertaken by an organization to promote effective management of its supply chain (Sollish & Semanik, 2012). The main purpose of the study was to establish the effect of procurement practices on performance of commercial state owned enterprises in Nairobi County. The specific objectives of the study were to establish the effect of buyer-supplier relationships on performance of commercial state owned enterprises in Nairobi County, to establish the effect of supplier selection procedures on performance of commercial state owned enterprises in Nairobi County, to determine how organizational capacity affect performance of commercial state owned enterprises in Nairobi County and to ascertain the effect of procurement process management on performance of commercial state owned enterprises in Nairobi County. The study adopted a descriptive survey design. Primary data was collected using questionnaires targeting managers in Finance, Procurement, Production and Sales and Marketing departments in each enterprise. The study achieved 80% response rate since ninety six (96) out of the 120 questionnaires administered were filled and returned. The population of the study comprised of thirty eight (38) commercial state owned enterprises operating in Nairobi county. A random sample of thirty (30) enterprises representing 78.95% was selected. The study findings revealed that buyer-supplier relationships, supplier selection procedures, organizational capacity and procurement process management practices had a strong impact on the performance of commercial state owned enterprises studied. The study recommends that all commercial state owned enterprises must implement efficient procurement practices in order to become more efficient in their operations and overall service delivery to their customers.

**Index Terms-** Procurement practices, Organizational Performance

## I. INTRODUCTION

Around the world, public sector organizations are experiencing an unprecedented pace of change and as a result, they are rapidly re-evaluating their operating models and market strategies not just to withstand these market forces, but capitalize on them. Clearly, procurement has a significant role to play in helping the public sector achieve their objectives and prepare for the uncertainty ahead. In part, this will require procurement to focus on driving costs out of the cost base. But the opportunity also exists for the function to add value in a much more strategic way

(Leenders *et al.*, 2008). Thai (2001) describes two types of goals in the procurement system: non procurement goals and procurement goals. Procurement goals are primarily associated with quality, reduction of financial and technical risks, and protection over competition and integrity in the system. Non procurement goals usually involve the economic, social, and political goals within the system.

Achieving efficiency in public procurement is an ambitious task, as procurement faces numerous challenges, especially due to the market structure, the legal framework and the political environment that procurers face (Thai, 2004). Pagnato (2003) estimated United States federal procurement at around \$200 billion per annum, and Coggburn (2003) put the combined procurement for state and local governments at more than \$1 trillion. Thai and Grimm (2000) estimated government's collective purchasing at around 20 percent of Gross Domestic Product (GDP), and for developing countries, Nicol (2003) put the figure at 15 percent of GDP. For Russia, federal procurement in 2004 was expected to amount to about 40 percent of the country's budget (Fradkov, 2004). The Organization for Economic Co-operation and Development (OECD), Development Assistance Committee (DAC) (2006) estimated the volume of global public sector procurement at 8 percent (\$3.2 trillion) of the worldwide GDP of \$40 trillion.

The African public sector has been grappling with poverty and provision of effective services. Tackling the poverty challenge is the responsibility of the public sector in collaboration with other stakeholders. However, the state will deliver more effectively to all citizens, and to poor people in particular if certain mechanisms are in place to man the running of government operations. Public procurement in developing countries is said to account for up to 25 percent of their GDP. For a number of years the rate in industrialized countries has remained at around 10 percent. Though in absolute terms, the procurement market trade volume in developing countries may not be significant, the relative higher ratio it has on total GDP is an incentive big enough for formation of any economic alliance which most international trade organizations would not afford to easily let go, this is besides also the political impact it may pose (Arrowsmith, 2010).

In the Middle East and Africa in general, central government purchases range from 9 to 13 percent (Gul, 2010). This indicates that public procurement plays a vital role in a country (Odhiambo & Kamau, 2003). Public procurement therefore has important economic and political

implications, and ensuring that the process is economical and efficient is crucial. This requires in part that the whole procurement process should be well understood by the actors: government, the procuring entities and the business community or suppliers and other stakeholders, including professional associations, academic entities and the general public.

Since independence, the Government has sought to rationalize procurement in public institutions through various instruments; mainly the 1967 Supplies manual, circulars from the Treasury issued from time to time and, at times, the involvement of the Crown agents. In the year 2001, the government came up with Procurement regulations (Exchequer and Audit Rules) to replace the circulars. These were slightly amended in the year 2002 to accommodate certain concerns. This was an improvement, but an insufficient move to fill in the existing gaps. The answer to the prevailing shortcoming in the procurement of goods and services in the public sector was seen to lie in enacting an Act of Parliament to govern the whole public process. This was realized in October, 2005; paving the way for the Minister of Finance to gazette the Public Procurement and Disposal Regulations, 2006 through Legal Notice No. 174 of 29<sup>th</sup> December, 2006 which was effected in 2007 (RoK, 2007).

While the Public Procurement and Disposal Act, 2005 was meant to address the challenges identified, experience suggests that the results have not entirely been as expected. The Public Procurement Act is important in the way the procurement processes are managed, and has sought to minimize cases of interference from players outside the concerned committees while at the same time discouraging fraudulent practices through debarment, transfer of procurements to other procuring entities and introduction of deterrent penalties. Article 227 of the Constitution of Kenya, 2010 has established a new framework to guide the public procurement and disposal process, which looks into ensuring that the Government Owned entities are agile enough to respond to opportunities in the market to grow value for the Kenyan public (RoK, 2010).

## II. STATEMENT OF THE PROBLEM

Government owned enterprises' operations in Kenya have become inefficient and non-profitable requiring the Government to shoulder major procurement burdens (SCAC, 2013). In a study carried out on parastatal governance problems in Kenya, the following characteristics emerged: inefficiency in operations, huge financial losses and the provision of poor products and services (Atieno, 2009). She attributed this to: poor governance, poor public sector financial management, bureaucratic wastage and pilferage in the management of parastatals, all of which subsequently lead to heavy budgetary burden to the public. The Public Procurement and Disposal Act 2005 provides a standardized framework for the procurement of goods and services across all public sector entities. This one size fits all approach has created challenges for many Government Owned entities.

A review conducted by the PPOA, while recognizing some strengths, identified a number of challenges including the cost of the procurement process, the long time to procure or reaction time to business opportunities, challenges of negotiation with suppliers, external approval processes and the issue of resale of branded items (PPOA, 2009). A research study is therefore needed to analyze and establish the best public procurement practices in commercial state owned enterprises because of the highlighted deficiencies. Further still, in spite of having various studies undertaken on procurement practices by various researchers, none of the studies have particularly addressed the effect of procurement practices on performance of commercial state owned enterprises in Nairobi county. This has created a significant knowledge gap and therefore forms the basis for this study.

## III. OBJECTIVES OF THE STUDY

The general objective of this study was to establish the effects of procurement practices on performance of commercial state owned enterprises in Nairobi County. The specific objectives were;

1. To examine the extent to which buyer-supplier relationships affect performance of commercial state owned enterprises in Nairobi County.
2. To establish how supplier selection procedures affect performance of commercial state owned enterprises in Nairobi County.
3. To determine how organizational capacity affect performance of commercial state owned enterprises in Nairobi County.
4. To ascertain the extent to which procurement process management affect performance of commercial state owned enterprises in Nairobi County.

## IV. RESEARCH QUESTIONS

The study aimed to answer the following research questions;

1. How does buyer-supplier relationships affect performance of commercial state owned enterprises in Nairobi County?
2. Which supplier selection procedures affect performance of commercial state owned enterprises in Nairobi County?
3. What effect does organizational capacity have on performance of commercial state owned enterprises in Nairobi County?
4. How does procurement process management affect performance of commercial state owned enterprises in Nairobi County?

## V. LITERATURE REVIEW

**Theoretical Framework**  
**Resource Based View (RBV) Theory**

The RBV developed as a complement to the industrial organization view with Bain (1968) and Porter (1985) as some of its main proponents. With its focus on the structure conduct-performance paradigm, the industrial organization view put the determinants of firm performance outside the firm, in its industry's structure. Being positioned against this view, the RBV explicitly looks for the internal sources of sustained competitive advantage and aims to explain why firms in the same industry might differ in performance. As such, the RBV does not replace the industrial organization view, rather it complements it (Peteraf & Barney, 2003).

RBV proponents argue that simultaneously valuable, rare, inimitable and non-substitutable resources can be a source of superior performance and may enable the firm to achieve sustained competitive advantage. The RBV of the firm is therefore a suitable approach to understanding the competitive dynamics whereby resources are intangible and tangible assets linked to the firm in a semi-permanent way, including: technological, human and physical assets. However, having resources alone is not sufficient, therefore, RBV theory adds a category of capabilities which result from complex patterns of interactions and coordination between resources (Wong & Karia, 2010).

RBV maintains that resources and capabilities are often synergistic in nature and can be more valuable when combined. RBV proposes that firms have different resource endowments, and that the manner in which they require, develop, maintain, bundle and apply them leads to the development of competitive advantage and superior performance over time. RBV tenets prescribe that resources and capabilities, for instance bundle of resources need to be valuable, rare, inimitable and organizationally utilizable, for example a firm has complementary resources to leverage and maximize capabilities to drive sustainable competitive advantage. In general, RBV theory indicates that exploiting a firm's non-imitable resources enables a firm to create long-lasting competitive capabilities and to generate a competitive advantage (Paulraj, 2011).

### **Partner Selection Theory**

Partner selection literature is very limited and focused on the criteria for choosing partners rather than on the process of partner selection (Saffu & Mamman, 2000). Most articles assume a rational decision-making process based on very specific selection criteria. Existing partner selection literature assumes a straight-line start-to-finish selection process (Saffu & Mamman, 2000). Depending on the motivation of the alliance as a whole, specific partner characteristics will be more or less valuable. A logical selection criteria is developed, often prioritizing the partner characteristics of interest. Finally, a partner is rationally selected, meeting all of the criteria. Some business alliances form as a result of personal ties between key decision makers (Barringer & Harrison, 2000).

Angeles and Nath (2000) used questionnaires to gather data from 152 respondent firms on their trading partner selection criteria. Six factors appeared to be most important including strategic commitment, trading partner flexibility,

and communications. A number of articles and theories have been developed regarding partner selection in international alliances. Resource-based and organizational learning theory support observed partner selection among emerging and developed markets in North America and Europe (Hitt & Dacin, 2000). Emerging market firms from Mexico, Poland and Romania looked for financial assets, technical capabilities, intangible assets, and a willingness to share expertise in their selection of partners. Developed market firms from Canada, France and the USA chose their partners based on unique competencies and local market knowledge and access (Saffu & Mamman, 2000).

### **Stakeholder Theory**

The origins of stakeholder theory draw on four key academic fields: sociology, economics, politics and ethics and especially the literature on corporate planning, systems theory, corporate social responsibility and organizational theory. Freeman (1984), over the course of his work entitled *Strategic Management: a Stakeholder approach*, generally accepted as launching the stakeholder theory concepts, defines how stakeholders with similar interests or rights form a group. What Freeman was seeking to explain was the relationship between the company and its external environment and its behavior within this environment. The author set out his model as if a chart in which the company is positioned at the center and is involved with stakeholders connected with the company. In this model, the company-stakeholder relationships are dyadic and mutually independent (Frooman, 1999).

According to Savage *et al.* (2004), the basic premises of Stakeholder theory are: the organization enters into relationships with many groups that influence or are influenced by the company, i.e. "stakeholders" in accordance with Freeman terminology; the theory focuses on the nature of these relationships in terms of processes and results for the company and for stakeholders, the interests of all legitimate stakeholder are of intrinsic value and it is assumed that there is no single prevailing set of interests.

The theory focuses upon management decision making, explains how stakeholders try and influence organizational decision making processes so as to be consistent with their needs and priorities. In terms of organizations, these should attempt to understand and balance the interests of the various participants. Taking these premises into consideration, and according to Baldwin (2002), the concept of stakeholder management was developed so that organizations could recognize, analyze and examine the characteristics of partners being influenced by organizational behavior. Thus, management is carried out over three levels: the identification of stakeholders, the development of processes identifying and interpreting their needs and interests and the construction of relationships with the entire process structured around the organization's respective objectives.

### **Transaction Cost Economics (TCE) Theory**

This theory views firms as organizations comprising of people with different views and objectives. It assumes that



the firm has outgrown to the extent that it substitutes for the market in determining the allocation of resources. This means the organization and structure of the firm determine price and production, with the unit of analysis being the transaction. The theory suggests that managers are opportunists and arrange firms' transactions to their interest (Williamson, 1996).

The main body of existing empirical work does not specifically or directly calculate transaction costs, but uses statistical methods in order to obtain the answers to their research questions. Such indirect operationalization methods define transaction costs or the research question directly as dependent variable. They define transaction dimensions, or even other sub-categories of them, as independent. All of these direct and indirect calculations of transaction costs are of ex post character, which represents another point of critique of TCE (Dyer, 1996).

Other points of critique come from Goshal and Moran (1996) who dedicate an entire article to the critiques of TCE: in "Bad for practice: A critique of the transaction cost theory", they particularly discuss the non-economic aspects of organizations, such as learning effects in an organization, trust and creating innovations. Additionally, other authors describe the longing for power of actors as an example of the non-economic aspects that TCE does not consider.

Coase (1988) raised the issue on why business organizations exist, with entrepreneurs making decisions on resource allocation independently, next to markets where buyers and suppliers allocate resources on the basis of the

price mechanism. In a study done by Nooteboom (1999), he stressed that a transaction is part of an exchange process, with a history of events taking place before and after that moment at which an agreement is reached and property or user rights are transferred. The production of goods involved, or the actual transfer and delivery may well take place after some time. The time factor thus plays an important role in the transaction process. Transaction costs will rise with increasing uncertainty about possible deviations between expectations and realization of these expectations, because of turbulence and demand uncertainty, technology, competition or the policy environment.

### **Conceptual Framework**

The analysis of the dependent variable and its influence on the independent variables, makes it possible to find answers to the research problem represented in form of a model known as a conceptual framework (Sekaran, 2009). In this study, the independent variables are: buyer-supplier relationships, supplier selection procedures, organizational capacity and procurement process management while the dependent variable is the effect of procurement practices on organizational performance as shown in Figure 1.

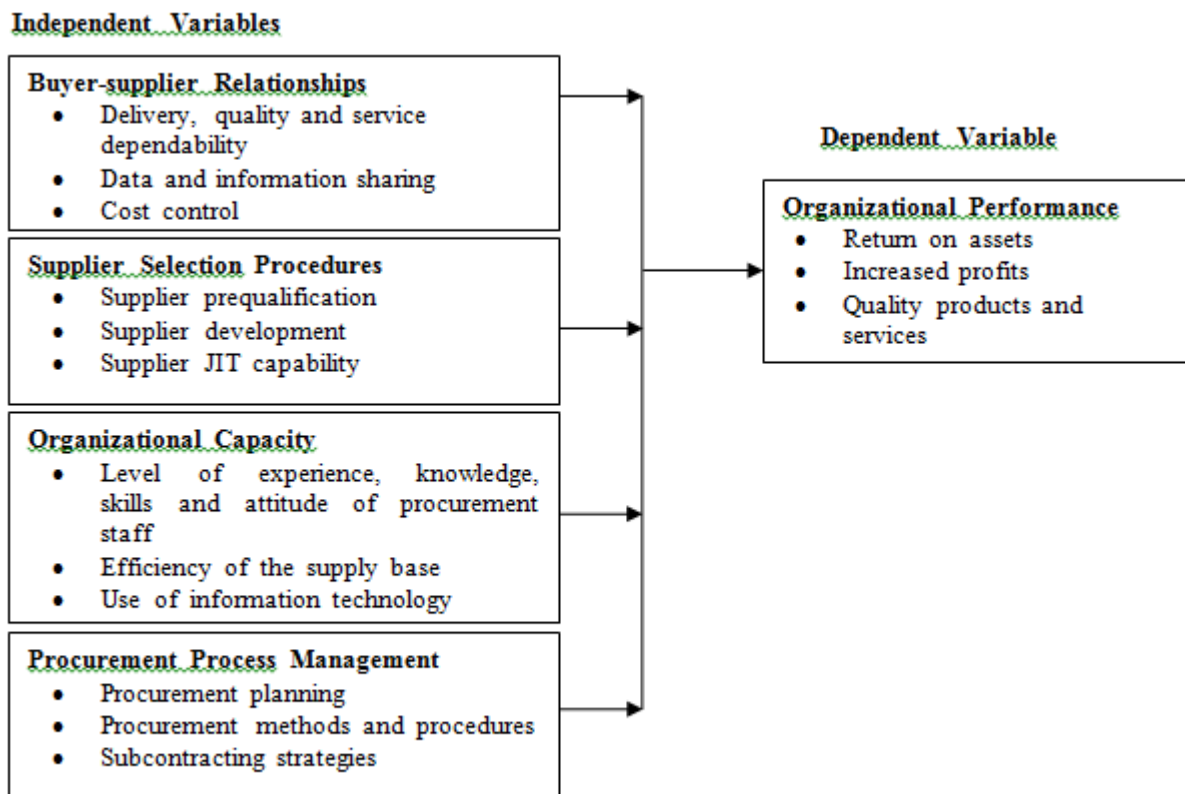


Figure 1: Conceptual Framework

## VI. RESEARCH METHODOLOGY

This study adopted a survey design to collect descriptive data at a particular time from a sample selected from the larger population. The data collected describes things as they were at that time of the study. A cross sectional survey of commercial state owned enterprises in Nairobi County was carried out to establish the relationship between procurement practices and their effect on performance.

The researcher randomly selected 30 enterprises based in Nairobi county. Burns and Grove (2003) define sampling as a process of selecting a group of people, events or behavior with which to conduct a study. A total of 120 of the respondents representing management in: Production, Procurement, Finance and Sales and Marketing departments in each enterprise were issued with the research instrument. Neuman (2006) suggests the general principal of the smaller the population, the bigger the ratio of the sample size to population size; for example, a ratio of about 30:100 (30 percent) for smaller populations (under 1000). This study targeted over 78.95 percent of the total population.

The study was facilitated by the use of primary data collected using questionnaires consisting of both structured

and unstructured questions. Research data for the study was collected using both secondary and primary sources. Secondary data was collected through documentary review of published records, journals, textbooks and Government documents, industry and annual reports, while primary data was collected using a self-administered structured and unstructured questionnaire. The questionnaires were distributed to the respondents in each organization using drop and pick method.

Research data was analyzed using descriptive statistics and the relationship between the variables established using the following linear regression model:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where Y is the dependent variable,  $\beta_0$  is the intercept,  $\varepsilon$  is the error term and  $X_1$ ,  $X_2$ ,  $X_3$  and  $X_4$  represented the four independent variables of the study. The researcher utilized Statistical Package for Social Sciences (SPSS) as the main descriptive statistical tool to analyze the data and determine the extent of relationships between the independent and dependent variables. The results of the processed data were presented using percentages, means, standard deviations, frequencies, pie charts and tables for easy understanding.

## VII. RESULTS

### Buyer-Supplier Relationships

**Table 1: Response means and standard deviations of buyer-supplier relationships**

No.	Statements	Mean	Standard. Deviation
1.	Strong buyer-supplier relations and timely deliveries	4.19	0.92
2.	Supplier partnerships influence in quality control	4.15	0.91
3.	Regular and timely sharing of critical supply chain information	3.41	1.14
4.	Perceived negative impact of information sharing	2.33	0.99
5.	Procurement of requirements at above prevailing market prices	1.31	1.29
6.	Existence of cost cutting strategies	4.07	1.02

Based on the descriptive statistics, the distribution of data points in the data set was established. Low standard deviation values presented shows that the data points are centered around the mean. Our illustrative empirical evidence has clearly shown that relationships and in particular buyer-supplier relationships, are key intangible organizational resources, thus confirming the earlier work by (Ni, 2006).

The mean and standard deviation of various indicators shown in Table 1 indicate higher means on strong buyer-supplier relationships (4.19), existence of partnerships with key suppliers (4.15) and cost cutting strategies (4.07) as having the greatest impact on buyer-supplier relationships. The standard deviation values also indicate that most of the respondents agree to the attributes. The low mean registered in information sharing (3.41), negative impact of sharing

information (2.33) and high acquisition prices (1.31) had a low impact on the buyer-supplier relationships.

**Results of Regression Analysis**

The model equation;  $Y = \beta_1X_1 + \epsilon$  explained 19% as measured by the goodness of fit as shown in Table 2. The results indicate that buyer-supplier relationships explained 19% of the variation on performance of commercial state owned enterprises in Nairobi County as shown by the adjusted  $R^2$ . This therefore implies that 19% of the corresponding change on performance can be explained by a unit change in the buyer-supplier relationship. Therefore the empirical evidence thus establishes that relations, especially buyer-supplier relationships are key intangible organizational resources as confirmed by Ni, (2006) in his earlier study.

**Regression Analysis**

**Table 2: Model Summary on Buyer-Supplier Relationships**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	0.21	0.13	0.19	1.24

**Supplier Selection Procedures**

**Table 3: Response means and standard deviations of supplier selection procedures**

No.	Statements	Mean	Standard Deviation
1.	Supplier selection done as per the Act and Regulations	4.59	1.35
2.	Need for supplier prequalification process to be amended	1.72	1.13
3.	Existence of supplier development measures	2.32	1.04
4.	Need for supplier development strategies	3.46	1.15
5.	Use of JIT (Just-in-Time) strategies	4.33	1.24
6.	Level of use of information strategies in the country	2.20	0.98

The mean and standard deviation of various indicators shown in Table 3 indicate higher means on legal requirements (4.59), supplier development (3.46) and JIT implementation (4.33) have the greatest impact on supplier selection procedures. The standard deviation values also indicate that most of the respondents agree to the attributes. The low mean registered in amendment of the existing laws on prequalification process (1.72), supplier development measures in place (2.32) and application of information

tools corresponding to the level of economic development of a country (2.20) registered a low impact on the supplier selection procedures.

However these findings differ slightly to what Ho *et al.*, (2010) established in their study where they identified quality, delivery and cost as the main attributes to be considered when selecting suppliers. The findings further concur with Musuga and Namusonge (2013) findings on JIT as a pivot element for achieving Kenya's Ministry of

Health’s mission by effectively addressing the supply of critical medical products as well as managing demand and supply. They further noted that JIT minimizes waste in form of storage costs and control the high operating costs.

**Results of Regression Analysis**

The model equation;  $Y = \beta_2X_2 + \epsilon$  explained 18% as measured by the goodness of fit as shown in Table 4. The results indicate that supplier selection procedures explained 18% of the variation on performance of commercial state

owned enterprises in Nairobi County as shown by the adjusted  $R^2$ . This therefore implies that 18% of the corresponding change on performance can be explained by a unit change in the supplier selection procedures. Supplier development was identified as one of the practices that affected performance. This was in line with a previous study by Johnson *et al.*, (2004) who found a positive relationship between supplier development and performance.

**Regression Analysis**

**Table 4: Model Summary on Supplier Selection Procedures**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	0.20	0.17	0.18	0.63

**Organizational Capacity**

**Table 5: Response means and standard deviations of organizational capacity**

No.	Statements	Mean	Standard Deviation
1.	Level of experience and knowledge of the procurement laws and regulations by procurement staff enhances efficiency	3.46	0.99
2.	Skills and professional qualifications of procurement staff	1.98	1.18
3.	Efficiency of a small supply base	2.57	1.12
4.	Influence of supply base on performance	1.52	1.05
5.	Use of information technology (IT) tools and strategies	1.93	1.15
6.	High cost of deploying and maintaining IT tools hinders their implementation	2.04	0.88

The mean and standard deviation of various indicators shown in Table 5 indicate higher means on level of knowledge and experience of the procurement laws and regulations by the procurement staff (3.46) and efficiency of a small supply base (2.57) have the greatest impact on organizational capacity. These results were consistent with Kiage (2013) who studied factors affecting procurement performance in the Ministry of Energy. In his findings, he established that procurement staff competencies affected procurement performance because they carry out their responsibilities unprofessionally leading to wastage of resources. The corresponding standard deviation values also indicate that most of the respondents agree to the attributes. The low mean registered in staff skills and their professional qualifications (1.98), supply base influence on performance (1.52), use of ERP and IT strategies (1.93) as well as the high cost of ERP implementation (2.04) had a minimal impact on organizational capacity.

**Results of Regression Analysis**

The model equation;  $Y = \beta_3X_3 + \epsilon$  explained 20% as measured by the goodness of fit as shown in Table 6. The results indicate that organizational capacity explained 20% of the variation on performance of commercial state owned enterprises in Nairobi County as shown by the adjusted  $R^2$ . This therefore implies that 20% of the corresponding change on performance can be explained by a unit change in the organizational capacity. Although lack of use IT tools was attributed to the high cost of acquisition and maintenance, a study on implementation of ERP systems in Kenyan universities, found that the implementation of ERP in Masinde Muliro University improved service delivery by 85% among the integrated departments: Human Resource, Finance, Procurement, Students Affairs and Computer Science.

**Regression Analysis**

**Table 6: Model Summary on Organizational Capacity**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	0.19	0.12	0.20	0.74

**Procurement Process Management**

**Table 7: Response means and standard deviations of procurement process management**

No.	Statements	Mean	Standard Deviation
1.	Procurement plans in place as per the Procurement Act	2.48	1.12
2.	Unplanned purchases due to poor budgeting	2.04	1.01
3.	Long procurement processes that hinder production schedules	2.48	1.18
4.	Use of Request for Quotations (RFQ) as the most common procurement method	2.04	1.01
5.	Subcontracting of orders due to lack of internal production capacity	2.48	1.18
6.	Subcontracting practices gradually erodes your client base	2.04	1.01

The mean and standard deviation of various indicators shown in Table 7 indicate slightly higher means on preparation of annual procurement plans as per the Act (2.48), long procurement process that interrupts production schedules (2.48) and subcontracting due to limited internal production capacity (2.48) have a significant impact on procurement process management. The corresponding standard deviation values also indicate that most of the respondents agree to the attributes. The low mean registered in unplanned purchases due to poor budgeting (2.04), rampant use of RFQs as the main procurement method (2.04) and erosion of clients due to subcontracting activities (2.04) had a lesser impact on procurement process management. Van Weele (2006) studied the efficient use of limited organizational resources such as personnel, budgets, time and equipment to meet varied goals and objectives. Van Weele (2006) continued to establish that effective resource utilization was facilitated by proper planning and budgeting controls which this study results has also established.

**Results of Regression Analysis**

The model equation;  $Y = \beta_4X_4 + \epsilon$  explained 21% as measured by the goodness of fit as shown in Table 8. The results indicate that procurement process management explained 21% of the variation on performance of commercial state owned enterprises in Nairobi County as shown by the adjusted R<sup>2</sup>. This therefore implies that 21% of the corresponding change on performance can be explained by a unit change in the procurement process management. This results were similar to Budi (2012), who studied challenges in the management of procurement process within Kenya Rural Roads Authority where he established that most of the delays in completion of road projects was a result of long, rigid and bureaucratic procurement processes. He noted that this in turn affected the overall budgeted costs for most of the road construction projects.

**Regression Analysis**

**Table 8: Model Summary on Procurement Process Management**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	0.14	0.16	0.21	0.91

**Regression Analysis Results of the Independent Variables**

A regression analysis was used to establish how buyer-supplier relationships, supplier selection procedures, organizational capacity and procurement process management affect performance of commercial state owned enterprises in Nairobi County. The model equation;  $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon$  explained 92% as measured by the

goodness of fit as shown in Table 4.14. The results indicate that all the independent variables combined explained 92% of the variation on performance of commercial state owned enterprises in Nairobi County as shown by the adjusted R<sup>2</sup>. This therefore implies that other factors not covered in the study represented 8%. The results therefore established a statistical significance in predicting how procurement

practices affect performance of commercial state owned enterprises in Nairobi County as given in Table 9 below:

**Regression Analysis**

**Table 9: Model Summary on the Independent Variables**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	0.98	0.96	0.92	0.91

**VIII. DISCUSSION**

**Buyer-Supplier Relationships**

This study set out to establish the extent to which buyer-supplier relationships influenced procurement practices and performance of commercial state owned enterprises in Nairobi county. The study revealed that majority of the respondents were in agreement that these enterprises did not have strong buyer-supplier relationship practices in place which contributed to the late deliveries reported from suppliers a regular basis. Most respondents also confirmed limited sharing of supply chain information and data between the buying organizations and the suppliers. The low performance noted in these organizations was a result of poor coordination between the two parties, leading to delayed production schedules and delayed customer deliveries. Another key outcome of the study was that majority of the respondents concurred with the fact that Government owned entities procured their requirements at highly exaggerated prices, making them uncompetitive leading to dismal performances. Respondents also agreed to a greater extent that commercial state owned enterprises surveyed did not employ strategies to control costs.

**Supplier Selection Procedures**

This study intended to establish the extent to which supplier selection procedures impacted on the procurement practices and performance of commercial state owned enterprises in Nairobi county. The results from the respondents clearly indicated that the supplier selection procedures as guided by the Public Procurement and Disposal Act 2005 and Regulations 2006 had serious shortcomings especially when it came to commercially-oriented state firms which compete with the private sector counterparts. The study revealed that the process mainly resulted in listing of general and unspecialized suppliers or “briefcase suppliers” contributing greatly to poor performance.

The study further determined the need for the current procurement laws and regulations to be amended to better fit the needs of the commercially-oriented state firms. A significant number of respondents confirmed the need to incorporate supplier development strategies to enhance professionalism, ownership and strategic participation of all key stakeholders in the procurement processes of those enterprises. The respondents specifically established the need for Government owned enterprises to implement JIT as a crucial strategy to promote efficiency and cost controls.

**Organizational Capacity**

The study findings determined that organizational capacity in terms of quality and experience of the procurement staff contributed significantly to the performance of the procurement functions and the organization in general. Majority of the respondents confirmed that procurement staff in Government owned enterprises did not have the right set of skills, experience and integrity to effectively execute their duties. These findings contravene the basic Public Procurement and Disposal Acts’ requirement calling for all public procurement staff to have professional qualifications including being members of professional bodies in supply chain management. This finding explains the inefficiencies and ineffective procurement practices seen in majority of the organizations surveyed.

The study also revealed that most of the enterprises surveyed did not maintain a small supply base similar to the practice in the private sector, leading to widespread inefficiencies and poor performance. The study established that there was none or slow uptake of information technology tools to streamline and manage the main functions of these organizations including procurement. Majority of the respondents were in agreement that the implementation of e-procurement, use of ERP and lately IFMIS systems would help the surveyed organizations to become more efficient, accountable of the use public funds and promote integrity in the procurement processes. The respondents concurred that such measures would definitely lead to better performance in the long run.

**Procurement Process Management**

The study findings revealed that poor management of procurement processes including planning, budgeting, length of time involved, use of quotations and subcontracting directly led to inefficiencies which led to missed targets and eventual poor performance. The respondents unanimously agreed that regular procurement planning was done annually as per the Public Procurement and Disposal Act, but lacked regular monitoring to offset changes in priorities.

Notably, majority of the respondents noted with concern the long procurement process courtesy of the current public procurement system because of its many weaknesses. They also took note of the amendment to the regulations which was done in 2013 that reduced the number of days for most tendering procedures but reiterated that more needed to be done. Additionally, respondents largely agreed that there was indiscriminate use of Request for Quotation (RFQ) procurement method in all of the sampled

enterprises. They concurred that a lot of valuable time and other resources were lost in processing quotations. They therefore recommended the full scale use of term contracts, which a few of the surveyed organizations had already started implementing.

The respondents also revealed that some organizations employed subcontracting strategies on a large scale due to the lack of internal capacities in form of equipment and personnel. A good number of the respondents confirmed that subcontracting jobs to third party organization ate into their profits and in the long run resulted in massive loss of clients, hence directly resulting in poor performance.

## IX. CONCLUSION

The study concludes that majority of the commercial state owned enterprises in Nairobi County employ various procurement practices in their operations. Buyer-supplier relationships, supplier selection procedures, organizational capacities and procurement process management have assisted those enterprises to enhance the performance of their organizations. This was supported by the results from a regression analysis conducted that indicated that there was a strong relationship between procurement practices and organizational performance.

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## RECOMMENDATION

The study has confirmed that procurement practices are very significant in enhancing the performance of commercial state owned enterprises in Nairobi County. It is therefore important that all state corporations both commercial and non-commercial to employ the optimum procurement practices to enhance performance, competitiveness and improve their effectiveness in the service delivery to the public. A further research is appropriate in establishing the effect of procurement practices in non-commercial entities in Kenya.

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#### AUTHORS

**First Author** – Walter Nyamongo Mokogi has worked as a procurement manager in the public sector since 2013 after working for over ten years in the private sector. He is a graduate in Tourism and Wildlife from Moi University, Kenya and is now finalizing his Master of Science degree in Procurement and Logistics Management at the Jomo Kenyatta University of Agriculture and Technology. Email: wmokogi@yahoo.com

**Second Author** – Dr. Christopher Mairura is a full time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He is a specialist in Entrepreneurship at the same University having attained a PHD in Entrepreneurship., Email: mairurac@gmail.com

**Third Author** – Dr. Kepha Ombui is a part time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He also works as a Human Resource Officer with a leading Agricultural Research Institution. He is an expert in Human Resource Management having attained a PHD in Human Resource Management., Email: andrew.ombui@kalro.org



# Retina vessel detection by using DCT Filtering

Nimerbir Kaur, Amanjot Kaur

Global institute of Management and Emerging Technology

**Abstract-** This is the research paper, which is based on the Retinopathy. Retinopathy is an eye disorder that is very closely related to diabetes. The full name is Diabetic Retinopathy, and can lead to blindness because it causes the retina to become damaged. When your blood sugar is too high damage can be done to the blood vessels, including those in your eyes. When this happens new blood vessels may develop over the retina causing scar. In this paper we used a DCT Filtering to remove the lighting and the noise from the image. It's a very unique method through which we can easily remove the noise from the retina .The method is evaluated on the publicly available DRIVE and STARE\_DBI. In this paper firstly we extract the RGB image then remove the background noise and last we will apply the DCT Filtering.

**Index Terms-** Vessel detection, Segmentation, DCT, Fundus Image, Retinopathy, Diabetes, Blood Vessel, Retina, Segmentation.

## I. INTRODUCTION

Retinopathy is an eye disorder that is very closely related to diabetes. Diabetic retinopathy is caused by changes in the blood vessels of the retina. When these blood vessels are damaged, they may leak blood and grow fragile new vessels. When the nerve cells are damaged, vision is impaired. Diabetic retinopathy is the most common diabetic eye disease and a leading cause of blindness. Diabetic retinopathy is a leading cause of blindness affecting 95% of type 1 diabetics within 15 years of onset of whom 2% may become blind and 10% suffer severe visual impairment. Annual screening is recommended to identify progression allowing early treatment, which may prevent up to 90% of cases of blindness. Grading standards for screening include background and sight threatening retinopathy, the latter being particularly important to detect reliably. The full name is Diabetic Retinopathy, and can lead to blindness because it causes the retina to become damaged. Retinopathy is an eye disorder that is very closely related to diabetes.[1] The full name is Diabetic Retinopathy, and can lead to blindness because it causes the retina to become damaged. When your blood sugar is too high damage can be done to the blood vessels, including those in your eyes. Now days, diabetic retinopathy is a key reason for the blindness in elder age people. Patients who are suffering from diabetes are more likely to have eye disease but the main threat to eye sight is effect on retina. To detect the diabetic retinopathy in diabetic patients, retinal images should be analyzed. The typical Fundus Image looks like in the Figure 1 the bright optic disc and vascular network can clearly seen in this image



Figure 1: Retinal Fundus Image

In the scope of image processing, segmentation of the optic disc, blood vessels and macula in digital fundus images is important for the research area of medical image analysis. [7].It is used to efficiently implement the diagnostic evaluation and taken as a basis of the cure to illness of patient. Early diagnostic is play an important vital role and prevent various cardiovascular and ophthalmologic diseases/problems. Generally, these problems are diabetes, cardiovascular disease, hypertension, arteriosclerosis, choroidal neovascularization, injuries and etc. Now days, diabetic retinopathy is a key reason for the blindness in elder age people. Patients who are suffering from diabetes are more likely to have eye disease but the main threat to eye sight is effect on retina. [1] To detect the diabetic retinopathy in diabetic patients, retinal images should be analyzed. The quality of the blood vessels structures in a retinal image is an important characteristic, as the ridges carry the information of characteristic features required for minutiae extraction. Retinal images are usually known as Fundus images are at the back of eye. Analysis of retinal images leads us to detect different diseases like retinopathy, glaucoma and macular degeneration. Diabetic retinopathy that can damage the retina is usually occurring due to diabetes mellitus complications which can lead to blindness if not treated in early stages [2]. Retina is usually red in color due to rich blood supply in it and it is responsible for the bright vision. Ophthalmologists analyze the retina by considering Now days, diabetic retinopathy is a key reason for the blindness in elder age people. Patients who are suffering from diabetes are more likely to have eye disease but the main threat to eye sight is effect on retina. [1] To detect the diabetic retinopathy in diabetic patients, retinal images should be analyzed. Retinal

images are usually known as Fundus images are at the back of eye. Analysis of retinal images leads us to detect different diseases like retinopathy, glaucoma and macular degeneration. Diabetic retinopathy that can damage the retina is usually occurring due to diabetes mellitus complications which can lead to blindness if not treated in early stages optical disk.

## II. PRE FILTERING TECHNIQUE

Pre filtering is a technique which is used for removing the background noise from the original image



**Fig: 2 Original image**

Fig:2 Show that the original image where the point allotted on it where the RGB show some value its means that it has a background noise and after apply the pre filtering technique the back noise will be remove from the original image Fig:3 show the RGB value zero its means now in the background of the Retinal image is noise less.

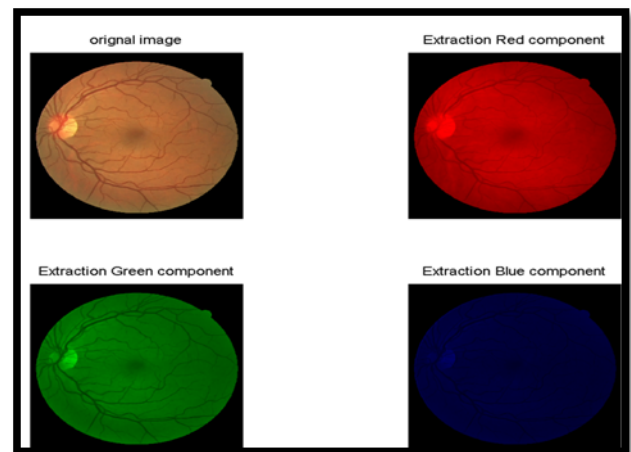


**Fig 3: After remove background noise**

Firstly we will remove the background noise by from the retinal fundus image by using pre filtering technique .After using pre filtering technique we will extract the RGB image from the second image, and we will work on the only green image because we can easily detect the vessel from the green image .then after this one we will apply the DCT filtering technique to remove the noise and the light effect from the green image.

## III. EXTRACTION OF RGB IMAGE

We all well know that every images make up their primary colour i.e Red, Blue and Green. Extraction is way to extract these all colour from the image. Extraction is the main part of Retinal images. The main work of the Retinopathy which is totally based upon blood vessel detection, the detection of blood vessel mainly done on the green part from the RGB colour. If we extract the green part from the original image the vessel shown very clearly than the other part of the RGB colour. It's clearly we can see in the Fig 4 there is extraction of RGB images but vessel easily seen in the green part ,So we always do work of Retinopathy on the green part of the retinal image[10]



**Fig 4: Extraction of RGB image**

## IV. APPLY DCT FILTERING ON THE IMAGE

Firstly we have know about DCT Filtering, it's a process through which we can remove the Noise and the lighting effect from the image Digital images are often degraded by noise, due to the imperfection of the acquisition system or the conditions during the acquisition. Noise decreases the perceptual quality by masking significant information, and also degrades performance of any processing applied over the acquired image. Hence, image profiteering is a common operation used in order to improve analysis and interpretation of remote sensing, broadcast transmission, optical scanning, and other vision data . Till now a great number of different image filtering techniques have been designed including nonlinear nonadaptive and adaptive filters , transform-based methods techniques based on independent component analysis (ICA), and principal component analysis (PCA) ,and so forth. These techniques have different advantages and drawbacks thoroughly discussed in ,and other references.

The application areas and conditions for which the use of these filters can be the most beneficial and expedient depend on the filter properties, noise statistical characteristics, and the priority of requirements. For effective filtering, it is desirable to considerably suppress noise in homogeneous (smooth) regions and to preserve edges, details, and texture at the same time. Acceptable computational cost is the most important requirement that can restrict a practical applicability of some denoising techniques, for example, those based on ICA and PCA .[5] From the viewpoint of noise suppression, preservation of edges, details and texture, and time efficiency requirements, quite good effectiveness has been demonstrated by locally adaptive methods .The latest modifications of locally adaptive filters include both typical nonlinear scanning window filters (employing order statistics) and transform-based filters, in particular, filters based on discrete cosine transform (DCT). For many image denoising applications, it is commonly assumed that the dominant noise is additive and its probability density function (pdf) is Gaussian . For microwave radar imagery, however, multiplicative noise is typical. The pdf of the noise can be either considered Gaussian or non-Gaussian (e.g., Rayleigh, negative exponential, gamma) depending on the radar type and its characteristics .Images scanned from photographic or some medical images are other examples [6] where additive Gaussian noise model fails. Homomorphic transformation can sometimes be a reasonable way of converting signal-dependent or pure multiplicative noise to an additive noise, which then can be filtered appropriately.However, quite often achievable benefits are not so obvious and without losing efficiency, it is possible to perform filtering without applying a homomorphic transformation to data (e.g., film-grain noise). Lee or Kuan filters are among those conventional and widely used techniques that aim to suppress multiplicative noise without the use of the homomorphic transform. The performance of such filters is improved by their integration into an iterative approach. However, iterative techniques are usually computationally costly, and they often may introduce oversmoothing. In this work, we aim to develop a class of transformbased adaptive filters capable of suppressing signaldependent and multiplicative noise, while preserving texture, edges, and details, which contain significant information for further processing and interpreting of images. In Section 2, we briefly overview a nonlinear transform domain filtering (how it is derived from a least mean square sense optimal filtering), for additive Gaussian noise. Note that any decorrelating orthogonal transform will be a possible choice for a transform domain filtering approach. Yet, we concentrate on the DCT in the following sections, discussing why we expect it to be a good choice for the transform domain filtering.

This algorithm of DCT-based denoising can be, in general, summarized below.

(1) Divide an image to be processed into overlapping blocks (scanning windows) of size  $M \times M$ ; let  $s$  be a shift (in one dimension, row, or column wise in pixels between two neighbouring overlapping blocks.

(2) For each block, with the left upper corner in the  $i$ th pixel, assign

$$x=(m, l) = g (i + m , j + l ) , m ,l = 0, \dots, M-1$$

(i) Calculate the DCT coefficients as follows:

$$X[p, q] = c[p]c[q] \sum_{m=0}^{M-1} \sum_{l=0}^{M-1} x(m, l)$$

$$X \text{ Cos } \frac{[(2m+1)qm]}{2M} \text{ Cos } \frac{[(2l+1)ql]}{2M}$$

Where

$$C[p]= \begin{cases} \sqrt{\frac{2}{M}} , 1 \leq p \leq M-1 \\ \frac{1}{M} , p = 0 \end{cases}$$

$$C[q]= \begin{cases} \sqrt{\frac{2}{M}} , 1 \leq q \leq M-1 \\ \frac{1}{M} , q = 0 \end{cases}$$

(ii) Apply thresholding to the DCT coefficients  $X[p, q]$  according to the selected type of thresholding and obtain  $X_{th}[p, q]$ .

(iii) Obtain the estimates within each block by applying the inverse DCT to the thresholded transform coefficients as

$$X[m, l] = c[p]c[q] \sum_{m=0}^{M-1} \sum_{l=0}^{M-1} x(m, l)$$

$$X \text{ Cos } \frac{[(2m+1)qm]}{2M} \text{ Cos } \frac{[(2l+1)ql]}{2M}$$

(iv) Get the filtered values for the block as

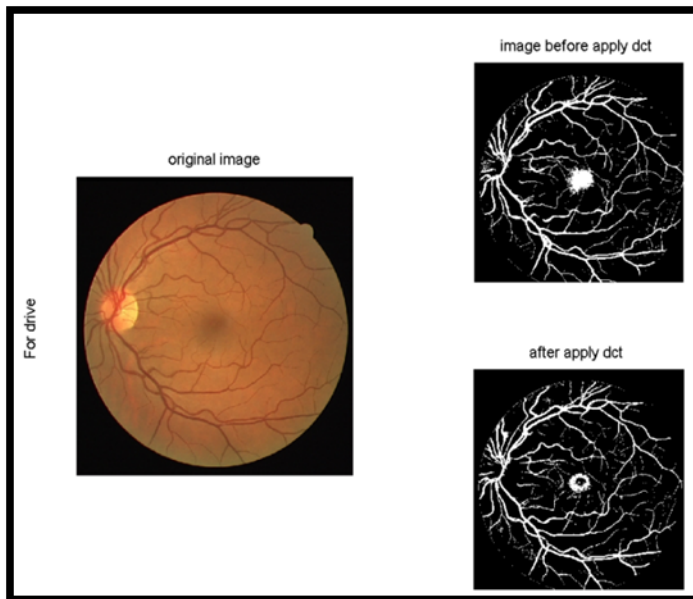
$$\bar{f}(i + m, j + l) = x_{th}(m, l), m, l = 0, \dots, M-1. (12)$$

(3) Obtain the final estimate  $\bar{f}$  for a pixel at  $i$ th location by averaging the multiple estimates of it, these come from neighbouring overlapping blocks including that pixel.[7]

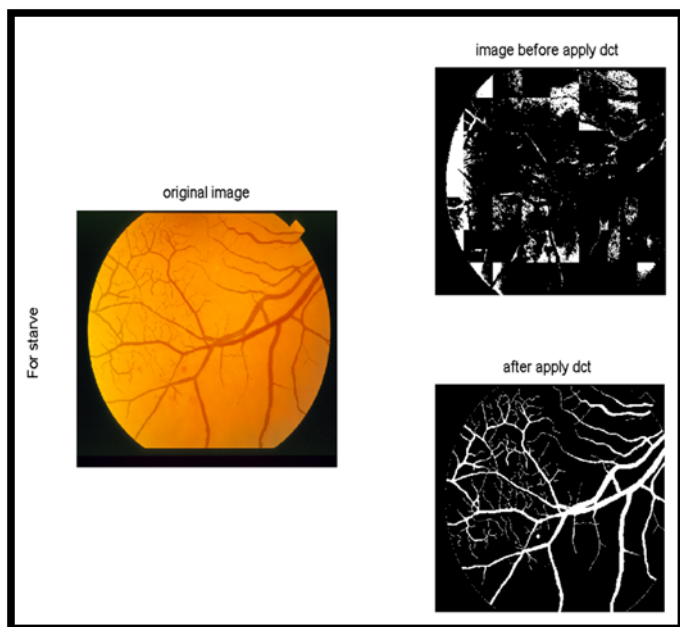
In Fig 5 and 6 the original image from the drive and starve database, and the two results come out first is when we did not apply DCT Filtering and the second is when we apply DCT Filtering. When we did not apply the DCT filtering the retina vessel did not detect properly and for the diabetic operation vessels are necessary It's very clear that after applying DCT Filtering the image of retina show more vessels and has a less noise .In this we can remove much noise from the image by using DCT Filtering its very helpful method to remove the noise.

So, when we detect vessel without DCT Filtering we can't improve result for vessel detection specially in the case diabetic retinopathy DCT Filtering is must otherwise the result will not come properly





**Fig:5 Image after applying DCT Filtration(For Drive Database)**



**Fig:6 Image after applying DCT Filtration(For Starve Database)**

## V. CONCLUSION

In this research paper we consider a Retinal image which has been taken from the Drive and starve database firstly we remove the background noise by applying the Pre Filtering technique and then extract the RGB component and we work on the green component then apply DCT Filtering on the green

component . DCT filtering help to remove the noise from image and the lighting effect from the Digital images . So, when we detect more vessel and improve result for vessel detection specially in the case diabetic retinopathy .For future work we will improve vessel detection through which we detect more vessel

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## AUTHORS

**First Author** – Nimerbir Kaur, Mtech, Student of Global institute of Management and Emerging Technology [Nbhangul@gmail.com](mailto:Nbhangul@gmail.com)

**Second Author** – Amanjot Kaur, Mtech, Professor of Global institute of Management and Emerging Technology

# Some results On Semiderivations of Semiprime Semirings

K.Kanak Sindhu\*, R.Murugesan\*\*, P.Namasivayam\*\*\*

\*Pollachi Institute of Engineering and Technology, Pollachi-642205, Tamilnadu, India

\*\*Thiruvalluvar College, Papanasam-627425, Tamilnadu, India

\*\*\*The M.D.T.Hindu College, Tirunelveli-627010

**Abstract-** Let  $S$  be a semiprime semiring. An additive mapping  $f : S \rightarrow S$  is called a semi derivation if there exists a function  $g : S \rightarrow S$  such that (i)  $f(xy) = f(x)g(y) + xf(y) = f(x)y + g(x)f(y)$ ,  
(ii)  $f(g(x)) = g(f(x))$  hold for all  $x, y \in S$ . In this paper we try to generalize some properties of prime rings with derivations to semiprime semirings with semiderivations.

**Index Terms-** Semirings, Semiprime semirings, Derivation, Semi derivation, Commuting mapping.

## I. INTRODUCTION

Let  $S$  be a semiprime semiring with center  $Z(S)$ . For any  $x, y \in S$ ,  $[x, y], (x, y)$  represents  $xy - yx, xy + yx$  respectively. Also we make use of basic commutator identities

$$[xy, z] = [x, z]y + x[y, z], [x, yz] = y[x, z] + [x, y]z, (xy, z) = (x, z)y + x(y, z) = [x, z]y + x(y, z)$$

J.C.Chang [6] studied on semi derivations of prime rings. He obtained some results of derivations of prime rings into semiderivations. H.E.Bell and W.S.Martindale III [7] investigated the commutativity property of a prime ring by means of semiderivations. C.L.Chuang [8] studied on the structure of semiderivations in prime rings. He obtained some remarkable results in connection with the semiderivations. J.Bergen and P.Grezesczuk [5] obtained the commutativity properties of semiprime rings with the help of semi derivations. A.Firat [3] generalized some results of prime rings with derivations to the prime rings with semiderivations. In this paper we generalize some results of prime rings with semiderivations to the semiprime semirings with semiderivations.

## II. PRELIMINARIES

### Definition 2.1

A **semiring**  $S$  is a nonempty set  $S$  equipped with two binary operations  $+$  and  $\bullet$  such that

1.  $(S, +)$  is a commutative monoid with identity element  $0$
2.  $(S, \bullet)$  is a monoid with identity element  $1$
3. Multiplication left and right distributes over addition.

### Definition 2.2

A semiring  $S$  is said to be **prime** if  $xsy = 0$  implies  $x = 0$  or  $y = 0$  for all  $x, y \in S$ .

### Definition 2.3

A semiring  $S$  is said to be **semiprime** if  $xsx = 0$  implies  $x = 0$  for all  $x \in S$ .

### Definition 2.4

A semiring  $S$  is said to be 2- torsion free if  $2x = 0$  implies  $x = 0$  for all  $x \in S$ .

**Definition 2.5**

A mapping  $f : S \rightarrow S$  is said to be **commuting** on S if  $[f(x), x] = 0$ , holds for all  $x \in S$  and is said to be **centralizing** on S if  $[f(x), x] \in Z(S)$  holds for all  $x \in S$ .

**Definition 2.6**

An additive mapping  $d : S \rightarrow S$  is called a **derivation** if  $d(xy) = d(x)y + xd(y)$  holds for all  $x, y \in S$ .

**Definition 2.7**

An additive mapping  $f : S \rightarrow S$  is called a **semiderivation** associated with a function  $g : S \rightarrow S$  if for all  $x, y \in S$  (i)  $f(xy) = f(x)g(y) + xf(y)$ , (ii)  $f(g(x)) = g(f(x))$ .

If  $g = I$ , ie an identity mapping of S then all semiderivations associated with g are merely ordinary derivations. If g is any endomorphism of S, then semiderivations are of the form  $f(x) = x - g(x)$ .

**Example 2.8**

Let  $S_1$  and  $S_2$  be two semiprime semirings. Let  $S = S_1 \oplus S_2$ . Let  $\alpha_1 : S_1 \rightarrow S_1$  be an additive map,  $\alpha_2 : S_2 \rightarrow S_2$  be a left and right  $S_2$  module which is not a derivation. Define  $f : S \rightarrow S$  such that  $f(x_1, x_2) = (0, \alpha_2(x_2))$  and  $g : S \rightarrow S$  such that  $g(x_1, x_2) = (\alpha_1(x_1), 0)$  for all  $x_1 \in S_1, x_2 \in S_2$ . Define addition and multiplication on S by  $(x_1, x_2) + (y_1, y_2) = (x_1 + y_1, x_2 + y_2)$  and  $(x_1, x_2) \bullet (y_1, y_2) = (x_1 \bullet y_1, x_2 \bullet y_2)$ . Then it can easily be seen that f is a semiderivation of S (with associated map g) which is not a derivation.

III. RESULTS

**Lemma 3.1**

Let S be a semiprime semiring,  $a \in S$ . If S admits a semiderivation f such that  $af(x) = 0$  or  $f(x)a = 0$  for all  $x \in S$  then  $a = 0$  or  $f = 0$ .

Proof:

By hypothesis  $af(x) = 0$  for all  $x \in S$

Replacing  $x$  by  $xy$  for all  $x, y \in S$

$$af(xy) = 0 \text{ for all } x, y \in S$$

$$af(x)g(y) + axf(y) = 0 \text{ for all } x, y \in S$$

$$axf(y) = 0 \text{ for all } x, y \in S$$

$$af(y) = 0 \text{ for all } y \in S$$

Since S is prime  $a = 0$  or  $f(y) = 0$  for all  $y \in S$ . Hence  $a = 0$  or  $f = 0$ .

Similarly we can prove for  $f(x)a = 0$

**Lemma 3.2**

Let S be a semiprime semiring, f a nonzero semiderivation of S associated with a function g (not necessarily surjective). Then g is a homomorphism of S.

Proof:

For any  $x, y, z \in S$

$$\begin{aligned} f(x(y+z)) &= f(x)g(y+z) + xf(y+z) \\ &= f(x)g(y+z) + xf(y) + xf(z) \end{aligned} \tag{1}$$

Also for any  $x, y, z \in S$

$$\begin{aligned} f(x(y+z)) &= f(xy+xz) \\ &= f(xy) + f(xz) \\ &= f(x)g(y) + xf(y) + f(x)g(z) + xf(z) \end{aligned} \tag{2}$$

Comparing (1) and (2)

$$g(y+z) = g(y) + g(z) \text{ for all } y, z \in S$$

Now for any  $x, y, z \in S$

$$\begin{aligned} f((xy)z) &= f(xy)g(z) + xyf(z) \\ &= f(x)g(y)g(z) + xf(y)g(z) + xyf(z) \end{aligned} \tag{3}$$

Also,

$$\begin{aligned} f((xy)z) &= f(x(yz)) \\ &= f(x)g(yz) + xf(yz) \\ &= f(x)g(yz) + xf(y)g(z) + xyf(z) \end{aligned} \tag{4}$$

Comparing (3) and (4)

$$g(yz) = g(y)g(z) \text{ for all } y, z \in S$$

Hence  $g$  is a homomorphism of  $S$ .

**Lemma 3.3**

Let  $S$  be a semiprime semiring,  $f$  a semiderivation of  $S$  such that  $f(S) \subseteq Z$  then  $f = 0$  or  $S$  is commutative.

Proof:

By hypothesis  $f(xy) \in Z$  for all  $x, y \in S$   
 ie,  $f(x)g(y) + xf(y) \in Z$  for all  $x, y \in S$

Commuting this term with  $x$

$$\begin{aligned} 0 &= [f(x)g(y) + xf(y), x] \\ &= [f(x)g(y), x] + [xf(y), x] \\ &= f(x)[g(y), x] + [f(x), x]g(y) + x[f(y), x] + [x, x]f(y) \\ &= f(x)[g(y), x] \end{aligned}$$

Since  $f(x) \in Z$  and  $g$  is a surjective function of  $S$ , we have  $f(x)s[y, x] = 0$  for all  $x, y \in S$ . Since  $S$  is prime  $f(x) = 0$  for all  $x \in S$  or  $[y, x] = 0$  for all  $x, y \in S$ . ie,  $f = 0$  or  $S$  is commutative.

**Lemma 3.4**

Let  $S$  be 2-torsion free semiprime semiring,  $f$  a semiderivation of  $S$  such that  $f^2(x) = 0$  for all  $x \in S$ , then  $f = 0$ .

Proof:

By hypothesis  $f^2(x) = 0$  for all  $x \in S$

Replace  $x$  by  $xy$

$$\begin{aligned}
 f^2(xy) &= 0, \text{ for all } x, y \in S \\
 0 &= f(f(xy)), \text{ for all } x, y \in S \\
 &= f(f(x)g(y) + xf(y)), \text{ for all } x, y \in S \\
 &= f^2(x)g(g(y)) + f(x)f(g(y)) + f(x)g(f(y)) + xf^2(y), \text{ for all } x, y \in S \\
 &= 2f(x)f(g(y)), \text{ for all } x, y \in S
 \end{aligned}$$

Since S is 2-torsion free and g is surjective we have  $f(x)f(y) = 0$  for all  $x, y \in S$

Replace  $y$  by  $yz$

$$\begin{aligned}
 f(x)f(yz) &= 0 \text{ for all } x, y, z \in S \\
 f(x)f(y)g(z) + f(x)yf(z) &= 0 \text{ for all } x, y, z \in S \\
 f(x)yf(z) &= 0 \text{ for all } x, y, z \in S \\
 f(x)sf(z) &= 0 \text{ for all } x, z \in S
 \end{aligned}$$

Since S is prime  $f(x) = 0$  or  $f(z) = 0$  all  $x, z \in S$

In both the cases  $f = 0$ .

**Lemma 3.5**

Let S be a 2-torsion free semiprime semiring and a is an element in S. If S admits a semiderivation f such that  $[f(x), a] = 0$  for all  $x \in S$  then  $f = 0$  or  $a \in Z(S)$ .

Proof:

By hypothesis  $[f(x), a] = 0$  for all  $x \in S$

Replace  $x$  by  $xy$

$$\begin{aligned}
 [f(xy), a] &= 0 \text{ for all } x, y \in S \\
 0 &= [f(x)g(y) + xf(y), a] \\
 &= [f(x)g(y), a] + [xf(y), a] \\
 &= f(x)[g(y), a] + [f(x), a]g(y) + x[f(y), a] + [x, a]f(y) \\
 &= f(x)[g(y), a] + [x, a]f(y) \text{ for all } x, y \in S
 \end{aligned}$$

Since g is surjective,  $0 = f(x)[y, a] + [x, a]f(y)$  for all  $x, y \in S$

Replace  $y$  by  $f(y)$

$$\begin{aligned}
 0 &= f(x)[f(y), a] + [x, a]f^2(y) \text{ for all } x, y \in S \\
 &= [x, a]f^2(y) \text{ for all } x, y \in S
 \end{aligned}$$

Replace  $x$  by  $xz$

$$\begin{aligned}
 0 &= [xz, a]f^2(y) \text{ for all } x, y, z \in S \\
 &= x[z, a]f^2(y) + [x, a]zf^2(y) \text{ for all } x, y, z \in S \\
 &= [x, a]zf^2(y) \text{ for all } x, y, z \in S \\
 &= [x, a]sf^2(y) \text{ for all } x, y \in S
 \end{aligned}$$

Since S is Prime,



$$[x, a] = 0 \text{ or } f^2(y) = 0$$

$$[x, a] = 0 \Rightarrow a \in Z(S) \text{ and } f^2(y) = 0 \Rightarrow f = 0 \text{ by lemma 3.4}$$

**Theorem 3.6**

Let S be a 2-torsion free semiprime semiring and f a semiderivation of S such that  $[f(S), f(S)] = 0$  then  $f = 0$  or S is commutative.

Proof:

By hypothesis,  $[f(S), f(S)] = 0$

$$[f(xy), f(z)] = 0 \text{ for all } x, y, z \in S$$

$$[f(x)g(y) + xf(y), f(z)] = 0$$

$$[f(x)g(y), f(z)] + [xf(y), f(z)] = 0$$

$$f(x)[g(y), f(z)] + [f(x), f(z)]g(y) + x[f(y), f(z)] + [x, f(z)]f(y) = 0$$

$$f(x)[g(y), f(z)] + [x, f(z)]f(y) = 0 \text{ for all } x, y, z \in S$$

Since g is surjective  $f(x)[y, f(z)] + [x, f(z)]f(y) = 0 \text{ for all } x, y, z \in S$

Put  $y = f(y)$

$$f(x)[f(y), f(z)] + [x, f(z)]f^2(y) = 0 \text{ for all } x, y, z \in S$$

$$[x, f(z)]f^2(y) = 0 \text{ for all } x, y, z \in S$$

$$[xu, f(z)]f^2(y) = 0 \text{ for all } x, y, z, u \in S$$

$$x[u, f(z)]f^2(y) + [x, f(z)]uf^2(y) = 0 \text{ for all } x, y, z, u \in S$$

$$[x, f(z)]uf^2(y) = 0 \text{ for all } x, y, z, u \in S$$

$$[x, f(z)]sf^2(y) = 0 \text{ for all } x, y, z \in S$$

Since S is prime  $[x, f(z)] = 0 \text{ or } f^2(y) = 0$

By lemma 3.4 and 3.5  $f = 0$  or S is commutative.

**Theorem 3.7**

Let S be a semiprime semiring, f a semiderivation of S such that  $[f(x), x] = 0 \text{ for all } x \in S$

Then  $f = 0$  or S is commutative.

Proof:

By hypothesis  $[f(x), x] = 0 \text{ for all } x \in S$

Linearizing,

$$0 = [f(x), y] + [f(y), x]$$

Replacing y by yx

$$0 = [f(x), yx] + [f(yx), x] \text{ for all } x, y \in S$$

$$= [f(x), y]x + y[f(x), x] + [f(y)x + g(y)f(x), x]$$

$$= [f(x), y]x + f(y)[x, x] + [f(y), x]x + g(y)[f(x), x] + [g(y), x]f(x)$$

$$= [g(y), x]f(x)$$

Since g is surjective

$$0 = [y, x]f(x) \text{ for all } x, y \in S$$

Re place y by yz

$$\begin{aligned} 0 &= [yz, x]f(x) \text{ for all } x, y, z \in S \\ &= y[z, x]f(x) + [y, x]zf(x) \text{ for all } x, y, z \in S \\ &= [y, x]zf(x) \text{ for all } x, y, z \in S \\ &= [y, x]sf(x) \text{ for all } x, y \in S \end{aligned}$$

Since S is prime  $[y, x] = 0$  or  $f(x) = 0$

This means that S is commutative or  $f = 0$ .

**Theorem 3.8**

Let S be a semiprime semiring, f a nonzero semiderivation of S such that  $f([x, y]) = 0$  for all  $x, y \in S$ . Then S is commutative

Proof:

By hypothesis  $f([x, y]) = 0$  for all  $x, y \in S$

Replacing y by xy

$$\begin{aligned} 0 &= f([x, xy]) \text{ for all } x, y \in S \\ &= f(x[x, y]) \text{ for all } x, y \in S \\ &= f(x)g([x, y]) + xf([x, y]) \text{ for all } x, y \in S \\ &= f(x)g([x, y]) \text{ for all } x, y \in S \\ &= f(x)[g(x), g(y)] \text{ since } g \text{ is a homomorphism} \\ &= f(x)[x, y] \text{ since } g \text{ is surjective} \end{aligned}$$

Re place y by yz

$$\begin{aligned} 0 &= f(x)[x, yz] \text{ for all } x, y, z \in S \\ &= f(x)y[x, z] \text{ for all } x, y, z \in S \\ &= f(x)s[x, z] \text{ for all } x, z \in S \end{aligned}$$

Since S is prime ,

$$f(x) = 0 \text{ or } [x, z] = 0$$

This implies that  $f = 0$  or S is commutative

Since f is nonzero S is commutative.

**Theorem 3.9**

Let S be a semiprime semiring, f a nonzero semiderivation of S such that

$$f([x, y]) = \pm[x, y] \text{ for all } x, y \in S. \text{ Then S is commutative .}$$

By hypothesis,  $f[x, y] = \pm[x, y]$  for all  $x, y \in S$

Replacing y by xy

$$\begin{aligned} f([x, xy]) &= \pm[x, xy] \text{ for all } x, y \in S \\ f(x[x, y]) &= \pm x[x, y] \\ f(x)g([x, y]) + xf([x, y]) &= \pm x[x, y] \\ f(x)g([x, y]) &= 0 \end{aligned}$$

By theorem 3.8  $S$  is commutative.

**Lemma 3.10**

Let  $S$  be a 2- torsion free semiprime semiring and  $f$  is a semiderivation of  $S$  with  $g : S \rightarrow S$  is an onto endomorphism. Let  $a \in S$ , If the mapping  $x \rightarrow [af(x), x]$  is commuting on  $S$  for all  $x \in S$  then  $x \rightarrow af(x)$  is commuting on  $S$ .

Proof:

By hypothesis,  $[[af(x), x], x] = 0$  for all  $x \in S$

Linearising

$$[[af(x), x], y] + [[af(x), y], x] = 0 \text{ for all } x, y \in S$$

Replacing  $y$  by  $yx$

$$[[af(x), x], yx] + [[af(x), yx], x] = 0 \text{ for all } x, y \in S$$

$$\begin{aligned} 0 &= [[af(x), x], yx] + [[af(x), yx], x] \text{ for all } x, y \in S \\ &= [[af(x), x], y]x + y[[af(x), x], x] + [[af(x), y], x]x + [y[af(x), x], x] \\ &= [[af(x), x], y]x + [af(x), y][x, x] + [[af(x), y], x]x + y[[af(x), x], x] + [y, x][af(x), x] \\ &= [y, x][af(x), x] \text{ for all } x, y \in S \end{aligned}$$

Re place  $y$  by  $zy$

$$\begin{aligned} 0 &= [zy, x][af(x), x] \text{ for all } x, y, z \in S \\ &= z[y, x][af(x), x] + [z, x]y[af(x), x] \\ &= [z, x]y[af(x), x] \text{ for all } x, y, z \in S \end{aligned}$$

In particular

$$\begin{aligned} 0 &= [af(x), x]y[af(x), x] \text{ for all } x, y \in S \\ &= [af(x), x]s[af(x), x] \text{ for all } x \in S \end{aligned}$$

By semiprimeness of  $S$ ,  $[af(x), x] = 0$  for all  $x \in S$

Hence  $x \rightarrow af(x)$  is commuting on  $S$ .

**Theorem 3.11**

Let  $S$  be a non commutative 2- torsion free semiprime semiring and  $f$  is a semiderivation of  $S$  with  $g : S \rightarrow S$  is an onto endomorphism. If the mapping  $x \rightarrow [af(x), x]$  is commuting on  $S$  for all  $x, y \in S$  then  $a = 0$  or  $f = 0$ .

Proof:

By hypothesis,  $[[af(x), x], x] = 0$  for all  $x \in S$

Then by lemma 3.10  $[af(x), x] = 0$  for all  $x \in S$

Linearizing

$$[af(x), y] + [af(y), x] = 0 \text{ for all } x, y \in S \tag{2}$$

Replacing  $y$  by  $yx$

$$\begin{aligned}
 [af(x), yx] + [af(yx), x] &= 0 \\
 [af(x), y]x + y[af(x), x] + [af(y)x + ag(y)f(x), x] &= 0 \\
 [af(x), y]x + [af(y), x]x + af(y)[x, x] + ag(y)[f(x), x] + [ag(y), x]f(x) &= 0 \\
 ag(y)[f(x), x] + [ag(y), x]f(x) &= 0
 \end{aligned} \tag{3}$$

Replacing  $g(y)$  by  $ag(y)$

$$\begin{aligned}
 a^2 g(y)[f(x), x] + [a^2 g(y), x]f(x) &= 0 \\
 a^2 g(y)[f(x), x] + a[ag(y), x]f(x) + [a, x]ag(y)f(x) &= 0
 \end{aligned} \tag{4}$$

Multiplying (3) by  $a$

$$a^2 g(y)[f(x), x] + a[ag(y), x]f(x) = 0 \tag{5}$$

Comparing (4) and (5)

$$[a, x]ag(y)f(x) = 0 \text{ for all } x, y \in S$$

$$[a, x]asf(x) = 0$$

Since  $S$  is prime  $[a, x]a = 0$  or  $f(x) = 0$  for all  $x \in S$   
 Let  $[a, x]a = 0$

Replacing  $x$  by  $xy$

$$\begin{aligned}
 [a, xy]a &= 0 \text{ for all } x, y \in S \\
 [a, x]ya &= 0 \text{ for all } x, y \in S \\
 [a, x]sa &= 0 \text{ for all } x \in S
 \end{aligned}$$

Since  $S$  is prime  $[a, x] = 0$  or  $a = 0$  for all  $x \in S$

Since  $S$  is non-commutative  $a = 0$  for all  $x \in S$

Hence  $a = 0$  or  $f = 0$ .

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#### AUTHORS

**First Author** – K.Kanak Sindhu, Pollachi Institute of Engineering and Technology, Pollachi-642205, Tamilnadu, India, kksindhu.tv@gmail.com

**Second Author** – R.Murugesan, Thiruvalluvar College, Papanasam-627425, Tamilnadu, India, rmurugesan2020@yahoo.com

**Third Author** – P.Namasivayam, The M.D.T.Hindu College, Tirunelveli-627010, Tamilnadu, India, vasuhe2010@gmail.com



# Morphotypes: Morphological plasticity in *Paphia malabarica* (Chemnitz) (Mollusca: Bivalvia) of a deep estuary, Ashtamudi estuary

Ampili, M\* and Shiny Sreedhar, K.\*\*

\* PG and Research Department of Zoology, N.S.S.Hindu College, Changanassery, Kottayam

\*\* PG and Research Department of Zoology, Sree Narayana College, Cherthala, Alleppey, Kerala, India

**Abstract-** Morphometric analysis of shell shape and size seems a priori to be a realistic alternative for inter-group discrimination. Analysis of external shell trait measurements of Venerid clam *Paphia malabarica* of Ashtamudi estuary, a deep estuary unveiled morphological plasticity in the population. The clam population in the barmouth of estuary was found to be morphologically varied from the clam population of upper reaches. The morphotypes displayed variation from 11% to 38% in external shell traits. The phenotypic plasticity can be explained by ecophenotypic variation along a depth gradient with uneven shell thickness and shorter form in deeper part of the estuary near barmouth where wave action and tidal currents were higher and with longer and deeper shells in shallow upper reaches of estuary. Ecological changes in the habitat affect the distribution and abundance of clams in the estuary. Habitat heterogeneity for long period increase genetic variations.

**Index Terms-** *Paphia malabarica*, phenotypic plasticity, morphotypes, ecophenotypes, shell traits.

## I. INTRODUCTION

Amongst marine taxa, molluscs have achieved notable evolutionary divergence over the Phanerozoic and acquired a unique variety of morphologies (Sepkoski 1981; Russell-Hunter 1983; Runnegar and Pojeta 1985). External skeleton, the bivalve shell, bound intimately to the growth and development, soft-anatomy and functional morphology of the entire organism. Conchological anatomy form a valid repository of homologous and synapomorphic characters, as well as ontogenetic and functional information. Morphometry deals with variation in the form (size and shape) of organisms. The morphometrics can quantify a trait of evolutionary significance, and deduce something of their ontogeny or evolutionary relationships by detecting changes in the shape of organisms. Morphometrics allow comparisons to describe complex shapes in an austere fashion, and permits numerical comparison between different forms. Most bivalves are ideal subjects for studying the relationship between body form and ecology. Their shape and growth are directly controlled by habitat specific factors due to the sedentary life of these animals.

Shell shape in bivalves is a key morphological characteristic that reflects both phylogenetic history and life habits (Stanley 1970; Crampton and Maxwell 2000). Morphometric techniques have been used to discriminate species on the basis of shell

variation (Anderson 1996; Marko and Jackson 2001; Anderson and Roopnarine 2005; Kosnik *et al.* 2006) and to examine patterns of shell development (Roopnarine 2001; Tang and Pantel 2005). Several studies on the bivalve shells have proved that it was very useful in defining specific shape features that might distinguish species or intraspecific variations among different population along a wide geographical range (Dommergues *et al.* 2003; Palmer *et al.* 2004; Rufino *et al.* 2006; Krapivka *et al.* 2007; Costa *et al.* 2008; Marquez *et al.* 2011). Such variability is likely to reflect changing eco-physiological requirements and constraints with body size, alongside genetic and environmental influences on shell morphology (Boulding and Hay 1993; Boulding and van Alstyne, 1993; Hollandar *et al.* 2006; Bondarev 2013). Sandra *et al.* (2011) analysed the ecophenotypic plasticity as a response to different environmental condition in Venerid clam *Tawera gayi*.

Studying growth and establishing allometric relationships yield valuable information for managing fishery resources and understanding environmental changes. The analysis of shape profiles in bivalves can underpin the geographically based studies of morphological variation that occur in individuals of different population. Moreover the allometric relationship allows comparison of life history and morphology between species or between populations of a species from different regions.

## II. MATERIALS AND METHODS

Random samples of bivalve clam, *Paphia malabarica* were collected from the clam beds of the deep estuary, Ashtamudi estuary for a period of two years. The clams collected were transported to the laboratory and kept in aerated habitat water for twenty four hours for defecation. The clams of the estuary were grouped in to two sets, set I constituted the clams collected from the upper reaches of the estuary and that of the barmouth was designated as set II. About hundred clams from each set were sacrificed for biometric measurements. The shell length, shell width, shell thickness and inflation of the shells were noted using digital vernier callipers. T-test was carried out to analyse the mean difference between the shell traits observed in *P. malabarica* morphotypes. Statistical analysis was carried out using SPSS (version 20.0).

### III. RESULT

**Intra-species variation in the external shell morphometry:** Observations on the external shell morphometry of *P.malabarica* revealed variations in external shell traits (Figure 1a and 1b). The clams collected from the station near the

barmouth of the estuary (Type II) was found to be always smaller than the clams collected from the upper reaches of the estuary (Type I). They always exhibited improper shell formation and shells with uneven thickness and with slightly bean shaped ventral outline (Figure 1 b).



**Figure 1** Shells of *P. malabarica* morphotypes in the estuary (a) morphotype I  
(b) morphotype II. Scale bar = 10mm

The analysis of the external shell trait data revealed significant differences between the mean values of shell length ( $t=10.947$ ,  $p< 0.001$ ), shell height ( $t= 10.285$ ,  $p< 0.001$ ) and thickness of the shell ( $t=21.821$ ,  $P< 0.001$ ). The difference in the mean values of inflation was not significant. Variations from 11% to 38% were obtained between each external shell trait recorded (Table 1). The statistical analysis of shell traits confirmed the phenotypic plasticity among the *Paphia* population.

### IV. DISCUSSION

As molluscan size varies both intra- and inter-specifically, the relative investment in the shell and non shell parts can change ontogenetically and within/between species. Such variability is likely to reflect changing eco-physiological requirements and constraints with body size, alongside genetic and environmental influences on shell morphology. Shell length and shell height are commonly used parameters to study growth kinetics of bivalves (Zainudin and Tsuchiya 2007). It would be unlikely that significantly different shell shapes in some species is genetically determined and therefore environmental factors would be likely to cause different morphologies resulting from phenotypic plasticity. Morphological variation is related to differences in depth, but not to horizontal distance (Olabarria and Thurston 2004). The dimensional relationships are modified by the environmental conditions such as salinity, current velocity, wave action, depth under which the organism lives (Seed 1968; Hickman 1979; Jones 1979) and overcrowding results in the assumption of a variety of crooked forms (Rao and Nayar 1956). Differences found among the shell traits of *P.malabarica* population could also be explained as the outcome of the phenotypic plasticity of the population subjected to different environmental conditions. This might be the reason for the shape derangements noted in the *Paphia* population near barmouth where the population density was very high when compared to

the density of the *Paphia* population in other sites. Several researchers have opined that density affect the growth rates in bivalves (Sutherland 1970; Creese and Underwood,1982; Claereboudt 1999). In the present study also the population density of the site near the barmouth was found to be higher than that of the remaining sites. It is known that in several bivalve species the height and width of shell increase during growth in order to counter involuntary dislodgement by turbulence and currents (Eagar 1978; Hinch and Bailey 1988).

### V. CONCLUSION

The external shell trait analysis revealed the phenotypic plasticity in *P.malabarica*. The *P.malabarica* population near the barmouth of the estuary showed marked external shell trait differences. They are found to be smaller than the clams collected from other sites. Thus two morphotypes (Type I and Type II) were located in the estuary. Besides over-crowding, the environmental factors such as salinity, current velocity, wave action and depth of the site might be causing the variations in the shell traits. This might be due to the environmental characters of the estuary that modify the dimensional characters in the organisms such as sediment nutrient characters and depth.

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#### AUTHORS

**First Author** – Ampili, M, PG and Research Department of Zoology, N.S.S.Hindu College, Changanassery, Kottayam, Kerala, India., ampilirajeev@gmail.com  
**Second Author** – Shiny Sreedhar, K, PG and Research Department of Zoology, Sree Narayana College, Cherthala, Alleppey, Kerala, India., drshinysreedhar@yahoo.co.in



**Table 1** t-test showing the mean difference between the shell traits observed in *P.malabarica* morphotypes.

Shell traits	Morphotype	Mean	SD	Mean Difference	t - value	Df	p - value
Length	Type I	31.8	2.08	3.457	10.947*	198	< 0.001
	Type II	28.3	2.37				
Height	Type I	23.3	1.82	2.605	10.285*	198	< 0.001
	Type II	20.7	1.77				
Thickness	Type I	1.5	0.22	0.921	21.821*	198	< 0.001
	Type II	2.4	0.36				
Inflation	Type I	14.8	2.09	0.462	1.856	198	Not significant
	Type II	14.3	1.34				

# Role of Serum Cholesterol Level in Pathogenesis of OCD

Dr Madhura TK

MBBS, MD (Biochemistry)

**Abstract-** Etiology and pathophysiology of obsessive compulsive disorder remains inconclusive till today. Multiple converging lines of evidence suggest that neurobiology plays a significant role in the etiology of obsessive compulsive disorder (OCD). Certain brain areas frequently involved in symptomatology of OCD, analyzed by neuroimaging studies. The strongest pharmacologic evidence concerns the serotonergic system and the well-established efficacy of potent serotonin reuptake inhibitors in the treatment of OCD. Cholesterol forming the vital component of neurons regulates neurochemical activity. Reduced serum cholesterol level causes hyperactivity of serotonin reuptake receptor activity precipitating symptoms of OCD.

**Index Terms-** OCD, Serotonin, receptors, neurotransmitters, cholesterol

## I. INTRODUCTION

Obsessions are recurrent, persistent, thoughts, images or impulses that are experienced as intrusive & inappropriate.<sup>1</sup> Compulsions are repetitive behaviors or mental acts that the person feels driven to perform in response to an obsession or according to rigid rules.<sup>1</sup>

Obsessive-compulsive disorder is the fourth commonest psychiatric disorder with disability in severe cases often comparable to the disability associated with mental illness such as schizophrenia and bipolar disorder. 2% of adults suffer from this disorder.<sup>2,3</sup>

The OCD usually presents at the age of 20-30 yr. If it presents in older age (in 4th decade) it usually comes after a stressful situation in life. OCD usually begins in adolescence or early adulthood although it can begin in childhood. Nearly 65% of the patients have the onset before 25 years of age and <15% have onset after 35 years of age.<sup>2,3</sup> Epidemiological studies show that around 2% of adults suffer from this disorder.

## ETIOLOGY<sup>4,5</sup>:

### 1. Neurobiological factors :

Onset of OCD symptoms follow neurological injury secondary to infection, head injury or neuronal over activity. Efficacy of serotonin reuptake inhibitors in symptomatic improvement in OCD cases has proved role of serotonin in pathophysiology of OCD.

### 2. Neurophysiological factors :

Positron emission tomography (PET) studies suggest increased glucose metabolism in orbital frontal cortex, prefrontal cortex & anterior cingulate gyrus, right caudate nucleus.

### 3. Neuroanatomical factors :

Neuroimaging studies that have been implicated the frontal-basal ganglio thalamic cortical circuit in the pathogenesis of the disorder.

### 4. Neurochemical basis :

Oxidative stress causes neuronal damage in the above mentioned areas. Damage caused disturbs intracellular events resulting in impaired release of neurotransmitters like serotonin, dopamine which have been proposed in the pathophysiological basis of OCD, thus decreasing the synaptic levels of neurotransmitters leading to symptomatology.

### 5. Neuropsychological factors

### 6. Immunological factors:

Subgroup of youngsters present OCD symptoms triggered or symptoms get precipitated with group A beta hemolytic streptococcal infection

### 7. Family history: 50% childhood cases are familial.

### 8. Genetic factors :

Studies suggest that 30% of adults with OCD had immediate family member with symptoms of OCD. Research suggests that if one parent has OCD the chances of the child having it are between 2% and 8%.

### 9. Behavioral factors :

According to Hobart Mowrer's conditioning theory, previously neutral stimulus becomes aversive, as a result of being associated with an unrelated aversive stimulus

Compulsions become strengthened as a result of anxiety reducing properties.

There are five main types of OCD that commonly appear in sufferers<sup>6,7</sup>

### 1. Washers and cleaners

Contamination obsessions are the most common type of obsessions in OCD. They are typically characterized by a fear of dirt or germs.

Obsession: a constant fear of contamination and being infected with disease and infecting others. Compulsion: sufferer avoids or removes all possible source of germs and dirt. Washers may repeatedly wash their hands or take showers while cleaners may clean their house repeatedly.

The cleaning compulsions include excessive or ritualized hand washing, showering, bathing, tooth brushing, and elaborate toilet routines.

### 2. Checkers

Obsession : a fear of forgetting to lock or switch something off will cause harm for which they will be blamed. Compulsion : time consuming rituals that involve checking & re-checking the objects of their obsession for eg. Locks/ switches.

Patients with doubts typically worry that something terrible may happen because they have not completed an act thoroughly or completely. Such patients can spend hours checking before leaving their home.

### 3. Orderers

**Obsession:** To organise or arrange objects in a specific pattern or order before performing a daily task.

**Compulsion:** Arranging things in a certain 'correct' way. If someone else touches or moves those objects out of place, they will feel extremely upset.

#### 4. Hoarders

**Obsession:** Excessive fear of discarding certain objects in the belief that they may be of use in the future.

**Compulsion:** Keeping or collecting items that are often useless. Even if some are useful, hoarders tend to collect so many items that they are unable to finish using all of them.

#### 5. Sexual and aggressive obsessions

Patients with these obsessions are plagued by thoughts, images or urges that are sexual or aggressive in nature. Patients often fear that they may commit a sexually unacceptable act such as touching the private parts of immediate family members. Aggressive obsessions include fears that one might harm self or others on an impulse (fear of stabbing with a knife, jumping in front of a car, leaping out of an open window) or because not careful enough (fear of hitting a pedestrian because of not being careful), and fear of blurting out obscenities or insults.<sup>6</sup>

## II. NEUROTRANSMITTER INVOLVED IN OCD PATHOPHYSIOLOGY

**Serotonin** is a monoamine neurotransmitter, biochemically derived from tryptophan. Primarily found in gastrointestinal tract, Central Nervous System, platelets etc. Functions of serotonin include the regulation of [mood](#), appetite, sleep, cognitive functions, including memory and learning.<sup>8,9</sup> Serotonin is the major neurotransmitter in raphe nuclei, which are grouped into nine pairs and distributed along the brainstem, centered around the reticular formation. Axons of neurons in the "caudal" raphe nuclei terminate at deep cerebellar nuclei, cerebellar cortex, spinal cord. Serotonin is released at terminal synaptic boutons acting at a wide gap of >20µm synapse and acts to activate 5-HT receptors located on the dendrites, cell bodies and presynaptic terminals of adjacent neurons. Serotonin receptors are G protein coupled seven transmembrane (or "heptahelical") receptors that activate an intracellular second messenger cascade except 5-HT<sub>3</sub>, which is ligand gated ion channel.<sup>10</sup>

SERT spans the plasma membrane 12 times. It belongs to NE, DA, SERT monoamine transporter family. Transporters are important sites for agents that treat [psychiatric disorders](#). Both drugs that reduce the binding of serotonin to transporters ([selective serotonin reuptake inhibitors](#), or SSRIs) and, less often, that increase it ([selective serotonin reuptake enhancers](#), or SSREs) are used to treat mental disorders. About half of patients with OCD are treated with SSRIs. [Fluoxetine](#) is an example of a [selective serotonin reuptake inhibitor](#), and [tianeptine](#) is an example of a [selective serotonin reuptake enhancer](#). The highly evolutionarily conserved serotonin transporter (SERT) regulates the entire serotonergic system and its receptors via modulation of extracellular fluid serotonin concentrations.<sup>11</sup>

### **CHOLESTEROL AND OCD :**

Cholesterol is the vital component of eukaryotic cell membranes and plays a crucial role maintaining cellular function,

membrane dynamics, transport across cell membranes and physical protection. The alteration in membrane physical properties is due to interaction of cholesterol moiety with various protein components in cellular membranes.

The heterogeneity in cholesterol distribution in membrane domains sequester proteins contributing to significance membrane function. The seven transmembrane domain G-protein coupled receptors (GPCRs) are among the largest protein families in mammals and represent 2% of the total proteins coded by the human genome. They mediate transduction events, which are the primary means of cellular communication and response to external environment. The recently reported role of cholesterol in the function and organization of the neuronal serotonin<sub>1A</sub> receptor, a representative of the GPCR family which is present endogenously in the hippocampal region of the brain, is highlighted. The neurotransmitter release at the synapses underlies fundamental brain activities such as cognition, emotion, and memory. It is therefore natural to speculate that the neurotransmitter release depends on the cholesterol level in the brain. A low cholesterol level may alter the pattern of the release, which in turn perturbs the brain activities to the extent that it could lead to behavioral dysfunction, depression, suicide, and memory loss.<sup>12</sup>

### **CHOLESTROL IN PRE-SYNAPTIC TERMINALS :**

There exists an elaborate assembly of protein and lipid components, releasing the transmitter from pre-synaptic neurons. Cholesterol is the vital component of exocytosis apparatus playing a crucial role in biogenesis and transport of neurotransmitters and other substances in synaptic vesicles. Synaptosomal preparations are used to calculate the lipid composition of pre synaptic terminals. The cholesterol: phospholipid ratio lies between 0.5: 1 in plasma membranes. The inner leaflet of synaptic membranes contains eight-fold more cholesterol than its outer counterpart and that this distribution is affected by disease and aging. Syntaxin and SNAP25, which form the soluble N-ethylmaleimide-sensitive factor attachment protein receptor (SNARE) complex with vesicle-associated membrane protein (VAMP), but none of the other exocytosis relevant proteins tested partitioned to the detergent-insoluble cholesterol-rich membrane fraction.<sup>13, 14, 15</sup>

Presynaptic transmitter release involves interplay of two highly specialized compartments, the membrane at the docking zone and the membrane of synaptic vesicles. The molecular composition of synaptic vesicles has been characterized, since these organelles can be purified to a high degree from synaptosomes due to their abundance and uniform size. Cholesterol has profound effects on the biophysical properties of membranes, thereby affecting the function of membrane-resident signaling components including ion channels, transporters and receptors. In a molecular level, cholesterol can affect synaptic membrane fusion in a number of different ways:

- (i) cholesterol is proposed to form laterally separated membrane domains called rafts, in cooperation with another brain lipid sphingolipid. The rafts could play a role in driving the clustering of SNAREs into a specific membrane site, which may be necessary for productive fusion.

- (ii) it is shown that cholesterol induces the clustering of the SNARE proteins by promoting self-assembly of the proteins without the rafts. The clustering of SNAREs is thought to be helpful for docking and fusion of vesicles.
- (iii) due to its unique inverse wedge-like molecular shape, cholesterol is thought to play a role in membrane fusion which involved curving and bending of the bilayers. <sup>16</sup>

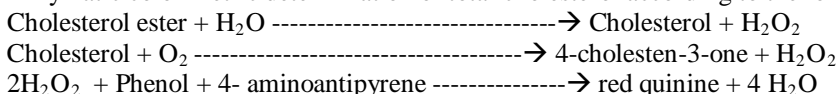
**III. ESTIMATION OF SERUM CHOLESTEROL LEVEL**

**METHOD :** cholesterol oxidase peroxidase methodology ( Agappe diagnostics)

**Sample collection :** After taking informed consent, under thorough aseptic precautions , 2 ml of venous sample is collected from the patient in a plain vacutainer and allowed to clot. After one hour, the vacuitainer is centrifuged at 2500 rpm for 5 min and serum is extracted and stored.

**Principle of CHOD-POD method :**

Enzymatic colorimetric determination of total cholesterol according to the following reactions.



**Reagent composition :**

**CHOLESTEROL STANDARD :** 1 X 5 ML

Cholesterol standard of concentration : 200mg/dl

Cholesterol R <sub>1</sub> : 2 X 50 ml	Cholesterol R <sub>2</sub> : 2 X 50 ml
Pipes buffer (pH 6.9) 50mmol/L	Cholesterol esterase ≥ 200U/L
Phenol 24 mmol/L	Cholesterol oxidase ≥250U/L
Sodium cholate 0.5 mmol/L	Peroxidase ≥ 1000U/L
	4-aminoantipyrene 0.5 mmol/L

**PREPARATION AND STABILITY OF WORKING REAGENT:**

Dissolve contents of reagent 2 (R<sub>2</sub>) with the amount of reagent 1 (R<sub>1</sub>) indicated on the vial label. The working reagent is stable for 90 days at 2-8° C.

Wavelength for estimation : 505-630nm

Linearity : 500mg/dL

**PROCEDURE:**

	BLANK	STANDARD	SAMPLE
Working reagent	1000 µL	1000 µL	1000 µL
Standard	-	10 µL	-
Sample	-	-	10 µL

Mix and incubate for 5 min. at 37 ° C. Measure the absorbance of sample and standard against reagent blank.

**CALCULATION:**

Cholesterol concentration (mg/dL) =  
 (Absorbance of sample / Absorbance of standard) x 200  
**NORMAL RANGE :** 140 – 200 mg/ dL

**METHOD :**

This is a case control study on 30 cases and 30 control group with match of age, sex and inclusion /exclusion criteria. Selected age group is between 15-45 years . excluding the cases and controls with history of metabolic disorders, smoking, alcohol consumption, unwillingness in participation in study.

**IV. RESULTS :**

All the calculations were done using Microsoft Office Excel 2010 and statistical analysis was done using the Graph Pad Prism software, version 5.01.

The collected data was analyzed by applying paired t test. P-value less than 0.05 ( $P < 0.05$ ) was considered to be statistically significant (S). P-value less than 0.001 ( $P < 0.001$ ) was considered to be statistically highly significant (HS). P-value more than 0.05 ( $P > 0.05$ ) was considered to be statistically non-significant (NS).

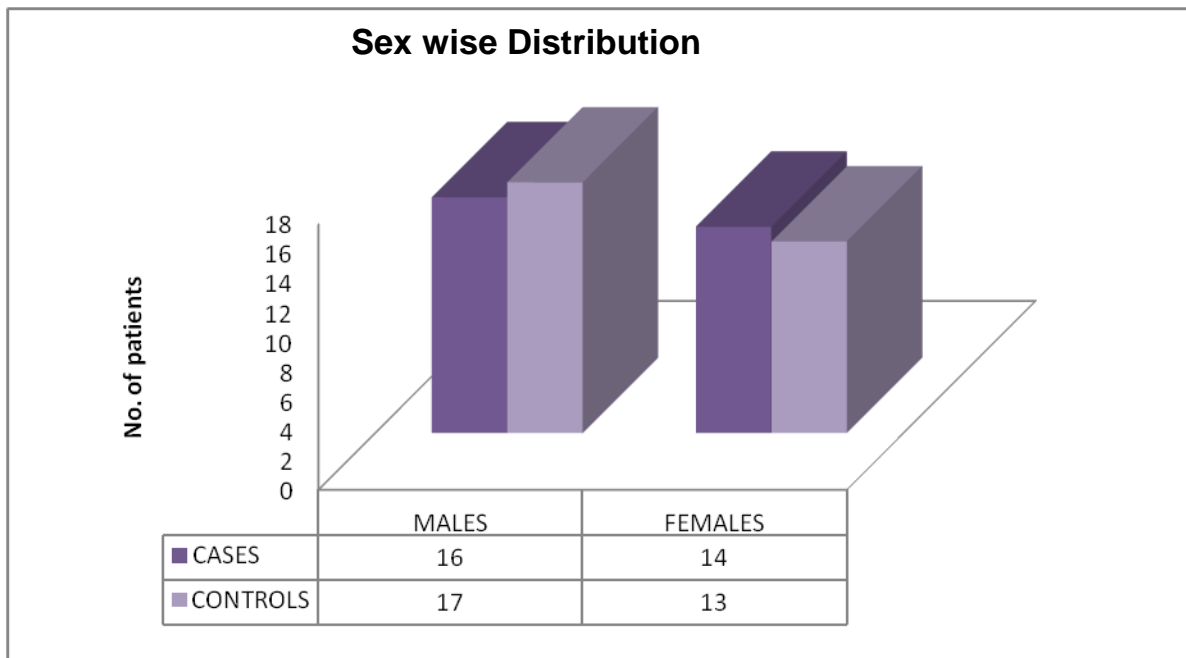
**Table 1: BASELINE CHARACTERISTICS OF PATIENTS**

	<b>CASES</b>	<b>CONTROLS</b>
Mean age $\pm$ SD (years)	34.5 $\pm$ 9.26	34.03 $\pm$ 8.52
Sex	16M/14F	17M/13F

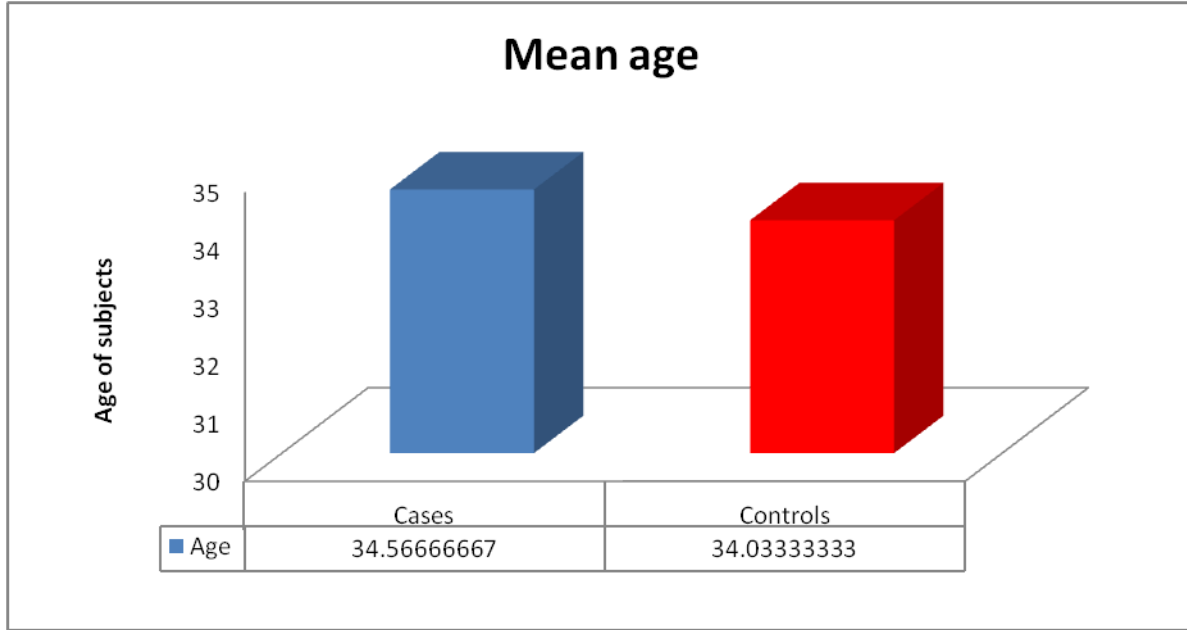
The average age of subjects in controls is 34.03 years and 34.5 years in patients with OCD, which shows that mean age is nearly equal in controls and cases.

Sex distribution in controls 17 males and 13 females and in patients with OCD 16 males and 14 females, which shows that sex ratio is nearly equal in controls and cases.

**Graph 1: BAR DIAGRAM SHOWING SEX WISE DISTRIBUTION IN CASES AND CONTROLS**



**Graph 2: BAR DIAGRAM SHOWING MEAN AGE DISTRIBUTION BETWEEN CASES AND CONTROLS.**

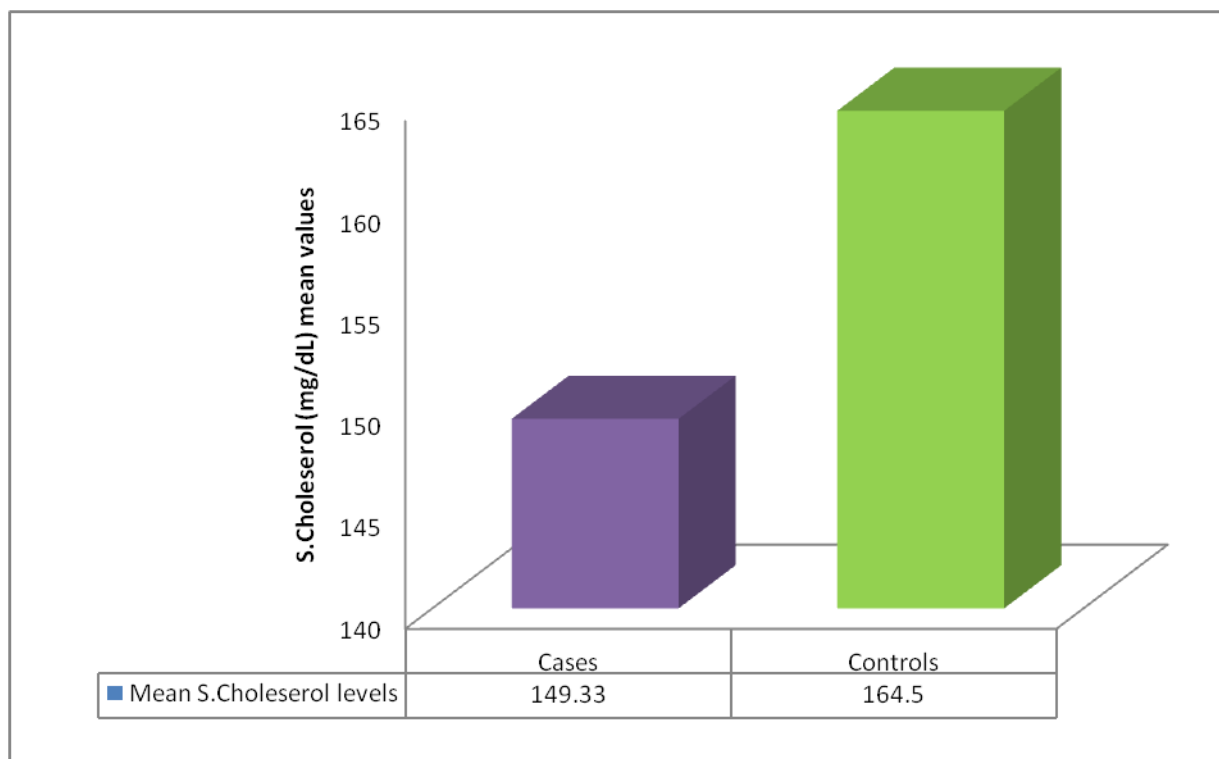


**TABLE 2: COMPARISON OF SERUM CHOLESTEROL LEVEL BETWEEN CASES AND CONTROLS**

Group	S. cholesterol level (mg/dL) Mean ± SD	T value	p value
Cases	149.33 + 25.65	4.88	<0.05
Controls	164.5 + 16.95		

There is significant decrease in serum cholesterol in OCD cases as compared to controls since ( p value 0.0047 i.e < 0.05)

**GRAPH 3: BAR DIAGRAM SHOWING COMPARISON OF MEAN VALUE SERUM CHOLESTEROL LEVEL BETWEEN CASES AND CONTROLS.**



## V. DISCUSSION AND CONCLUSION

Obsessive-compulsive disorder (OCD) is a neuropsychiatric disorder characterized by recurrent distressing thoughts and repetitive behaviors or mental rituals performed to reduce anxiety. Symptoms are often accompanied by feelings of shame and secrecy because patients realize the thoughts and behaviors are excessive or unreasonable. This secrecy, along with a lack of recognition of OCD symptoms by health care professionals, often leads to a long delay in diagnosis and treatment

Brain is highly enriched in cholesterol containing almost one quarter of total bodily cholesterol. In neurons, cholesterol makes up nearly 40% of total membrane lipids and is in equilibrium with serum cholesterol level. Lowered serum cholesterol levels as seen in cases with respect to controls causes reduced levels of neuronal membrane cholesterol, which cause impaired release of serotonin due to inefficient exocytosis and SERT dysfunction causing exaggerated uptake of serotonin from synapse. Thus there exists relative deficiency of serotonin in the synapses, which impairs neurotransmission leading to misfiring of neurons and misconveyed impulse transmission precipitating symptoms of OCD.<sup>9</sup>

## VI. OCD AND SERUM CHOLESTEROL LEVEL

- Cholesterol is an essential component of eukaryotic membranes and plays a crucial role in membrane organization, dynamics and function. Cholesterol is a multifaceted molecule, which serves as essential membrane component, as cofactor for signaling

molecules and as precursor for steroid hormones. Cholesterol plays a vital role in the activity of membrane transporter e.g SERT (serotonin transporter).

- Reduced Serum cholesterol levels in OCD patients also depict low levels of neuronal membrane cholesterol and the increased activity of serotonin transporter (SERT), integral membrane protein which reuptakes serotonin from synapse leading to relative deficiency of serotonin in the synapse that inturn lead to symptoms of OCD.
- Lowered serum cholesterol levels causes impaired release of neurotransmitter serotonin because of inefficient exocytosis of pre-synaptic neuronal vesicles. And SERT activity is impaired resulting in faster and exaggerated serotonin uptake. Thus the synapse becomes deficient in serotonin causing neuronal irritability and excessive transmission of impulses resulting in OCD symptoms.
- In the present study, there was significant decrease in serum cholesterol levels in cases ( $149.33 \pm 25.65$ ) ( $p < 0.05$ ) (table 2; graph 3) as compared to the control group ( $164.5 \pm 16.95$ ) ( $p > 0.05$ ). This shows that the role of decreased serum cholesterol level in the pathogenesis of OCD

## ACKNOWLEDGEMENT

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## AUTHORS

**First Author – Dr Madhura TK MBBS, MD  
(BIOCHEMISTRY)**



# How Sound Affects Us

## I. INTRODUCTION

Sound therapy involves using sound waves to heal the body and mind.

Such sounds are not what we traditionally think of as music but usually continuous tones created by drums, gongs or more modern ultrasonic machines.

“Everything in Life is Vibration” – Albert Einstein

The theory behind sound therapy is that all of our bodies’ cells vibrate at a natural frequency. These frequencies can become misaligned or otherwise changed through illness or physical stress.

By subjecting the body, or part of the body, to a sound at a particular frequency such problems can be improved. An example is playing back a recording of a particular sound at a predetermined and constant frequency to treat muscular aches and pains, which may have been caused by stress.

Some people claim that sound therapy works well for them, while others remain more sceptical. Regardless of the effectiveness of sound therapy there is little doubt that music can affect us and can be used effectively to aid relaxation and stress relief.

## II. POWER OF MUSIC

It is a well-established fact that music can alter our mood, stir emotions and may even lead us to behave in unusual ways. There are many ways that music can make us feel, including:

Patriotic – National anthems and other music associated with a country or geographic area.

Loyalty – Music and sounds associated with sports events, schools, clubs and other organisations.

Spiritual – Hymns, chants, gospel and other music and sounds associated with religion or the divine.

Nostalgic – Music can remind us of the past, both good times and bad times.

Love – Music can be used to express love and as a sign of affection.

Hate – Music can be used in war and violence and to promote anger.

Energetic – Rhythms in music can make us tap our feet, clap our hands and dance. Music can aid physical exercise.

Happy – Music can lift our mood, make us smile, laugh and sing along.

Sad – Music can make us feel melancholy, gloomy or even depressed. Music can make us cry.

Excited – Music is often used to excite us, like at a funfair or during some tense moment in a movie.

Irritated – Music we don’t like can irritate us, as can an ‘ear-worm’ a tune that gets stuck in your head and is repeated over and over.

Unexplained – Sometimes music can cause more unexplained physical reactions, like the hairs standing up on the back of your neck or goosebumps which are more commonly

associated with strong feelings of nostalgia, pleasure, euphoria, astonishment or awe.

The list above is by no means complete, music and sound affect us in all conceivable ways – even when we are not fully listening or paying attention. It should be clear that music can also, therefore, be used as an effective relaxation technique – a way to reduce stress levels and release tensions.

One problem with using music as a tool for relaxation is that everybody has different tastes. You need to find what works best for you.

Musical styles and genres are so diverse that it may be difficult to find a particular style that best suits you.

Furthermore, different styles may help you to relax at different times and in different ways. A warm, candle-lit bath whilst listening to soft classical music may work sometimes, whereas loud rock music may help you to release pent up tensions through dancing and/or singing along.

It is important, therefore, that you find out what sort of music can help you and in what circumstance. Work on increasing your musical repertoire to find styles, artists, composers and genres that you enjoy listening to.

Listen to different radio stations online or over the air, buy or borrow new music and experiment; you may discover a whole new area of music that appeals to you.

## Personal Music Therapy

Relaxation with music does not necessarily mean sitting or lying still whilst listening, although this can be particularly relaxing.

Enjoying the therapeutic benefits of music can be achieved in much more active situations, during sport, at work, while you cook, while gardening – with modern technology such as MP3 players and smart-phones music has become truly portable and customisable it can be enjoyed anywhere.

By actively listening to music – this means consciously listening, not just hearing music – you occupy your brain and distract it from other thoughts.

If you are stressed about something then it is likely that your problems, worries and concerns occupy a lot of your brain time making you tired and irritable – classic symptoms of stress. Music can offer a healthy and low-cost escape, lifting your mood and maybe even making you smile.

## III. SOME WAYS TO ENJOY MUSIC

**Fully relaxing** – try using the basic relaxation technique outlined on our Relaxation Techniques main page. Use headphones or noise reducing in-ear buds to listen to some soothing music. Set the volume at a comfortable level for you, neither too loud nor too quiet. Relax and concentrate on listening to the music.

**Overcoming a fear** – a good example of this is on an aeroplane. Many people have certain anxieties about flying, especially during take-off and landing. Use your headphones or ear-buds and close your eyes or use an eye mask – choose some soothing music to help you overcome your fear. Remember your

fellow passengers, the noise of the plane may cancel out a lot of your music but being able to hear somebody else's headphones can be very annoying.

**Overcoming frustration** – being stuck in traffic, especially if you are running late for work or another appointment is, as you will know if it has ever happened to you, very frustrating. Try putting some of your favourite music on in the car (when appropriate) – turn the volume up and sing or hum along. This can be a great way to alleviate the stress of such situations.

**While you exercise** – exercise itself is a good stress reliever and can help your mind relax – your endorphin (anti-stress hormone) levels increase while your cortisol (stress hormone) levels decrease. Exercising to music can help take your mind away from the fact you are exercising, especially if you find it boring or physically hard, so you actually get a better workout. If you have ever been to the gym you will notice how most people exercise to music. Pick music with a beat that matches the rhythm of your exercise, if you concentrate on the music your body will slip into a rhythm and you will achieve your goals more easily.

**Whenever is appropriate** – try listening to your music more frequently, whenever you can and is appropriate to your surroundings.

#### IV. VOCAL TONING

Vocal toning is a method of using your voice to help create inner calm and reduce stress.

Vocal toning is not singing and therefore your ability to sing or whether or not you consider yourself 'tone-deaf' is not relevant.

Toning is based on the idea that we have many pent-up emotions and frustrations. We are taught, from an early age, to be quiet in most day-to-day situations, making loud noises is discouraged or seen as a sign of anger or aggression.

Toning provides a way of freeing suppressed feelings and emotions through the release of sound, encouraging us to make random loud noises and sounds.

Try some vocal toning to see if it works for you.

Make long, draw out, loud noises: shouts, grunts, screeches, hums. Don't worry about what you sound like, just make the noises that feel right to you. As with laughter therapy, vocal toning can help reduce adrenaline and cortisol the main hormones associated with stress.

# Clinical Profile and Outcome of Malaria Patients with Acute Kidney Injury

Dr. K.S. Amaravathi\*, Dr. P. Shakuntala\*, Dr. B. Sudarsi\*, Dr. N. Srinivasa Rao\*\*, Dr. R. Nagamani, Dr. P. Ramya\*\*\*

\* M.D., Asst Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

\*\* M.D., Prof of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India.

\*\*\* M.D., Osmania General Hospital, Hyderabad, Telangana State, India.

**Abstract-** Malaria has protean clinical manifestations and renal complications, particularly acute kidney injury that could be life threatening. This study was a prospective study of 50 patients with malaria-associated AKI at our hospital. Smear positive and Parasite V and F positive malaria patients with AKI as defined by RIFLE (Risk, Injury, Failure, Loss of kidney function, and End-stage kidney disease) classification were selected to evaluate the clinical profile and outcome. Out of 50 patients in our study 38 were males and 12 were females. 42% were between 26-40 years. Fever was the most common presenting complaint (100%), followed by chills and rigors (90%), headache (74%), vomiting (70%), myalgia (60%), altered sensorium (30%) and discolouration of sclera (36%). Pallor (62%) was the most common sign followed by splenomegaly (62%), icterus (40%) and hepatomegaly (34%). Artemisinin combination therapy was given for all patients and renal replacement therapy was given to 12 (24%) patients. We had a mortality of 12%, all of them had multiple complications. Acute kidney injury in malaria occurred most commonly in plasmodium falciparum 70% infected patients. Applying RIFLE criteria helps in early identification of high risk cases, so that prompt treatment is instituted early, thereby reducing the mortality rate.

**Index Terms-** acute kidney injury (AKI), plasmodium vivax (PV), plasmodium falciparum(PF),RIFLE criteria

## I. INTRODUCTION

Malaria is a common life-threatening protozoan disease transmitted to people through the bites of infected female anopheles mosquitoes. Malaria is endemic throughout South America, the Indian subcontinent, eastern Asia and Africa.<sup>1</sup> According to the latest estimates, released in December 2014, there were about 198 million cases of malaria in 2013 (with an uncertainty range of 124 million to 283 million) and an estimated 584 000 deaths (with an uncertainty range of 367 000 to 755 000).<sup>2</sup>

AKI occurs commonly in Plasmodium falciparum (PF) malaria and rarely in Plasmodium vivax (PV) malaria.<sup>3,4,5</sup> The overall prevalence of AKI in falciparum malaria varies between <1 and 60%, with the mortality rate up to 45%.<sup>6,7,8,9</sup>

Prompt and accurate diagnosis of malaria is needed for implementation of appropriate treatment to reduce associated morbidity and mortality. The management of malaria-induced AKI includes appropriate antimalarials (parenteral artesunate or

quinine), fluid electrolyte management, supportive therapy, avoidance of nephrotoxic drugs and renal replacement therapy (RRT) at the earliest.<sup>6,10</sup> Hemodialysis (HD) is effective for malaria-associated AKI.<sup>11,12</sup>

This study was conducted to evaluate the clinical profile, outcome, and predictors of mortality of malaria patients with AKI.

## II. MATERIALS AND METHODS

This is a Prospective study of 50 patients with malaria-associated AKI at our hospital. Smear positive and Parasite V and F positive malaria patients with AKI as defined by RIFLE Classification (based on Serum Creatinine and Urine output) were included in the study. Post renal AKI, patients with intake of nephrotoxic drug intake and contrast nephropathy were excluded.

The diagnosis of malaria was confirmed by direct visualization of the parasite in Giemsa-stained peripheral blood smear and serological tests. Clinical history and assessment were recorded and all other known etiological causes of fever and jaundice were excluded by relevant investigations. All the patients were subjected to complete hemogram, liver function tests, renal function tests (blood urea, serum creatinine, serum electrolytes). Intake output chart was maintained in all patients. Urine samples were examined for routine and microscopic examination. Serological tests for Human Immunodeficiency Virus and hepatitis B and C were performed. Estimation of blood sugar, coagulation profile for disseminated intravascular coagulation (DIC), and arterial blood gas analysis were carried out when indicated. Chest x-ray and ultrasonography (USG) of abdomen were recorded in all the patients.

AKI was defined according to RIFLE s criteria, with normal kidney size on USG. All patients received artesunate 2.4 mg/kg intravenously, followed by 2.4 mg/kg at 12 and 24 hours, followed by 2.4 mg/kg once daily for a total of 7 days and doxycycline (100 mg orally twice daily. Supportive measures were instituted as needed. Renal Replacement Therapy (RRT) was initiated for fluid overload, hyperkalemia, clinical evidence of uremia, metabolic acidosis, rapidly increasing S.Cr level, blood urea nitrogen (BUN)>100 mg/dl, and S.Cr >4 to 5 mg/dl. RRT was initiated prior to the development of overt symptoms and signs of renal failure due to malaria. Heparin-free (in most of patients) intermittent hemodialysis (HD) was provided on alternate days through temporary femoral/jugular catheter for 4

hours and peritoneal dialysis(PD) were done in hemodynamically unstable patients.

### III. RESULTS

Out of 50 patients in our study 38 were males and 12 were females, maximum number of patients were young (42%) between 26-40 years. Fever was the most common presenting complaint (100%), followed by chills and rigors (90%), headache (74%), vomiting (70), myalgia (60%), altered sensorium (30%) and discolouration of sclera (36%). Pallor (62%) was the most common sign followed by splenomegaly (62%), icterus (40%) and hepatomegaly(34%). Plasmodium falciparum infection was seen in 35(70%), p.vivax in 6 (12%) and mixed infection in 9 (18%) patients.

**Table 1. Showing Laboratory investigations:**

Bilirubin (mg/dl)	1.2- 3	4 (8%)
	3- 6	20 (40%)
Blood urea (mg/dl)	<45	4 (8%)
	45- 100	39 (78%)
	100- 150	7 (14%)
Serum creatinine (mg/dl)	<1.7	29 (58%)
	1.7 -3.0	12 (24%)
	3 – 4.5	5 (10%)
	4.5 -6	4 (8%)
Haemoglobin (gm/dl)	<6	7 (14%)
	6-8	14 (28%)
	8-10	10 (20%)
	>10	19 (38%)
Platelet count (lacks/cumm)	>1.5 lac	30 (60%)
	1 – 1.5	10 (20%)
	0.5 - 1	2 (4%)
	0.2 -0.5	8 (16%)

**Table 2. Patients were classified according to Serum Creatinine**

Risk[>1.5 times the baseline]	33 (66%)
Injury[> 2 the baseline]	8 (16%)
Failure[> 3 the baseline or creatinine > 4].	9 (18%)

**Table 3. Patients were classified according to urine output**

Risk [<0.5ml/kg/hr for 6 hrs]	33 (66%)
Injury[<0.5 ml/kg/hr for 12 hrs]	5 (10%)
Failure[<0.3 ml /kg/hr for 24 hrs Anuria for 12 hrs]	12 (24%)

Patients are classified according to RIFLEs criteria depending on whichever is the worst of the two. 33 [66%] of the patients were classified as under Risk, 5 [10%] patients had Injury and 12 [24%] patients were classified as under Failure. Complications associated with AKI noticed were anuria in

3(6%), hyperkalemia in 8(16%), acidosis in 4(8%), volume overload in 3(6%) patients. Injection artisunate was given to all patients. Dialysis in 12 (24%) patients of whom 7(14%) had hemodialysis and 5 (10%) had peritoneal dialysis. The overall mortality was 12% in our study and all of them had multiple complications.

**Table 4. Correlation between complications and outcome [death]**

Decreased urine output	6	100%
Altered mental status	6	100%
Hyperkalaemia	6	100%
Hypotension	5	83.33%
Bleeding	5	83.33%
Acidosis	4	66.66%
Mechanical ventilation	4	66.66%
Anuria	3	50%
Hypoglycaemia	2	33.33%

### IV. DISCUSSION

The pathogenesis of acute kidney injury in malaria is unclear but may be related to erythrocyte sequestration and agglutination interfering with renal microcirculatory flow and metabolism. Clinically and pathologically, this syndrome manifests as acute tubular necrosis. Renal cortical necrosis never develops. Acute renal failure may occur simultaneously with other vital-organ dysfunction (in which case the mortality risk is high) or may progress as other disease manifestations resolve. In survivors, urine flow resumes in a median of 4 days, and serum creatinine levels return to normal in a mean of 17 days. Early dialysis or hemofiltration considerably enhances the likelihood of a patient's survival, particularly in acute hypercatabolic renal failure.<sup>1</sup>

Our analysis of malaria patients with AKI revealed that it was observed more commonly in adults and male patients similar to earlier studies<sup>13</sup>. This could be explained by more outdoor activities of males in Asian countries as compared with females. Most common presentation was anaemia [62 %] and jaundice [40%] with AKI. AKI occurs commonly with jaundice, thrombocytopenia, and rarely with cerebral malaria. AKI was usually seen in early second week and is oliguric in 72% of cases. The etiology of AKI was usually multifactorial due to hyperbilirubinemia, intravascular hemolysis,, volume depletion, hypoxia, shock, pigment nephropathy, Disseminated intravascular coagulation (DIC), and sepsis.<sup>3,4,5,6</sup> The mortality rate with kidney injury in our study is 12% as compared to 11.8% in Kute VB et al<sup>14</sup> and 21% in Kanodia KV et al.<sup>8</sup> Haemodialysis was done in 14 % cases and peritoneal dialysis in 10 %. The overall requirement of RRT was therefore seen in 24% of cases which was much less compared to other studies, 96.6% and 3.3% in Kute VB et al<sup>14</sup> and in Kanodia KV et al<sup>8</sup> 78% respectively.

The major factors associated with mortality in our study were severe oligo/anuria, central nervous system (CNS) involvement, hyperkalemia, bleeding and hypotension. Low mortality (12%) in our study of malaria with AKI despite of having jaundice in 40% is due to prompt diagnosis, timely HD, and supportive therapy.<sup>8</sup>

## V. CONCLUSIONS

Most of the cases of complicated malaria occur in young and middle age group. More number of patients presented with multiple complications than single complication, mortality was more in these patients. Artemisinin combination therapy is effective in treating complicated malaria. Applying RIFLE criteria helps in early identification of high risk cases, so that prompt treatment is instituted early, thereby reducing the mortality rate.

We conclude that malaria is an important cause of AKI in Asia and particularly in tropical areas. AKI occurs most commonly in association with *P. falciparum* malaria. Early diagnosis and prompt management including dialysis can reduce mortality and expedite recovery of renal function.

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## AUTHORS

- First Author** – Dr. K.S. Amaravathi, M.D., Asst Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India
- Second Author** – Dr. P. Shakuntala, M.D., Asst Prof of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India
- Third Author** – Dr. B. Sudarsi, M.D., Asst Prof of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India
- Fourth Author** – Dr. N. Srinivasa Rao, M.D., Prof of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India
- Fifth Author** – Dr. R. Nagamani, M.D., Prof. of Medicine, Osmania General Hospital, Hyderabad, Telangana State, India
- Sixth Author** – Dr. P. Ramya, M.D., Osmania General Hospital, Hyderabad, Telangana State, India

# Sex, Sleaze and the Sinister-What the viewer wants out of Hindi horror films

Prof. Suparna Naresh

Department of Media Studies, Christ University, Bangalore

**Abstract-** The history of Hindi films is more than a hundred years old. In the hundred odd years Hindi films have seen myriad changes. The changes have happened in terms of genres, themes, story lines, budgets and even promotion strategies. The one genre that has frequently raised quite a few eyebrows is Horror. As with its western counterpart where the original horror gave way to several sub genres like Gothic horror, Slasher horror, Teen horror, and Vampire horror and so on and so forth, Hindi horror films have sprouted many versions of their own. From the initial horror endeavour **Mahal** by acclaimed director Kamal Amrohi in the year 1949 to the latest **Khamoshiyaan** in 2015 from the stable of Mahesh Bhat, Hindi horror films have reinvented themselves from being just garden variety to becoming game changers for their makers by ringing the cash registers. Often ridiculed in the past for their excesses and tacky treatment, Hindi horror films in recent years have metamorphosed into products that are classy and sophisticated to say the least. The elements of horror vis-à-vis creaking doors, darkly lit corridors, and scary background score now have the new add on elements of sex and skin show, which have become the USP (unique selling points) of such films. The present paper attempts to explore the different facets that are a common fixture in Hindi horror films today and reasons for their popularity among viewers.

**Index Terms-** Hindi Horror, Media Text, Gratification, Film Audience

## I. INTRODUCTION

“**T**error is the finest emotion, and so I will try to terrorize the reader”- Stephen King

There is a familiar phrase in English ‘All the world loves a lover’, close on the heels of this phrase is another phrase not as familiar maybe but definitely noteworthy ‘All the world loves to be scared’. The Uses and Gratification theory is highly relevant at this point (applicable to a variety of media texts) in order to understand why an audience consumes a certain text. This theory states that all media is constructed in order to fulfil the audience’s needs. It is possible to apply this theory to those who enjoy the horror genre in particular and show why it is a preferred genre. Why is it that people enjoy being scared? This is the premise that has influenced scores of film makers to try their hand at attempting to do just that-scary, frighten and shock the living daylights out of the viewer. We have had umpteen number of horror classics from Alfred Hitchcock who prided himself in being the best of his tribe. Hitchcock’s *Psycho*, *Birds*, *39 steps*, *Vertigo*, *Notorious* are just a few of the films that are part of the

many, made by the director and still considered the best of horror films to this day.

Horror films have a long history that is as old as human communication. For centuries humans have been scaring each other, the proof of which can be seen in our oral traditions that have woven stories of werewolves, goblins, devils, monsters and witches as in the west and *Daayan* (home grown witches) *Bhoot* (ghost) and *Shaitan* (Devil) in the Indian context, that were passed on to us as part of tribal culture. With the invention of printing, many tales of fright and terror emerged in the shape of supernatural literature, passing on the legacy of scary stories through the power of paper/print. With theatre, horror got further entrenched in our lives, with the likes of Guignol Theatre of Paris staging plays that were liberally laced with blood and gore. With the motion pictures or movies as they were referred to years ago, horror grew in stature and prominence. Some memorable films of early twentieth century used fantastic techniques to explore the theme of horror- *The Golem* (1915), *Nosteratu* (1922), *The Cabinet of Dr. Caligari* (1929).

## II. WHAT MAKES A FILM SCARY OR HORRIFYING?

According to experts people love to be scared, which accounts for the many horror films being made in Hollywood and Bollywood. In the US of A, a survey conducted on one thousand movie goers revealed that more than 70 percent of respondents said that they would definitely watch a scary movie on Halloween night (Nate Hensely, 2008), proving the original premise that people enjoy being scared. Horror films prey on people’s fears as is obvious from the themes that have emerged in all these years. The launching of satellites (Russian Sputnik) led to fears of alien invasion that still continues to enthrall us. Nuclear power gone awry gave way to dozens of films on mutant animals/humans on rampage, insects taking over America and the like. The emergence of psychological deviance as a theme led to films like *Psycho* (1960) and *The Haunting* (1963). According to American psychologist Dr. Glen D. Walters, horror films have three primary factors that act as allure. The first being tension, that can be created through mystery, suspense and the un-known. The second is relevance, where the potential viewer should be able to connect with the story line at some point or the other. Grievous bodily harm, imminent death and danger make this connection possible. The third factor is that of unrealism. The graphic nature of some of the horror films rather than driving us off attract us towards the screen because of the sheer improbability of such an event happening in reality, which is in contrast to a documentary that is based in reality and therefore

more unsettling. This is referred to as fabricated reality and finds many aficionados among film viewers.

### III. HORROR FILMS IN HINDI

There have been many successful horror films made in Hindi over the years, beginning with *Mahal* in 1949. Later *Bees Saal Baad* (1962) *Gumnam* (1965) and *Bhoot Bangla* (1965) carried the genre forward. One of the major reasons for Hindi horror films to succeed was the music. Apart from a strong story line, there was excellent music and singing that helped in presenting some of the most chilling scenes seen in Hindi cinema. These early films were story driven and were backed by great actors of the time. The seventies saw the tenor of Hindi horror films changing. There was a strong influence of the west seen in the treatment. Stories took a backseat with the sensational given precedence. The entry of Ramsay Brothers in the year 1972 saw a 180 degree turn in the Hindi horror genre. The gradual creeping of sex and skin show became apparent. The duo of Ramsays made several horror films in Hindi that had a liberal dose of sex and exposure. *Veerana* (the isolated) had the story line of a young girl possessed by a vengeful spirit who was appeased only after seducing a hapless male and then killing him. The story thus lent itself to a number of sexually laden scenes. Another film from the Ramsay stock was *Khoon Ki Pyasi* (The thirsty witch) which had a seductress baying for the blood of young men because of an evil power that had taken possession of her. This film has often been labelled C-grade, semi-porn, for its sleazy sexual scenes. The Ramsay brothers made many such films that were so similar to one another that in the early 1990s it became difficult for the viewer to differentiate them. The sameness in story lines, casting and treatment led to the horror genre losing a sense of purpose or proportion.

It is often said by most film experts that the horror genre is a difficult one to work with especially in the context of Indian cinema. Initially in the early years of Hindi cinema horror films were not that popular with the film viewing crowd, it was much later that Hindi horror movies got a wide cult following among Bollywood lovers. Early forays into the horror genre was limited only to stereotypical movies that had an excess of blood, gore, bodies. The Ramsay brothers were famous for making such films, considered by most as B/C-grade due to the lack of big names, a proper story/plot line. Ironically it was the Ramsay brothers who single handed kept the genre alive right through the 70s, 80s and 90s. The psychological horror movies, layered with possibilities made an entry at the turn of the new millennium. These were riddled with paranormal activities and suggestive eeriness similar to their western counterpart.

By the 2000s, several directors had begun to work and receive critical acclaim for their work in the horror genre. Ram Gopal Verma, Vikram Bhatt, Priyadarshan and Sangeeth Sivan are few of the notable names. The sub-genre of Hindi Horror Films has had a revival since with Vikram Bhatt's *Raaz* (2002) which was largely inspired by a Hollywood hit (the Harrison Ford starrer *'What Lies Beneath'*) which became an instant box office hit. Other horror films that achieved repute were- Ram Gopal Verma's *Bhoot*, *Krishna Cottage*, *Darna Mana Hai*, *Darna Zaroori Hai* and *Phoonk*. Director Priyadarshan's 2007 smash hit *Bhool Bhulaiyaa* is a unique film of the horror genre

that has made proper use of comic elements blended well with a thrilling plot.

Hindi Horror Films have attained a new dimension due to the efforts of two film production houses-Vishesh Films and Balaji Motion Pictures, headed by Mahesh-Mukesh Bhat and Ekta Kapoor respectively. The horror films that come out of these two production centres are high on production value, big names, arresting story-lines, engaging music and most of all sexual content. So heavy is the sexual content in the films made by the two production houses that the term Horrex- a portmanteau of horror and sex- is used to indicate such films. From Vishesh Films there were *Raaz 1,2* and *3*, *Dangerous Ishq*, *1920*, *1920 evil returns* and *Khamoshian*. From Balaji Motion Pictures we have had *Kucch To Hai*, *Krishna Cottage*, *Ek Thi Daayan*, *Ragini MMS 1* and *2*. The common thread weaving these films from two diverse source is sex. The producers take great pride in the successes of these films that lure a comparatively young audience between the age group of 18- 25 who are attracted by the titillation on display in generous proportion. The success of these films have influenced others to try similar ventures leading to almost a formulaic horror genre laden with meaningless sex and sleaze, that have no relevance to plot or story, except for the fact that they bring in money.

### IV. REVIEW OF LITERATURE

**Need to Redefine Bollywood Horror Genre- The Viewpaper:** According to a contributor of *The Viewpaper*, an on-line youth newspaper, the horror genre has nothing much to offer the Indian audience, the comments are anything but flattering.... 'Let me start with the re-definition of "spookism" by the Ramsay Brothers who actually defined the B-grade film genre with some pathetic movies, some of which were actually runaway successes. I still wonder why! Okay, well these movies' titles speak volumes for them. Let me share some with you – *Do Gaz Zameen ke Neeche*, *Purana Mandir*, *Shaitani Ilaka*, *Khooni Saya!* With names as grotesque as possible, the movie plot revolved around evil spirits and deformed creatures terrorizing villages. The most popular targets were thinly clad women. In between the horror (if there was any) there was a liberal sprinkling of sex and as much nudity that could pass uncensored! It was their "success formula" which they rarely deviated from'. Opinions such as these are common enough regarding Hindi horror films, given the fact that it is largely true. The films mentioned ran true to form, with nubile heroines clad next to nothing, heroes with excessive libidinal energy and contrived scenes to milk the situation to maximum.

**Bollywood and its Other(s): Towards new configurations-Edited by Vikrant Kishore, Amit Sarwal and Parichay Patra :** In this collection of essays writer Mithuraaj Dhusia in his article *The Ramsay Chronicles* sites Peter Hutchings who is of the opinion that the Ramsays were greatly influenced by western horror films hence similar treatment seen in the Hindi versions and an obvious fact that emerges is that the Ramsays generously borrowed from many American horror films, often giving way to irrelevant story plots and meaningless sequences. The Ramsays consciously used elements of sex in great doses to provide a diversion from the scary elements that



incidentally also provided the much needed titillation. So sex here was a contrived feature not a natural flow of the story.

**Horrex Returns: Top 10 Bollywood films where horror meets sex:** The genre of 'Horrex' films has been around for quite some time in Bollywood, but not as much as it has suddenly gained steam. With film after film bringing together horror and adequate doses of sex, this genre is steadily on the rise these days. The Ramsay Brothers were the ones who immortalised this genre of films, as far as Bollywood is concerned; and despite most of their films having been passed off as B-Grade ones, Horrex is now back in fashion.

**Horror Movies: Why People Love Them:** In an article in the on-line magazine *Livescience*, author Leslie Fink questions the motives behind people wanting to watch horror films....“The question is: Why? If our best selves find the horrific so repulsive, why do we pay good money to watch it again and again?” She cites Jeffrey Goldstein, a professor of social and organizational psychology at the University of Utrecht in the Netherlands. Goldstein edited a book on the subject titled “Why We Watch: The Attractions of Violent Entertainment” (Oxford University Press)”. He and other social scientists suggest we watch for different reasons, which include enjoying the adrenaline rush, being distracted from mundane life, vicariously thumbing our noses at social norms, and enjoying a voyeuristic glimpse of the horrific from a safe distance.

## V. METHODOLOGY

A focus group discussion (FGD) is a good way to gather together people from similar backgrounds or experiences to discuss a specific topic of interest. The participants are guided by a moderator (or group facilitator) who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. The present research has utilised the focus group discussion since the researcher at this point seeks open-ended thoughts and feelings from viewers on the issue of what makes viewers watch contemporary Hindi horror films. Further, Focus groups discussions allow for broader and deeper insights into the topic as opposed to quantitative research that involves numerical-based data collection. According to an article from the Iowa State University Extension Programme (2004), focus group discussions being a qualitative technique, are rich in detail and often provide surprises on what people may think of a product/issue. This is quite different from quantitative surveys or studies which limit respondents to single-word or short phrase multiple choice responses.

The present study is grounded on the Uses and Gratification Theory which is a popular approach to understanding mass communication. The theory gives emphasis to the consumer, or audience/viewer instead of the actual message itself by asking “What do people do with media?” instead of “What does media do to people?” This was said by Katz, in 1959. It assumes that members of the audience are not passive but take an active/dominant role in interpreting media into their own lives.

The theory also holds the idea that audiences are responsible for choosing media to meet their needs. The approach secondly suggests that people use the media to fulfil specific gratifications. This theory would therefore suggest that the media competes

against other information sources for viewers' gratification (Katz, E., Blumler, J.G and Gurevitch 1974)

## VI. FINDINGS AND ANALYSIS

Speaking to Sharon Begley feature writer *The Daily Beast* (an on-line magazine), “If we have a relatively calm, uneventful lifestyle, we seek out something that’s going to be exciting for us, because our nervous system requires periodic revving, just like a good muscular engine,” says Stuart Fischhoff, professor emeritus of psychology at California State University, Los Angeles, and senior editor of the online magazine *Journal of Media Psychology*. A 1995 study found that the higher people score on a scale that measures sensation-seeking, the more they like horror films. “There are people who have a tremendous need for stimulation and excitement,” says Fischhoff. “Horror movies are one of the better ways to get really excited.” This explains why [horror movies](#) are more popular with younger audiences. Teenagers and twenty-plus adults “are more likely to look for intense experiences,” says John Edward Campbell, an expert in media studies at Temple University. This fades with age, as people become more sensitive to their own physiology: middle-aged and older adults do not tend to seek out experiences that make their hearts race, since they feel real life is scary enough. They don’t need to get their scares from movies. As Fischhoff puts it, “Older people have stimulation fatigue. Life’s [real] horrors scare them, or they don’t find them entertaining any more—or interesting.”(*Why Our Brains Love Horror Movies, The Daily Beast*)

## VII. FOCUS GROUP DISCUSSION

The group was a disparate one consisting of twelve people of which half the members were between the age group of 18-25, the remaining varied between 40-65. This was done to provide a contrast between the comparatively young audience and the more seasoned/senior audience. According to the Uses and Gratification theory, audience choose any form of media that fulfil their select needs which include the need to identify role models that reflect similar values to theirs and be someone else, if only temporarily; the need to educate, being able to acquire information, knowledge and understanding; the need to entertain, to derive enjoyment by of “escapism” enabling the audience to forget their worries; the need for social interaction, a reference to media content that creates an opportunity for conversation between people leading to debate and discussion among people.

To the question, what may be the reasons for watching a Hindi horror film, the answers were varied as expected. The younger viewers in the group were vociferous in their agreement that they watched a Hindi horror film for its sheer entertainment. Since most of the Hindi horror films follow the commercial cinema pattern by way of presentation, in that they have all the ingredients of commercial films vis-à-vis good banner, music, lavish settings, technology, promotion- it is quite acceptable to have the young audience seek such escapist fare to spend their time. The older viewers on the other hand said they watched Hindi horror films expecting a good story that would have something new to tell. The second question posed was what



made a Hindi horror film entertaining/interesting enough to watch? This was asked to find out more details on the viewer's taste. Almost all the youngsters stated that the elements of danger, suspense, shock in itself was extremely thrilling. Some added that the nail baiting situations were what was most anticipated. Not knowing what would happen next, the unpredictability was something that most youngsters looked forward to. The older audience on the other hand said that they were familiar with most horror patterns and rarely if at all were they very taken in by the thrills, since they had been indoctrinated as it were to such situations. According to Professor Stuart Fischhoff, "experiments have shown that Young people often need intense stimulation: sounds, tastes, touch. They're sensory risk-takers, thrill-seekers. They like horror films far more than older people." The third question was rooted on the issue of various elements that made the Hindi horror film appealing. To this the young audience were unabashedly bold to state that they looked forward to the male/female protagonists. The young males in the group were strong in their avowal of the heroine and the females were ardent in their appreciation of the hero. Both genders favoured a romantic thread in the story, the females more strongly than the male. The male were more appreciative of the sexual elements that have become a liberal feature of Hindi horror films in recent years. They seemed to welcome the skin show, the presence of the vamp or other girl in the story which enhanced the entertainment value for them. For a few of the young male in the group the sex scenes were the biggest draw since Hindi horror films were generally bolder in exploring and representing sex scenes in comparison to other genres. This sub-group (young males in the group) cited films such as '*Alone*' and '*Raagini MMS*' as films watched with great expectation and eagerness for the sex scenes. This behaviour is reminiscent of the forbidden fruit syndrome, where youngsters in conservative culture/society like India have little or no sexual freedom and are forced to depend on outlets such as these films for their sexual fulfilment/exploration. The older viewers were rather disapproving of these elements. The real attraction for them was the final resolution, to see good win over evil. This seemed to provide a closure to ambivalent feelings of insecurity in them. The fourth question was related to the creative and qualitative value of Hindi horror films. The young and the senior members of the group were in agreement that contemporary Hindi horror films were mere replicas of the western counterparts. There was rampant replication of the western ideas, story-line, treatment and presentation. The group summarily agreed that there was very little original work being done in this field. The group cited exceptions like '*Daayan*' and '*Bhoot*', but accepted that they were only exceptions and not the rule. The fifth poser was what the group expected of Hindi horror films in the future? The young wanted films that were better by way of technical sophistication in the presentation, they were otherwise happy with the status quo. The seniors differed in this regard, wanting more complexity in story-line, had little concern over technical sophistication and hoped for an end to meaningless sex, violence, gore and blood, knowing it was an impossible expectation. The eclectic responses were a refreshing change to predictable ones and quite in contrast to a [Google study](#), conducted in conjunction with Millward Brown Digital, which revealed the fact that people who saw horror movies cared more

about convenient show-times when making up their minds about what they wanted to go and see in the theatres. It was evident through this study that as long as a horror film was being shown in multiplexes viewers would flock to see it because they were in the mood to be scared. This essentially meant that the audience weren't concerned about the film's reviews, its cast, director or plot, rather something as simple as the theatre timings could swing things in favour of a horror film. Unlike the quoted study, the members of the focus group expressed opinions that were unambiguous and clear.

## VIII. CONCLUSION

According to movie analyst Phil Contrino quoted in the *Washington Post*, "As a genre, it's(horror) never completely dead, because people always want to be scared." This essentially captures the basic premise and understanding of the present paper- the motivating factors behind viewer's watching horror films, in this case, factors influencing viewers watching Hindi horror films. Whether it's about suppression, catharsis, or simply enjoying the thrill of it all, experiencing horror within safe confines is an important part of every culture. Horror films help us understand what it is that terrifies us and make bold statements about the world we live in.

From the varied secondary sources it is clear that viewers attribute different reasons for wanting to watch horror films. Both in the west and India, research and study makes it clear that reasons can range from the very esoteric-in order to relate and bond with like-minded people-to the very banal-show timings of theatres. Pre-existing research also reveals that Hindi horror films are here to stay and have a good fan following, with many film makers of Hindi horror reaping financial benefits. It is also clear, that in recent times the Hindi horror film has evolved a great deal since the early years. Existing material also reveals viewer's penchant for sexually laden scenes that have become a trend setter of sorts in Hindi horror films.

The Focus Group Discussion has revealed a clear difference in stands between the group members. The young audience thinks very differently from the older audience. Their respective motivating factors for wanting to watch Hindi horror films are very different. So age does play a significant role in influencing people's media needs and perception. Applying the Uses and Gratification theory in this context helped unravel the audiences' motivation in accessing a particular media content, in this context Hindi horror films. This theory is relevant and valid for understanding the core question "What do people do with media?" With Hindi horror films the audience gets entertained, thrilled, titillated and most of all frightened and scared to the core. It is apparent that when it comes to Hindi horror films '*Sex, Sleaze and the Sinister*' seems to gratify the viewer.

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#### AUTHORS

**First Author** – Suparna Naresh, Associate Professor, Department of Media Studies, Christ University, Bangalore, India  
[suparna.naresh@christuniversity.in](mailto:suparna.naresh@christuniversity.in)

# An Overview on Dialectal Variation

Mohammad Abdel Qader Abu Shareah, Badri Abdulhakim.D.M.Mudhsh, Ayman Hamid AL-Takhayinh

\* Aligarh Muslim University  
\*\* Linguistics department

**Abstract-** Dialectal variation has witnessed a noticeable progress in the past half –century, this progression lead to consider the dialectal variation as a very important aspect of research in sociolinguistics. This study concentrate on dialect and language in general, it also explains the differences between standard language and dialect, and it shows how a particular dialect is used in a specific region and it is considered as an identity as well, it aimed to show how dialect’s groups of one language may be considered mutual intelligibility or non-mutual intelligibility, and this classification is based on the percentage of convergence and divergence among them.

**Index Terms-** language variation, standard language, dialect, mutual intelligibility, convergence and divergence.

## I. INTRODUCTION

Language variation is an observed phenomenon found in every language in this world. Variation is far from being a defect of a language; it is true that human being language is governed system in which a huge amount of creativity which is one of the important characteristics of language is possible. Variation is a neutral operation, and linguists could not prove that non-standard language (dialect) is less enough by means of communication than what is called standard language, so that variation does not make the language less in quality or rank , but the problem is in the speech community attitudes’ to the speakers or talkers of these dialects ,speech community is the responsible to give a social rank to the different forms of language, the matter of stigmatizing and elevating some speakers depends directly on the background of the speaker and the abilities which is based on the selecting and pronouncing of some words.

Every language has its varieties or dialects, when a certain variety of a language is used according to the users then it is called dialect, dialects are normally determined by speaker’s geographical background, O Grady et al. Defines dialect as “A regional or social variety of a language characterized by its own phonological, syntactical, and lexical properties”. If we take English as an example in Britain, there are huge numbers of dialects of English which differ from each other according to the geographical area e.g. the Scottish dialect, Yorkshire dialect, Lancashire dialect.

Dialect is a distinctive form of a language, it is associated with some social regional, group and ethnic, it differs from other varieties of a language by its own linguistic features such as vocabulary, pronunciation, grammar. Dialect in the classical form is a dialect of certain region; dialect is different way of saying the same thing where it reflects the social structure as gender, class origin.

## II. LITERATURE REVIEW

Sociolinguistics is considered of why and how people use a language differently according to social contexts. It explains reasons of how and why people speak differently. Men and women are reasons behind dialectal variation; these social factors have been the focus of attention of sociolinguistics research in the mid 1970s. Coates (1998) states that it is common in all societies that "the way men speak is held in high esteem, while women's ways of talking are compared unfavorably with men's". The traditional idea that women are chatterboxes is not existed these days, because in many different researches in various social contexts- in the workplace, in the school ,in the television, companies have proved that women is less in talk than Coates(1998).

Many studies about dialect variation, Clopper and Pisoni (2004) investigated how receiver or listeners can identify dialect of regions; they used acoustic-phonetic cues in dialect categorization. Sentence-length utterances are used from 11 male speakers in their twenties from the TIMIT Acoustic-Phonetic Speech body; all of them belong to various areas of the United States. receivers or (listeners) were asked to listen to two various sentences and eight novel sentences, and their duty is to categorize each talker into one of six geographic regions, the result of this study showed the ability of the listeners to classify talkers, and it was basically because of experiment, also it was found that the listeners looked after to some certain phonetic signals in their speech, which helped them to affiliate every talker to a certain dialect.

A lot of studies in the nineteenth century on Catalan dialects are created as part of LEXDIALGRAM project, gathering a variety of research works related to this subject, and categorizing them under the following categories: dictionary, lexicon and vocabulary, lexicography and grammar and spelling guide. The fundamental object is to bring these works and researches to be more public, and also to promote the studies which analyze the case of Catalan language and its dialects in nineteenth century, computerization, design application, digitations were procedures applied to help consultation for these materials, and suggestions to add mapping in the future. Conclusion of this project is that the study of grammar corpus or body in the computerized form helps to increase the understanding of linguistic variation in time dialectal studies were not existed.

Languages across this world are noted for dialectal diffusion. English as an example has many variations including British English, Australian English, Nigerian English South-African English, etc. For instance, British English is clearly different from that of the American, and the talks of these two different groups also differ from Australian English. If speakers of a certain language speak different varieties of the language, it

is said that they speak different dialects of one language. The term 'register' came into public in 1960s, and it is described as a traditional way of using language that is appropriate in specific context. This term is different from dialect, which is described as a variety according to user, and each speaker uses one variety all the time.

### III. OBJECTIVES

- 1) To develop the conceptual framework of language and dialectal variation.
- 2) To explain the stages of development of standard language.
- 3) To show when two or more languages or dialects are classified under the category of language or dialect convergence or divergence.
- 4) To highlight on reasons behind language variation.
- 5) To identify the most important concepts about language and language variation.

### IV. LANGUAGE VARIATION

No human language is stable, unvarying or uniform; all languages present internal differences. Actual usage varies from people to people, and user to user, in terms of the pronunciation, or the choice of lexicon and the meaning of those lexicons, and even the use of syntactic rules. To show a known example, American's speech vary from the speech of the British, it is noticed too that the speech of these two groups in turn is distinct from the speech used in Australia. If a language is used differently by two different groups, they are often said to speak different dialects of the language.

It is not difficult to define exactly what a dialect is; in fact the term dialect has come to be used in different ways. The traditional example of a dialect is the regional dialect: the distinct variety of a language which is spoken in a certain geographical area. For example, we may speak of Appalachian dialects or Ozark dialects, on the grounds that inhabitants of these areas have certain different linguistic features that distinguish them from speakers of other varieties of English. Speakers can also speak of a social variety: the distinct form of a language spoken by group of a particular socioeconomic class, such as the ghetto languages in the United States or the working-class dialects in England. In addition, certain ethnic varieties of language can be distinguished, such as the form of English sometimes referred to as Yiddish English, which is historically associated with speakers of Eastern European Jewish ancestry.

It is important to know that dialects are never purely social, or purely ethnic or purely regional. For instance, the distinctive Appalachian and Ozark dialects are not merely dialects spoken by any of the inhabitants. As we see, regional, social, and ethnic factors combine and intersect in various ways in the identification of dialects.

Language variation does not end with the term dialects. Every noticeable dialect of a language is itself subject to be considered internal variation: not two speakers of a language, even if they speak the same dialect or variety, use and produce their language in the same way. We can recognize different

individuals by their overt speech and language style; in fact, a person's language is one of the most essential features of self-identity. When the form of a language spoken by a single individual is referred to as a dialect, every speaker of a language has a distinct idiolect.

The moment we realize that variation in language is pervasive, it is obvious that there is no such thing as a single language used at all times by all speaker or users. There is no such thing as a single English language as example, there are many English languages (idiolects and dialects) it depends on who is using the language and what is the context of usage. Taking in Consideration the well-known phenomenon of variation in vocabulary words that exists among English speakers.

### V. STANDARD LANGUAGE

Finegan, Edward (2007) defined Standard Language as "A language variety used by a group of people in their public discourse. Alternatively, varieties become standard by undergoing a process of standardization, during which it is organized for description in grammars and dictionaries and encoded in such reference works". The most important phenomenon of the development of language in historical times has been the establishment of the national common languages — Greek, French, English, German, etc. "standard" languages which have turn away, or are going to turn away the local dialects, most of standard languages are combined varieties that are developed over periods, and which cover characteristics from different dialects. The histories of, for example, Standard English (Nevalainen, *ibid.*), Standard German (Mattheier) and Standard Dutch (Willems, *ibid.*) were formed by continuous selection processes which happened by degrees over time. The outcome was a compound recombination of distinctive features from many dialects and a standard norm which is different in structure from its dialectal forms.

Language standardization is always established with the possibility of selecting between linguistic alternatives. Two major types of choosing and selecting are to be distinguished: polycentric selection and monocentric selection, Monocentric selection is the selection of a present (or also old) regional or social dialect as the foundation of the rising standard language. and the fact that some standard languages present a relatively clear regional or social origin, for instance, the "Copenhagenness" of Standard Danish as explained by Kristiansen, this volume; polycentric selection appears to be more popular in history of this language.

The process of selection is normally accompanied by debates and conflicts on finding the "best usage" and so the "best" grounds for the new standard variety. The case of the history of Italian which has been discussed under the label question Della lingua — a discussion which reflects a list of combination of issues about power and language, and about code differentiation and identification.

The non-linguistic goal of the "standardization" (e.g. scientific, national unity, or economic advancement,) is most apparent in this place of the process. Conflicts about competing standard language norms are not involved with all standard language histories. Contributions for some language as, Standard

English (Nevalainen), Standard Icelandic (Árnason) and Standard Swedish (Teleman) emerged amidst a relative quiet, but this relative quietness did not happen with the histories of some languages, German (Mattheier), Norwegian (Jahr) and Yiddish (Peltz) were described by a vast debates about standard norms

## VI. LANGUAGE CONTRAST DIALECT

Language and dialect are terms which imply each other; the terms are very close to each other, so one may find it difficult to give a precise definition to both terms. Language from non-linguistic point of view is defined as “the most significant tool that a human being uses to communicate his or her thoughts and view of discourse”, however the definition of a language from the linguistic point of view is more complex and problematic, and the linguists even have not found the precise definition to language. Most of linguists define language as a system of arbitrary vocal symbols by means of which human being communicate with each other, if we look to the definitions we find the focus is on ‘vocal system’ and ‘communication’.

In defining the term dialect as : A dialect is simply a distinct form of a language, possibly associated with a recognizable region ,social, or ethnic group, differentiated from the other forms of a language by specific linguistic features ,(for example) pronunciation, grammar or any combination of this.

Dialect is described as lack of prestige, and it is incorrect, substandard, and it does not obey the rules of grammar. This quotation make the case clear and it enables a language to be considered as a language, e.g. (has status, standard, functional, prestigious, and written) and all of these properties attached with language but dialect lacks.

## VII. DIALECT AND REGION

In the advanced nations, region no longer maintains its seniority. A lot of changes in urbanization, mobility, embourgeoisement, literacy and other social factors have led to a strict leveling of regional dialects and accents. Labov (1972) says “My own studies of on-going linguistic changes indicate that dialect diversification is continuing...in spite of close contact among the social groups involved”.

For more than a century, dialectologists were originally concerned in where their informants lived, and they started out their fieldworkers accordingly, from Edmond Edmond moving by cycle through the French rural areas collecting data for the Atlas linguistique de France in 1896-1900 to Raven I. McDavid motoring around the eastern seaside of the United States collecting field records for the Linguistic Atlas of the Middle and Southern Atlantic States from 1945 to 1949. And for those years, dialectology was basically dialect geography considering region as an independent variable.

Warelius and the other founders of dialectology were convinced about the relationship between dialect variety and local landscape. In eighteenth century philosophers believed that language was an organic, natural, entity, like a plant, and its variation was believed to have the same source as the diversity of vegetation. It’s just like vegetable life took on distinctly different appearances according to the soil and climate that nourished it,

so languages took on obviously different features in different climates.

## VIII. CONVERGENCE AND DIVERGENCE

The concepts of dialect convergence (dc) and dialect divergence (dd) can be defined respectively, as the decrease and increase in similarity between dialects. while (dc) involves the linguistic unification, focusing, (dd) is as the amount of linguistic diversification, linguists define convergence as partial similarities increasing at the expense of differences (so, from their perspective, divergence is the essential subject case of diachronic dialectology).and to be clear from these definitions, divergence and convergence are relational ideas, referring to either processes or the results of processes.

Dialect change has different appearances. Within these, dialect convergence (dc) and dialect divergence (dd) which affect the relationships between related dialects or varieties. Dc and Dd are phenomena attached to dialects have existed. different historical developments, include the ‘modernization’ of society, have given less importance to the nature of dialects and have partly changed the strategy of (dc) and (dd); moreover, they have lead them to dialect – standard language convergence. Trudgill (2002) Dialect convergence may lead to simplification, and to the reduction of intrasystemic, especially ‘quantitative’, variation. However, in most studies on dialect divergence or convergence, concentration is only paid to how processes of linguistic change influence on intersystem variation, for instance, dialectal differences, these differences is related to either quantitatively variable features or categorical.

## IX. MUTUAL INTELLIGIBILITY

Mutual intelligibility is considered as one of the most important aspects for dialect distribution. However, previously, it was talked about it from a personal perspective. The primary step to determine mutual intelligibility is that when we talk to person with an accent, we often attempt to set up a pattern of sound agreement. As long as the sounds of the stranger agreement to ours in a systematic manner.

The concept of mutual intelligibility seems like a rational criterion to define dialects, the situation can be considerably complex by political and social factors. In China, for instance, a northern Chinese speaker of the Beijing dialect (named as Mandarin) cannot comprehend the speech of a southern Chinese speaker of Cantonese, and vice versa. For this reason, linguists may well label Mandarin and Cantonese as two different “languages.” though, in classical studies of the Chinese language, both Mandarin and Cantonese are considered as “dialects” of Chinese, saying that they are historically related (i.e., they may have been branches of several related dialects that are existed earlier in the history of the Chinese language). Further, both Mandarin and Cantonese are spoken by the same people (the two languages are used in the same country and government), and the written language is used by the speakers of both ‘dialects’, (in the form of Chinese characters) as a common language of communication. For this reasons, the tendency has

continued to use the term dialect to indicate various mutually unintelligible forms of the Chinese language.

While discussing the idea of mutual intelligibility, it is main to notice, by way of contrast, cases that might be called one-way intelligibility, involving speakers of different languages, but historically related. For example, speakers of Brazilian Portuguese who are not familiar with Spanish can often comprehend the forms of Spanish spoken in adjacent countries. The identical Spanish speakers, however, seems to find Portuguese largely unintelligible. An analogous situation holds between Swedish and Danish speakers of Danish can (more or less) comprehend Swedish, but the reverse situation is much less popular. Even if one group of users can comprehend another group, it cannot be said that the two groups speak the same language unless they comprehend each other, thus the idea of mutual intelligibility is strict in determining when two languages are the same language.

#### X. METHODOLOGY

The conducted study has been done to define and explain the relationships among the main concepts in the sociolinguistics field .the study was a qualitative method, in which the collection of material is mainly based on previous studies such as, papers, websites, books, articles .the study is meant to bring out the hard efforts which are done by previous scholars to be more apparent and visible.

#### XI. CONCLUSION

This paper is mainly talking about language and dialect .It tried to show how a language is more common (structured, correct), but dialect is less public (un-structured, incorrect) and specified to a certain geographical area, it was part of this study to show a clear distinction between dialect and language, when these two terms were the focus of intention of linguists to give a clear distinction for both terms. and finally ,this paper discussed the matter of convergence and divergence between languages or dialects , and this case still has some ambiguity, for example, languages like (Swedish, Danish) are classified as dialects of the same language, on the other hand ,some dialects of the same language are more suitable to be categorized as different languages as(Germany, Danish).

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#### SUGGESTIONS AND RECOMMENDATIONS

This paper recommends to look to dialect and language from other perspective , not only to make comparison between them , but to take dialect and language as a separate discipline, it recommends also to search why dialect are less prestigious than standard language ,while they are linguistically considered as a variety of the same language.

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#### AUTHORS

**First Author** – Mohammad Abdel Qader Abu Shareah–, Research Scholar, Aligarh Muslim University (AMU), mohammada\_bushareah@yahoo.com..  
**Second Author** – Badri Abdulhakim.D.M.Mudhsh–Research Scholar, Aligarh Muslim University(AMU), badrimudhsh@yahoo.com.  
**Third Author** – Ayman Hamid AL-Takhayinh– Research scholar, Aligarh Muslim University(AMU), Aymantakhayinh@yahoo.com

**Correspondence Author** – Mohammad,  
mohammadabushareah@yahoo.com, 00918439722289.

# Performance Analysis of Back propagation Network Model for Personalized Recommender System

P.Prabhu\*, N.Anbzhagan\*\*

\* Directorate of distance education, Alagappa University, Karaikudi, Tamilnadu, India

\*\* Department of Mathematics, Alagappa University, Karaikudi, Tamilnadu, India

**Abstract-** A real world challenging task of an e-commerce application is to identify the needs of the active users based on user navigation patterns. Online navigation patterns are grown every day and extracting business intelligence is a challenging one. There are various personalized recommender systems have been proposed in the literature. In this paper we propose and analyse the performance of back propagation neural network model for personalized recommender system for better quality in terms of accuracy. The performance of an algorithm has been tested with different parameters with real world dataset for the performance benchmark.

**Index Terms-** Business intelligence, Back propagation, Clustering, Data mining, Recommender system, Personalization.

## I. INTRODUCTION

With the gradual increase of customers and products in electronic commerce systems, there is a requirement of efficient personalized recommender systems. Personalized recommendation systems can help people to find interesting things and they are widely used with the development of electronic commerce. Many recommendation systems employ the collaborative filtering technology, which has been proved to be one of the most successful techniques in recommender systems in recent years [14]. These systems are developed for movies, books, communities, news, articles etc. In general, there are five types of recommendation systems [12]. They are collaborative filtering, content based, demographic and utility based systems.

Neural Networks plays vital role in recommender systems to identify missing values from the dataset and to identify user's navigation patterns and classification. It has many advantages like robust in noisy environments, high degree of accuracy, improves its performance by learning, parallelized, low error rate. Hence in this work, back propagation neural network approach has been proposed and analysed for personalized recommender systems which outperform in accuracy.

## II. RELATED WORKS

Reports on work in progress related to applying data clustering algorithms to ratings data in collaborative filtering is presented [13]. They use existing data partitioning and clustering algorithms to partition the set of items based on user rating data. Predictions are then computed independently within each partition. Ideally, partitioning will improve the quality of

collaborative filtering predictions and increase the scalability of collaborative filtering systems. They report preliminary results that suggest that partitioning algorithms can greatly increase scalability, but they have mixed results on improving accuracy. However, partitioning based on ratings data does result in more accurate predictions than random partitioning, and the results are similar to those when the data is partitioned based on a known content classification.

The performance comparison between multi-layer perceptron (back propagation, delta rule and perceptron) is presented [18]. The author investigates the performance of three algorithms to train MLP networks. It was found that the back propagation algorithm are much better than others algorithms.

Due to its time efficiency, clustering is often applied in mobile phone RS. An example is recommendation system for tourists [7] where clusters are built on users sharing similar interests. Data are taken from registering forms and partitioned using k-means algorithm.

An efficient recommender system using collaborative filtering mechanism with k-separability approach for web based marketing [17]. Author follows the collaborative recommender method in which a user rating is aggregation of various characters using matrix but dataset becomes very noisy and difficult to separate. So, the K-Separability approach extends linear separability of data clusters into  $k > 2$  segments on the discriminating hyper plane. It can be implemented by single layer or 2-layer perceptron.

This article presents a solution of recommender system which helps users to select an interesting product [8]. The system analyses data from other customers' ratings of the products. It uses clustering methods to find similarities among the users and proposed techniques to identify users' profiles. The system was implemented in Apache Mahout environment and tested on a movie database. Selected similarity measures are based on: Euclidean distance, cosine as well as correlation coefficient and loglikelihood function.

In [6] author introduces a novel collaborative filtering recommender system for ecommerce which copes reasonably well with the ratings sparsity issue through the use of the notion of selective predictability and the use of the information theoretic measure known as entropy to estimate the same.

## III. NEURAL NETWORK

Neural network refers to the information processing systems or computer software system that can simulate the structure and function of the biological brain [9]. It is nonlinear complex



network system consisting of a large number of processing units that are similar to neurons. The structure of neural network is determined by the basic processing unit and their inter-connection methods. The field of neural networks may be thought to be related to artificial intelligence, machine learning, parallel processing, statistics, and other fields. Thus, this approach follows the steps to identify users' behavioural pattern and recommends N products by using neural network learning model.

#### A. Self-Organizing Map

Neural networks that use unsupervised learning attempt to find features in the data that characterise the desired output [21]. They look for clusters of like data. These types of neural networks are often called self-organizing neural networks. Self-Organizing Map [1] is a kind of unsupervised learning technique of Neural Networks which helps in reducing the high dimensional data into low dimensional data and visualizes that.

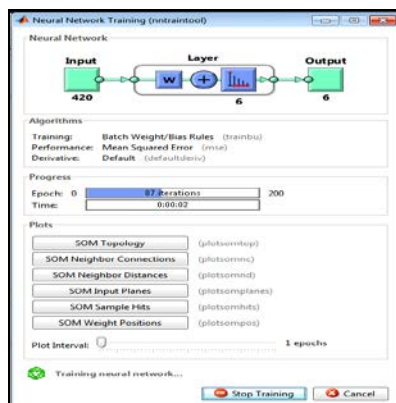


Figure 1 SOM Training State

#### B. Back-Propagation Network

A Back-Propagation Network (BPN) is a neural network that uses a supervised learning method and feed-forward architecture. A BPN is one of the most frequently utilized neural network techniques for classification and prediction [2] and is considered an advanced multiple regression analysis that can accommodate complex and non-linear data relationships [3]. It was first described by Werbos et al. [4], and further developed by Ronald et al [5]. In this work Self Organizing Map (SOM) neural network is used to cluster the users. Back propagation Network (BPN) is used to identify active users matching cluster for generating recommendations.

### IV. PROPOSED METHODOLOGY

This back propagation network approach has four phases. Firstly pre-process the dataset by using feature selection methods and rules to overcome the scalability problem. Secondly clustering is applied, to identify the user navigation behaviour patterns from the given dataset based on the similarity of users. Thirdly, classify the active users matching pattern. Finally obtain intelligence from the patterns for better decision making process to the businesses such as generating recommendations for the active users.

#### A. Feature selection

Feature selection and reduction techniques reduce the dataset size by removing irrelevant or redundant features. These techniques are used to find the minimum set of features required to create mining models. It reduces number of features in the patterns to understand the patterns easier. Heuristic methods such as step-wise forward selection, step-wise backward elimination, combining forward selection and backward elimination, Principle Component Analysis (PCA) and decision tree induction can be used for selecting the relevant features.

#### B. Filtering

Filtering helps you create mining models that use subsets of data in a mining structure for scalability. One can create filters use constrains to use only a part of the data for training and testing a variety of models for subset selection. In e-commerce recommender system filtering of users in the dataset is based on knowledge /profile of users defined in terms of rules to reduce the dataset.

#### C. Clustering to identify users Navigation Patterns

Clustering is applied to identify users navigation patterns. There are various types of clustering has been proposed in the literature. In this work neural network based Self Organizing Map (SOM) clustering is used to cluster users. Self-organizing maps learn to cluster data based on similarity and topology. The basic SOM model consists of two layers, an input layer and an output layer. The process of SOM is as follows:

1. Assign random values to weight vectors  $W$  of a neuron.
2. Provide an input vector  $D$  to the network
3. distance between weight vector  $W$  and input sample  $D$  is calculated
4. Traverse each node in the network and select the minimum distance neuron
5. Update the nodes in the neighbourhood
6. Iterate from step2 until stopping criterion is satisfied.

The advantage of SOM clustering is stability and convergence assured.

#### D. Identifying best matching pattern of active users

Back propagation neural network is used to classify active user's best matching patterns because of its improved performance accuracy. Normally there are three types of back-propagation training algorithms. They are Levenberg-Marquardt, Conjugate gradient and resilient back-propagation algorithms. Among these algorithms resilient back-propagation algorithm is faster than the standard deepest algorithms. It also requires modest increase in memory requirements and less impact of parameter settings. Hence in this work, resilient back propagation neural network is used to identify matching patterns of active users.

#### E. Generation of Recommendation List

Once the best matching patterns are identified the recommendation list can be generated. The recommendations list is generated from the identified user's user navigation behaviour patterns, According to the navigational behaviour pattern of items, this algorithm generate N items as recommendation that have not yet been purchased by the active users.

#### F. Algorithm: **KBSOMBPN**

// Algorithm for BPN model

Input:

The number of clusters k.

$D = \{s_1, s_2, s_3, \dots, s_{ns}\}$  // Train data

$TD=AU= \{s_1, s_2, s_3, \dots, s_{nts}\}$  //Test data

Output:

A set of clusters  $C_k$ ; N Recommendation List

Begin

1. // Feature selection

$$R = \eta_l = \{x/x \in A, x \geq v_1 \text{ and } x \leq v_2\}, \text{ where } l =$$

a. 1 to nfr

$$A' = \sum(a'_j) \approx \sigma(a_i(A)/D), \text{ where } i = 1 \text{ to } nf; j =$$

b. 1 to nsf

$$c. D' = \sum(A) = \{a'_1, a'_2, a'_3, \dots, a'_{nsf}\}$$

2. // Filtering of samples

$$a. R = \eta_l = \{y/y \in D', y \geq v_1 \text{ and } y \leq v_2\}, \text{ where } l =$$

1 to nsr

$$b. D'' = \sum(s_j) \approx \sigma(s_i/D'), \text{ where } i = 1 \text{ to } n; j=1 \text{ to } nss$$

3. Clustering of users in  $D''$  using SOM

a. Create self organizing map by randomizing weight vectors W

b. Select the input  $D''$

c. Traverse each node in the map

i. Calculate the similarity between input vector  $D''$  and weight vector W using Euclidean distance

ii. Find the node with smallest distance(best node)

d. Update the nodes weights of best node and neighbors

e. Repeat until converge

4. Classify-using-BPN()

5. Identify frequent items of matching cluster users from  $(a_{ij}(A')/D'')$

6. Generate N recommendations on Test set TD

7. Validate Recommendations.

End

### Algorithm 2: Classify-using-BPN()

Input:

Cluster of samples

Test set TD of Active user AU

Output:

Identified matching cluster

Begin

//Find the matching cluster  $C_i$  of Active Users AU

Initialize all weights and biases in network

Repeat

for each training tuple X in Training set do

Propagate the inputs forward  $D''$

- for each input layer unit
- for each hidden or output unit

Back propagate the errors

- for each unit in output layer

- for each unit in the hidden layers
- for each weight in network
- for each bias in network

Until termination condition is satisfied

Calculate the Performance Metrics on the Test Set TD.

End

This algorithm has been experimentally simulated and evaluated with different real-time datasets with different active users profile and preferences.

## V. EXPERIMENTAL EVALUATIONS

Active users knowledge such as user profile and preferences are consider as rules for selecting the features. Different active users profile with various types of preferences defined in terms of rules are analysed for evaluating performance of this algorithm.

### A. MovieLens dataset

MovieLens data set collected by the GroupLens Research Project is used to test the performance of this proposed algorithm [19]. The GroupLens Research Project is a research group in the Department of Computer Science and Engineering at the University of Minnesota. Members of the GroupLens Research Project are involved in many research projects related to the fields of information filtering, collaborative filtering, and recommender systems.

This data set consists of 100,000 ratings (1-5) from 943 users on 1682 movies. Each user has rated at least 20 movies. The data set was converted into a user-movie matrix R that had 943 rows (users) and 1682 columns (movies that were rated by at least one of the users).The dataset features are normalized between 0 and 1.Simple demographic information about the users is age, gender, occupation, zip. This has 5 disjoint sets with 5 fold cross validation. There are some real-world datasets such as Jester and e-commerce are also available on the web site for recommender systems.

### B. Evaluation Metrics

We have evaluated the results of tests of the machine learning algorithms on the MovieLens dataset by using evaluation metrics like Silhouette index (SI), Measure Absolute Error (MAE), recall, precision, and F1 Measure.

### C. Experimental Setup

All our experiments were implemented using MatlabR2013a. We ran all our experiments on a Windows 7 Home Basic based PC with Core i3 processor having a speed of 2.40 GHz and 3GB of RAM.

## VI. EXPERIMENTAL RESULTS

In this section we present detailed experimental results of the proposed algorithm and compared its performance with different metrics. Firstly the quality of the clustering is evaluated using Silhouette Index measure. Second the prediction evaluation result using Total Mean Absolute Error (TMAE) is calculated. Finally recommendation generation is evaluated using recall, precision and f1 measure.

### A. Clustering Quality Evaluation Results

We examine the influence of various cluster number  $k$  on clustering validity. The optimum number of clusters can be determined by testing various numbers of clusters and its silhouette measure. Figure 2 shows the silhouette measure value calculated using various number of clusters  $k$ .

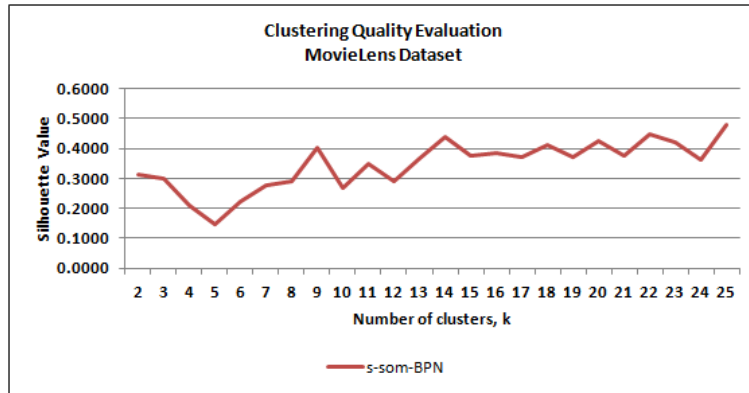


Figure 2 : Clustering Quality Evaluation

B. Prediction Evaluation Results

We simulated the algorithm with various train data and test data to compute the Total Mean Absolute Error (TMAE). Figure 3 shows the accuracy of prediction calculated using accuracy measure TMAE.

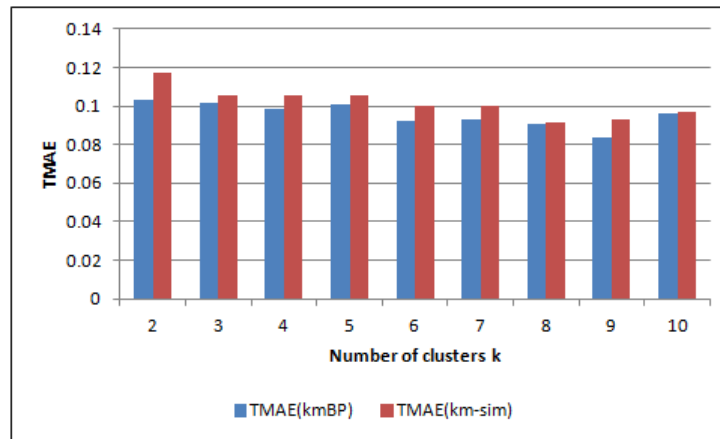


Figure 3. Accuracy of similarity matching

It can be observed from the results that average for back propagation similarity computation has a clear advantage, as the MAE is significantly lower in this case.

C. Recommendation Evaluation Results

We used different number of recommendations to evaluate the recommendations. Figure 4 shows the influence of number of recommendation on recall and precision measure.

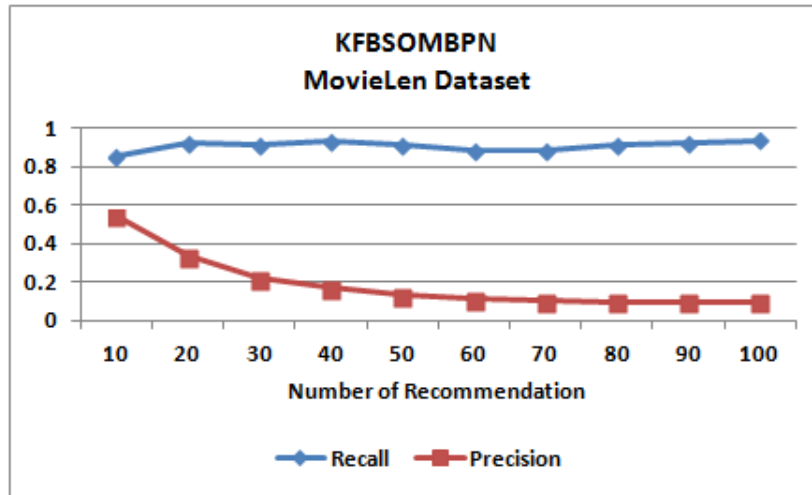


Figure 4 Number of Recommendation vs. Recall vs. Precision

Figure 5 shows the influence of various numbers of recommendations on F1 measure.

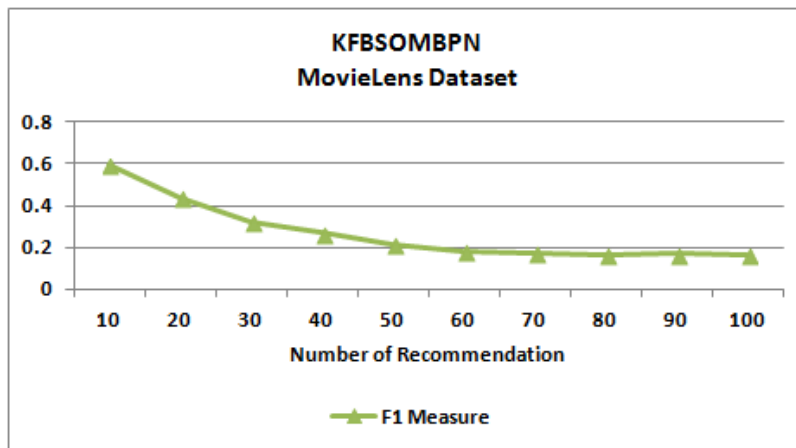


Figure 5 Number of recommendations vs. F1 measure

The simulation results show that proposed algorithm is performing well in terms of accuracy in matching the active user's cluster and recommendation quality.

### VII. CONCLUSIONS

The proposed approach utilizes the knowledge filtering, clustering and back propagation neural network classification to produce the recommendations. The performance of the algorithm has been tested with various parameters such as number of clusters, dimensions and N recommendations. The results from various simulations with real world movielens dataset show that recommendation generated by this algorithm is more scalable and accurate.

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#### AUTHORS

**First Author** – P.Prabhu, Directorate of distance education, Alagappa University, Karaikudi, Tamilnadu, India, pprabhu70@gmail.com

**Second Author** – N.Anbzhagan, Department of Mathematics, Alagappa University, Karaikudi, Tamilnadu, India, Anbzhagan\_n@yahoo.co.in

**Correspondence Author** – P.Prabhu, Directorate of distance education, Alagappa University, Karaikudi, Tamilnadu, India, pprabhu70@gmail.com

# Combination of Two Exponential Ratio Type Estimators for Estimating Population Mean Using Auxiliary Variable with Double Sampling in Presence of Non-Response

Rajkumar Hazra

M.Sc. (Indian Institute of Technology Kanpur, UP, India)

Guest Lecturer, Department of Statistics, Midnapore College (Autonomous), Midnapore-721101, WB, India

**Abstract-** We have to proposed combination of two exponential ratio type estimators for estimating population mean using auxiliary variable with double sampling in presence of non-response and study its properties like as mean square error (MSE) and bias. An illustration of the proposed estimator has been made with the relevant class of estimators for optimum value of  $\alpha$ .

**Index Terms-** Double Sampling, Bias and MSE, Non-response, Sampling Technique.

## I. INTRODUCTION

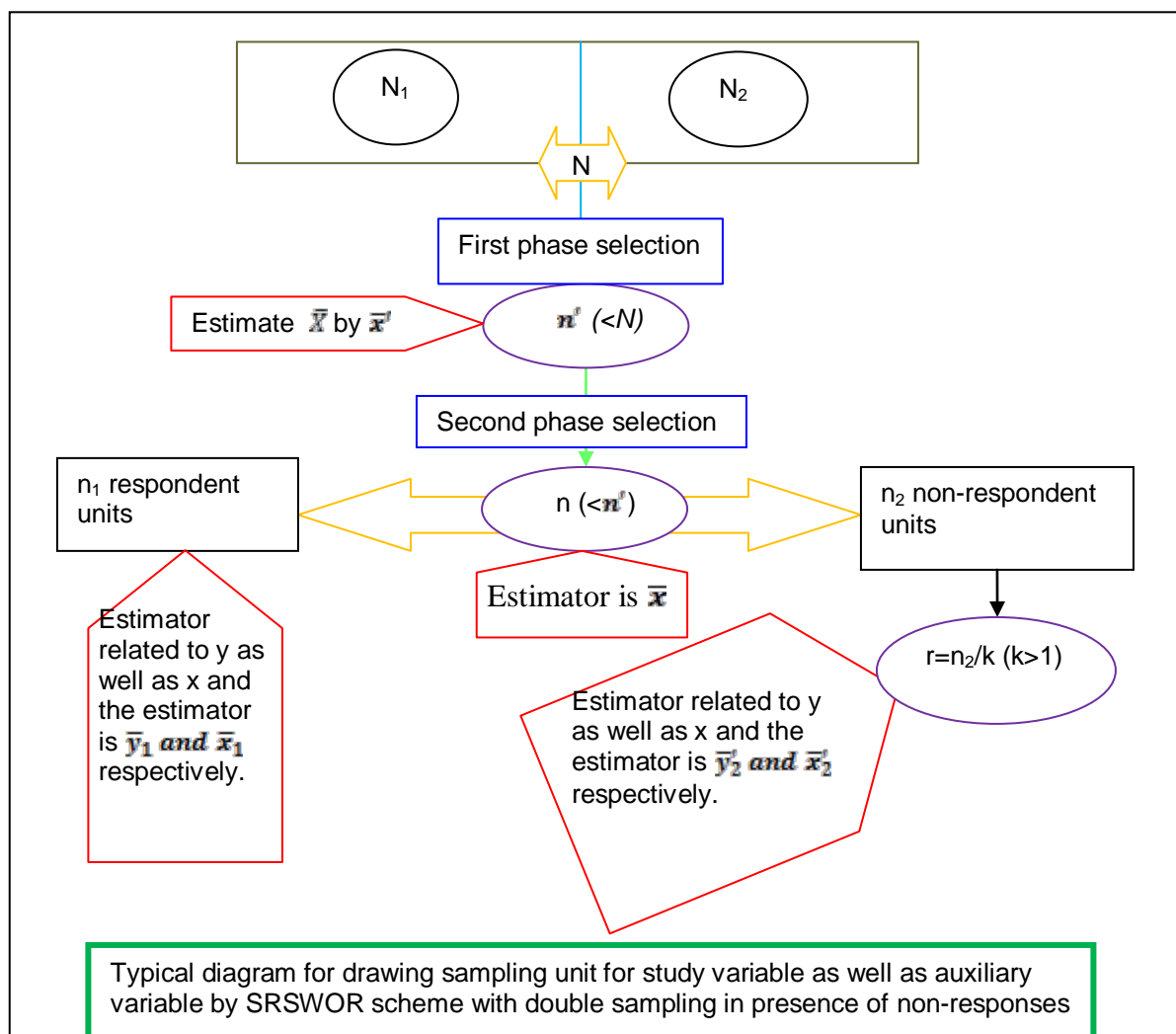
We know that auxiliary information in study of sample survey gives us an efficient estimate of population parameters like as population mean or total, under some crucial conditions. This information may be used for drawing a random sample using SRSWOR / SRSWR, to stratification, systematic or probability proportional to size sampling strategy or for estimating the population parameter or at both purposes. Auxiliary information gives us a variety of techniques by means of ratio, product, regression and other methods. Dalenius (1934) states that "As demonstrated by the developments in the last half-century, supplementary information may be exploited for all aspects of the sample design, the definition of sampling units, the selection design and the estimation method." In practical situation almost all surveys suffer from non-response. Hansen and Hurwitz (1946), assumed that a sub-sample of initial non-respondents is recontacted with a more expensive method, suggesting the first attempt by mail questionnaire and the second attempt by a personal interview. Sodipo and Obisesan (2007) have considered the problem of estimating the population mean in the presence of non-response, in sample survey with full response of an auxiliary character  $x$ . Other authors such as

Cochran (1977), Rao (1986, 1987), Khare and Srivastava (1993, 1995, 1997), Khare and Rehman (2014), Okafor and Lee (2000) and Tabasum and Khan (2004, 2006) and Singh and Kumar (2008a,b) have studied the problem of non-response under double (two-stage) sampling.

In the present paper, we have to proposed combination of two exponential ratio type estimators for estimating population mean using auxiliary variable with double sampling in presence of non-response. We have obtained the expressions for bias and mean square errors of the proposed estimators for the fixed value of  $n$  and  $n'$ , also for the optimum values of the constants. An illustration of the proposed estimators has been made with the relevant class of estimators.

## II. SAMPLING SCHEME

The double sampling in presence of non-response sampling scheme is that; let a population have  $N$  units and the population is divided in two parts say  $N_1$  of responding units and  $N_2$  of non-responding units. Here we first estimate population mean of auxiliary variable ( $x$ ) is in the first stage sample of size  $n'$  ( $< N$ ) from population of size  $N$  by using SRSWOR scheme and estimate population mean  $\bar{X}$  by  $\bar{x}'$ , which is the mean of the values of  $x$  on the first phase sample. Now we draw a second stage sample of size  $n$  is selected from  $n'$  by SRSWOR scheme and on the second stage sample of size  $n$  in which  $n_1$  units respond and  $n_2$  units non-respondent for study variable ( $y$ ) and as well as auxiliary variable ( $x$ ). From the  $n_2$  non-respondent units a sample of size  $r = n_2/k$ ;  $k > 1$  units is draw by SRSWOR scheme, where  $k$  is the inverse sampling rate at the second stage sample of size  $n$ . All the  $r$  units respond at this time now.



### III. NOTATION AND TERMINOLOGY

In this paper we used sufficient number of notations and terms, they are defined as follows ( $\bar{y}_1, \bar{y}_2$ ) be the sample mean based on  $n_1$  and  $r$  units of study variable and ( $\bar{x}_1, \bar{x}_2, \bar{x}', \bar{x}$ ) be the sample mean of auxiliary variable based on  $n_1, r, n', n$  units respectively.  $\bar{Y}$  and  $\bar{X}$  be the population mean of study variable and auxiliary variable based on population size  $N=N_1+N_2$ . Also  $\bar{Y}_2, \bar{X}_2$  be the population mean of study variable and auxiliary variable based on population size  $N_2$  (non-response part).

$$S_y^2 = \sum_{i=1}^N (y_i - \bar{Y})^2 / (N - 1), S_x^2 = \sum_{i=1}^N (x_i - \bar{X})^2 / (N - 1), S_{y2}^2 = \sum_{i=1}^{N_2} (y_i - \bar{Y}_2)^2 / (N_2 - 1),$$

$$S_{x2}^2 = \sum_{i=1}^{N_2} (x_i - \bar{X}_2)^2 / (N_2 - 1), C_y^2 = S_y^2 / \bar{Y}^2, C_{y2}^2 = S_{y2}^2 / \bar{Y}_2^2, C_x^2 = S_x^2 / \bar{X}^2,$$

$$S_{yx} = \frac{\sum_{i=1}^N (y_i - \bar{Y})(x_i - \bar{X})}{N - 1}, S_{yx2} = \frac{\sum_{i=1}^{N_2} (y_i - \bar{Y}_2)(x_i - \bar{X}_2)}{N_2 - 1}, \rho_{yx} = \frac{S_{yx}}{S_y S_x}, \rho_{yx2} = \frac{S_{yx2}}{S_{y2} S_{x2}}, \beta_{yx} = \frac{S_{yx}}{S_x^2}$$



$$\beta_{yx2} = \frac{S_{yx2}}{S_{x2}^2}, K_{yx} = \frac{\rho_{yx} C_y}{C_x}, K_{yx2} = \frac{\rho_{yx2} C_{y2}}{C_{x2}}, b^* = \frac{\tilde{S}_{yx}}{\tilde{S}_x^2}, b^{**} = \frac{\tilde{S}_{yx}}{s_x^2}, s_x^2 = \sum_{i=1}^n \frac{(x_i - \bar{x})^2}{n-1}, C_{yx} = \frac{S_{yx}}{\bar{X}\bar{Y}}$$

$C_{yx2} = \frac{S_{yx2}}{\bar{X}\bar{Y}}$ ,  $\tilde{S}_{yx}$  and  $\tilde{S}_x^2$  are estimates of  $S_{yx}$  and  $S_x^2$  respectively based on  $n_1+r$  units.  $\rho_{yx}$  and  $\rho_{yx2}$  are respectively the correlation coefficient of response and non-response group between study variable  $y$  and auxiliary variable  $x$ .

$w_1 = n_1/n, w_2 = n_2/n, f = n/N, W_2 = N_2/N, \lambda = (1-f)/n, \lambda' = (1-f')/n', \lambda^* = \frac{W_2(k-1)}{n}, f' = n'/N$ . We also use the constant  $a$ .

#### IV. SOME WELL KNEW ESTIMATORS AND ITS MSE

A usual unbiased estimator for the population mean  $\bar{Y}$  of the study variable  $y$ , proposed by Hansen and Hurwitz (1946), is defined by

$$\bar{y}^* = w_1 \bar{y}_1 + w_2 \bar{y}_2$$

The variance of  $\bar{y}^*$  is given by

$$\text{Var}(\bar{y}^*) = \bar{Y}^2 (\lambda C_y^2 + \lambda' C_{y2}^2)$$

It is well known that in estimating the population mean, sample survey experts sometimes use auxiliary information to improve the precision of the estimates. Let  $x$  denote an auxiliary variable with population mean  $\bar{X}$ . The Hansen and Hurwitz (1946) estimator is

$$\bar{x}^* = w_1 \bar{x}_1 + w_2 \bar{x}_2$$

The variance of  $\bar{x}^*$  is given by

$$\text{Var}(\bar{x}^*) = \bar{X}^2 (\lambda C_x^2 + \lambda' C_{x2}^2)$$

Khare and Srivastava (1993), Tabasum and Khan's (2004) defined ratio estimator in presence of nonresponse

$$T_1 = \bar{y}^* \frac{\bar{x}}{\bar{x}^*}$$

$$\text{MSE}(T_1) = \bar{Y}^2 [(\lambda - \lambda') \{C_y^2 + (1 - 2K_{yx}) C_x^2\} + \lambda' \{C_{y2}^2 + (1 - 2K_{yx2}) C_{x2}^2\} + \lambda' C_y^2]$$

Khare and Srivastava (1993), Tabasum and Khan's (2006) defined a ratio type estimator in presence of non-response as  $T_2 = \bar{y}^* \frac{\bar{x}}{\bar{x}}$  and its MSE is

$$\text{MSE}(T_2) = \bar{Y}^2 [(\lambda - \lambda') \{C_y^2 + (1 - 2K_{yx}) C_x^2\} + \lambda' C_{y2}^2 + \lambda' C_y^2]$$

Singh and Kumar's (2008a) defined a ratio type estimator in presence of non-response as

$$T_3 = \bar{y}^* \left( \frac{\bar{x}'}{\bar{x}^*} \right) \left( \frac{\bar{x}}{\bar{x}'} \right)$$

and its MSE is

$$\text{MSE}(T_3) = \bar{Y}^2 [(\lambda - \lambda') \{C_y^2 + 4(1 - K_{yx}) C_x^2\} + \lambda' \{C_{y2}^2 + (1 - 2K_{yx2}) C_{x2}^2\} + \lambda' C_y^2]$$

Singh and Kumar's (2008a) defined a product type estimator in presence of non-response as

$$T_4 = \bar{y}^* \left( \frac{\bar{x}}{\bar{x}'} \right) \left( \frac{\bar{x}'}{\bar{x}^*} \right)$$

and its MSE is

$$\text{MSE}(T_4) = \bar{Y}^2 [(\lambda - \lambda') \{C_y^2 + 4(1 - K_{yx}) C_x^2\} + \lambda' \{C_{y2}^2 + (1 + 2K_{yx2}) C_{x2}^2\} + \lambda' C_y^2]$$



Singh and Ruiz Espejo (2007) defined an estimator in presence of nonresponse as

$$T_5 = \bar{y}^* \left\{ b \frac{\bar{x}'}{\bar{x}^*} + (1 - b) \frac{\bar{x}''}{\bar{x}^*} \right\}$$

where b is any suitably chosen constant and its MSE is

$$D = \{\lambda' S_x^2 + \lambda^* S_{x2}^2\}, \quad D^* = \{(\lambda - \lambda') K_{yx} S_x^2 + \lambda^* K_{yx2} S_{x2}^2\}$$

$$MSE(T_5) = \left[ \lambda' C_y^2 + (\lambda - \lambda') \left\{ S_y^2 + \frac{D^*}{D} \left( \frac{D^*}{D} - 2\beta_{yx} \right) S_x^2 \right\} + \lambda^* \left\{ S_{y2}^2 + \frac{D^*}{D} \left( \frac{D^*}{D} - 2\beta_{yx2} \right) S_{x2}^2 \right\} \right]$$

Khare and Srivastava (1995), defined a regression type estimator in presence of non-response

$$T_6 = \bar{y}^* + b^{**} (\bar{x}' - \bar{x}^*)$$

and its MSE is

$$MSE(T_6) = Var(\bar{y}^*) - \bar{Y}^2 \left( \frac{1}{n} - \frac{1}{n'} \right) \rho_{yx}^2 C_y^2$$

Khare and Rehman (2014) defined generalized ratio in regression type estimators of non-response as

$$T_7 = \bar{y}^* \left( \frac{\bar{x}'}{\bar{x}^*} \right)^a + b^* (\bar{x}' - \bar{x}^*)$$

and its MSE is

$$MSE(T_7) = Var(\bar{y}^*) + \left( \frac{1}{n} - \frac{1}{n'} \right) \{ \bar{Y}^2 \alpha^2 C_x^2 + \bar{X}^2 B^2 C_x^2 - 2\bar{Y}^2 \alpha C_{yx} - 2\bar{X}\bar{Y} B C_{yx} + 2\bar{X}\bar{Y} B \alpha C_x^2 \} + \lambda^* \{ \bar{Y}^2 \alpha^2 C_{x2}^2 + \bar{X}^2 B^2 C_{x2}^2 - 2\bar{Y}^2 \alpha C_{yx2} - 2\bar{X}\bar{Y} B C_{yx2} + 2\bar{X}\bar{Y} B \alpha C_{x2}^2 \}$$

where

$$\alpha^{opt} = \left[ \left( \frac{1}{n} - \frac{1}{n'} \right) (\bar{Y} C_{yx} - \bar{X} B C_x^2) + \lambda^* (\bar{Y} C_{yx2} - \bar{X} B C_{x2}^2) \right] / \left[ \left( \frac{1}{n} - \frac{1}{n'} \right) \bar{X} C_x^2 + \lambda^* \bar{Y} C_{x2}^2 \right] \text{ and } B = \frac{\rho_{yx} S_y}{S_x}$$

## V. PROPOSED ESTIMATOR WITH BIAS AND MSE

In the given sampling scheme we have to proposed combination of two exponential ratio type estimators for estimating population mean using auxiliary variables with double sampling in the presence of non-response, which is given as follows:

$$T_P = \bar{y}^* \left\{ \alpha \exp \left( \frac{\bar{x}'}{\bar{x}^*} - 1 \right) + (1 - \alpha) \exp \left( \frac{\bar{x}''}{\bar{x}^*} - 1 \right) \right\} \quad (1)$$

where  $\alpha$  is constant.

To obtain the bias and variance of the estimator  $T_P$ , we write

$$\bar{y}^* = \bar{Y}(1 + \varepsilon_0), \bar{x}^* = \bar{X}(1 + \varepsilon_1), \bar{x}' = \bar{X}(1 + \varepsilon_1'), \bar{x}'' = \bar{X}(1 + \varepsilon_2)$$

such

that,

$$E(\varepsilon_0) = E(\varepsilon_1) = E(\varepsilon_1') = E(\varepsilon_2) = 0 \text{ and}$$

$$E(\varepsilon_0^2) = \lambda C_y^2 + \lambda^* C_{y2}^2, E(\varepsilon_1^2) = \lambda C_x^2 + \lambda^* C_{x2}^2, E(\varepsilon_1'^2) = \lambda' C_x^2, E(\varepsilon_2^2) = \lambda C_x^2,$$

$$E(\varepsilon_0 \varepsilon_1) = \lambda \rho_{yx} C_y C_x + \lambda^* \rho_{yx2} C_{y2} C_{x2}, E(\varepsilon_0 \varepsilon_2) = \lambda \rho_{yx} C_y C_x, E(\varepsilon_1 \varepsilon_1') = \lambda' C_x^2, E(\varepsilon_1 \varepsilon_2) = \lambda C_x^2, E(\varepsilon_2 \varepsilon_1') = \lambda' C_x^2, E(\varepsilon_0 \varepsilon_1') = \lambda' \rho_{yx} C_y C_x$$

So the estimator  $T_P$  can be expressed in terms of  $\varepsilon$ 's as follows

$$T_P = \bar{Y}(1 + \varepsilon_0) [\alpha \exp\{(\varepsilon'_1 - \varepsilon_1)(1 + \varepsilon_1)^{-1}\} + (1 - \alpha) \exp\{(\varepsilon'_1 - \varepsilon_2)(1 + \varepsilon_2)^{-1}\}] \quad (2)$$

If we assume that  $|\varepsilon_0| < 1$ ,  $|\varepsilon'_1| < 1$ ,  $|\varepsilon_2| < 1$  then the right hand side of (2) is expandable. Now, expanding the right hand side of (2) to the second degree of approximation, we have

$$T_P = \bar{Y}(1 + \varepsilon_0) [\alpha \exp\{(\varepsilon'_1 - \varepsilon_1)(1 - \varepsilon_1 + \varepsilon_1^2)\} + (1 - \alpha) \exp\{(\varepsilon'_1 - \varepsilon_2)(1 - \varepsilon_2 + \varepsilon_2^2)\}]$$

$$T_P - \bar{Y} = \bar{Y}(1 + \varepsilon_0) [\alpha \exp(\varepsilon'_1 - \varepsilon_1 - \varepsilon_1 \varepsilon'_1 + \varepsilon_1^2) + (1 - \alpha) \exp(\varepsilon'_1 - \varepsilon_2 - \varepsilon_1 \varepsilon_2 + \varepsilon_2^2)] - \bar{Y}$$

$$T_P - \bar{Y} = \bar{Y}(1 + \varepsilon_0) \left[ \alpha \left( 1 + \varepsilon'_1 - \varepsilon_1 - \varepsilon_1 \varepsilon'_1 + \varepsilon_1^2 + \frac{\varepsilon_1^2 + \varepsilon_1'^2 - 2\varepsilon_1 \varepsilon'_1}{2} \right) + \right. \\ \left. (1 - \alpha) \left( 1 + \varepsilon'_1 - \varepsilon_2 - \varepsilon_2 \varepsilon'_1 + \varepsilon_2^2 + \frac{\varepsilon_2^2 + \varepsilon_1'^2 - 2\varepsilon_2 \varepsilon'_1}{2} \right) \right] - \bar{Y}$$

$$T_P - \bar{Y} = \bar{Y}(1 + \varepsilon_0) \left[ \alpha \left( 1 + \varepsilon'_1 - \varepsilon_1 - 2\varepsilon_1 \varepsilon'_1 + \frac{3\varepsilon_1^2}{2} + \frac{\varepsilon_1'^2}{2} \right) + \right. \\ \left. (1 - \alpha) \left( 1 + \varepsilon'_1 - \varepsilon_2 - 2\varepsilon_2 \varepsilon'_1 + \frac{3\varepsilon_2^2}{2} + \frac{\varepsilon_1'^2}{2} \right) \right] - \bar{Y}$$

$$T_P - \bar{Y} = \bar{Y} \left[ \alpha \left( 1 + \varepsilon_0 + \varepsilon'_1 + \varepsilon_0 \varepsilon'_1 - \varepsilon_1 - \varepsilon_0 \varepsilon_1 - 2\varepsilon_1 \varepsilon'_1 + \frac{3\varepsilon_1^2}{2} + \frac{\varepsilon_1'^2}{2} \right) + \right. \\ \left. (1 - \alpha) \left( 1 + \varepsilon_0 + \varepsilon'_1 + \varepsilon_0 \varepsilon'_1 - \varepsilon_2 - \varepsilon_0 \varepsilon_2 - 2\varepsilon_2 \varepsilon'_1 + \frac{3\varepsilon_2^2}{2} + \frac{\varepsilon_1'^2}{2} \right) \right] - \bar{Y}$$

$$T_P - \bar{Y} = \bar{Y} \left[ \alpha \left( \varepsilon_0 + \varepsilon'_1 + \varepsilon_0 \varepsilon'_1 - \varepsilon_1 - \varepsilon_0 \varepsilon_1 - 2\varepsilon_1 \varepsilon'_1 + \frac{3\varepsilon_1^2}{2} + \frac{\varepsilon_1'^2}{2} \right) + \right. \\ \left. \varepsilon_0 - \varepsilon'_1 - \varepsilon_0 \varepsilon'_1 + \varepsilon_2 + \varepsilon_0 \varepsilon_2 + 2\varepsilon_2 \varepsilon'_1 - \frac{3\varepsilon_2^2}{2} - \frac{\varepsilon_1'^2}{2} \right. \\ \left. \left( \varepsilon_0 + \varepsilon'_1 + \varepsilon_0 \varepsilon'_1 - \varepsilon_2 - \varepsilon_0 \varepsilon_2 - 2\varepsilon_2 \varepsilon'_1 + \frac{3\varepsilon_2^2}{2} + \frac{\varepsilon_1'^2}{2} \right) \right]$$

$$T_P - \bar{Y} = \bar{Y} \left[ \alpha \left( \varepsilon_2 - \varepsilon_1 - \varepsilon_0 \varepsilon_1 - 2\varepsilon_1 \varepsilon'_1 + \varepsilon_0 \varepsilon_2 + 2\varepsilon_2 \varepsilon'_1 - \frac{3\varepsilon_2^2}{2} + \frac{3\varepsilon_1^2}{2} \right) + \right. \\ \left. \left( \varepsilon_0 + \varepsilon'_1 + \varepsilon_0 \varepsilon'_1 - \varepsilon_2 - \varepsilon_0 \varepsilon_2 - 2\varepsilon_2 \varepsilon'_1 + \frac{3\varepsilon_2^2}{2} + \frac{\varepsilon_1'^2}{2} \right) \right] \quad (3)$$

Taking expectation on both side of (3), we get the bias of  $T_P$  to the first degree of approximation is given by

$$B(T_P) = \bar{Y} \left[ \alpha \left( -\lambda \rho_{yx} C_y C_x - \lambda' \rho_{yx2} C_{y2} C_{x2} - 2\lambda' C_x^2 + \lambda \rho_{yx} C_y C_x + 2\lambda' C_x^2 - \frac{3\lambda C_x^2}{2} + \frac{3(\lambda C_x^2 + \lambda' C_{x2}^2)}{2} \right) + \right. \\ \left. \left( \lambda' \rho_{yx} C_y S_x - \lambda \rho_{yx} C_y S_x - 2\lambda' C_x^2 + \frac{3\lambda C_x^2}{2} + \frac{\lambda' C_x^2}{2} \right) \right] \\ B(T_P) = \bar{Y} \left[ \alpha \left( -\lambda' \rho_{yx2} C_{y2} C_{x2} + \frac{3\lambda' C_{x2}^2}{2} \right) + \left( \frac{3\lambda C_x^2}{2} (\lambda - \lambda') - \rho_{yx} C_y S_x (\lambda - \lambda') \right) \right] \quad (4)$$

So our estimator  $T_P$  is approximately unbiased if the value of the constant is

$$\alpha = \frac{\left( \frac{3\lambda C_x^2}{2} (\lambda - \lambda') - \rho_{yx} C_y S_x (\lambda - \lambda') \right)}{\left( \lambda' \rho_{yx2} C_{y2} C_{x2} - \frac{3\lambda' C_{x2}^2}{2} \right)}$$

Rewrite (3) we have

$$T_P - \bar{Y} = \bar{Y}[\alpha(\varepsilon_2 - \varepsilon_1) + (\varepsilon_0 + \varepsilon_1' - \varepsilon_2)] \tag{5}$$

Squaring both sides of (5) and neglecting terms of  $\varepsilon$ 's involving power greater than two, we have

$$\begin{aligned} (T_P - \bar{Y})^2 &= \bar{Y}^2[\alpha(\varepsilon_2 - \varepsilon_1) + (\varepsilon_0 + \varepsilon_1' - \varepsilon_2)]^2 \\ (T_P - \bar{Y})^2 &= \bar{Y}^2[\alpha^2(\varepsilon_2 - \varepsilon_1)^2 + (\varepsilon_0 + \varepsilon_1' - \varepsilon_2)^2 + 2\alpha(\varepsilon_2 - \varepsilon_1)(\varepsilon_0 + \varepsilon_1' - \varepsilon_2)] \\ (T_P - \bar{Y})^2 &= \bar{Y}^2\left[\alpha^2(\varepsilon_2^2 + \varepsilon_1^2 - 2\varepsilon_1\varepsilon_2) + (\varepsilon_0^2 + \varepsilon_1'^2 + \varepsilon_2^2 + 2\varepsilon_0\varepsilon_1' - 2\varepsilon_0\varepsilon_2 - 2\varepsilon_1'\varepsilon_2) + \right. \\ &\quad \left. 2\alpha(\varepsilon_0\varepsilon_2 - \varepsilon_0\varepsilon_1 + \varepsilon_1'\varepsilon_2 - \varepsilon_1\varepsilon_1' - \varepsilon_2^2 + \varepsilon_1\varepsilon_2)\right] \end{aligned} \tag{6}$$

Taking expectation on both sides on (6), we get the MSE of the estimator  $T_P$  to the first degree of approximation, we get

$$\begin{aligned} MSE(T_P) &= \bar{Y}^2 \left[ \alpha^2(\lambda C_x^2 + \lambda C_x^2 + \lambda' C_{x2}^2 - 2\lambda C_x^2) + \right. \\ &\quad \left. (\lambda C_y^2 + \lambda' C_{y2}^2 + \lambda' C_x^2 + \lambda C_x^2 + 2\lambda' \rho_{yx} C_y C_x - 2\lambda \rho_{yx} C_y C_x - 2\lambda' C_x^2) + \right. \\ &\quad \left. 2\alpha(\lambda \rho_{yx} C_y C_x - \lambda \rho_{yx} C_y C_x - \lambda' \rho_{yx2} C_{y2} C_{x2} + \lambda' C_x^2 - \lambda' C_x^2 - \lambda C_x^2 + \lambda C_x^2) \right] \\ MSE(T_P) &= \bar{Y}^2 \left[ \alpha^2(\lambda' C_{x2}^2) + (\lambda C_y^2 + \lambda' C_{y2}^2 + (\lambda - \lambda') C_x^2 - 2(\lambda - \lambda') \rho_{yx} C_y C_x) - \right. \\ &\quad \left. 2\alpha(\lambda' \rho_{yx2} C_{y2} C_{x2}) \right] \end{aligned} \tag{7}$$

The MSE (7) is minimized for

$$\alpha = \frac{(\lambda' \rho_{yx2} C_{y2} C_{x2})}{\lambda' C_{x2}^2}$$

Hence the optimal value of  $\alpha$  is

$$\alpha^{opt} = \frac{(\rho_{yx2} C_{y2})}{C_{x2}}$$

The optimal variance is

$$MSE(T_P)^{opt} = \bar{Y}^2[(\lambda C_y^2 + \lambda' C_{y2}^2 + (\lambda - \lambda') C_x^2 - 2(\lambda - \lambda') \rho_{yx} C_y C_x) - \lambda' \rho_{yx2}^2 C_{y2}^2]$$

### VI. EMPIRICAL STUDY

To illustrate for the proposed results we considered the data earlier consider by Khare and Sinha(2009), Khare and Rehman (2014). The description of the population is given below:

Here we study 96 village wise population of rural area under Police-station – Singur, District -Hooghly, West Bengal from the District Census Handbook 1981. The 25% villages (i.e. 24 villages) whose area is greater than 160 hectares have been considered as non-response group of the population. The number of agricultural labors in the village is taken as study character (y) while the area (in hectares) of the village is taken as auxiliary variable x. The values of the different parameters of the population are given below:

**Table-1: Calculation for different term.**

Term	Value	Term	Value	Term	Value	Term	Value
$\bar{Y}$	137.9271	$C_{y2}^2$	4.34246	$S_{yx2}$	28362.05463	$f$	0.729167
$\bar{Y}^2$	19023.88	$C_{x2}^2$	0.885105	$C_{yx2}$	1.419396	$\lambda$	0.014583
$\bar{X}$	144.872	$\rho_{yx}$	0.773	$K_{yx2}$	1.603649	$\lambda'$	0.003869
$\bar{X}^2$	20987.9	$\rho_{yx}^2$	0.597529	N	96	$\lambda - \lambda'$	0.010714
$S_y^2$	33306.69	$S_{yx}$	16585.1	n	40	B	1.19998
$C_y^2$	1.750783	$C_{yx}$	0.830012	$n'$	70	$B^2$	1.43994
$S_x^2$	13821.21	$K_{yx}$	1.260396	$\frac{1}{n} - \frac{1}{n'}$	0.010714	$\beta_{yx}$	1.19997
$C_x^2$	0.658532	$\rho_{yx2}$	0.724	f	0.416667	$\beta_{yx2}$	1.52677
	k=2	k=3	k=4	k=5		$S_y$	182.5012
$\lambda^*$	0.00625	0.0125	0.01875	0.025		$S_{y2}$	287.4202

$D$	169.5779727	285.6811	401.7841	517.8871711	$C_{T_2}$	2.08386
$D^*$	208.9057936	231.167	253.42746	275.6882877	$C_x$	0.8115
$\frac{D^*}{D}$	1.231915857	0.80918	0.630756	0.532332722	$S_x$	117.5636
$a$	0.146709	0.20556	0.237288	0.257133	$C_{x_2}$	0.9408
$a^2$	0.021524	0.042255	0.056306	0.066117	$S_{x_2}$	136.2956

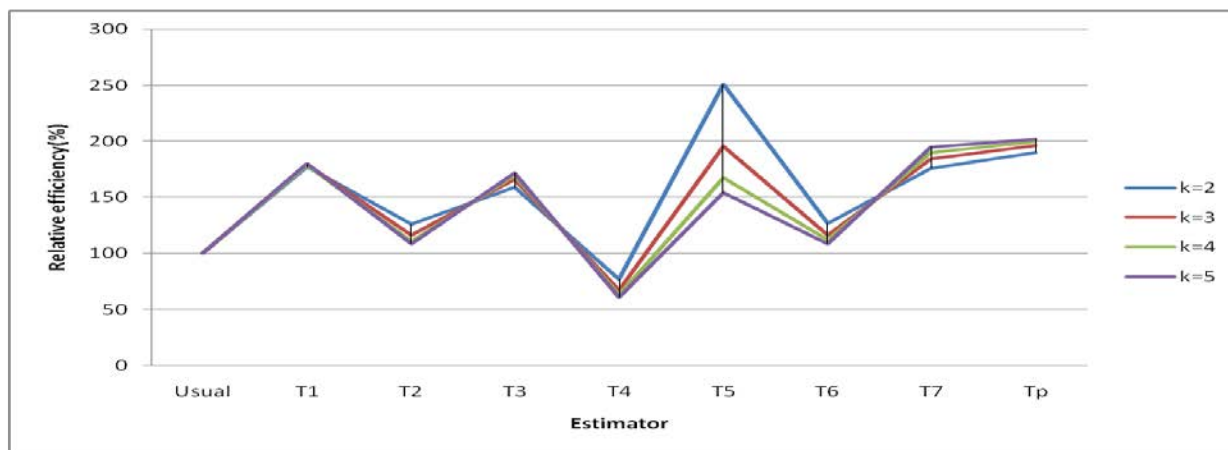
**Table-2: Relative efficiency of the estimators (in %) and MSE with respect to  $\bar{y}^*$  for fixed values of  $n$ ,  $n'$  and different values of  $k$  (  $N=96$ ,  $n'=70$  and  $n=40$ ).**

MSE					Relative efficiency(%)				
Estimator	k=2	k=3	k=4	k=5	Estimator	k=2	k=3	k=4	k=5
$\bar{y}^*$	1002.0	1518.4	2034.7	2551.0	$\bar{y}^*$	100	100	100	100
$T_1$	565.6	849.6	1133.7	1417.7	$T_1$	177	179	179	180
$T_2$	797.9	1314.2	1830.5	2346.9	$T_2$	126	116	111	109
$T_3$	629.9	914.0	1198.0	1482.0	$T_3$	159	166	170	172
$T_4$	1305.0	2264.1	3223.2	4182.3	$T_4$	77	67	63	61
$T_5$	399.6	777.2	1208.3	1651.6	$T_5$	251	195	168	154
$T_6$	788.8	1305.1	1821.4	2337.8	$T_6$	127	116	112	109
$T_7$	568.3	824.9	1069.4	1308.7	$T_7$	176	184	190	195
$T_p$	527.3	772.9	1018.6	1264.3	$T_p$	190	196	200	202

The figure-1 and table-2 shows that

- a) If  $k$  is increase then the relative efficiency (%) of the estimators  $T_2, T_4, T_5, T_6$  decrease.
- b) If  $k$  is increase then the relative efficiency (%) of the estimators  $T_1, T_3, T_7, T_p$  increase.
- c) We see that proposed estimator is more efficient than the other estimators.
- d) Also we see that at  $k=2$  the estimator  $T_5$  is more efficient than the proposed estimator  $T_p$ , but after  $k>2$  i.e., increasing of  $k$  the proposed estimator goes to more efficient than the  $T_5$ .

Therefore the proposed estimator should be preferred for the estimation of population mean using auxiliary variable with double sampling in presence of non-response.



**Figure-1: Relative efficiency (%) with respect to different estimator.**

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#### AUTHORS

**First Author** – Rajkumar Hazra, M.Sc. (Indian Institute of Technology Kanpur, UP, India), Guest Lecturer, Department of Statistics, Midnapore College (Autonomus), Midnapore-721101, WB, India, e-mail: hazra.rajkumariitk@gmail.com, Contact No-8768240807

# Comparison of Patient Response to Laparoscopic versus Open Cholecystectomy: A study From A Rural Center in India

Somendra Pal Singh, Prashant Gupta, Anil Kumar Sharma, Manjaree Mishra, Praveen Singh, Shashi Prakash Mishra

Assistant Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130

**Abstract- Introduction-** Laparoscopic cholecystectomy is now gold standard for the treatment of gall stone diseases. Studies have compared various parameters to prove its superiority over open cholecystectomy.

**Aim-** The aim of this study was to prove the superiority of any of the two procedures over the other in terms of above parameters in our patients from rural background.

**Materials and Methods-** The study included 81 patients which were randomized in two groups; A- Laparoscopic B- Open Cholecystectomy group.

**Observations and Results-** We observed a statistically significant difference between the two groups in terms of high level of CRP post operatively, average VAS score on post operative day 1 and 2 and the incidence of surgical site infections.

**Conclusion-** The results of this study supports that Laparoscopic cholecystectomy appears to consist the merits to be the gold standard procedure for symptomatic gall stone diseases in rural population as well.

**Index Terms-** Laparoscopic, Open, Cholecystectomy, CRP, VAS, SSI

## I. INTRODUCTION

The invention of laparoscopic surgery has definitely brought a paradigm shift in the traditional surgical practice. This is rather a new way of thinking and has motivated surgeons to think of doing possibly every operation by a minimally invasive way. History of first cholecystectomy dates back to 1882, when Carl Langebuch of Germany performed the first cholecystectomy [1]. Prof Dr Erich Mühe of Germany performed the first laparoscopic cholecystectomy (LC) in 1985. [1] The first laparoscopic cholecystectomy in India was performed in 1990 at the JJ Hospital, Mumbai, followed a few months later in Pune by Dr. Jyotsna Kulkarni. [2].

Laparoscopic cholecystectomy (LC) is now the gold standard treatment of symptomatic gallstones and the indications for laparoscopic cholecystectomy are same as that of open cholecystectomy.[3] Various workers in randomized control trials have claimed laparoscopic cholecystectomy to be better as compared with the open technique due to earlier return of bowel motility, less post-operative pain, better cosmetic result and shorter hospital stay resulting in equal or lower hospital costs, as documented by various. [4-7]

There have been many studies which have compared both the procedures in term of hospitalization, analgesia required; sick leave, stress response etc and results have been varied. [4] We did a randomized control trial to evaluate the response of our patients (which are mainly from rural background) to laparoscopic versus open cholecystectomy to ascertain that laparoscopic cholecystectomy possesses the capability of being more an acceptable procedure than open; in our patients as well.

## II. AIM

The current study has compared the response of our patients to laparoscopic versus open cholecystectomy in terms of percentage change in total leukocyte count (preoperative to post operative), post operative serum level of C Reactive Proteins, post operative ultrasound abdomen, pain as measured on Visual Analogue Scale after 24 hrs and 48 hrs of surgery and surgical site infections up to the end of one week of surgery. Thus the aim of this study was to prove the superiority of any of the two procedures over the other in terms of above parameters in our patients.

## III. MATERIALS AND METHODS

This study was performed in a Rural Post Graduate Institute of Medical Science & Research in North India. The study was approved from the Institutional Ethical Committee. The diagnosed gall stone patients been admitted to a single unit in Surgery department of Institute for elective cholecystectomy between January 2013 to January 2015, were included in the study. The exclusion criteria being patients more than 60 years of age, having higher ASA grades ( $\geq 3$ ), patients having diabetes mellitus and/or diagnosed cardiac illness and patients unwilling to participate in the study. A detailed history and clinical examination of all the patients was done and all the patients were investigated as per protocol. Patients were randomized in two groups according to their will after explaining the procedures and study to be done. Group A was having patients undergoing elective laparoscopic cholecystectomy and Group B having patients undergoing elective open cholecystectomy. The patients were operated by any of surgeons from a single surgical unit as per the availability. All the patients in both the groups received single shot of Inj. Ceftriaxone 1 gram I.V. after sensitivity test, at the time of induction of anesthesia.

Group A patients underwent classical 4 port cholecystectomy and Group B patients underwent open cholecystectomy with right subcostal incision. All the patients were operated under general anesthesia with endotracheal intubation. All the patients were advised for I.V. antibiotics and analgesics at least up to 24 hours after surgery. Post operatively all the patients were investigated on next morning for total leukocyte count, serum C reactive protein level and ultrasound of abdomen. Pain was recorded by a non surgeon observer unaware of the procedure performed on the patient. Pain recording was done on Visual Analogue Scale on morning next to day of surgery (post operative day 1) and on the next morning (post operative day 2). The occurrence of surgical site infections was recorded up to one week after surgery.

Statistical analysis was done using unpaired t test and Fischer Exact Test. P value less than 0.05 was considered to be statistically significant.

#### IV. OBSERVATIONS AND RESULTS

Total 102 patients were enrolled in the study but finally 81 patients were included as 21 patients were excluded from study because of one or more reasons. Out of 81 patients, 42 patients were in group A (Laparoscopic cholecystectomy group) and 39 patients were in group B (Open Cholecystectomy group).

There were total 12 male patients and 69 female patients. Group A had 5 males and 37 females whereas Group B had 7 males and 32 females. The mean age of patients in group A was 37.3 years while it was 43.2 years in group B; which was not carrying any statistical significance. [Table 1]

The average change in total leukocyte count (post operatively as compared to pre operative value) in group A was 23.4 and in group B was 33.8. This data was also not bearing any statistical significance. [Table 1]

Post operatively high level of serum C reactive protein was noted in 42.9 % patients in group A while it was high in 53.8 % in group B. This difference was found to be statistically significant. [Table 1]

Average VAS score for assessment of pain post operatively was 4.7 on day one and 1.8 on day after surgery in group A while it was respectively 8.3 and 5.6 in group B. This difference in average VAS score between two groups on post operative day 1 and 2 was statistically significant. [Table 1]

The incidence of surgical site infections in group A was 7.1 % while it was 23.1 % in group B. This difference again was statistically significant. [Table 1]

Hence we observed a statistically significant difference between the two groups in terms of high level of CRP post operatively, average VAS score on post operative day 1 and 2 and the incidence of surgical site infections.

#### V. DISCUSSION

Laparoscopic cholecystectomy has definitely revolutionized the treatment of patients of gall stone diseases. This is no doubt a surgical procedure which has very rapidly replaced the pre-existing in form of open cholecystectomy and has been widely accepted worldwide. Udwardia TE stated that there can be no

doubt that MAS is the most compelling and dynamic force driving surgical progress and endeavour in the current era. [2]

Berggren U et al in their study titled Laparoscopic versus open cholecystectomy: hospitalization, sick leave, analgesia and trauma responses; concluded that though laparoscopic cholecystectomy has rapidly become established as the treatment of choice for cholecystolithiasis, there is very little evidence, however, to support the claimed benefit to patients. They found that urinary adrenaline and cortisol levels as well as those of plasma glucose, C-reactive protein and interleukin 6 were increased after surgery in both groups of patients, but without any significant difference between them. The mean duration of postoperative hospital stay and sick leave was significantly longer with open than laparoscopic cholecystectomy. The findings demonstrate obvious advantages of laparoscopic surgery as regards postoperative pain and convalescence, although factors reflecting the magnitude of trauma did not differ. [4]

Ortega AE et al have performed a prospective randomized comparison of the metabolic and stress hormonal responses of laparoscopic and open cholecystectomy and concluded that elective laparoscopic and open cholecystectomy for uncomplicated cholelithiasis result in similar degrees of perioperative hormonal stimulation. The different hormonal responses in the immediate and later postoperative periods after laparoscopic and open cholecystectomy suggest differential stressful stimuli between the two procedures. [8]

An overview of Cochrane HepatoBiliary Group reviews by Keus F et al titled Open, small incision, or laparoscopic cholecystectomy for patients with symptomatic cholecystolithiasis also concluded that No statistically significant differences in the outcome measures of mortality and complications have been found among open, small incision, and laparoscopic cholecystectomy. There were no data on symptom relief. Complications in elective cholecystectomy are high. The quicker recovery of both laparoscopic and small incision cholecystectomy patients compared with patients on open cholecystectomy justifies the existing preferences for both minimal invasive techniques over open cholecystectomy. Laparoscopic and small incision cholecystectomies seem to be comparable, but the latter has a significantly shorter operative time, and seems to be less costly. [9]

Tariq Saeed et al performed a Comparative study of laparoscopic versus open cholecystectomy and concluded that Laparoscopic cholecystectomy is associated with short stay in hospital, early mobilization and return to work, good cosmetic results and good media coverage. Laparoscopic cholecystectomy has proven to be a safe procedure with low morbidity and an equal mortality rate as compared to open cholecystectomy. [10]

Sagheer Ahmed et al also did a study titled Open cholecystectomy versus laparoscopic cholecystectomy: a Comparative study. They have concluded that laparoscopic cholecystectomy is a safe and justified replacement for open cholecystectomy. There is a definite learning curve for surgeons who are newly exposed. The complication rates reduced as the surgeons become more experienced in this procedure to a level comparable with that of open cholecystectomy. [11]

Rooh-ul-Muqim et al also concluded that laparoscopic cholecystectomy is associated with speedy recovery, less

requirement of post operative analgesia and early resumption to work. [12]

Haque Z studied Metabolic and stress responses of the body to trauma: produced by the laparoscopic and open cholecystectomy. They observed that blood glucose and stress hormones (cortisol, adrenaline, nor adrenaline) and C-reactive protein all were found significantly raised in the postoperative period in open cholecystectomy than laparoscopic cholecystectomy group. The postoperative recovery was also prolonged in the open group. The obvious clinical advantages of laparoscopic cholecystectomy over open cholecystectomy are mainly because of less metabolic and stress response. [13]

Thus the advantages of laparoscopic cholecystectomy appear to be beyond discussion. However we tried in our study to look into the response of our patients to laparoscopic cholecystectomy as compared to open cholecystectomy. Our study group included the patients from rural background where the acceptability of minimal access procedures as such is not that obvious as in urban population. In both the groups following procedure, we studied percentage increase in total leukocyte count, high level of serum C reactive proteins, pain on VAS on post operative day 1 and 2 and the incidence of surgical site infection. The increase in post operative total leukocyte count was lesser as compared to open cholecystectomy group but this difference was not statistically significant. We found that laparoscopic cholecystectomy group was having lesser incidence of high serum C reactive proteins levels post operative. Moreover pain as measured on VAS on post operative day 1 and 2 was also less in laparoscopic cholecystectomy groups. Laparoscopic cholecystectomy group was also having lesser incidence of surgical site infections. All these differences were statistically significant (<0.05).

## VI. CONCLUSION

We hereby conclude that patient response as measured by us in terms of high level of serum CRP, pain score and incidence of surgical site infection; are less in laparoscopic cholecystectomy as compared to open cholecystectomy. Laparoscopic cholecystectomy thus appears to consist the merits to be the gold standard procedure for symptomatic gall stone diseases in rural population as well.

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## AUTHORS

**First Author** – Dr Somendra Pal Singh, Assistant Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130., Email- somendrachauhan@hotmail.com

**Second Author** – Dr Prashant Gupta, Associate Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130., Email- drprashantguptams@gmail.com

**Third Author** – Dr Anil Kumar Sharma, Associate Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130., Email- dranil\_ascoms@yahoo.com

**Fourth Author** – Dr Manjaree Mishra, Senior Resident, Department of Anesthesia. UPRIMS&R, Saifai, Etawah (U.P.), India. 206130., Email- drmanjareemd@gmail.com

**Fifth Author** – Dr. Praveen Singh, Junior Resident, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130. Email- attitudeindian@gmail.com

**Sixth Author** – Dr Shashi Prakash Mishra, Assistant Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130., Email- sprakashsurgery@gmail.com

**Correspondence Author** – Dr Shashi Prakash Mishra, MBBS, MS, Assistant Professor, Department of Surgery, UPRIMS&R, Saifai, Etawah (U.P.), India. 206130. Contact no. +919415352841, E mail- sprakashsurgery@gmail.com



**Table 1- Comparison of various parameters in both groups**

<b>Parameter</b>	<b>Group A</b>	<b>Group B</b>	<b>P value</b>
<b>Mean Age (years)</b>	<b>37.3</b>	<b>43.2</b>	<b>0.1287</b>
<b>Average increase in TLC (%)</b>	<b>23.4</b>	<b>33.8</b>	<b>0.2655</b>
<b>High Serum CRP level (%)</b>	<b>42.9</b>	<b>53.8</b>	<b>0.0009</b>
<b>Average VAS score on POD1</b>	<b>4.7</b>	<b>8.3</b>	<b>0.0001</b>
<b>Average VAS Score on POD2</b>	<b>1.8</b>	<b>5.6</b>	<b>0.0001</b>
<b>Surgical Site Infections (%)</b>	<b>7.1</b>	<b>23.1</b>	<b>0.0288</b>

# Study of Zooplankton diversity in Bhatye Estuary, Ratnagiri, Maharashtra

Arvind Kulkarni and Madhura Mukadam

Department of Zoology, Gogate Jogalekar College, Ratnagiri (MS) 415612.

**Abstract-** The study area, Ratnagiri is situated at 170North and 730East and having an area of about 50,209 sq miles. The coastline of Ratnagiri district is 250 miles long and marked with several islands, which is a result of drowned topography. Ratnagiri coast has been blessed with luxuriant, thick mangrove vegetation with patches of other associated flora and fauna. Bhatye estuary is situated at 73015' East and 16051' North near Ratnagiri and known for the mangroves on the mud flats. Zooplankton samples were collected by surface hauling by using conical plankton net (80  $\mu$ m bolting nylon). The zooplankton samples were then sorted out making sub-samples. The zooplanktons are the secondary producers and the first level converters of plant matter into animal substances and thus they occupy an important place in the food web of aquatic environments like mangroves. The zooplankton assume a great ecological significance in mangrove ecosystems as this ecosystem is the feeding, breeding and nursery grounds for many fin and shell fishes; and the young fin and shell fishes (meroplankton/larvae) spend most of their live times in the brackish waters, and after becoming adult they move over to sea. Hence, zooplankton determine the quantum of fish stock. The zooplankton species like Acrocalanus species, Eucalanus pileatus, Lucicutia flavicornis, Mesocyclops species and Pontellina plumata dominated the estuarine region.

**Index Terms-** Zooplankton, Eucalanus pileatus, Lucicutia flavicornis, Mesocyclops etc.

## I. INTRODUCTION

Ratnagiri is located on the western coast of Maharashtra and seems to be economically backward area in Maharashtra. Hence, very little attention has been paid to the scientific studies along this coast. Further, it is also known as paradise of Maharashtra and very popular for its scenic beauty and land of sun and sand and off course travelers' delight. Being a coastal district, Ratnagiri enjoys a unique combination of nature's endowment, a significant component of which is the diversity of its coastal habitats characterized by a variety of landforms like beaches, estuaries, island's etc. At Bhatye, river Kajali meets the Arabian Sea and forms an estuarine zone. Various mangrove species along with their associated flora form characteristic vegetation in Bhatye estuarine region. Bhatye Estuary happens to be one of the most important estuarine region (*extends to almost 25 Km inside the coast up to Hattis*) along the Ratnagiri Coast and is breeding ground for most of the commercially important fish species like elasmobranchs, eels, cat fishes, *Chirocentrus* species, sardines, clupeids, *Horpodon nehereus*,

pomfrets, mackerels, seer fishes, tunas, prawns, lobsters and cuttle fishes. The fishery economics of Ratnagiri largely depends on Bhatye Estuary and the favorable area for carrying out fishing activities is 530 ha. Hence this particular area is important from the biodiversity and economics point of view.

Zooplanktons are tiny animals found in all aquatic ecosystems, particularly the pelagic and littoral zones in the ocean. They are one of the primary consumers of the ocean and grazes on the phytoplankton. They themselves are an important food source for large animals (Day *et al.*, 1989) and are important in the remineralization and transport of nutrients (Harris E., 1959) which is very important in the conservation of modern oceanic food webs (Perumal *et al.*, 1999 and Rajasagar *et al.*, 2000). The species diversity and abundance of the community structure of the zooplankton is necessary to assess the potential fishery resource of a place (Varadharajan *et al.*, 2009). Zooplankton provides an important food source for larval vertebrates and invertebrates in natural waters and in aquaculture ponds. It has been reported that in many countries the failure of fishing is attributed to the reduced zooplankton (Rajasagar *et al.*, 2000; Robertson and Blabber, 1992). Present study was undertaken in the mangrove habitats of Bhatye estuary, Ratnagiri. By considering the growing importance of this ecosystem, harboring large faunal communities and highly rich fishing zone, so far no attempt has been made on the biotic community of this was undertaken. Keeping all these facts & figures in view, the present study was focused mainly on the zooplankton diversity of this ecosystem.

## II. MATERIAL AND METHODS

The present study was carried out in the Bhatye estuary, Ratnagiri. Six stations were selected within a stretch of about 25 Km. Three zones were selected for sampling, considering the nature of study area. Zone-I include Station-1 and 2, which is a marine zone. Zone- II as middle zone occupies Mangroves Island (Station- 3 and 4), while Zone- III was riverine zone includes Station-5 and 6. Depth of the water column varied from 3-15 m. Sampling was done from January 2011 to January 2012, fortnightly covering intermediate phase of the tide to avoid tidal effect, if any. Diesel engine boat was used to reach different stations.

Zooplankton samples were collected by surface hauling by using conical plankton net (80  $\mu$ m bolting nylon). A total 50 litres of water was filtered and then transferred in 100ml plastic bottle and later it was preserved in 5 % neutralised formaldehyde solution. The zooplankton samples were then sorted out making sub-samples. Zooplanktons were then identified by using

available literature (Kasturirangan, 1963, Dumont and Tundisi, 1984, Zheng Zhong *et al*, 1989, Santhanam and Srinivasan, 1994, Perumal *et al*, 1999 and Conway and White, 2003). Qualitative and quantitative analysis of zooplankton was carried out by using (Omori and Ikeda, 1984).

### III. RESULTS AND DISCUSSION

The checklist for zooplankton species is shown in Table 1. From this table it is clear that zooplankton species like *Acrocalanus* species, *Eucalanus pileatus*, *Lucicutia flavicornis*, *Mesocyclops* species and *Pontellina plumata* dominated the

estuarine region. The zooplankton are the secondary producers and the first level converters of plant matter into animal substances and thus they occupy an important place in the food web of aquatic environments like mangroves. The zooplankton assume a great ecological significance in mangrove ecosystems as this ecosystem is the feeding, breeding and nursery grounds for many fin and shell fishes; and the young fin and shell fishes (meroplankton/larvae) spend most of their live times in the brackish waters, and after becoming adult they move over to sea. Hence, zooplankton determine the quantum of fish stock.

**Table 1 : Checklist of zooplankton species of Bhatye Estuary, Ratnagiri**

Zooplankton species	Zone I		Zone II		Zone III	
	Stn. I	Stn. II	Stn. III	Stn. IV	Stn. V	Stn. VI
<i>Acrocalanus species</i>	+	+	+	+	+	
<i>Ascolethrix danae</i>	+		+		+	
<i>Calanopia minor</i>		+				+
<i>Calonopia elliptica</i>						
<i>Centropages dorisipinatus</i>						
<i>Codonellopsis ostenfeldii</i>	+		+		+	
<i>Cypris subglobosa (Ostracod)</i>		+		+		
<i>Eucalanus crassus</i>						
<i>Eucalanus pileatus</i>	+	+	+	+	+	+
<i>Eucalanus subcrassus</i>	+		+		+	
<i>Eucyclops species</i>						+
<i>Euterpina species</i>						
<i>Favella brevis</i>	+	+	+	+	+	
<i>Favella philipiensis</i>						
<i>Isias tropica</i>						
<i>copepodid of Cyclopoida</i>						+
<i>Larva of Penaid prawn</i>	+		+		+	
<i>Longipedia coronata</i>						
<i>Longipedia webri</i>		+				
<i>Lucicutia flavicornis</i>	+		+		+	+
<i>Mesocyclops species</i>	+	+	+	+	+	+
<i>Metacalanus aurivilli</i>						
<i>Metis jousseamei</i>	+		+		+	
<i>Microsetella rosea</i>		+		+		
<i>Nauplius of balanus</i>						
<i>Oithona brevicornis</i>		+		+		+
<i>Oithona species</i>						
<i>Oncaea media</i>		+		+		
<i>Oncaea venusta</i>						
<i>Pontellina plumata</i>	+	+	+	+	+	
<i>Pontellopsis macronyx</i>						
<i>Sapphirina auronitens</i>						
<i>Sapphirina species</i>						
<i>Scolecithrix danae</i>		+		+		
<i>Setella gracilis</i>						
<i>Nauplius of Calanoida</i>	+		+		+	+
<i>Phylodiaptomus blanci</i>						
<i>Heliodiaptomus cinctus</i>		+	+		+	

<i>Heliodiaptomus vidus</i>						
<i>Harpacticoid nauplii</i>						

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#### AUTHORS

**First Author** – Arvind Kulkarni , Department of Zoology, Gogate Jogalekar College, Ratnagiri (MS) 415612., Madhuramukadam111@gmail.com

**Second Author** – Madhura Mukadam, Department of Zoology, Gogate Jogalekar College, Ratnagiri (MS) 415612., Madhuramukadam111@gmail.com

# Ferrofluid-Diesel Blend

Sarath Babu Ramachandran

Assistant Professor, Department of Mechanical Engineering, Vidya Academy of Science and Technology, Thrissur, Kerala

**Abstract-** Ferrofluid -diesel blend are fuels for regular diesel engines. The advantages of ferrofluid diesel blend are reductions in the emissions of nitrogen oxides and particulate matters, which are both health hazardous, and reduction in fuel consumption due to better burning efficiency. An important aspect is that ferrodiesel can be used without engine modifications. This paper presents the influence of ferrofluid on the emissions and on the combustion efficiency. Whereas there is a decrease in emissions of nitrogen oxides and particulate matters, there is an increase in the emissions of hydrocarbons and carbon monoxide with increasing ferrofluid content of the blend. The combustion efficiency is slightly improved when ferrofluid is blended with diesel

**Index Terms-** Ferrofluid-diesel blend, ferrofluid, nitrogen oxide emission, engine performance

## I. INTRODUCTION

From the beginning of engine development there has been researches going to purge the emissions as far as possible. There have been many techniques. As combustion itself being a difficult phenomenon, even to scratch its surface would require profound knowledge not only in thermodynamics, but also in fluid mechanics too. Still that won't be enough for travelling such a feet. The main aim of this paper is that to give equitable information in the reduction of formation of NO<sub>x</sub> by reducing the temperature inside the chamber. Combustion being an exothermic reaction it will be impossible for ceasing the formation of NO<sub>x</sub> instead this focuses on a reduction in its formation. For reconnaissance, a combined study of ferrofluid and combustion was performed.

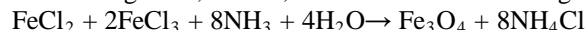
The earlier studies have shown that emulsified fuels and nano particles promote fuel combustion. In this study, an oil-based ferrofluid is added to diesel fuel to explore the effects on engine performance and exhaust emissions of a diesel engine. Using oil-based ferrofluid has advantages compared to other nano powders. It can be diluted and can therefore reap the benefits of water diesel emulsion. The most important preference of ferrofluids compared to other nano particles is that magnetic nano particles can be collected at the exhaust of the engine and they will not cause pollution.

Experimental tests were carried out to investigate the effects of adding oil-based ferrofluid to diesel fuel in a diesel engine. These effects included the combustion performance and exhaust emission characteristics of the diesel engine. Emulsified diesel fuels of 0%, 4%, 8% and 12% ferrofluid/diesel ratios by volume were used in a four-stroke diesel engine at rated speed

## II. FERROFLUID

Ferrofluids are colloidal suspensions of magnetic material in a liquid medium that respond to an external magnetic field. One of the most important features of ferrofluids is their stability, which means that particles in the fluid do not agglomerate and phase-separate even in the presence of strong magnetic fields.

The synthesis of ferrofluid was based on reacting iron II (FeCl<sub>2</sub>) and iron III (FeCl<sub>3</sub>) ions in an aqueous ammonia solution to form magnetite, Fe<sub>3</sub>O<sub>4</sub>, as shown in the following equation:



The cited procedure claims that those nanoparticles diameters are on the order of 10 nm. Furthermore, aqueous tetra-methyl-ammonium hydroxide ((CH<sub>3</sub>)<sub>4</sub>NOH) solution which was used as a surfactant can surround the magnetite particles with hydroxide anions and tetra-methyl-ammonium cations to create electrostatic interparticle repulsion in an aqueous environment

## III. EXPERIMENTAL SETUP AND PROCEDURE

Tests were conducted in the engine using the pure diesel, pure diesel and their various blends, at the rated speed. Starting from no load, the engine was loaded to a load, a little above the rated load. Engine was started and stopped at no load. Enough cooling water supply was ensured. The output power was measured from the energy meter readings, using a stopwatch. The time taken for the consumption of 10cc fuel was also noted. Measurements were taken at no load and then the load was gradually increased to higher values.

Produced ferrofluid mixed diesel was tested in a diesel engine for the performance. Load test was conducted at constant speed and for various percentage of brake power. The setup used for the testing consists of a single cylinder, four-stroke engine, an alternator and an electrical loading arrangement. The alternator is connected to the output shaft of the engine. Bulb type loading was used in the loading arrangement. The various performance measures were found out and plotted against the brake power.

**Table1.Engine specifications**

Engine Made	Kirloskar
Bore Diameter	80 mm
Stroke Length	110mm
No. Of Strokes	4
No. Of Cylinders	1

Rated Power	5 Hp
Rated Speed	1500 Rpm
Type Of Cooling	Water Cooled
Type Of Loading	Electrical Type
Alternator Efficiency	80%

To conduct the engine performance and emission test, the ferrofluid obtained by chemical process is blended with petroleum diesel to get a volume proportion of 4%, 8% and 12% volumetric proportions of ferrofluid. The experiments were conducted at no load, 50% of full load, and 75% of full load conditions with ferrofluid blend and pure diesel operation. Data such as fuel flow, exhaust temperature, exhaust smoke opacity etc were recorded at this condition. Steady state performance and emissions readings are taken during each trial run and the average of the experimental results are used for further calculations.

The NETEL diesel smoke meter is used to measure the opacity of the exhaust gases. Opacity is the extinction of light between light source and photovoltaic receiver. NO<sub>x</sub> and CO emission test were conducted using IR200 Infrared Gas Analyzer

#### IV. RESULTS AND DISCUSSIONS

**4.1 Engine Performance.** The specific fuel consumption (SFC) and the brake thermal efficiency (BTH) can be calculated by the engine torque, the engine speed, and the mass consumption rate of the fuel. For all fuels, the SFC decreases with an increase in the engine load, while the BTH increases with the increase in engine load for all different fuels. This is obvious from the fact that the increase in fuel required to operate the engine is less than the increase in brake power at higher loads. Adding a ferrofluid to diesel fuel will decrease the SFC. According to experimental results, adding 4% ferrofluid to diesel fuel decreased the SFC relatively by 6.06 – 9.09%, adding 8% ferrofluid to diesel fuel decreased the SFC relatively by 8.00 – 15.15% and adding 12% ferrofluid to diesel fuel decreased the SFC relatively by 10.52 – 18.18. The decrease in SFC can be due to the positive effects of nano particles on physical properties of fuel and also reduction of the ignition delay time, which lead to more complete combustion. In addition, it can be due to effects of nano particles on fuel propagation in the combustion chamber. On the other hand, nano particles added to diesel fuel increase the mixture momentum and, consequently, the penetration depth in the cylinder. As a result, combustion is improved.

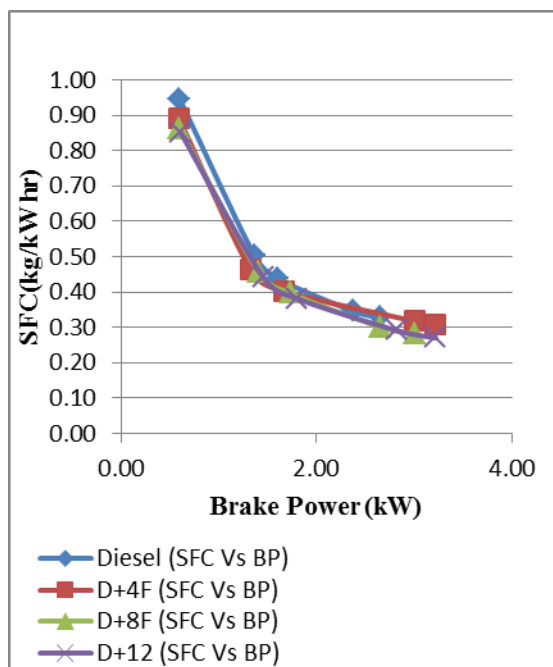


Figure 1.variation of SFC with respect to BP at rated speed

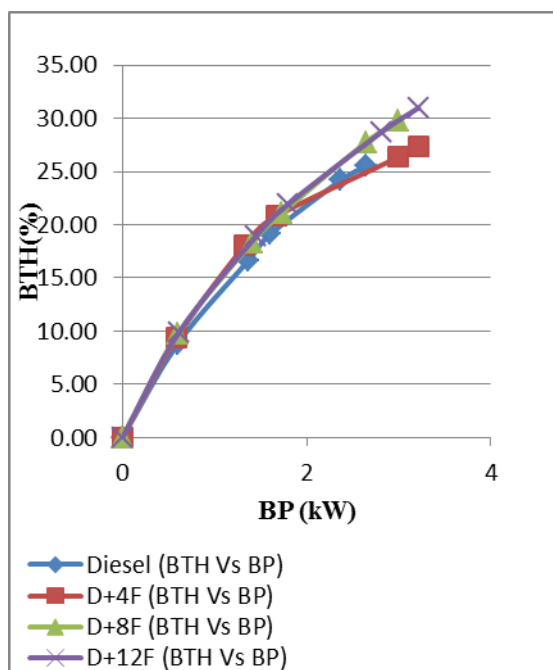


Figure 2.variation of BTH with respect to BP at rated speed

In addition, the higher viscosity of the emulsified fuel than that of the base fuel and the presence of water promote a finer, cloud-like atomization of the emulsified mixture during injection, resulting in improving combustion efficiency significantly. It has been claimed that the water in the emulsified fuel improves the combustion process owing to the simultaneous additional braking of the droplets, to the increase in evaporation surface of the droplets and to better mixing of the burning fuel in air.  $\eta_{BTH}$  is dependent on SFC, and thus the BTH of D+4F D+8F and D+12F improved compared to diesel fuel for the same reasons., BTH

increases with an increase in load for each fuel. Adding 4% ferrofluid to diesel fuel increased the BTH by 6.21 – 9.10 % relatively, adding 8% ferrofluid to diesel fuel increased the BTH by 9.6 – 16.69 % relatively and adding 12% ferrofluid to diesel fuel increased the BTH by 11.07 – 21.43 %. Based on the results, it can be concluded that adding ferrofluid to diesel fuel has a perceptible effect on engine performance

4.2 *NO<sub>x</sub> Emissions.* The variation of nitrogen oxides (NO<sub>x</sub>) emissions with load for different fuels. NO<sub>x</sub> emissions increase with engine load for all fuels. Furthermore, compared with diesel fuel, D+4F, D+8F and D+12F decreased NO<sub>x</sub> emissions at all loads. Adding 4% ferrofluid to diesel fuel decreased NO<sub>x</sub> emissions by 8 to 21 ppm, adding 8% ferrofluid to diesel fuel decreased NO<sub>x</sub> emissions by 12 to 25 ppm and adding 12% ferrofluid to diesel fuel decreased NO<sub>x</sub> emissions by 17 to 30 ppm. Many factors contribute to the formation of NO<sub>x</sub> emissions. According to the Zeldovich mechanism, the formation of NO<sub>x</sub> is dependent on oxygen concentration, residence time, and temperature. This reduction may be due to the latent heat of evaporation of water, the high thermal capacity of water, and also nano particles, which can reduce the temperature in the combustion chamber and consequently reduce NO<sub>x</sub> emissions.

4.3. *CO Emissions.* Adding ferrofluid to diesel fuel increases CO emissions. Adding 4% ferrofluid to diesel fuel increased CO emissions 11 to 18 ppm, adding 8% ferrofluid to diesel fuel increased CO emissions by 23 to 32 ppm and adding 12% ferrofluid to diesel fuel increased CO emissions by 30 to 43 ppm. CO emission greatly depends on the air-to-fuel ratio relative to stoichiometric proportions. Generally, CI engines operate with lean mixture, and hence CO emissions would be low. Nano particles may have affected fuel propagation in the combustion chamber. The increase in CO emission may be due to operation of the engine using D+4F, D+8F and D+12F in different situation compared to diesel fuel..

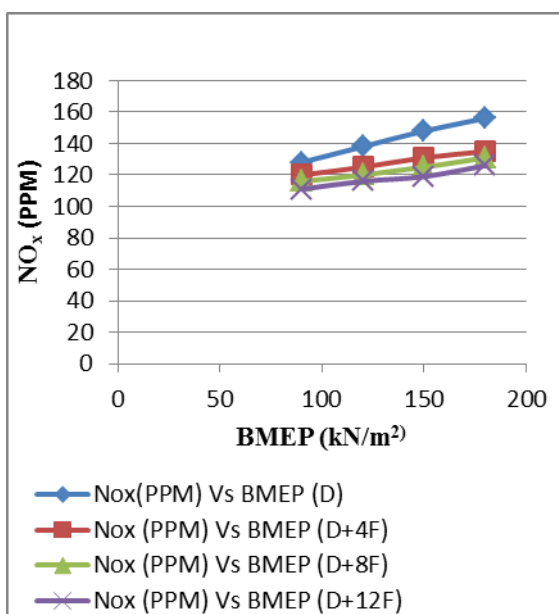


Figure 3. Variation of NO<sub>x</sub> emission with respect to BMEP at rated speed

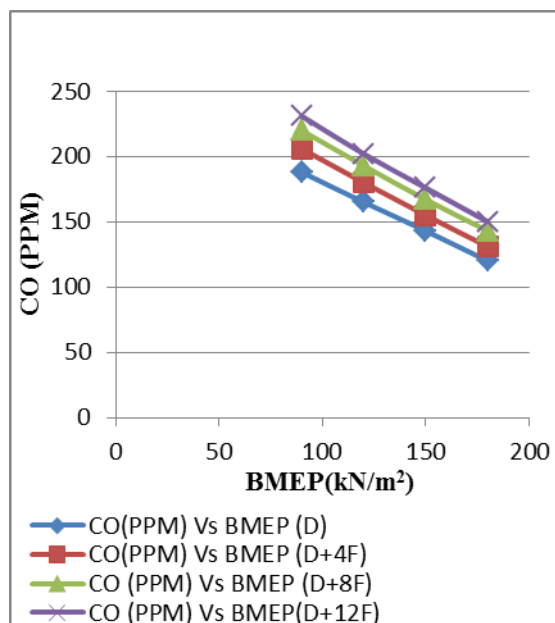


Figure 4. Variation of CO emission with respect to BMEP at rated speed

## V. CONCLUSION

Experimental measurements and analysis were conducted on a four-stroke diesel engine to investigate the effects of adding water-based ferrofluid to diesel fuel. Engine tests were done for emulsified diesel fuels of 0%, 4%, 8% and 12% ferrofluid/diesel at 15000 rpm.

The test results indicated that adding ferrofluid to diesel fuel not only improves engine performance (increasing BTE and decreasing SFC) but also reduces NO<sub>x</sub> emissions. The results showed that increasing ferrofluid concentration will magnify the results.

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AUTHORS

**First Author** – Sarath Babu Ramachandran, \*Assistant Professor, Department of Mechanical Engineering, Vidya Academy of Science and Technology, Thrissur, Kerala  
Email: sarath.b.r@vidyaacademy.ac.in



# Phytotoxicity effect of palm oil mill effluent (POME) on lettuce seed (*L. sativa L.*) after vermifiltration treatment

Siti Azahani Azuar<sup>1</sup>, Hasnuri Mat Hassan<sup>2</sup> and Mahamad Hakimi Ibrahim<sup>1</sup>

<sup>1</sup>Environmental Technology Division, School of Technology Industry, Universiti Sains Malaysia, 11800 Penang, Malaysia

<sup>2</sup>School of Biological Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia

**Abstract-** Palm oil industry is one of the leading agricultural industries in Malaysia and been contributing significantly towards the country's economy and increase standard of living among Malaysians. The raw palm oil mill effluent (POME) is acidic, with a pH level 4.6 and it may cause environmental problems, so that treatment of POME is necessary. In Malaysia, high generation of POME from crude palm oil production is currently treated using conventional method known as ponding system, which is space inefficient. As an attempt to resolve the long-standing dilemma, recent and alternative method such as vermifiltration is being studied and introduced to wastewater treatment. Vermifiltration is a filtration process where solids are separated from liquid aided by earthworms. In this research, the performance of a vermifilter (VF) containing the earthworms, African Night Crawler and a control filter (CF), without earthworms were compared using the mixture of sand and garden soil as vermibed. Worm density of 8 g/L with flow rates 100 ml/min was used in the vermifilter for a 150 day period. The research was conducted at laboratory scale. Both filters, vermifilter and control filter were set as triplicates. The POME pH increased from acidic to neutral. It was observed that vermifilter reactor shows the highest reduction rate of BOD<sub>5</sub>, COD, TSS and turbidity by 92%, 90%, 95% and 86% respectively compared to control filter by 55%, 45%, 65% and 52% respectively. Moreover, the phytotoxicity in treated POME in vermifiltration system was showed through germination test. The result of germination percentage showed germination percentage higher than 50% only for control, 1% and 3% treatments, so this three treatments indicates the maturity of the compost. For 10% and 30% treatments showed germination percentage lower than 50%. For, 100% treatment showed 0% and its proved that 100% of treated POME not safely used for agricultural purposes. Vermifiltration technology can therefore be applied as an environmentally friendly technique and has potential to treat POME.

**Index Terms-** African night crawler, palm oil mill effluent, phytotoxicity, vermifiltration.

## I. INTRODUCTION

Palm oil industry is one of the leading agricultural industries in Malaysia. Palm oil industries have been contributing significantly towards the country's economy and increase standard of living among Malaysians. During the production of one tonne of crude palm oil, more than 2.5 tonnes of POME is produced [1]. The POME is a thick brownish viscous liquid

waste and non-toxic because no chemicals are added during oil extraction but has an unpleasant odor. It is highly polluting [2]. Generally, the average chemical oxygen demand (COD) and biochemical oxygen demand (BOD) in the POME are around 50,000 and 25,000 mg/L, respectively [3]. The POME can cause environmental problems if discharged without effective treatment because it contains high concentrations of oil and grease, organic matter, suspended solids (SS) and plant nutrients. Recently, palm oil mills face a huge challenge in meeting increasingly stringent environmental standards.

Vermifilter (VF) was widely used to treat the wastewater, and appeared to have high treatment efficiencies, including synchronous stabilization of wastewater and sludge. Earthworms have also proved to be master bio-processing agents for the management of organic effluents from diverse sources ranging from domestic sewage to industrial refuse [4]. Therefore, vermifiltration may work as a reliable tool for treatment the POME. *Vermifiltration* using waste eater earthworms is a newly conceived novel technology with several advantages over the conventional systems. A typical system will separate the wastewater solids by allowing wastewater to be gravity fed over filtration material such as fine mesh. The wastewater solids are then biodegraded by worms into humus material [5]. Earthworms' body works as a 'biofilter' and have been found can remove the 5-days' BOD (BOD<sub>5</sub>) by over 90%, COD by 80–90%, total dissolved solids (TDS) by 90–92%, and the total suspended solids (TSS) by 90–95% from wastewater by the general mechanism of 'ingestion' and biodegradation of organic wastes, heavy metals, solids and pathogens from wastewater and also by their 'absorption' through body walls. Besides, earthworms have the capacity to bio-accumulate high concentrations of toxic chemicals in their tissues and kill any pathogen by discharge of anti-pathogenic 'coelomic fluid' and the resulting treated wastewater becomes almost free of chemicals and pathogens to be reused for non-potable purposes [6]. Earthworms will provide low cost solutions to several social, economic and environmental problems of human society. They are both 'protective' & 'productive' for environment and society [7].

In previous studies by [8], the POME had been neutralized by adding Calcium Hydroxide into the POME before introduced into the system. The pH of the POME was adjusted to pH 5-7. The performance of the vermifilter and control system for palm oil mill effluent (POME) treated using the earthworm, *Lumbricus rubellus* were compared based on the water quality measured, with results pointing to the vermifilter's promising potential in reducing the COD and TSS against the control.

The present study employed African Night Crawler (*Eudrilus Eugeniae*) in treating raw untreated POME and focused on remove BOD, COD, and TSS from untreated raw POME using vermifilter system without change the pH of the POME. Besides, in this study the effect of treated POME after through vermifilter system on the growth of selected plant in soil-less culture through seed germination will be investigate to be platform for further scientific study in palm growing countries and to suggest that the POME vermifiltrate can be used safely for agricultural cultivation.

## II. MATERIALS AND METHODS

### A. Raw Sewage

Raw palm oil mill effluent (POME) that used in this experiment was obtained from MALPOM Sdn. Bhd. in Nibong Tebal, Pulau Pinang. It was stored in 10L plastic bottles and was placed in laboratory under room temperature (21 – 25 °C) to allow the POME to cool down. Table 1 shows the characteristics of raw POME that obtained during the experiment. There is great fluctuation in these values depending upon catchment area and flow rate.

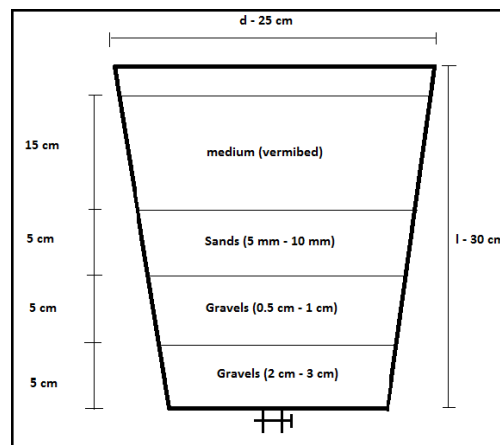
**Table 1: Characteristics of raw POME**

Characteristics	pH	BOD <sub>5</sub> (mg/L)	COD (mg/L)	TSS (mg/L)	Turbidity (NTU)
Raw POME	4.9	25 000	50 000	20 000	15 000 –
	-	30	61	25	20 000
	5.3	000	000	000	

### B. Vermifilter setup

Figure 1 presents the schematic diagram of the vermifilter reactor system which was constructed in close area at the laboratory of School of Industrial Technology, Universiti Sains Malaysia. The bottom most layer is made of gravels of size 2 cm – 3 cm in diameter and it fills up to the depth of 5 cm. Above this lies 5 cm layer of gravels of 0.5 cm – 1.0 cm in diameter. On the top of this is the 5 cm layer of sand of 5 mm – 10 mm sizes. The topmost layer of about 15 cm consists of the mixture of sand and garden soil act as vermibed in which the earthworms are released. Then, the POME is soaked in the medium for one night. This purpose is to stabilize the medium before earthworms is released into reactor. The next day, the earthworms were released at the topmost layer. Earthworms, African Night Crawler were introduced into the vermibed at density of 8 g/L with the flow rates 100 ml/min. The worms were given around one week settling time in the vermibed to acclimatize in the new environment. The density of the earthworms were chosen based on the studies by [9] concerning the performance and mechanisms of a microbial-earthworm ecofilter for removing organic matter and nitrogen from synthetic domestic wastewater. The POME percolated down through various layers in the vermifilter passing through the vermibed inhabited by earthworms, the sandy layer and the gravels under gravitational influence and at the end, the vermifiltrate (the treated wastewater) was collected from the bottom of the system.

POME that obtained during the experiment. There is great fluctuation in these values depending upon catchment area and flow rate.



**Figure 1: Schematic diagram of filter reactor**

### C. The control reactor without earthworms : comparison to assess the precise role of earthworms as biofilter

A control reactor (CF) is the exact replica of vermifilter reactor (VF) but devoid of earthworm. The CF was organized for reference and comparison. It is important to note that the medium, sand particles and the gravels in the reactor also contribute in the filtration and cleaning of POME by adsorption of the impurities on their surface. They provide ideal sites for colonization by decomposer microbes which work to reduce BOD<sub>5</sub>, COD, turbidity, and TSS from POME. As the POME passes through, a layer of microbial film is produced around them together they constitute the ‘geological’ and the ‘microbial’ system of POME filtration. With more POME passing through the gravels there is more formation of ‘biofilms’ of decomposer microbes. Hence it is important to have control reactor to determine the precise role of earthworms in the removal of BOD<sub>5</sub>, COD, turbidity and TSS.

### D. Parameter studied in POME vermifiltration

The POME that was fed to the vermifilter reactor (VF) and control reactor (CF) which was collected at the bottom of the reactor in a chamber were analyzed to study the biochemical oxygen demand of 5 days (BOD<sub>5</sub>), chemical oxygen demand (COD), total suspended solids (TSS), turbidity and the pH value based on the guidelines of APHA Standard Methods For examination of water and wastewater and Standard Methods For The Examination of Water & Wastewater 21<sup>st</sup> Edition.

### E. Germination test

Germination tests were conducted to obtain data on germination percentage of lettuce seed (*L. sativa L.*) with commercial hydroponic solution as control along with five different concentrations (1%, 3%, 10%, 30% and 100%) of treated POME collected after vermifiltration process. A piece of filter paper moistened with sample (10ml) was placed in petri plate. Seeds were treated with 0.2 N mercuric chloride for 2 minutes and washed with distilled water prior to its germination to remove contamination on seed coat. Lettuce seeds were placed on filter paper in a petri plate and incubated for 120 hours in dark

condition at constant temperature  $22^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Germination of lettuce seeds were observed after 120 hours.

### III. RESULTS AND DISCUSSION

#### A. The pH value of treated POME

Results indicate that the pH value of raw POME was improved during the treatment process in both reactor, vermifilter reactor (VF) and control reactor (CF) (Figure 2). The pH of the raw POME is within the range of 4.9 to 5.3. Based on studies, after passing through the both treatment process (VF and CF), the pH of effluent increased to the 6.9 - 7.8 range. In the VF, the pH was within the 7.0 - 7.8 range, which could be due to earthworm mediated rapid mineralization of organic fractions of wastewater. Earthworm activity caused an in-built pH buffering ability by increasing the pH, hence neutralizing the sewage wastewater [10]. In the CF, the pH was within the 6.8 - 7.3. The pH value of the VF and CF improved throughout the experimental study.

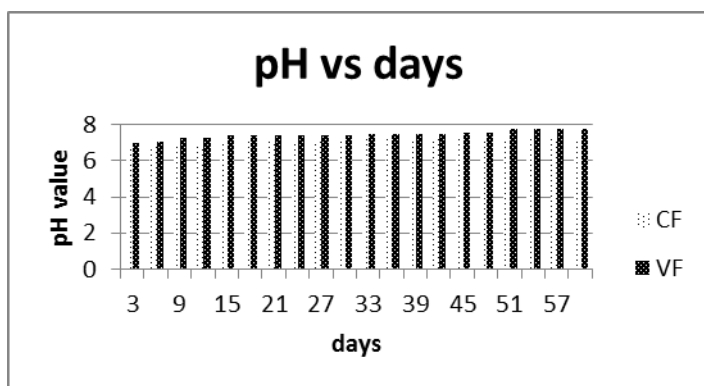


Figure 2: pH value vs day (CF and VF)

#### B. Removal of BOD<sub>5</sub>

The Results in Figure 3 shows that the removal efficiency of BOD<sub>5</sub> of the treated POME in the VF is higher than removal efficiency of BOD<sub>5</sub> in CF, 92% and 55 % respectively. Since the earthworms are primarily accountable to biodegrade waste as compared to inorganic waste through enzyme as a biocatalysts to quicker the rate of biochemical reaction, BOD removal efficiency was found to be much better than that of BOD<sub>5</sub> removal efficiency in CF.

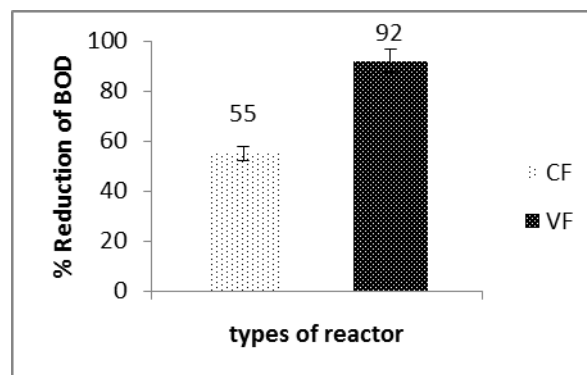


Figure 3: Percentage of reduction in BOD<sub>5</sub> of POME treated by CF and VF.

#### C. Removal of COD

Figure 4 indicates the COD removal efficiency for both types of reactor, vermifilter reactor, VF (with earthworms) and control reactor, CF (without earthworms) during the experimental time. Results show that the average COD removed from the POME by earthworms is over 90% while that without earthworms is just over 45%. COD removal by earthworms is not significant as the BOD, but at least much higher than the microbial system. The enzymes in the gut of earthworms help in the degradation of several of those chemicals which cannot be decomposed by microbes.

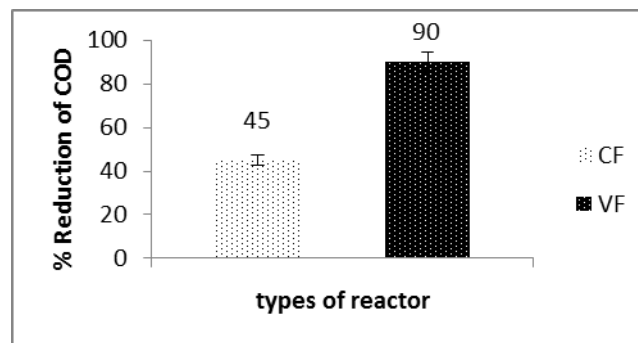


Figure 4: Percentage of reduction in COD of POME treated by CF and VF.

#### D. Removal of TSS

Results shows that the earthworms can significantly remove the suspended solids from the POME by over 95%, which in the control reactor (where geological and microbial system works together) is over 65% only (Figure 5). These solids accumulate over time as 'sludge' and choke the system which ceases to work. However, in the VF, the results suggest earthworms to possess the capability in removing solid fractions from wastewater during VF processes. Suspended solids are trapped on the surface of vermifilters and processed by earthworms, being subsequently fed to soil microbes immobilized in the vermifilter [5]. This explains why the vermifilter reactor did not choke and work smoothly. Earthworms eat up the solids and also improve the 'adsorption' properties of the geological system by grinding them in their gizzard.

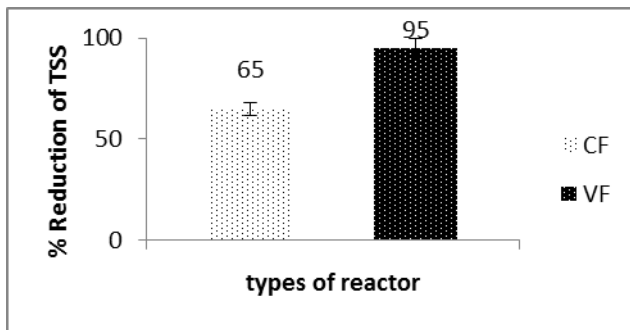


Figure 5: Percentage of reduction in TSS of POME treated by CF and VF.

E. Removal of turbidity

Results shows that the average reduction in turbidity is over 86% for vermifilter reactor (VF) and 52% for control reactor (CF) (Figure 6). The geological system plays very important role in turbidity removal by ‘adsorption’ of suspended particles on the surface of the vermifilter medium, sand and gravels in addition to the earthworms’ activity.

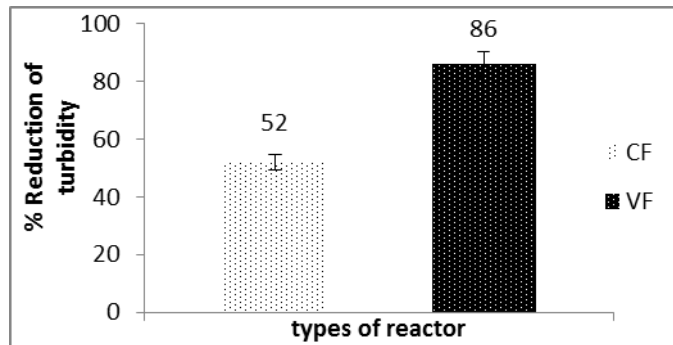


Figure 6: Percentage of reduction in turbidity of POME treated by CF and VF

F. Phytotoxicity

Germination test was conducted by using lettuce seed (*L. sativa* L.). Germination percentage was calculated and showed in Figure 7. Seed germination has been used for evaluating the maturity of compost in degree of decomposition of phytotoxic organic substances [11]. However, according to [12], seed germination also a well-known and rapid method for phytotoxicity test. Germination percentage of >50% indicates the maturity of the compost [13] and findings (Figure 7) showed germination percentage higher than 50% only for control, 1% and 3% treatments. For 10%, 30% and 100% treatments showed germination percentage lower than 50%. Phytotoxic effects of organic wastes are due to several factors, including heavy metals [14] and salts [15]. POME contains high electrical conductivity that might be one of the factors that may inhibit plant growth and germination [16]. Therefore, it explained the lower germination percentage showed by 10%, 30%, and 100% concentration of treated water because its contains POME with high electrical conductivity. Besides, according to [14] the delay in germination can cause by metal content present which explain lower germination percentage exhibits in treated water because POME contains high heavy metals.

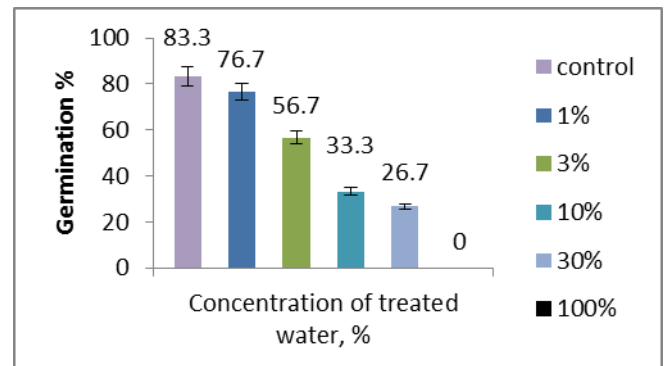


Figure 7: Germination percentage of control (commercial hydroponic solution) and different concentration of treated water (POME 1%, 3%, 10%, 30% and 100%).

IV. CONCLUSION

Vermifiltration system was effective to remove biochemical oxygen demand (BOD<sub>5</sub>), chemical oxygen demand (COD), total suspended solid (TSS) and turbidity in POME. However, in the control reactor (CF) the systems fails to work for longer time as it is frequently choked due to the formation of sludge and colonies of bacteria and fungi in the absence of the earthworms. POME treated by vermifilter (VF) indicates a better reduction in BOD<sub>5</sub>, COD, TSS and turbidity compared to CF system. The pH of the treated POME in VF increased from pH 7.0 to pH 8.0 and remained stable throughout the process. The pH comply the Malaysia Sewage and Industrial Effluent Discharge Standard. The result of germination percentage showed germination percentage higher than 50% only for control, 1% and 3% treatments, so its proved the maturity of the compost. For 10% and 30% treatments showed germination percentage lower than 50%. For, 100% treatment showed 0% and its proved that 100% concentrations of treated POME not safely used for agricultural purposes. Therefore, vermifiltration of POME had been found to be generally good and effective way to treat POME but not good enough for agricultural purposes because it contains high toxicity level.

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#### AUTHORS

**First Author** – Siti Azahani Azuar, Environmental Technology Division, School of Technology Industry, Universiti Sains Malaysia and hanie\_89@hotmail.com

**Second Author** – Hasnuri Mat Hassan, School of Biological Sciences, Universiti Sains Malaysia and hasnurimh@usm.my

**Third Author** – Mahamad Hakimi Ibrahim, Environmental Technology Division, School of Technology Industry, Universiti Sains Malaysia and mhakimi@usm.my

**Correspondence Author** – Siti Azahani Azuar, hanie\_89@hotmail.com

# Faustian Myth in Herman Melville's *Moby Dick*

Anuma

University of Delhi

## I. INTRODUCTION

In this paper, I am going to explore Faustian Myth in Herman Melville's *Moby Dick* (1851) which is an outstanding work of American Renaissance and Romanticism. This novel is about an irrevocable quest of Ahab, captain of the whaler *Pequod*, to seek revenge on Moby Dick, a whale which has destroyed his ship on his previous voyage that severed his leg from the knee. Here, in this paper I am not relating Faust's story to this novel in a traditional way by talking about devil, pact and damnation but regarding this novel Faustian by the characteristics that it shares with the character of Faust by examining its boundless aspirations, its expansionism, its identification of knowledge with power, its attempt to subdue nature, its yearning for control over its own destiny.

Herman Melville (1819-1891) was an American writer most famous for his novel *Moby Dick* although the fame from the novel came posthumously. Melville did experience fame in his lifetime from *Typee*, however, although in typical United States fashion, he first had to get the travelogue published overseas in London in 1846 before receiving wide acclaim stateside a year later for the sensational account of a tribe attributed to acts of cannibalism that had to be billed as a novel because few believed the truthfulness of his narrative. His books written directly after *Typee* were initially released by his publishers with the intent of drawing as much popular acclaim but soon it was discovered that Herman Melville was not out to titillate the masses with exoticisms but had some depth in his questioning of human existence. The excitement over Melville as a man may be held responsible for sometimes excessive praise of his writing, for the elaboration of awful but often improbable "hidden meanings" and for the amusing contradictory opinions among enthusiastic critics. To Lewis Mumford, for instance, Melville is always a conscious artist; to Van Wyck Brooks he is an unconscious artist. To M. Josephson, Melville is an escape writer; to Mumford he is a realist in the deeper sense.

Melville's principal concern in all his novels are "a concern with the problem of self discovery and self realization". In *Moby Dick*, the voyage is, literally or metaphorically, one into "landlessness". the whaler *Pequod's* voyage into landlessness is Melville's version of the Romantic transformation of the Faustian ethos. This novel is a Faustian venture in its epic ambitiousness, thus represents Melville's efforts to understand some deeper spiritual truths. Melville's interest was to sought the new world, that is the world of mind. The Faustian mind aimed at knowledge of and, through knowledge, at benefit from or mastery over the forces it perceived. Faustian space symbolized the soul's claim to dominance over what is "other".

In *Moby Dick* Melville confronts this collapse of Faustian space and its consequences. The experience of space is the

central factor in *Moby Dick*. At first Ishmael voices the traditional Faustian yearning for "limitless space": " I am tormented with an everlasting itch for things remote." In order to satisfy this yearning, he has repeatedly shipped as a merchant sailor(p. 15). His now opting for a whaling voyage will lead to a very different experience, although his early remarks reveal a duality of purpose consonant with traditional Faustian aspirations: he wants to experience not only the sea, which in the symbolic world of *Moby Dick* is the mirror of the self, but also alien worlds beyond the sea, that is, the truly "other". this journey of *Pequod* bears out this landlessness, this failure to encounter "otherness". The voyage becomes an experience of the void that leads to a heightened experience of the self. Here, Ahab like Faust suffers boundless solitude. Ishmael also suffers this despair and isolation. this is a voyage towards self where characters face ultimate truth that is the realization of self. The real object of Faustian quest is self in all its mysterious complexity. in this way, this novel is a product of the mind which has turned its attention from chaos and confusion towards the contemplation of mind. this voyage is an endeavor to see more clearly into the mystery of the self, but this endeavor being in vain, the mystery looms for ever unresolved. the confrontation with the whale most clearly reveals the problems facing Faustian man. The whale as symbol brings us closer to the Faustian quest in its romantic stage than the whale as objective reality: what is sought after is no longer knowledge of the "other" but knowledge of the self. Ishmael's interpretation in "The whiteness of the Whale" is the least definitional of all, and it is for that reason symbolically the truest: more than anyone else Ishmael hints at the insoluble ambiguities the endless mysteries suggested by the whale, whose color serves to reinforce his role as "phantom" and "idea", since whiteness" in its profoundest idealized significance... calls up a peculiar apparition to the soul" (p 166).

*Moby Dick* demonstrates that when the "not me" becomes a mystery inaccessible to the mind and thus, in effect, a void, the "me" becomes a mystery insusceptible to definition. Ahab, who does not know whether the whale is "agent" or "principal", inscrutable mask or inscrutable essence (p 140), has the same questions concerning the whale's counterpart, himself: "Is Ahab, Ahab? Is it I, God, or who, that lifts this arm?" (p 445). Ahab's plight is prefigured in his fantasy of the artificial man that he wants the blacksmith to forge. He does not want him to have "eyes to see outwards," but instead "a skylight on top of his head to illuminate inwards"; within, however, there is only a void, since the artificial man, though endowed with a "chest modeled after the Thames tunnel, " will have "no heart at all" (p 390). In reference to the lack of progress into knowledge characterizing his quest, Ahab claims that " we are turned round and round in this world" (p 445). The loss of "otherness" entails a reduction of the Faustian quest to an endless solipsistic circle from which there is no escape into something even resembling an absolute.

Ishmael's emancipation from traditional Faustianism is incomplete so long as he has not transcended what Kierkegaard considered man's self-defeating desire "to lay hold of something so really fixed it can exclude all dialectics, so long, that is, as he even desires a "final" answer. As a participant in the action of the novel, Ishmael shares with Ahab, Bulkington, and the others the dilemma inherent in the pursuit of an aim fatally beyond human reach. But Ishmael dives but is not annihilated. He survives to become the narrator of the action he participated in, and it is as narrator that he best exemplifies the essence of Romantic Faustianism, the recognition that "the goal of the journey of life is the experience of the journey itself." Ishmael never gets any answer from this circular quest:

Round the world! There is much in that sound to inspire proud feelings; but whereto does all that circumnavigation conduct? Only through numberless perils to the very point whence we started ... Were this world an endless plain, and by sailing eastward we could forever reach new distances, and discover sights more sweet and strange than any Cyclades or Islands of King Solomon, then there were promise in the voyage. But in pursuit of those for mysteries we dream of, or in tormented chase of that demon phantom that, some time or other, swims before all human hearts; while chasing such over this round globe, they either lead us on his barren mazes of midway leave us whelmed. (p 204).

There are two types of Ishmael's character in the novel. In Walter E. Bezanson's words, "the first Ishmael is the enfolding sensibility of the novel, the hand that writes the tale, the imagination through which all imagination of the book pass. He is the narrator... The second Ishmael is not the narrator, not the informing presence, but is the young man of whom, among others, narrator Ishmael tells us in his story... This is forecastle Ishmael or the younger Ishmael of 'some years ago'. Narrator Ishmael, moreover, is concerned with both narrative and narration. When focusing on narrative, he tries imaginatively to recapture the moods and hopes and perceptions of forecastle Ishmael and his companions; his narrative deals with the then, with an experience already completed. When focusing on narration, Ishmael's concern is with the now- with his ongoing

endeavor to put into words what happened then. The now, representing an experience not yet completed, puts its stamp upon the books as emphatically as the then: novel "is always in process and in all but the most literal sense remains unfinished. For the good reader the experience of the novel is participation in the act of creation. Authorial Ishmael's endeavor to give form and tentative meaning to his journey in the Pequod resulted in a book that is as much about the experience of writing a book as about the experience recalled in the book. And in a sense, the writing turned out to be as frustrating as the journey: both experiences fail to provide answers to the questions they evoke. The difference consists in Ishmael's responses to these failures; and his responses reveal different Faustian selves.

In its demonstration of the failure of traditional Faustianism, the novel is a deeply pessimistic book: all the aspirations of the captain and crew, whether other directed or inner directed, meet with frustration or disaster. In this way, this novel explores Faustian quest.

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#### AUTHORS

**First Author** – Anuma, University of Delhi

# EMPIRICAL REVIEW ON THE DETERMINANTS INFLUENCING FIRM PERFORMANCE IN DEVELOPING COUNTRIES

Mohammed Sani Abdullahi\*, Aminu Abubakar\*, Rahama Lami Aliyu\*, Murtala Bala Umar\*\*

\*Department of Business Administration and Management. School of Management Studies  
Kano State Polytechnic, Nigeria. P.M.B.: 3401 Kano State, Nigeria.

\*\*Faculty of Economics and Management Sciences. Universiti Sultan Zainal Abidin, Malaysia.

**Correspondence Author** – Mohammed Sani Abdullahi. Email: abdulmohdsani@gmail.com  
Tel: +60142125771, +2348036609594.

**Abstract-** It has been discovered that firm performance was influenced or affected by so many factors or variables either positively or negatively. The objective of this paper is to review empirical literatures on the determinants influencing firm performance in developing countries. This study reviews almost fifty articles from different academic journals, and it discovered different variables or factors that influences or affects firm performance in developing countries. Most of the empirical studies reviewed make used of Ordinary Least Square (OLS) as the method of data analysis, and majority of the studies does not state their sample size, method of data collection, and the theory or theories that support and give direction to their studies. The finding of the articles reviewed varies some are with positive or negative results while others are with both positive and negative results. This study suggests that future researchers should make use of variables that serves as the determinants of firm performance in developing countries. The methodology should be clearly stated in term of sample size, and method of data collection. Structural equation modeling (SEM) that serves as method of data analysis is suggested that was known as the second generation method because base on the literatures reviewed it shows that regression analysis was the most used method. Finally, theory or theories should also be used by future researchers to support their study and at the same time it give suitable direction and meaning to a study. This study serves as a guide for further studies especially in developing countries.

**Index Terms:** Firm Performance, Regression, Influencing, Affecting, SMEs, and Determinants

## I. INTRODUCTION

Firm performance is often compounded by criteria such as profit margin or increased turnover (Elizabeth & Baines, 1998). In several researches, the word performance and success are used interchangeably, and there are used in this study. Sandberg et al. (2002) stressed that performance is the ability to contribute to job and wealth creation through firm start-up, growth, and survival. According to Elizabeth and Baines (1998) and Pasanen (2003) opined that success is often equated with the

achievement of defined and measurable goals or objectives in all sectors of human life, which may be of subjective (Non-financial nature) as well as objective (Financial nature). Firm performance is substantially influenced by so many factors (Elizabeth & Baines, 1998). In business, there are two major streams on the determinants of firm performance. One is based primarily upon an economic tradition, emphasizing the importance of external market factors in determining firm success. The other line of study builds on the sociological and behavioural paradigm or factors and sees organizational factors and their environment as the major determinants of firm success. Within this school of thought, little and direct attention is given to organization competitive position (Buzzell & Gale, 1987).

Previous financial and non-financial literature has not come to a definitive conclusion as to what factors determine firm performance during any state of the economy (Rumelt, 1991). Several studies such as Altman (1968) and Ohlson (1980) developed different bankruptcy prediction models that determine factors that influenced or affect firm performance during various economic times. Many researchers (Hawawini, Subramanian, and Verdin, 2003) stressed that industry or external firm factors play major roles in dictating the influence of firm performance. On the other hand, other researchers (Opler and Titman, 1994) opined that internal factors of a firm's stand as the major determinants of the operating performance and there are the major drivers for competitive advantage or success which is crucial for surviving economic downturns of any developing country.

The objective of this paper is to review empirical literatures on the determinants influencing firm performance in developing countries. This paper cover three section. The first section highlight introduction to the study. The second section review empirical literatures while the last section concludes the study.

## II. EMPIRICAL REVIEW OF LITERATURES

Lim (2004) carried out a study to investigate the Impact of Employee's Training Programme on the Performance of Small and Medium Enterprises in Northern Malaysia". SMEs



investment in employees training programme, SMEs application of information technology (IT) in employees training programme, and SMEs human resources (HR) development function in employees training programme are the factors that influence or impacted on SMEs performance. The population of the study was the manufacturing SMEs in Northern Malaysia listed in the Federation of Malaysia Manufacturing Directory in Malaysia Industries, 2003. And a set of questionnaire was designed and mailed to the selected SMEs, and multiple regression analysis was used to test the hypotheses under study. The finding of the study indicates that there is positive relationship between SMEs investment in employees training programme and SMEs performance, and the result indicate that there is no relationship between SMEs application of IT in employees training programme and SMEs performance and between SMEs HR development functions in employees training programme and SMEs performance.

Abor (2007) examine Debt Policy and Performance of SMEs; the study was a comparative one both in Ghana and South African. The researcher used debt policy/ratio that includes short-term debt ratio, long-term debt ratio, total debt ratio, and trade credit as the variables that influenced the performance of SMEs. Panel data was used in the study, and it was analyzed by regression analysis to find a relationship between variables. The result of the study spelled out that using measures of performance; the finding indicates that capital structure affects or influences financial performance but not exclusively. The result also reveals that capital structure, most especially long-term and total debt ratios, adversely affect the performance of SMEs. The study also indicates that agency issues may lead to SMEs pursuing high debt policy and resulting in lower performance.

Zindiye et al. (2008) carried out a study investigate into the Factors Affecting the Performances of SMEs in the Manufacturing Sector of Harare, Zimbabwe. The researchers make use of skilled human resources, management skills, economic factors, and economic initiative as the factors that influenced the performance of SMEs. Questionnaire was used to collect data for the study and statistical tools such as ANOVA (Analysis of Variance) as well as regression analysis were employed to test the data statistically. The finding of the study reveal that lack of skilled human resources results in poor performance of SMEs, management skills play a significant role in the performance of SMEs, economic factors were found to have the most prominent relationship to business performance and economic initiation were found to have a significant effect on business performance.

In a study conducted by Ebaid (2009) identify the Impact of the Capital Structure Choice on Firm Performance: Empirical Evidence from Egypt. The researcher uses capital structure, short term debt (STD), total debt (TD), and long time debt (LTD) as the variables or factors that have an impact on firm performance. The researcher make use of secondary data traded on the Egyptian stock exchange during the period of 1997-2005, and also multiple regression method of analysis were used in the research to estimate the relationship between the leverage level and firm performance. The study finding indicate that using three accounting- based measure of financial performance (example, return on equity, return on asset, and gross profit margin), and also based on a sample of non-financial Egyptian listed firm from

1997-2005. The finding shows that capital structure choice decision, in a general term has a weak-to-no impact on firm performance.

Kampumure (2009) carried out research to investigate Leasing Competence, Lease Structure and Perceived Performance of Small and Medium Scale Enterprises in Uganda. The researcher makes use of leasing competence and lease structure as the variables that influenced perceived performance of SMEs. Sample of one hundred and thirty-two SMEs located in Kampala district was selected, and also the data use for the study data was collected using a questionnaire filled in by SMEs managers and it was analyzed using statistical package for social science (SPSS) version 11 and Excel software, and also regression was used to test the hypotheses. The study result shows that there is a significant positive relationship between the leasing competence and perceived performance. These mean that leasing competence of lessee manager leads to improved perceived performance of SMEs. And also the study revealed that there is a significant and positive relationship between lease structure and perceived performance, meaning that the more favourable lease structure, the higher the perceived performance of lessee SMEs.

Aziz and Yasin (2010) conducted research to assess How will Market Orientation (MO) and External Environment (EE) Influence the Performance among SMEs in the Agro-Food Sector in Malaysia?. MO involves customer competitor orientation, inter-functional coordination, and information while EE include market technology turbulence, and competitive intensity are all the factors that influenced business performance. Questionnaire was issue to the managers of the selected food and beverage manufacturers' directory, which serves as the sources of data used for the study, and regression analysis was used to test the hypotheses of the study. On the MO, the result indicates that customer-competition orientation and information dissemination were positively related to business performance while inter-functional coordination is not related significantly to business performance. In the same line, the result of external technology turbulence and competitive intensity does not moderate the relationship between MO and business performance.

Mohd et al. (2010) examine the Moderating Effect of Government Policy on Entrepreneurship and Growth Performance of Small and Medium Enterprises (SMEs) in Cambodia. In their study, the researchers use entrepreneurial value, firm financing, management, market practices, and Government policy as the factors that influenced the growth performance of SMEs. Survey method was used to gather two hundred and twenty usable questionnaires from SMEs owner/managers in the city of Phnom Penh in Cambodia, and multiple regression analysis was used to determine the result. The finding of the study indicates a positive relationship between entrepreneurial value, firm financing, management, market practice and growth performance of SMEs. The result also confirms that government policy has an essential role as a full moderator in such relationships.

Chittithawan et al. (2011) in their work Determine the Factors Affecting Business Success of Small and Medium Scale Enterprises (SMEs) in Thailand. In their study management and know-how, customer and market, SMEs characteristic, the way of doing business and cooperation, product and services,

resources and finance, strategy and external environment are used as a variable that influences business success of SMEs in Thailand. Data use for the study was collected through Survey questionnaire, and ordinary least square was used to measure or test the hypotheses under study. The result of the study revealed that SMEs characteristic, customer and markets, the way of doing business and cooperation, resources and finance, and external environment has a positive and significant effect on the business success of SMEs in Thailand.

Fatoki (2011) evaluate the Impact of Social, Financial, and Human Capital on the Performance of SMEs in South African. Questionnaire were used as the method of data collection, and three hundred and thirty-two questionnaire was self-administered, but only one hundred and twenty-two was returned, and ordinary least square method were used to test the hypotheses under study. The result of the research work revealed that there is a positive relationship between human, social, financial capital and the performance of SMEs.

Hassim et al. (2011) investigated the Effects of Entrepreneurial Orientation on Firms Organizational Innovation and Market Orientation towards Firm Business Performance in Malaysia. The researchers use entrepreneurial orientation, market orientation, and innovativeness as the factors that affect or influenced the firm business performance. Data was collected through questionnaire from SMEs in Malaysia, according to Business Directory, there are sixteen thousand nine hundred and twenty (16,920) SMEs in Malaysia, and nine hundred questionnaire was administered through mail to the SMEs firm, and also only three hundred and ninety-eight responses were received which was for the study. And the hypotheses were analyzed through multiple regression. The findings of the study indicate that entrepreneurial orientation and innovativeness has a positive effect on firm business performance while market orientation exhibits an adverse effect on firm performance. The external environmental factors have a moderating effect on the correlation or relationship between market orientation and firm performance.

In a research conducted by Islam et al. (2011) assess the Effect of Entrepreneur and Firm Characteristics on the Success of SMEs in Bangladesh. The business success of SMEs was influenced by the characteristics of entrepreneurs and characteristic of the firm. Primary method was used through a questionnaire to collect data, and also the data collected was analyzed by SPSS. The finding of the study indicates that characteristics of entrepreneurs are the significant factor for business success of SMEs, while firm characteristics are also indicated not to be a significant factor in the business success of SMEs in Bangladesh.

In a similar research, carried out by Jasra et al. (2011) examine the Determinants of Business Success of Small and Medium Enterprises in Pakistan. Financial resources, marketing strategy, technological resources, government support, information access, business access, business plan and entrepreneur skills are used as the variables that influenced business success. Data was collected for the study through Survey questionnaire, and regression method was used through SPSS software to test the hypotheses variable under study. The result of the study signifies that there is a significant and positive relationship between business success and its determinants. The

findings also indicate that financial resources are essential factors in the success of the business perceived by small and medium enterprises.

Mudavanhu (2011) identify the Determinants of SMEs Failure in Zimbabwe: A study of Bindura. The study make use of education, availability of credit, cost of raw material, and domestic competition as the determinant or factors that influenced SMEs failure whereby the proxy of SMEs failure is return on investment (ROI). Data for the study was collected or gathered through formal and informal interviews, questionnaires and also through focus group discussion with SMEs which were selected randomly from different clusters that represent various industries, and OLS was used as the method of analysis. The result shows that the unavailability of credit, lack of general knowledge of business management; import competition and high cost of raw material are the primary causes of SMEs failure in Zimbabwe.

Okpara (2011) investigate the factors constraining the growth and survival of SMEs in Nigeria: implication for poverty. The research makes use of financial, lack of management, corruption, and infrastructure as variables that affect or influenced the performance of SMEs. A questionnaire was used to collect data from two hundred and eleven small business owners and managers located in the cities of Aba, Onitsha, Abuja, and Lagos in Nigeria. The was analyzed descriptively, and multiple regression analysis was used through SPSS, and the result shows that financial constraints, lack of management, corruption, and infrastructure constraints are negatively correlated with small business performance, and also the result of the research work indicate that the most constraints that hinders small business growth and survival in Nigeria are mostly lack of financial support, corruption, poor management, lack experience and training, insufficient profits, poor infrastructure and low demand for product and services.

Similarly, Philip (2011) carried out research in other to investigate the factors affecting Business Success of Small and Medium Enterprises (SMEs) in Bangladesh. The researcher makes use of product and services, external environment, management and know-how, resources and finance, a way of doing business and cooperation, and SMEs characteristics as the factors that affect the business success of SMEs. Questionnaire was used to collect data, and it was analyzed by through SPSS software that gives relevant analysis in terms of reliability analysis, frequency analysis, regression analysis, one-way ANOVA and T- test. The result of the study shows that the most variable that affect business success of SMEs were management know-how, products and services, the way of doing business, and external environment, and there has significant relationship with business success of SMEs. But resources and finance and SMEs characteristics do not have a significant relationship with the business success of SMEs.

In a study conducted by Machirori (2012) identify the Impact of Networking on Access to Finance and SMEs performance in the Buffalo City Municipality, Eastern Cape town of South Africa. Based on the study performance of SMEs was influenced by the following factors or variables that are entrepreneurial characteristic, firm characteristic, networking, access to debt finance. Primary research instrument known as questionnaire was used to collect data, and also regression

analysis was used through SPSS to analyze the data. The result reveals that the gender and education of SMEs owner and also the age, legal status, and size of SMEs are the entrepreneurial and firm characteristics that are positively related to networking by SMEs. Also, the result indicates that there was a positive and significant relationship between networking and access to finance and performance of SMEs. The result of this research work also indicates that access to debt finance slightly mediates the relationship between networking and performance of SMEs.

Moorthy et al. (2012) carried out research to assess the Factors Affecting the Performance of SMEs in Malaysia. Effective entrepreneurship, appropriate human resource, use of marketing information, and application of information technology are utilized by the researchers as the factors that affect or influenced the performance of SMEs. In their study a total of three hundred set of questionnaire was presented via email to the randomly SMEs selected in the manufacturing industry all over Malaysia to collect data for the study and the variables were tested through multiple regression analysis, and also the findings of their study indicates that there is an adverse relationship between ineffective entrepreneur as well as inappropriate human resources management and the performance of SMEs. And also the result indicates that there is a positive relationship between the use of marketing information, application of information technology and the performance of SMEs. In short, the study discovered that the use of marketing information can influence or affect the performance of SMEs at the highest.

Olugbenga (2012) conducted a study to assess the Policy Support and Performance of SMEs in South West Nigeria. In the study performance of SMEs, was influenced or affected by technology, infrastructure, and finance. Primary data was employed to get access to information from one hundred and forty-four bakery firms from South-West Nigeria, and also primary data were sourced using interview and questionnaire administration, and also regression analysis was used to estimate the model. The result of the study revealed that technological and financial support impacted positively on the performance of the SMEs and while infrastructural facilities are negatively related or correlated with the performance of SMEs in Nigeria.

Yahya et al. (2012) investigate the Impact of Training on Small and Medium Scale Enterprises (SMEs) Performance in Malaysia. A survey questionnaire was used for data collection from the sample SMEs under study, and the study used regression analysis method to measure the impact of training on SMEs performance, and also the result of the study found that training has a positive and significant impact on SMEs performance.

Ahmad et al. (2012) investigate the New Determination of Factors Affecting the Growth of Small and Medium-Sized Enterprises in Pakistan. Access to finance, public and private partnership, lack of training and education, stress, lack of motivation, lack of political stability, bureaucracy, lack of management, access to public infrastructure, and inflation, was used by the factors that influenced growth of SMEs. Questionnaire gathered data for the research, and Pearson correlation analysis was used to analyze the data through SPSS. The finding of the study shows that access to finance, public and private partnership, lack of training and education, stress, lack of

motivation, lack of political stability, bureaucracy, lack of management, access to public infrastructure and inflation are positive associated with the growth of SMEs. Lack of training and education shows the highest correlation with growth of SMEs and bureaucracy demonstrates the second highly correlation with growth of SMEs followed by access to finance, public and private partnership, stress on employees, lack of political stability, lack of management, access to public infrastructure and inflation all have positive association with growth of SMEs, while lack of motivation was reveal as the least but positive correlation with growth of SMEs.

Akinruwu et al. (2013) conduct a study to investigate the Determinants of Small and Medium Scale Enterprises Performance in Ekiti State, Nigeria: A Business Survey Approach in Nigeria. The researcher makes use of funding, political, education, infrastructure, Government policy, raw-material, entrepreneur competencies, customer patronage, technology and distribution channels as factors that influenced SMEs performance. Survey questionnaire was used to collect data, and also the data gathered was analyzed through SPSS whereby regression analysis was also employed to provide an accurate result of the study. The result of the study indicates that funds, managerial skills, government policy, education, infrastructure, and entrepreneur competencies are significantly related to the performance of SMEs at 5% level of significant. By ranking funds, were considered most important follow by education, government policy, management skills, and infrastructure. While political, raw-material, customer patronage, technology, and distribution channel do not have positive and significant relationship with SMEs performance.

In a study carried out by Amwele (2013) examine the Empirical Investigation into the Factors Affecting the Performance of Small and Medium-Sized Enterprises in the Retail Sector in Windhoek, Namibia. In the study entrepreneur characteristics, SMEs characteristics, management and know-how, way of doing business and operation, products and services, customers and market, resources and finance, external environment, business strategy, innovations and training, competition, infrastructure, Government interventions and corruption are all found to be the factors that affect business performance. Questionnaire was used to gather data from the respondents, and the data was analyzed through descriptive statistics such as mean for central tendency and standard deviation for variability. The finding of the study shows that entrepreneur characteristics, SMEs characteristics, management and know-how, way of doing business and operation, products and services, customer and market, business strategy are not an obstacle to the SMEs performance, while resource and finance, and external environment are the obstacles to SMEs performance. And also the result further indicate that innovation and training, infrastructure, and government intervention and policy had an adverse impact on the current performance of SMEs, but the finding shows that competition has an adverse impact or influenced by the current SMEs performance.

Dermol (2013) determine the Influence of Training and Training Transfer Factors on Organizational Learning and Performance in Slovenia. In the study volume and quality of training, supervisor support, peer support, acquisition and interpretation of information, organizational incentive, and

cognitive and behavioural changes are the factors or variables that influenced company performance. In the empirical analysis, structural equation modeling was used based on a sample of two hundred and forty-seven Services Company. The study indicates that there is a positive relationship between supervisor support and organizational incentives for training transfer. Organizational incentives are directly related or correlated with both studied company-level training outcomes, also the acquisition and interpretation of information, cognitive and behavior changes. Also, they are also indirectly related or correlated with the company performance through encouraging cognitive and behavioural change. The volume and quality of training are correlated and related only to the acquisition and interpretation of information while here is no direct relationship or correlation with company performance.

Egbuna and Agali (2013) identify the effect of planning on the performance of small and medium enterprises in South Western Nigeria, using economic instability, source of finance and planning as factors that influenced performance of SMEs. A structured questionnaire was used as a method of data collection from SMEs under study, and descriptive statistic such as table, charts, frequency and percentage was used to analyze the data collected. The result shows that economic instability and access to sources of finance are the major challenges or obstacle facing SMEs, and proper planning can increase the productivity and profitability of SMEs in Nigeria, and the result further indicates that planning has a significant effect on performance of SMEs.

Hove and Tarisai (2013) carried out a study to assess the Internal Factors Affecting the Successful Growth and Survival of Small and Micro Agri-Business Firms in Alice Communal Area in South African, the researcher make use of business plan, marketing strategy, mission/vision, SWOT analysis, and finance are the factors affecting or influencing the survival of small and micro agri-business firm. The researcher makes use of a quantitative method for data collection. Ultimately, all the quantitative data collected was coded into epi-info software for graphs and descriptive statistic to ensure reliability and generalized the result. The result of the research shows that the most significant internal factors that have impacted on the successful growth/survival of small and micro agric business firm in Alice communal area are: marketing strategy, business plan, mission/vision, SWOT analysis and finance.

Laukkanen et al. (2013) conduct research to investigate the Effect of Strategic Orientation on Business Performance in Small and Medium Scale Enterprises (SMEs): A Multi-group Analysis Comparing Hungary and Finland". Learning orientation, entrepreneurial orientation, market orientation, brand orientation, with brand performance and market performance that are mediator are the factors that influenced or affect business performance in SMEs. In the study a data set of one thousand one hundred and twenty effective responses was collected from two European countries like Hungary, and it represent a post-socialist rapidly growing market, and also Finland with a stable, highly develop and competitive economy. Confirmatory Factor Analysis (CFA) was used to test the measurement invariance, subsequently follow by SEM, and that is used to test the hypotheses under study. The result of the finding indicates that entrepreneurial orientation (EO), market orientation (MO), and brand orientation (BO) has a positive and significant effect on

business performance or growth in Small and Medium Scale Enterprises (SMEs) in both Hungary and Finland through brand and market performance. About learning orientation (LO), a positive yet somewhat weak effect on growth was identified only in the Hungary samples. And also the moderation analysis shows that country moderates the hypothesized paths from SOs to business performance or growth.

Mahmood and Hanafi (2013) conducted a research to assess the Entrepreneurial Orientation and Business Performance of Women-Owned Small and Medium Enterprises in Malaysia: Competitive advantage as a Mediator. Entrepreneurial orientation and competitive advantage were the variables that influence business performance. The data used was collected through mail survey questionnaire completed by women owner/managers and it was selected randomly from a sampling frame of registered SMEs, and the data was analyzed through regression analysis in order to actualize the result of the study. Finally, the result of the study revealed that there is a significant correlation relationship between entrepreneurial orientation and business performance and while the competitive advantage was found to partially or slightly mediate the entrepreneurial orientation and business performance relationship.

Martey et al. (2013) conducted a research to examine the Performance and Constraints of Small Scale Enterprises (SSE) in Accra Metropolitan Area of Ghana. The researchers make use of age, gender, marital status, education, experience, employees, ownership status, initial capital and annual cost are used to influence performance. Survey questionnaire and the interview was used as a method of data collection in the study, and SPSS and econometric views (E-views) was used to analyze the data collected. The result of the study indicates that the age of entrepreneurs is one of the most influential determinants of performance of SMEs. The findings further indicate that the performance of entrepreneurs of married entrepreneurs is lower than those that have not get married by 819. The number of years of formal education attained by the entrepreneur is positively associated with the performance of small-scale enterprises. The result also indicates the years of experience influence the profit of small scale enterprises positively, and the performance of small-scale enterprises is significantly affected positively by the number of employees engaged in the business. The result shows that initial capital invested in the business significantly affects performance negatively. Finally, the annual cost incurred by small scale enterprises significantly affects the revenue of the business positively.

Mbugua (2013) identify the Factors Affecting the Growth of Micro and Small Enterprises (MSE): A Case of Tailoring and Dressmaking Enterprises in Eldoret Kenya. The researcher makes use of business management, level of marketing, availability of finance, and also the characteristic of the entrepreneurs as the variable or factors that influenced the growth of micro and small enterprises. Questionnaire that includes both structured and unstructured questions was the main source for data collection, and it was supported by interviews and observation checklist. Base on the one hundred and forty-eight sample enterprises, only one hundred and thirty were returned completed and satisfactory. Chi-square and regression analysis were used to analyze the data. The finding indicates that there is a significant relationship between marketing and the growth of

the enterprises. In the same line or vein, the result shows that there is a positive relationship or correlation between the availability of finance and growth of the enterprises. But the result indicate that the characteristics of entrepreneurs are divided into three part such as number of years in self-employment, motive of going into self-employment and marital status of the owner-managers, and also the finding further spelt out that there was no significant relationship between the number of years an entrepreneur was in self-employment and the growth of the enterprises, and also the study identifies that there was a positive and significant relationship between motive of going to self-employment as a variable of entrepreneurial attributes and the growth of the enterprises. Finally, the study found an inverse relationship between marital status and growth of enterprises.

Mohammed and Nzelibe (2013) conducted a study to investigate the Assessment of the Performance of SMEs as a Catalyst for Employment Generation and Wealth Creation in Nigeria. In the study financing, perceived political environment, and lack of management skills was used as the factors that influenced the performance of SMEs. Data used for the research work was collected through questionnaires, and a sample of one hundred and fifty SMEs was used from a population of two hundred and forty SMEs in Nasarawa States, Nigeria. Regression analysis model was employed to test or analyzed the hypotheses of the study. The finding of the study signifies that there are other major obstacles other than financing that hinders the development and growth of SMEs in Nigeria, and it shows that there is an association or connection between the perceived political environment and performance of SMEs, and lack of management skills affect and influenced the performance of small and medium enterprises in Nigeria.

Nabintu (2013) investigate the Factors Affecting the Performance of Small and Micro Enterprises Traders at City Park Hawkers Market in Nairobi County, Kenya. In his study performance of SMEs, was influenced by access to business information, access to finance, technological input in the payment system, and availability of management experience. Questionnaire was the Method use in collecting data for the study, and multiple regression analysis was used to determine the relationship between the variables under study. The study makes use of signaling theory, pecking order theory and balance scorecard. The finding of the study narrates that there is a positive correlation or relationship between financial performance of SMEs and access to information, access to finance, technological input payment system and availability of managerial experience of magnitude 0.132, 0.066, 0.238, and 0.362 respectively. However, the positive relationship were very low as they fall below a threshold of 0.5 which might be due to the ordinal nature of the data collected since the magnitude of the respective factors could not be established.

Ofoegbu et al. (2013) examine the Effect of Contextual Factors on the Performance of SMEs in Nigeria, a study of Ilorin metropolis. In their study performance of SMEs is influenced by capital, availability of raw material, electricity (power), enabling environment, available market for sales products, states of the economy, competition, and government policy and action. Questionnaire is used as the method of collecting data, and one hundred and forty respondents were selected randomly from the entire SMEs in the state metropolis. Simple linear regression

method were used, and the result of the research revealed that there is a significant relationship between capital, availability of raw material, availability of power supply, enable environment, availability of market, state of the economy, business competition and SMEs performance, while the result also shows that there is an inverse relationship between Government policy with SMEs performance.

Shehu et al. (2013) carried out a study to investigate the Mediating Effect Between Some Determinants of SMEs Performance in Nigeria. The research uses Owner/manager knowledge, competitive intensity, complexity of marketing, technical competence, firm size, and advisory services as the factors that influence or affects SMEs performance in Nigeria. The study make use of structure questionnaire survey that consist a sample of two hundred and seventy-eight manufacturing SMEs operating or functioning in Kano State, Nigeria, and a total of one hundred and ninety-eight questionnaire were filled correctly and return which represent 71% of the response rate, and also a Structural Equation Modeling (SEM) was used to test the hypotheses under study. The result of the study indicates that there is a positive and strong relationship between advisory services, complexity of marketing decision, owner/ manager knowledge and SMEs performance, and also the result shows that there is no positive relationship between firm size, technical competence services, and SMEs performance. The study result also shows that advisory services mediate the relationship between owner-manager knowledge and the complexity of marketing decision.

In another study conducted by Uddin and Bose (2013) determine the Factors Affecting the Success of SMEs in Bangladesh: Evidence from Khulna City. Success of SMEs was influenced or affected by business plan, channel of distribution, management skills, use of technology, government support, access to capital, personnel (HR), customer management, and improved product/services. The data used were collected from SMEs owners of the Khulna city, which is the divisional city of Bangladesh and a total of 195 respondents, were interviewed for the study. Two factors were identified, first using the rotated components matrix, and later using regression statistic were employed to measure the data. The result shows that business plan, channel of distribution, management skills, and government support has a high and positive correlation with the success factors of SMEs whereas personnel and product/services have a bit of negative correlation and finally the rest three variable such as technology, customer management, and access to capital has a slight positive correlation.

Similarly in a study conducted by Mata and Aliyu (2014) assess the Relationship between Some Determinant of SMEs Performance in Nigeria: A Qualitative Approach. The researchers make use of market orientation and entrepreneurial orientation as the factors that influenced SMEs performance. The study makes use of a qualitative interview with one owner/manager of manufacturing SMEs in Kano, and Nvivo trial version was used as the method of data analysis. The result of the study indicated that there is a positive relationship between the constructs, meaning that both market and entrepreneurial orientation correlate with SMEs performance.

Anga (2014) investigate the Determinants of Small and Medium Size Enterprises (SMEs) in Nigeria. Survey

questionnaire was used to collect data from two hundred and thirty sample of SMEs under study, and the data collected was analyzed by SPSS and also logistic regression analysis was employed to measure the determinants of SMEs whereby internal and external factors which involve risk taking, communication/business skills, ability to make decision, management skills, finance, government policies, corruption, marketing information communication technology, and infrastructure all influence performance of SMEs. The result shows that risk-taking, communication/business skills, ability to make a decision has no significant effect on the performance of SMEs. Finance, government policy, market of the product shows an adverse impact on the performance of SMEs. While corruption, information communication technology (ICT) shows a positive relationship with the performance of SMEs, and the last result indicate that infrastructure affect the performance of SMEs in Nigeria.

Arham (2014) assess the Leadership and Performance: The Case of Malaysian Small and Medium Scale Enterprises (SMEs) in the Services Sector. Leadership behaviour, transformational leadership, transactional leadership are used as the factors that influenced organizational performance by the research. Two methods of data collection were employed. The first one was through online survey in which a total of five hundred enterprises were obtained from the SMEs Corp. in Malaysia. The second approach involved distribution of three hundred and fifty questionnaires through several agencies that conduct seminar and training for SMEs in Malaysia like the SMEs Corp, Malaysia, Malaysia Institute of Management and Entrepreneurship Development Agencies (MIMEDA). Altogether, the response rate for the study was 22.7% in which one hundred and ninety-three respondents responded to the survey questionnaire, and the hypotheses were tested through or with multiple regression analysis. The finding indicates that there were significant relationships between different leadership behaviours and organization performance of services SMEs, and also the result reveal that transformational leadership contributed more positively and significantly to the performance of SMEs than transactional leadership behavior. The result indicates that leadership behaviour of leaders of SMEs is one of the essential factors that affect or influences SMEs performance in the services sector.

In another study carried out by Ilimiani et al. (2014) determine the Factors Affecting Business Performance the Small Medium Enterprises (SMEs) of Batik Pekalongan Central Java, Indonesia. The researchers used production competency, marketing competency, innovation competency, and business strategy as the factors that affect business performance. Questionnaire was use to collect data from SMEs in Pekalongan, Central Java Indonesia, and regression analysis was used to test the hypotheses under study. The result of the study shows that production competence, marketing competence, interaction production competence, and business strategy has a positive effect on the business performance consistently.

Kinyua (2014) identifies the Factors Affecting the Performance of Small and Medium Scale Enterprises in the Jua Kali Sector in Nakuru Town of Kenya. In his study performance of SMEs, was influenced by finance, management skills, macro environment, and infrastructure. The research employed a survey

research design and employed a stratified random sampling. Questionnaire was used as a primary method to collect data from two hundred and sixty-two respondents, and the data collected was analyzed descriptively and inferentially, and also it was presented through figures, table, and percentages. The finding of the study indicates that access to finance had the potential to positively affect performance of SMEs, management skills was found to positively and significantly affect performance of SMEs, macro environment factor significantly affect the performance of SMEs, but infrastructure did not significantly affect the performance of SMEs.

Magableh et al. (2014) identify the Determinants and Impact of Training: The Case of Small and Medium Scale Enterprises (SMEs) in Jordan. Probit model and heckit method to measure the impact of training on SMEs performance on a sample of five hundred SMEs was used, and survey questionnaires serve as the method of data collection. The finding of the study revealed that training has a positive impact on SMEs performance.

Mohd et al. (2014) carried out research to examine the Key Element of Market Orientation on Malaysia SMEs Performance. The researchers use customer focus, market dissemination, market intelligence and responsiveness as the variables that influence SMEs performance. The study employed the mail questionnaire survey approach as a method of data collection. And the data collected for the research was from the managers and top management of SMEs in Malaysia, and also multiple regression analysis was used to test the variable of the study. The finding of the study reveals that customer focus and market dissemination has a significant relationship with SMEs performance while market intelligence and responsiveness does not have significant relationship or influence on the SMEs performance.

In a study conducted by Muzenda (2014) investigate the Conceptual Model of the Determinants of Performance of Tourism Sector of SMEs in South African. Entrepreneur attributes, firm characteristics, and external environment are used in the study as the factors that influenced or affect SMEs performance. A structured questionnaire was used as the method of data collection from a total of one hundred and fifty-one respondents that were selected randomly, and the data collected was analyzed using SPSS. The Cronbach's alpha shows 0.826 and the Keiser-Meyer-Olkin show shows 0.707 which indicate the data used is reliable and adequate. Base on the Cramer's V coefficients obtained from the Chi-square test. The finding indicates or shows that there is a significant association between entrepreneur attributes, firm characteristic, external environment, and SMEs performance.

Ojokuku et al. (2014) evaluate the Human Resource Management Practices (HRMP) and Small Size Business Performance: Evidence from Osun State, South Western Nigeria. The researchers make use of compensation, recruitment, training, performance appraisal, and firm size, ownership type, financial resource and legal regulation are the factors that influenced business performance. A survey of seventeen one small scale businesses in three urbanized local governments in the study area was conducted. Questionnaire was the method used collect data for the study, and also the data gathered was analyzed by multiple regression analysis. The result of the study shows that

HRM practices have a significant impact on business performance at one percent level of significance. The finding also shows that compensation and performance appraisal has a significant impact on business performance while recruitment does not have a significant impact on business performance. It was also indicated that training has an inverse relationship with the business performance. The finding at the same time narrates that financial resources and firm size were the factors that significantly influence the adoption of HRM practice by small scale business in Nigeria.

Okoye et al. (2014) determine the Effect of Business Development Services on Performances of SMEs in Kenya. The researchers make use of market access, procurement services, and infrastructure facilities as the variables that affect or influenced the performance of SMEs. Cross-sectional survey were employed in the study, and primary data were also used to collect data from one hundred and fifty enterprises in Nairobi Kenya, and linear regression analysis was used to analyzed the data obtained. The findings show that market access does not have any relationship with the performance of SMEs, but while procurement services and infrastructure has a significant and positive relationship influence on the performance of the enterprises.

In another study conducted by Shehu and Mahmood (2014) assess the Relationship Between Market Orientation (MO) and Business Performance of Nigerian SMEs: The Role of Organization Culture". The researchers make use of market orientation and organization culture as the variables that influence or affect business performance. Base for the review it was discovered that data use for the study was collected through questionnaire, whereby six hundred and forty questionnaire were administered to SMEs owners/ managers operating in Kano, the Northwest part of Nigeria, and five hundred and eleven questionnaire were returned which represent 79.8% response rate. Correlation analysis and regression were used to test the hypotheses under study. The finding from correlation analysis shows a positive relationship between market orientation, organizational culture, and business performance. And at the same time the regression result revealed that there is no significant relationship between orientation and SMEs performance, whereas the mediation test was not supported.

Thaimuta and Moronge (2014) examine the Factors Affecting the Performance of Matatu Paratransit Venture in Small and Medium Enterprises (SMEs) in Nairobi County, Kenya. Management skills, entrepreneurial skills, training, and government policies that affect the performance of matatu paratransit sector in Nairobi County, and the data use for the study was collected through questionnaire. Multiple regression was used to analyze the data, and it was performed through SPSS software, and resource base view theory, entrepreneurship theory, economic theory of entrepreneurship, and empowerment theory was use as a supporting theory to the study. The finding states that management skills, entrepreneurial skills, training and the role of government policies influence or affect the performance of matatu paratransit sector in Nairobi County Kenya.

Ugheoke et al. (2014) investigate the Impact of Strategic Human Resource Management (SHRM) on the Tangible Performance: Evidence from Nigerian SMEs. Strategic human

resources management (SHRM), work knowledge, individual fit and job fit, incentive for individual employee contribution, and incentive for achieving firm goal are used by the researcher as the variable that influenced tangible performance. The study makes use of Cross-Sectional approach or technique to collect data from a sample of two hundred and fifty SMEs in Lagos, Nigeria, and it was carried out through questionnaire. Multiple regression analysis was used to test or investigate the variables under study. The result of the study found that there is a significant relationship between, work knowledge, individual fit and job fit, the incentive for individual employee contribution and incentive for achieving the firm goal with the tangible firm performance.

### III. CONCLUSION

Based on the studies conducted by various researchers, it was reviewed systematically, and it clearly shows that different researchers used different variables that influence or affect firm performance, and it is base on their case studies. Some of the researchers makes use of variables that really captures or influence performance of SMEs like in the study of (Mudavanhu, 2011; Okpara, 2011, Ahmad et al. 2012; Olugbenga, 2012; Akinruwu et al. 2013; Amwele, 2013; Anga, 2014; Kinyua, 2014), while others did not use the suitable variables that actually captures, influence or affect the performance of SMEs like in the study of (Abor, 2007; Kampumure, 2009; Islam et al. 2011, Mahmood & Hanafi, 2013; Mata & Aliyu, 2014; Mohd et al., 2014). The method of data analysis that was mostly used by the researchers was regression analysis like in the study of (Lim, 2004; Abor, 2007; Aziz & Yasin, 2010; Mohd et al. 2010; Fatoki, 2011; Hassim et al. 2011; Mudavanhu, 2011; Olugbenga, 2012; Mohammed & Nzelbe, 2013; Mahmood & Hanafi, 2013; Nabintu, 2013; Thaimuta & Moronge, 2014; Ojukuku et al. 2014; Arham, 2014), and most of the researchers did not makes use of supporting theory or theories to their studies, like in the study of (Lim, 2004; Ebaid, 2009; Philip, 2011; Ahmad et al. 2012; Moorthy et al. 2012; Olugbenga, 2012; Ofoegbu, 2013; Martey et al. 2013; Mohammed & Nzelibe, 2013; Uddin & Bose, 2013; Dermol, 2013; Laukkanen, 2013; Shehu et al. 2013; Muzenda, 2014; Ilimiani, 2014; Okeyo et al. 2014; Shehu & Mahmood, 2014), and also base on their findings the researchers found or discovered different result in their studies.

This study suggests that future researchers should make use of variables that serves as the determinants of firm performance in developing countries. The methodology should be clearly stated in term of sample size, and method of data collection. Structural equation modeling (SEM) that serves as method of data analysis is suggested that was known as the second generation method because base on the literatures reviewed it shows that regression analysis was the most used method. Finally, theory or theories should also be used by future researchers to support their study and at the same time it give suitable direction and meaning to a study.

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#### AUTHORS

**First Author** – Mohammed Sani Abdullahi.  
Department of Business Administration and Management.  
School of Management Studies. Kano State Polytechnic, Nigeria.  
P.M.B.: 3401 Kano State, Nigeria.

**Second Author** – Aminu Abubakar.  
Department of Business Administration and Management.  
School of Management Studies. Kano State Polytechnic, Nigeria.

**Third Author** – Rahama Lami Aliyu.  
Department of Business Administration and Management.  
School of Management Studies. Kano State Polytechnic, Nigeria.

**Fourth Author** – Murtala Bala Umar.  
Faculty of Economics and Management Sciences.  
Universiti Sultan Zainal Abidin, Malaysia.

**Correspondence Author** – Mohammed Sani Abdullahi.  
Email: [abdulmohdsani@gmail.com](mailto:abdulmohdsani@gmail.com) Tel: +60142125771,  
+2348036609594.

# Cloud Computing For Micro, Small & Medium Scale Enterprises (MSMEs) In India

Narendra Bhende\*, Dr. (Col) Kunal Bhattacharya\*\*

\* Research Scholar, Global Business School & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pune, India

\*\* Professor, Research and Collaboration, Global Business School & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pune, India

**Abstract-** The micro, small and medium scale organizations in India are still in nascent state as far as use of IT systems is concerned, though they play a pivotal role in the overall industrial economy of the country. Further analysis of this problem reveals that there are number of barriers which come in the way of MSMEs adopting to new IT systems. They also lack the financial power required to adopt latest information technology and so cannot grow beyond a certain point. This paper analyses these barriers and discusses possibility of using Cloud Computing as a one stop solution. The barriers faced by MSMEs in adopting latest IT systems are actually enablers for adoption of cloud computing. But then there are other barriers faced by MSMEs in adopting to cloud computing. One main reason for MSMEs to ignore recent developments in information technology is lack of awareness. This paper critically analyzes enablers and barriers in adoption of cloud computing by MSMEs. It also attempts to create awareness, answering many concerns about cloud computing that can be used by MSMEs. It suggests use of cloud computing by MSMEs in India thereby reducing upfront investments, costs and improving efficiency and flexibility.

**Index Terms-** Cloud computing, MSMEs, Information Technology

## I. INTRODUCTION

Micro, Small and Medium Scale Enterprises are defined by the Reserve Bank of India (Reserve Bank of India, 2006-07) as follows-

For Enterprises engaged in the manufacture or production, processing or preservation of goods - "A micro enterprise is an enterprise where investment in plant and machinery does not exceed Rs 25 lakh; A small enterprise is an enterprise where the investment in plant and machinery is more than Rs. 25 lakh but does not exceed Rs. 5 crore; and A medium enterprise is an enterprise where the investment in plant and machinery is more than Rs.5 crore but does not exceed Rs.10 crore. "

For Enterprises engaged in providing or rendering of services - "A micro enterprise is an enterprise where the investment in equipment does not exceed Rs. 10 lakh; A small enterprise is an enterprise where the investment in equipment is more than Rs.10 lakh but does not exceed Rs. 2 crore; and A medium enterprise is an enterprise where the investment in equipment is more than Rs. 2 crore but does not exceed Rs. 5 crore."

Cloud computing is computing using shared resources that are delivered as service over internet and charged based on usage. The resources can be infrastructure as a service (IaaS), software as a service (SaaS) or platform as a service (PaaS). Users can access the services using thin clients or even mobile devices. Infrastructure as a service delivers infrastructure in terms of servers, firewalls, switches, routers and other hardware/networking components including virtualization. Software as a service provides software like ERPs, E-commerce and CRMs. Platform as a service allows organizations to select their IT platform - mostly the operating system (MS-Windows, Unix, Linux etc.) and environments (like Java, .Net etc.).

## II. RESEARCH ELABORATION

### 2.1 Statement of the problem and Objectives:

#### 2.1.1 Statement of the problem:

All organizations in today's world should adopt the latest in information technology to be competitive for sustainability and growth.

However, adoption of the latest in information technology by MSMEs in India is low. It is affected by a number of enablers and barriers. The barriers are outweighing the enablers resulting in limited penetration of such systems in MSME sector.

Cloud computing offers a solution to this problem as most of the barriers are eliminated but this also gives rise to a new set of barriers.

The enablers and barriers for adoption of the cloud computing by MSMEs in India needs to be critically analyzed. This will help the industry to decide the way forward towards adopting the cloud computing and thereby availing the latest in information technology.

#### 2.1.2 Objectives:

2.1.2.1 Critically analyze the enablers faced by MSMEs in adoption of cloud computing in India.

2.1.2.2 Critically analyze the barriers faced by MSMEs in adoption of cloud computing in India.

### 2.2 Conceptual Framework

For adoption of IT systems, as per traditional approach, the organizations need to go through huge efforts as explained in the following paragraphs.

The organizations must have their own servers. This requires a specialized server room (also called data center) to commission the servers. The servers need to have a platform for it to work. The platforms are mainly the operating systems - it

can be MS Windows, UNIX, Linux, Solaris or any other operating system. Apart from this, it requires a software development environment like Java or .Net. This platform and the environment are of no use unless there are applications running on the same. So the organizations need to conduct a requirement analysis and decide applications. The applications can range from a simple e-mailing solution or a financial package to complex ERPs and E-commerce systems. Even after organization deploying all this, the users need to be able to access the applications and so the organizations require IT networking done.

At this stage, users can access applications and the organization can be said to have adopted information technology. But then, there are still uncertainties and risks in terms of high maintenance and chances of failure. By now, the organizations must have spent huge amount of money, time and efforts without getting substantial benefits from the same. This can be easily managed by large organizations with sufficient IT budgets on hand. But the micro, small and medium scale organizations cannot afford to invest heavily into the information technology. Also they cannot sustain the higher maintenance costs or failures.

Cloud computing is computing using shared resources that are delivered as service over internet and charged based on usage. This means MSMEs can avoid upfront huge capital investments. This is a great relief to them. The systems are readily available on cloud thereby saving implementation time. Cost is based on 'Pay per usage' so organizations can have a great control over costs without worrying about maintenance costs. This does not require skilled resources or expertise as the cloud service provider takes care of the same. The risk of failure is minimized as there is no huge capital investment which would go waste in case of failures. The MSME can easily switch the service provider if the requirements are not met.

So conceptually, Cloud-computing dissolves all the barriers in adoption of latest information technology by MSMEs. In fact, those can be considered as enablers for adoption of cloud computing by MSMEs. But then, there are some barriers still existing.

This paper critically analyzes enablers and barriers for adoption of cloud computing by MSMEs in India.

### 2.3 Literature review

According to Miller Michael [7], if you are using even the web based e-mail applications like Gmail or Hotmail, you are already computing in the cloud. That changes the way you work and collaborate online. Compare this with the desktop based e-mail program (MS-Outlook) to understand the difference.

OECD, United Nations. Economic Commission for Latin America and the Caribbean [10] in the book 'Latin American Economic Outlook 2013 SME Policies for Structural Change' mention that cloud computing is an opportunity for SMEs, since it significantly reduces the weight of ICTs in their cost structures. Cloud computing gives SMEs the opportunity to access low-cost, standardized, configurable online computer services. These services include computing, storage, software and data management using shared physical and virtual resources (networks, servers and applications).

According to Zaigham Mahmood [6], SMEs across geographies and industries are making major changes to their

business models to be able to compete with larger firms by utilizing cloud services to improve operations and become more efficient. The adoption of cloud by SMEs initially have been driven by internal user demand and horizontal application development (e.g. Dropbox and cloud e-mail), where a trusted partner does add a value component to the implementation.

Masaaki Kurosu [4] has pointed out that, in recent years, many SMEs adopted various ERP packages from different ERP vendors, there is a new technology/ concepts available in ERP adoption for SMEs called cloud computing. Comparing to ERP, cloud computing seems like intangible because both hardware and software are not under control by the business who adopted this technology. Therefore, the key factors that impact acceptance of this technology by business will be a good research question. This is the area where this paper is contributing some insights.

Pang Chuan et. al, [2] have mentioned that with emergence of cloud concept, it can bring a great benefit to an enterprise especially for SMEs in terms of IT infrastructure. However, there are some risks and issues that need to be considered and explored when applying cloud computing. The adoption of e-business and cloud computing technologies and its development could lead to main changes in enterprises and its competitive space. These changes may create many opportunities for the enterprises to apply cloud computing successfully.

Sanjay Mohapatra & Laxmikant Lokhande [9] have mentioned a quote by Sharad Sanghi, CEO, Netmagic – 'You should be able to increase and decrease IT infrastructure and you should be able to pay for only what you use'. This described the cloud computing very well. They further add, with cloud computing, IT costs can be adjusted on demand. Thus, there is a business case for cloud computing. Cloud computing reduces the cost of investment and increases operational efficiency; this happens because the firms can engage its human resources to its core business areas. As a result, small and medium enterprises can get a head start in their business operations.

Alina Lonea et. al. [5] in their paper mentions the following - Small and medium-sized enterprises (SMEs) were the initial focus for cloud services and they are susceptible to a continuous adoption of cloud computing services, because of its strong advantages of accessing data from any place in the world over internet without concerning about the infrastructure used and the problems involved by the installation and maintenance processes, in order to assure an efficient expertise.

Reza Sahandi et. al. in their paper [11] mentioned about the survey of SMEs in UK that they conducted, which shows SMEs interests in exploiting the cloud computing services but there are still some concerns with regard to security and vendor lock-in. This could have affected the speed of cloud computing being adopted. Cloud computing is still a new technological venture for SMEs, but it takes good business sense and appropriate steps to fully reap its benefits. Whenever security, data privacy, interpretability, and portability standards ameliorate, cloud computing adoption will proliferate.

Carolyn Begg and Tom Cairn [1] in their paper believe that the lack of attention given to SMEs by the data governance community is unwise given the significant contribution this sector makes to economies worldwide. In addition, SMEs need to recognize the value of their data and importance of data

governance for their own survival in an increasingly digital business environment. It is likely that SMEs will continue to increase their use of IT, and e-business systems in particular, and this will bring growing amounts of data that requires governance.

Richard Millham [8] in his paper points out that cloud computing is particularly advantageous to small-to-medium sized enterprises (SME's) because they have access to enterprise systems at a fraction of the cost without requiring the resources or expertise to host these systems in-house. The paper further focuses on enabling legacy systems to adapt to new technology; in particular, demonstrating methods, such as wrapping of these systems, to enable legacy systems to migrate to the cloud paradigm. However this is only one part. Legacy systems in their original or their migrated paradigm must be able to adapt to business changes that their legacy system model as well.

## 2.4 Research Methodology

The study is based on analytical, qualitative, applied, Empirical and one time Field research. It is descriptive and exploratory research based on data collected during October 2014 to March 2015 from MSMEs in Navi Mumbai region.

Main methods of data collection are

- i. Primary Data -
  - a. Interviews of management of MSMEs
  - b. Discussion with IT industry practitioners
- ii. Secondary Data -
  - a. Annual reports of companies
  - b. Reports published by government agencies
  - c. Industrial data publications by various industry bodies
  - d. Journals, research papers, white papers & articles
  - e. Internet and print media
  - f. Relevant case studies

The Universe size of the data was 2292 MSME units in Navi Mumbai. Using Krejcie and Morgan table, the sample size derived was 330. Total data from 341 samples was collected using random sampling. The data collection was done through questionnaire using personal interviews and schedules.

## 2.5 Research Model

### 2.5.1 Hypothesis testing

- i. The researcher identified ten factors affecting positively (Enablers) for adoption of cloud computing by MSMEs. Based on this, following hypothesis was constituted.

H1 => Willingness to adopt cloud computing is a function of following enablers:

- i. Low cost
- ii. Low time
- iii. Improves Company Image
- iv. Low risk of failure
- v. Improves Information availability
- vi. Improves overall quality of information
- vii. Low resources requirement
- viii. Improves customer satisfaction & sales
- ix. Keep up with competition
- x. Low Complexities

This hypothesis was tested using the descriptive analysis.

Each of the enablers was considered as an independent variable and with willingness to adopt cloud computing as a dependent variable, correlation was found. Further the regression analysis was performed to estimate the relationship among enablers.

- ii. The researcher identified ten factors affecting negatively (barriers) to the adoption of cloud computing by MSMEs. Based on this, following hypothesis was constituted.

H2 => Willingness to adopt cloud computing is a function of following barriers:

- i. High Operative Cost
- ii. Awareness not available
- iii. Data Security concerns
- iv. Dependency on service providers
- v. Dependency on internet speed
- vi. Compulsory upgrades to latest technology
- vii. Minimum fixed cost irrespective of usage
- viii. Legal & compliance issues
- ix. Increasing costs every year
- x. Flexibility issues

This hypothesis was tested using the descriptive analysis. Each of the barriers was considered as an independent variable and with willingness to adopt cloud computing as a dependent variable, correlation was found. Further the regression analysis was performed to estimate the relationship among barriers.

## III. RESULTS & FINDINGS

### 3.1 Results, Findings and Discussion

#### 3.1.1 Results of testing hypothesis H1: Correlation between Positive Factors (Enablers) and willingness to adopt cloud computing:

Based on analysis of the data, the following results are obtained. The findings are discussed below:

3.1.1.1 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Low cost  
 $r = 0.813$ .  
 $p\text{-value} = 0.000$

This indicates the strong positive correlation between willingness to adopt cloud computing and 'low cost' as enabler.

This is the only factor having strong positive correlation with willingness to adopt cloud computing. This finding further stresses that cost is the most important parameter for decision making of SMEs. In other words, the biggest advantage of adoption of cloud computing for SMEs is the low cost

3.1.1.2 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Low time  
 $r = 0.502$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'low time' as enabler.

This clearly indicates that MSMEs are not much concerned about time to implement cloud computing. This is contrary to

researcher's observation of large organizations for whom the time to implement the cloud computing matters a lot. This is due to the perceived impact of implementing cloud computing on the overall business which differs between MSMEs and large scale organizations.

### 3.1.1.3 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Improves Company Image

$r = 0.590$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'improves company image' as enabler.

This result is expected as the MSMEs considered for this study are industrial units rather than service oriented organizations. Cloud computing is more beneficial for improving internal processes for industrial MSMEs though they do consider cloud computing as a factor in improving company image.

### 3.1.1.4 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Low risk of failure

$r = 0.650$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'low risk of failure' as enabler.

Most of the MSMEs do not have their own IT systems or have minimum required computerization. In such cases, the risk of failure due to adoption of cloud computing is low. This is as against the case of large organizations who have huge IT systems running their core business functions and adoption of cloud computing may disrupt the normal functioning.

### 3.1.1.5 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Improves Information availability

$r = 0.741$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'improves information availability' as enabler.

MSMEs do agree that adoption of cloud computing will improve information availability. This is due to multiple reasons. The cloud computing can be accessed from almost anywhere and anytime with availability of client and internet. This enables users to access IT systems on the go from their laptops or mobile devices. The systems are available 24x7 improving information availability.

### 3.1.1.6 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Improves overall quality of information

$r = 0.670$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'improves overall quality of information' as enabler.

The cloud services make the information available in different formats due to availability of various software and tools which may be free or paid based on the service provider. This includes data analysis, business intelligence, data warehousing and social media enablement. This improves quality of information available from cloud computing.

### 3.1.1.7 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Low resources requirement

$r = 0.441$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'low resource requirement' as enabler

MSMEs are mainly concerned about costs and resource cost is an important parameter in MSME business management. Availability of expert resources is a main concern and so is the cost to retain them. Cloud computing frees MSMEs from this problem as the service providers take care of most of the technology issues. MSMEs just need to specify their requirement and start accessing the systems. This results in low resource requirement by adoption of cloud computing.

### 3.1.1.8 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Improves customer satisfaction,

$r = 0.473$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'improves customer satisfaction' as enabler.

Customers expect 24x7 system availability with quality information and ease of access. This was till now only possible for large organizations with high IT budgets. With availability of cloud computing, now MSMEs can also make the high availability and feature rich customer facing systems and improve customer satisfaction.

### 3.1.1.9 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Keep up with competition

$r = 0.638$   
 $p\text{-value} = 0.000$

This indicates the moderately positive correlation between willingness to adopt cloud computing and 'keep up with competition' as enabler

Large organizations adopt the latest information technology and maintain their market positions. It is extremely difficult for MSMEs to compete with them. With advent of cloud computing, it is now possible for MSMEs to utilize similar systems at much lower costs. Also some of the MSMEs have already adopted cloud computing and getting benefited from the same. In order to keep up with competition, remaining MSMEs need to adopt cloud computing as soon as possible.

### 3.1.1.10 Correlation between willingness to adopt cloud computing and Positive Factor (Enabler): Low Complexities

$r = 0.457$

p-value = 0.000

This indicates the moderately positive correlation between willingness to adopt cloud computing and ‘low complexities’ as enabler

Every business is supposed to have core expertise in their business but to avail benefits of modern information technologies; they are forced to spend their efforts on information technology which are complex for them considering that is not their field of expertise. With cloud computing, as the service provider takes care of complexities of information technology, MSMEs can focus on their core business.

3.1.2 Regression analysis for positive factors (Enablers)

**Table 1: Analysis of variance for enablers for adoption of cloud computing by MSMEs**

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	10	386.778	38.6778	75.39	0
Low cost	1	50.665	50.6651	98.75	0
Low time	1	1.94	1.9404	3.78	0.053
Improves Company Image	1	0.226	0.2264	0.44	0.507
Low risk of failure	1	1.209	1.2092	2.36	0.126
Improves Information availability	1	7.945	7.9451	15.49	0
Improves overall quality of information	1	0.12	0.1199	0.23	0.629
Low resources requirement	1	7.489	7.4893	14.6	0
Improves customer satisfaction	1	0.003	0.0025	0	0.944
Keep up with competition	1	1.145	1.1448	2.23	0.136
Low Complexities	1	0.886	0.8862	1.73	0.19
Error	330	169.31	0.5131		
Lack-of-Fit	80	54.082	0.676	1.47	0.014
Pure Error	250	115.228	0.4609		
Total	340	556.088			

**Table 2: Model Summary for enablers for adoption of cloud computing by MSMEs**

S	R-sq	R-sq(adj)	R-sq(pred)
0.716282	69.55%	68.63%	67.51%

**Table 3: Coefficients for enablers for adoption of cloud computing by MSMEs**

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	0.309	0.325	0.95	0.342	
Low cost	0.4976	0.0501	9.94	0	4.02
Low time	-0.1795	0.0923	-1.94	0.053	2.61
Improves Company Image	-0.038	0.0572	-0.66	0.507	3.77
Low risk of failure	-0.1031	0.0672	-1.54	0.126	10.84
Improves Information availabili	0.3162	0.0804	3.94	0	6.12
Improves overall quality of inf	-0.055	0.115	-0.48	0.629	10.03
Low resources requirement	0.391	0.102	3.82	0	1.35
Improves customer satisfaction	0.008	0.115	0.07	0.944	2.95
Keep up with competition	0.1033	0.0691	1.49	0.136	11.49
Low Complexities	0.0513	0.039	1.31	0.19	2.17

Regression Equation

Willingness to adopt cloud computing =  
 + 0.309 + 0.4976 Low cost  
 - 0.1795 Low time  
 - 0.0380 Improves Company Image  
 - 0.1031 Low risk of failure  
 + 0.3162 Improves Information availability  
 - 0.055 Improves overall quality of information  
 + 0.391 Low resources requirement  
 + 0.008 Improves customer satisfaction  
 + 0.1033 Keep up with competition  
 + 0.0513 Low Complexities

3.2 Effect of Negative Factors (Barriers)

3.2.1 Correlation between Negative Factors (Barriers) and willingness to adopt cloud computing

3.2.1.1 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): High Operative Cost  
 r = -0.669  
 P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and ‘high operative costs’ as barrier.

Cloud computing saves MSMEs from initial high capital investments but it also results into high operative costs. This high operative costs are relative and change from unit to unit based on usage patterns. But overall, high operative cost is a concern for MSMEs.

3.2.1.2 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Awareness not available  
 r = -0.714  
 P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and ‘awareness not available’ as a barrier.

The researcher has observed that the MSMEs are really interested in adoption of latest information technology. But they do not have sufficient information or guidance about the ways to adopt cloud computing. The consulting firms and IT services firms are mainly interested in large organizations as their clients and MSMEs also cannot afford their charges.

3.2.1.3 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Data Security concerns  
 r = -0.828  
 P-Value = 0.000

This indicates the strong negative correlation between willingness to adopt cloud computing and ‘data security concerns’ as barrier.

Data security concerns is the most important factor in decision making for cloud computing. Organizations always feel the data is secured when stored on the computers in their own data centers with all sorts of physical security measures. But they forget that in today’s networked world, physical security cannot secure the data. In fact, the data in the computers of the cloud service providers is much safer considering the latest security technologies they maintain and the legal agreements supporting data security.

3.2.1.4 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Dependency on service providers  
 r = -0.608  
 P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and ‘dependency on service provider’ as barrier

The MSMEs perceive that cloud computing is provided by the cloud service provider thereby there will be dependency on the service provider. This is correct but the services provided are

governed by the legal agreement between the service provider and the client organization. There are stringent SLAs on the service provider and client organization can demand adequate compensations in case of any breaches. This makes the organizations safe. Also in case the client organization is still not satisfied with the performance of the service provider, they can switch to another cloud service provider. Considering stiff completion among the cloud service providers, switching is no more a problem.

3.2.1.5 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Dependency on internet speed

$r = -0.491$

P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and 'dependency on internet speed' as barrier

Dependency on internet speed is a real concern as the cloud services are provided on internet. MSME organizations adopting to cloud computing need to select a suitable internet service provider for their staff to avail cloud based solutions. They can even select multiple internet service providers so that there can be uninterrupted services in case one of those fails. There are still concerns in the remote areas where internet is not available and in such cases, cloud computing cannot be utilized. Hence MSMEs need to consider this factor carefully.

3.2.1.6 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Compulsory upgrades to latest technology

$r = -0.568$

P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and 'compulsory upgrade to latest technology' as barrier.

Cloud service providers typically provide latest OS versions and environments with up to date service packs and patches installed as recommended by the product vendors. This is in fact a useful feature. But this requires the software version upgrade as the existing software used by organization may not work in the upgraded environment. This results in additional costs and change management.

3.2.1.7 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Minimum fixed cost irrespective of usage

$r = -0.713$

P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and 'minimum fixed cost irrespective of usage' as barrier

The cloud service providers have different payment models. The basis of payment in most cases is 'pay per usage'. But there are some hidden fixed costs just to maintain the data and accounts with service provider. This is inevitable and the costs are minimal comparing with maintaining own data center.

3.2.1.8 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Legal & compliance issues

$r = -0.563$

P-Value = 0.000

This indicates the moderately negative correlation between willingness to adopt cloud computing and 'legal and compliance issues' as barrier

MSMEs and for that matter all the business organizations are busy with their core business and need not spend time and efforts of non-core areas. Cloud service providers host company's sensitive data and business critical systems and so insists on signing legal agreements. Also the organizations compliance policies may not be accepted by cloud service providers and need to be diluted. For e.g. some of the cloud service providers do not allow site inspection of their server facilities.

3.2.1.9 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Increasing costs every year

$r = -0.564$

P-Value = 0.000

It is very obvious that the costs of services go on increasing every year due to inflation based on monetary indices. But the concern here is that the cloud service providers provide cloud services at highly discounted rates to their clients in the beginning to grab a new client. But from the next year, they start charging higher amounts with huge mark-ups and hidden costs. This practice causes the organizations to think that the operative costs are too high in subsequent years and so this factor becomes a barrier in adoption of cloud computing.

3.2.1.10 Correlation between willingness to adopt cloud computing and Negative Factor (Barrier): Flexibility issues

$r = -0.514$

P-Value = 0.000

Cloud computing provides high amount of technical flexibility. It can provide higher computing power, storage space and other technology areas very easily but this flexibility is restricted by the scope of services as defined in the legal agreement. So some specific requests of the client organization can be denied by the cloud service provider. Also the usage of cloud computing is restricted and the service provider can object for certain activities performed by client organization.

3.2.2 Regression analysis for negative factors (Barriers)



**Table 4: Analysis of variance for barriers in adoption of cloud computing by MSMEs**

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	10	490.707	49.0707	118.21	0
High Operative Cost	1	1.608	1.6082	3.87	0.05
Awareness not available	1	1.395	1.3948	3.36	0.068
Data Security concerns	1	70.659	70.6588	170.21	0
Dependency on service providers	1	0.872	0.8722	2.1	0.148
Dependency on internet speed	1	0.305	0.3045	0.73	0.392
Compulsory upgrades to latest technology	1	3.976	3.9763	9.58	0.002
Minimum fixed cost irrespective	1	3.372	3.3722	8.12	0.005
Legal & compliance issues	1	0.512	0.5117	1.23	0.268
Increasing costs every year	1	0.4	0.4003	0.96	0.327
Flexibility issues	1	0.027	0.0272	0.07	0.798
Error	330	136.994	0.4151		
Lack-of-Fit	131	97.294	0.7427	3.72	0
Pure Error	199	39.7	0.1995		
Total	340	627.701			

**Table 5: Model Summary for barriers in adoption of cloud computing by MSMEs**

S	R-sq	R-sq(adj)	R-sq(pred)
0.644307	0.7818	0.7751	0.7652

**Table 6: Coefficients for barriers in adoption of cloud computing by MSMEs**

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	6.592	0.12	54.96	0	
High Operative Cost	-0.0713	0.0362	-1.97	0.05	2.29
Awareness not available	-0.0868	0.0474	-1.83	0.068	3.55
Data Security concerns	-0.5674	0.0435	-13.05	0	2.34
Dependency on service providers	-0.0588	0.0406	-1.45	0.148	2.31
Dependency on internet speed	-0.0329	0.0385	-0.86	0.392	1.87
Compulsory upgrades to latest technology	-0.1152	0.0372	-3.09	0.002	2.14
Minimum fixed cost irrespective	-0.1213	0.0426	-2.85	0.005	2.83
Legal & compliance issues	-0.0449	0.0405	-1.11	0.268	2.02
Increasing costs every year	-0.0367	0.0374	-0.98	0.327	2.09
Flexibility issues	0.0086	0.0335	0.26	0.798	1.7

Regression Equation:

Willingness to adopt cloud computing =  
 6.592 - 0.0713 High Operative Cost  
 - 0.0868 Awareness not available  
 - 0.5674 Data Security concerns  
 - 0.0588 Dependency on service providers  
 - 0.0329 Dependency on internet speed  
 - 0.1152 Compulsory upgrades to latest t  
 - 0.1213 Minimum fixed cost irrespective  
 - 0.0449 Legal & compliance issues  
 - 0.0367 Increasing costs every year  
 + 0.0086 Flexibility issues

#### IV. CONCLUSIONS

##### 4.1 Conclusions

The MSMEs should adopt the cloud computing which will enable them to utilize the latest information technology.

The willingness to adopt cloud computing in MSME sector is function of multiple enablers and barriers. The main enabler is the low cost followed by information availability. The main barrier is concern about the data security followed by awareness.

##### 4.2 Scope for further research

Each of the enablers and barriers considered in this study can be further studied in depth from multiple dimensions.

##### 4.3 Managerial implications

The MSME management can consider this study as a viewpoint and can take steps towards adoption of cloud computing in their units. A step by step approach is recommended for MSMEs for venturing into the world of cloud computing rather than a big bang approach.

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#### AUTHORS

**First Author** – Narendra Bhende, B.E., M.B.A., Ph.D. Scholar at Global Business School & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pune, India

**Second Author** – Dr. (Col) Kunal Bhattacharya, Professor, Research and Collaboration, Global Business School & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pune, India

**Correspondence Author** – Narendra Bhende,  
Email address: Narendra.bhende@gmail.com,  
Alternate email address: narendrab\_in@hotmail.com  
Contact Number +919324070146

# Anaesthetic implications in paediatric patient with tuberous sclerosis: A case report

Dr. Mitesh Faliya, Dr. Prasad Kulkarni, Dr. Narsimha Reddy, Dr. AV Pai

Department of Anaesthesiology, MVJ Medical College & Research Hospital, Bangalore Rural - 562114

## Abstract-

**Introduction:** Tuberous sclerosis is an autosomal dominant rare multisystem syndrome which is now referred to as tuberous sclerosis complex, emphasizing the variance of the clinical symptoms. It is frequently associated with seizure disorder and its knowledge is thus of utmost importance to the anaesthetist keeping in mind the multiple antiepileptic drugs and their interactions involved.

**Case report:** An eight year old female patient, a known case of tuberous sclerosis, was scheduled for left eye lensectomy under general anaesthesia for a subluxated cataract in left eye. Patient had multiple calcified subependymal nodules and calcified cortical tubers on computerized axial tomography (CT). Her antiepileptic drug, carbamazepine was continued till the day of surgery. Premedication was done with injection midazolam, glycopyrrolate and fentanyl. Induction was done with injection thiopentone sodium following preoxygenation. Injection rocuronium bromide was given to facilitate endotracheal intubation. Anaesthesia was maintained with intermittent positive pressure ventilation under sevoflurane in gas oxygen mixture. The course and conduct of anaesthesia was uneventful and the patient could be discharged following uneventful recovery.

**Conclusion:** A general awareness is essential about the seizure provoking nature of certain anaesthetic drugs that are best avoided in such patients. Further the factors triggering the epileptogenic crises should be kept in mind while dealing with such patients. Thus, adequate knowledge of the disease is imperative and a meticulous perioperative anaesthetic care is mandatory throughout the course.

**Index Terms-** Tuberous sclerosis, epilepsy, anaesthetic implications, antiepileptic drugs

## I. INTRODUCTION

Tuberous sclerosis is an autosomal dominant<sup>1</sup> rare multisystem syndrome characterized by hamartomatous tumours of the brain, skin, viscera, and eye. Bourneville, in 1880, coined the term *tuberous sclerosis*.<sup>2</sup> In 1908, Vogt first proposed epilepsy, mental retardation, and the skin lesions of adenoma sebaceum as a diagnostic triad for tuberous sclerosis.<sup>3</sup> The primary features that are considered to be very specific for tuberous sclerosis include facial angiofibromas (pathognomonic), multiple ungual fibromas, histologically confirmed cortical tubers, histologically confirmed subependymal nodule(s), multiple retinal astrocytomas, and radiologic evidence of multiple calcified subependymal nodules protruding into the ventricle.<sup>4</sup> Tuberous sclerosis is now referred

to as *tuberous sclerosis complex*, emphasizing the variance of the clinical symptoms.<sup>5</sup>

The disease is a result due to inactivating mutations in either the TSC1 gene, located on chromosome 9q34 or the TSC2 gene on chromosome 16p13.<sup>6</sup>

## II. CASE REPORT

An eight year old female patient, a known case of tuberous sclerosis, was scheduled to have left eye lensectomy under general anaesthesia for a subluxated cataract in left eye. She suffered from seizure disorder, delayed milestones, caries teeth and adenoma sebaceum on face with shagreen patches on the skin of lumbosacral region. (Figure 1)

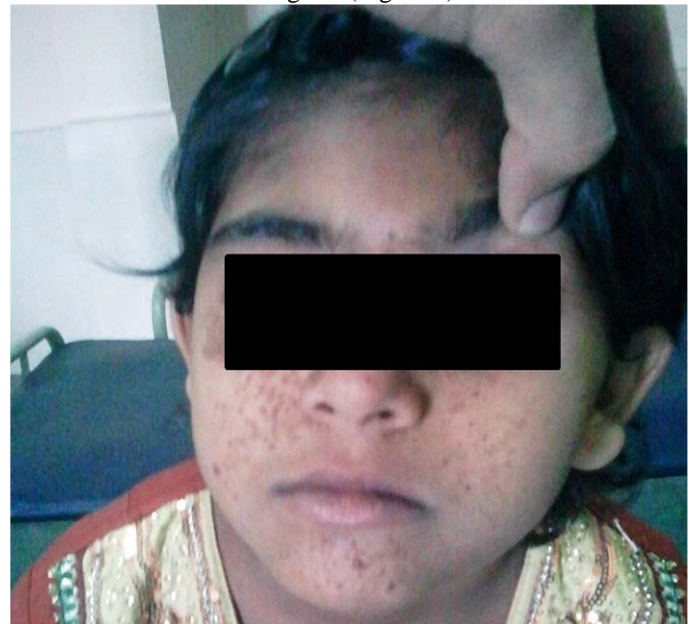


Figure 1: Photograph shows multiple erythematous facial papules known as adenoma sebaceum

Patient had multiple calcified subependymal nodules and calcified cortical tubers on computerized axial tomography (CT). (Figure 2)



Figure 2: Transverse section CT brain shows multiple calcified cortical tubers in caudate nucleus (arrow heads) and left periventricular white matter (arrow).

#### Workup:

A complete history and physical examination are essential as organs affected by TS vary greatly from one patient to the other. In addition to routine investigations of blood and urine, chest radiograph, electrocardiogram, echocardiogram, serum electrolytes, blood urea and creatinine were done which were found to be within normal limits. CT scan revealed multiple calcified cortical tubers in the caudate nucleus and periventricular white matter. Histologically, these cortical tubers are glioneuronal hamartomas which are focal developmental malformations of the cerebral cortex, characterized by the proliferation of glial and neuronal cells and exhibiting loss of the 6-layered structure of the cortex and bizarre-appearing giant cells, dysplastic neurons, and astrocytes.<sup>7,8</sup> Subependymal nodules are hamartomas typically seen in the subependymal wall of the lateral ventricles and may protrude into the ventricular lumen. Together with the cortical tubers, they are present in approximately 90% of children with TSC.<sup>9</sup>

### III. ANAESTHETIC TECHNIQUE

- Patient was posted for a left eye cataract surgery.
- Antiepileptic drug (tablet carbamazepine 100mg BD) was continued till the day of surgery.
- Premedication was done with injection midazolam 0.5mg, injection glycopyrrolate (0.01mg/kg) and injection fentanyl (1 mcg/kg), 45 minutes before the surgery.

- Induction was done with injection thiopentone sodium 4mg/kg body weight following preoxygenation with 100% oxygen for 3 minutes.
- Injection rocuronium bromide (1 mg/kg) was given to facilitate endotracheal intubation and airway secured with 5 sized cuffed endotracheal tube at 16 cm after confirming bilateral equal air entry.
- Anaesthesia was maintained with intermittent positive pressure ventilation under sevoflurane in gas oxygen mixture.
- Mannitol was infused to keep the intraocular pressure to the optimum level.
- Injection ondansetron 2 mg was given intravenously at the conclusion of surgery to prevent postoperative nausea and vomiting.
- The residual neuromuscular blockade was reversed with a mixture of pyridostigmine (0.2 mg/kg) and glycopyrrolate (0.01mg/kg).
- The course and conduct of anaesthesia was uneventful and the patient could be discharged following uneventful recovery.

### IV. DISCUSSION

A complete history and physical examination are crucial since the organs affected by TS can vary to a great extent from one patient to the other.

Tuberous sclerosis is rare disorder and involves multiple organs. Such cases demand thorough history, examination and investigation in order to know the severity of disease and possible on table anaesthesia complications. Epileptogenic drugs like enflurane<sup>10</sup>, methohexitone<sup>11</sup>, ketamine<sup>12</sup>, etomidate<sup>13,14</sup>, morphine<sup>15</sup>, meperidine, vecuronium should be avoided. Further hypoxia and hypercapnea which precipitate seizures is avoided. Benzodiazepines<sup>16</sup>, sevoflurane, isoflurane<sup>17</sup>, desflurane<sup>18</sup>, fentanyl<sup>19</sup> and nitrous oxide can safely be used. If renal and hepatic function of patient is affected then mivacurium and cisatracurium may be the safest choices. Post operatively patient should be monitored for seizure activity and adequate pain relief should be provided.

In such patients with well controlled epilepsy, all efforts should be made to avoid interruption of antiepileptic medication perioperatively. Anticonvulsant therapy should be optimized prior to the procedure and continued until the morning of surgery and throughout the perioperative period.<sup>20</sup> Our patient was on carbamazepine that changes the ionic conductance to sodium with a membrane stabilizing effect. In addition to accelerating its own metabolism, Carbamazepine exacerbates hepatic oxidation and conjugation of other liposoluble drugs. Due to its potent enzyme inducing properties, carbamazepine reduces the plasma concentrations of thiopental, propofol, midazolam, opioids and neuromuscular non depolarizing blockers. There is risk of hepatotoxicity after anaesthesia with halothane, enflurane, and possibly with sevoflurane.<sup>21</sup> Thus, a notable pharmacokinetic and pharmacodynamic interactions exist between antiepileptic drugs and the drugs commonly used in anaesthesia, and these

interactions affect both drug efficacy and seizure risk intraoperatively.

The premedication was carried out with the use of a benzodiazepine, midazolam, as it is widely used due to its potent anticonvulsant and anxiolytic effects. During maintenance of anaesthesia, sevoflurane was administered because at concentrations of less than 1.5 MAC (avoiding hyperventilation) it is safe in the epileptic patients.<sup>22</sup>

The need for intraoperative invasive monitoring depends on the severity of the cardiovascular or cerebrovascular pathology and the type of procedure. Short surgical procedures as that of a cataract surgery or minor procedures like imaging does not demand invasive monitoring. Postoperatively, a short observation period is adequate following minor procedures in mildly affected patients.

Thus, several specific considerations exist that an anesthesiologist must consider when managing an epilepsy patient. The ability of the anaesthetics to modulate or potentiate seizure activity is to be kept in mind. Also, the effects of anti-epileptic drugs and interaction with anaesthesia should be considered. The presence of concomitant medical problems occasionally associated with epilepsy should be evaluated. The first generation anti-epileptic drugs (which was being used in our patient), such as carbamazepine, phenytoin and phenobarbital are resistant to the effects of neuromuscular-blocking agents. These drugs also enhance cytochrome P450, which affects the metabolism of other drugs and may necessitate dose adjustments of anaesthetic drugs like propofol, muscle relaxants and opioids. Hence, epileptic patients receiving anti-epileptic drugs require higher doses of fentanyl to maintain a comparable depth of anaesthesia.

## V. CONCLUSION

Although the surgery was uneventful with smooth anaesthetic outcome, the probability for anaesthetic complications due to TS remains high throughout the procedure. A general awareness is essential about the seizure provoking nature of certain anaesthetic drugs that are best avoided in such patients. Further the factors triggering the epileptogenic crises should be kept in mind while dealing with such patients. Thus, adequate knowledge of the disease is imperative and a meticulous perioperative anaesthetic care is mandatory throughout the course.

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## AUTHORS

**First Author** – Dr. Mitesh Faliya, MD Anaesthesiology resident, MVJ Medical College & Research Hospital, Bangalore – 562114  
faliyamitesh@gmail.com

**Second Author** – Dr. Prasad Kulkarni, Professor, Dept of Anaesthesiology, MVJ Medical College & Research Hospital, Bangalore – 562114  
prasadmukul@gmail.com

**Third Author** – Dr. Narsimha Reddy, Professor, Dept of Anaesthesiology, MVJ Medical College & Research Hospital, Bangalore – 562114  
bnreddy253@gmail.com

**Fourth Author** – Dr. AV Pai, Professor & Head of Dept of Anaesthesiology, MVJ Medical College & Research Hospital, Bangalore – 562114  
pai\_av@yahoo.co.in

**Correspondence Author** – Dr. Mitesh Faliya  
MVJ Medical College & Research Hospital, Bangalore – 562114  
faliमितेश@gmail.com Ph - +91 7795671956

# Grace of Sri Rama

Muthyala Ramakrishna Rao

**Abstract-** Grace of Sri Rama " (Sri Ramabdhī Shukti māni ) which comprises , Sri meaning goddess Lakshmi ( Universal power ) born as Sita with the former originating from the sea and the latter being born in the earth , Rama combining in the Himself the vital seeds of Shiva and Vishnu, *Abdhi* meaning the ocean and *Shuktimāni* which means pearl . So it can be understood that when we chum the Ocean of the Ramayana , we will find two pearls , one being the great Sethu (the great bridge) and the other Lankanagara (city of Lanka ), both of which had been constructed on the Ocean . Vishwakarma ( the divine arctic ) , the divine sculptor under instruction from Brahma , the creator has constructed the city of Lanka as residence of the Shiva , a God in the trinity . In the same way the illustrations king in the Hindu legends "Nala born off the vital elements of Vishwakarma constructed the great Sethu , Varadhi (the great bridge ) across the Ocean in compliance with Rama's instructions. Both the Lanka city and the great Sethu are water related constructions as both were built on the sea . Sethu as well as Lanka being the two ornamental pearls of the " Ramayana " , an attempt is made in book both through research and through consultation of the ancient works to enlightens the rulers on these two aspects.

The two being dazzling pearls , the book whose theme revolved round them , it is hoped will shine like a chain of gems adorning Lord Sri Rama shedding the light of numerous suns, in turn reflecting the light on us making our lives purposeful . It is my conviction that every fact found in the book is in harmony with Science our Indian culture .

## I. INTRODUCTION

**G**RACE OF SREE RAMA [ SRI RAMABDHI SHUKTIMANI ] is a research oriented work . Hindu legends , Mythologies , ancient history the Surya theory and modern Science have all gone into the making of the book . To know something about the Sethu (great bridge ) and "Lanka Nagara " (The city of Lanka) that are described in Srimadramayana , it is necessary for us to know certain related facts . Therefore in the book there are 14 aspects which are described below. every aspect is based on spiritually as well as modern scientific knowledge . The facts described "Ramayana" are in hormone with the present. every branch of Science is latently linked to the Ramayana . The book aims at establishing in which island, the "Bharata Varsha "(The land of Bharata ) is located, how our country has come to be known as "Bharatha Khanda " (continent of Bharata and Bharatha Varsha, the land of Bharatha ) and the names of islands, separated from our country . Every fact in the book has its reference to other standard mythological works. The book puts forte information about the yojana units of measurements as found in the "Surya theory " providing its calculation as per the present unit of measuring distance. The Lankanagara of Ravana and the present Sri Lanka both of which were separated from India are two distant islands and are not one and the same.

There is a description of only one islands Lankanagara in the period of Rama found in the Ramayana . On account of geographical change 90% of the land Lankanagara got submerged into the sea, and the remaining 10% of the land not merged into the Simhala island. With the result the people of the present Sri Lanka say that their land ( Sri Lanka ) abounds in the remnants of Ramayana there by implying that the Lanka of the Ramayana is nothing else but their own land , with 90 % of the great Sethu having submerged in the Sea, the remaining part is seen at present between "Danushkoti " ( In India ) and Thalimannar (in Sri Lanka ) . It is thought the remaining part of the great Sethu also may move to the North eastern side . one account of the geographical movement in due course . All this information is shown with pictures , in the book . Details are given with regard to the emperors and the kings who ruled our country in the past along with the presidents, prime ministers and the governors of our state in the modern period and soon . The book also aims at establishing the fact that , on the basis of " Srimadramayana " and other standard works as well as the "Bhagavatha "and various mythologies . Lankanagara of Ravana and simhala ( the present Sri Lanka ) are two separate entities and that the Sethu (the great bridge ) had not been constructed between "Rameshwaram" (in India ) and Sri Lanka as universally believed .

## II. GEOLOGICAL CONDITION

Man enters the lap of the earth the moment he gets out of his mother's womb . the earth remains his shelter as long as he lives. God has arranged for his substance even before he is born. So the geographical condition is considered the first stage in man's odyssey .

2. Biological condition : The earth is the base for man to make a steady growth . there are 84 millions species of animals on the earth as per Vedas as well as science . Some animals have become extinct both on account of the vagaries of nature , and change in the geological conditions . certain animals are seen through the microscope and some not visible even through the microscope . Man takes birth and receives fruits of the deeds of his previous births . This is known as " The Law of Karma " . Also the creation of universe by Brahma is sufficiently dealt with . The biological condition regarded the second state as man's stay changes from his mother's womb to the earth .

3. Chronological condition : It is related to both the above conditions . time is a measuring rod to record the changes on the earth , and the development of man . The wheel of time rotates eternally . All the incarnations , the time of Brahma (The Creation ) and the age of mankind spreading across the enormous gamut of time tables. Time is a base for geological as well as biological transformation . So it is termed the third condition .

4. Astrological picture : It is related to time . the positions of the planets , stars and their movements with the passage of times brings about changes in human beings , as well as on the earth .

So changes in time can be known on the basis of the movement of the stars and the planets . Therefore the astrological condition is dealt with in the fourth chapter after that dealing with time .

5. The Yojana theory ( Vedic unit of measuring distance ) : The distance between the earth and heavenly bodies ( Planets and stars ) and distance of them from the earth on account of their movement was measured in times of "Yojanas" in the ancient times. Accordingly in the Ramayana also distance was measured by Yojanas . Later the conversion of yojanas into miles came to be made .

6. Journey of Rama : This is linked to all the preceding five aspect having been born on the earth , Sri Rama walked on foot across the length and breadth of country ( India ) and the distance covered by Him has been measured by Yojanas . So this chapter becomes the eight one in the book .

7. Lineage of Rulers : The chapter gives an account of the names of the kings of the Surya and Chandra dynasties and their respective tenures . Fitting it is included in the seventh section.

8. The picture of the Sethu , Varadhi (The great bridge ) : This parts gives an insight into the way Rama undertook a hectic journey on foot to the Southern tip of the country and the way he got the endless bridge ( The great Sethu or Varadhi ) constructed across the Southern Ocean to reach the city of Lanka . The great Sethu was constructed with trees and rocks . Which consists of nature's bounty . The length and width of the bridge was calculated in yojana units in the Ramayana . he section also throws light on the changes that the great Sethu underwent . Owing to the vagaries of nature . So the chapter becomes eighth in the order .

9. A view of the city of Lanka : This chapter is a sequel to the preceding three chapter. In this book " Grace of Sri Rama " (Sri Ramabdhhi Shuktimani ) the 8th, 9th chapters assumed a lot of importance . The city of Lanka underwent transformation from its geological condition on account of the movement of earth > The way it lost its original state and assumed a new state is explained from the angle of modern Science .

10. Research aspect : All the things discussed including different conditions and their changes are explained from the point of view of the legend as well as modern Science in this section . The situation regarding the great section, the city of Lanka and the Simhala Island along with changes in nature are elaborated in the section which logical occupies the tenth place in the order .

11. Indian cultural Scenario: The part explains hoe our people even today are following such ancient Indian culture as seen in our mythologies and legends . Even the historians of other countries have written books glorifying our culture > So it is included the eleventh section .

12. Bibliographical details : The section provides information regarding the books in English and Telugu from which data has been collected for writing the book . So it occupies the 12th place in the sequence .

13. Lineage of the author : This chapter given an account of the heredity of the author who has under taken the uphill task of writing a research oriented book based on Ramayana with an aim of showing the athletic picture of the great Sethu or Varadhi (bridge ), Lankanagara , Simhala, island etc. by patiently and perseverant gathering information from various southern

mythology legendary and Scientific . So naturally it has becomes the penultimate section.

14. Graphic representation : This section gives pictorial description of certain important things mentioned in the chapters 1 to 11 . The last section , therefore appears to be the fitting conclusion of the treatise .

Note : it is hoped that dissertation written on the basis of Indian mythologies . legends and modern Science to establish the athletic facts and universal values associated with the Ramayana will absorb the attention of the Ramayana enthusiasts .

Hindu religion's text the Valmiki Ramayana . I have to say that it was one of the most tiring and stressful, but a we some experiences that I've had so far as a religion major.

I am interested in religion and gender ,and the submit paper that I presented dealt with these to topics; but this belong post needs a trigger warning because in my paper. I explored Hindu religion tax, the Valmiki Ramayana concepts about important issue of Sethu and Lanka . This papers specifically ancient history and Surya Siddhanta topics to collation Lanka and Sethu , Lanka not a Sri Lanka (Sinhala, Ceylon) , these are two islands to separate from India sub-continental .

The Hindu religious text. The Valmiki Ramayana was significant ni my research , because there is a present evidence in India . There are so many evidences their Ayodhya, Mithila , Janakapuram (one of the parliamentary constancy in Nepal) Chitrakoot (one of the district in Uttarpradesh ), Parnashala (Bank of Godavari in Khamamm district ), Kishkinda (Hampi) , Being that the Ramayana is a historical and culturally, influential text. I used it as a touchstone to talk about ancient Ramayana and Sethu and Lanka. This may be simple, but I argued that texts are interpreted and used in many ways, and two of the ways in which the Ramayana seems to be used is to structure system of Sethu and Lanka.

The "Grace of Sri Rama " research project started since 10 years , actual Ramayana searching to find out Sethu which place constriction two mountains in between "Mahendra giri to Suveladri mountain ( Mahendragiri was Indian western Ghats to covered south edging point of Kanyakumari ) and Suveladri mountains to covered in Lanka Nagara North side , but it is sink in Southern Ocean ).

The Valmiki Ramayana to describe only Lanka Nagara ,,but not mentioned single word of Simhala or Sri Lanka .

Lanka Nagara describe in Surya Siddhantha , and Sri Kota Venkatachalam describe Lanka Nagar with image in " Brahma Srushti Vignanam " in the chapter of "Bhugolama ".The Surya Siddhanta first time describe God of architect Vishwakarama.

This project started out as an belong assignment for Hindu tradition religion book of Ramayana ( it is not a religion book , it is how to living different types of in societies and The man becoming a God ) religion class with principal Sri Hanmanta Rao he was working College principal and his qualification of M.A (Telugu), M.A (Sanskrit), M.A(English ) now he was doing PhD in English language ) . He was helped me and also Grace of Sri Rama book was translated .

My papers submission to conference or Research instruction of regional language , but to give a paper on my own research, that I was completely interested in, was both absolutely nerve , wracking and fulfilling for me, there was way in which I had this



knowledge that it was presenting that I was seeing in the Valmiki Ramayana and other reference books Indian mythological and modern science.

so with that said . I think deserves a lot of the credit my success, at least during the two points in . I was imaging things so hugely out of proportion to the point that when I got these things seemed much hard working done in this project.

### III. EQUATION

Surya Siddhanta mentioned unites of distance Yojana converted to Miles and Kilometres.

1.Verse: 1.59 of the Surya Siddhānta gives the diameter of the Earth as 1600 *yojanas*. Geometry of the Great Pyramid

Height of the Great Pyramid = 147.6505019m

Circumference of the Circle A = 147.6505019m<sup>2</sup>

d = 46.99865415m

Area of the Circle A = 1734.843719 m<sup>2</sup> = Area of the Square BC = 41.65145518m

Width of the Pyramid's King Chamber = 206.0658189 inches = 10 Royal cubits = 5.2340718 m

C = 41.65145518m

41.65145518 : 5.2340718 = 7.957753881

**Verse:** 1.59 of the Surya Siddhānta gives the diameter of the Earth as 1600 *yojanas*:

1600 · 7.957753881 = 12,732.40621 = in kilometres

It's the average diameter of the Earth.

12,732.40621 · 3.14159 = 40,000 = in kilometres it's the average circumference of the Earth

40,000 : 7.957753881 = 5026.543997 *yojanas*.

Conclusion: *yojana* = 7.957753881 km = 4.944719017 miles

One *yojana* = 7.957753881 (km) = C

2. As per Ramayana which measurements to equal of modern science As per Ramayana :

as per Surya Siddhanta rulers one *yojana* to converted in to Miles

1. Mahendra mountains (India) and southern Ocean melted place (Kanyakumari) to

Lankanagara (upper side of equator) Northern side Suveladr mountains in between distance 495.50 miles .

2. Lankanagara to Pushpitaka mountain in between distance = 650 miles

3. Pushpitaka mountain to Suryagiri in between distance = 677.50 miles

4. Surayagiri to Vaidhyuta giri in between distance = 600 miles

5. Vaidhyuta giri to Kunjara mountains in between distance = 400 miles

6. Kunjara mountain to Vrushabha mountain in between distance = 1400 miles

7. Vrushabha mountains to Chandana vana in between distance = 1200 miles

8. Chandana Vana to Badamukha mountains in between distance = 1328 miles.

∴ Kanyakumari to Badamukha mountains in between = 6,750 miles

494.50 + 650 + 677.50 + 600 + 400 + 1400 + 1200 + 1328 = 6750 miles

As per modern science to measurement from Kanyakumari to South equator and South pole

Kanyakumari to South equator in between distance = 561.098 miles

Kanyakumari to South pole in between distance = 6776.0529 miles

The difference Ramayana measurements and Modern Science measurement:

6776.0529 - 6750 = 26.0529 miles .

Conclusion : It is small difference from Indian Mythology and Modern Science + 26.0529 miles.

describe in Ramayana places and distance to known truth with modern Science .

### IV. CONCLUSION

There is a description of only one islands Lankanagara in the period of Rama found in the Ramayana . On account of geographical change 90% of the land *Lankanagara* got submerged into the sea, and the remaining 10% of the land not merged into the *Simhala* island. With the result the people of the present Sri Lanka say that their land ( Sri Lanka ) abounds in the remnants of Ramayana there by implying that the Lanka of the Ramayana is nothing else but their own land , with 90 % of the great Sethu having submerged in the Sea, the remaining part is seen at present between "*Danushkoti* " ( In India ) and "*Thalimannar*" (in Sri Lanka) . It is thought the remaining part of the great Sethu also may move to the North eastern side . one account of the geographical movement in due course . All this information is shown with pictures , in the book . Details are given with regard to the emperors and the kings who ruled our country in the past along with the presidents, prime ministers and the governors of our state in the modern period and soon . The book also aims at establishing the fact that , on the basis of "*Srimadramayana*" and other standard works as well as the "*Bhagavatha* " and various mythologies . *Lankanagara of Ravana* and *Simhala* ( the present Sri Lanka ) are two separate entities and that the Sethu (the great bridge) had not been constructed between "*Rameshwaram*" (in India) and Sri Lanka as universally believed .

Note : it is hoped that dissertation written on the basis of Indian mythologies . legends and modern Science to establish the athletic facts and universal values associated with the Ramayana will absorb the attention of the Ramayana enthusiasts .

It is to be seen that the first 4 chapters of the book deal with the journey of man from his birth . 5th ,6th and 7th chapters throw light on the glory . 8th,9th and 10th chapters speak of the changes resulting from the vagaries of nature , Again chapters from one to eleven open the door to our Indian culture and chapter eleven contains information about the book consulted for the required information for the preparation of the books.

In terms of viewing myself as a future academic I have thought about the ways in which re-work this research . Ideally , I would like to narrow my research down to a more specific time frame . Right now, partition of India is the historical context that I have in mind. In this context I would like to take comparatively the motives and dynamic behind this project. I hope to find an answer to at least part of this question, as I continue to do work on this project in the future .



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#### AUTHORS

**First Author** – Muthyala Ramakrishna Rao. Address: 10-2-289/108 , Flat no 302, Saivihar Apartment, Shantinagar Colony, Hyderabad-500028, Telangana : State, India.  
Cell No 9866420245, email: ramam999@gmail.com,  
[www.graceofsreerama.org](http://www.graceofsreerama.org)

# Influence of Cold Chain Supply Logistics on the Safety of Vaccines. A Case of Pharmaceutical Distributors in Nairobi County

Monicah W. Njuguna<sup>1</sup>, Dr. Christopher J Mairura<sup>2</sup>, Dr. Kepha Ombui<sup>3</sup>

<sup>1</sup>MSC Student: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>2</sup>Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

<sup>3</sup>Adjunct Lecturer: Jomo Kenyatta University of Agriculture and Technology, Kenya

**Abstract-** Supply of safe vaccines is very important and appropriate procedures, monitoring and logistics systems need to be put in place to ensure safety. The pharmaceutical supply chain have various global regulatory requirements to be met during transport, storage, packaging and handling environmentally sensitive products like biologicals, vaccines and some medicines. This is to ensure that quality and efficacy of cold chain products is not compromised along the supply chain. Global players have regulations and guidelines that address product integrity and safety during the entire supply chain. It was therefore of importance to identify how Pharmaceutical distributors in Nairobi County have developed their cold chain supply systems and how it is able to maintain cold chain for temperature-sensitive pharmaceuticals considering the challenges of; Transport systems, storage facilities, packaging, technical capacity, unreliable electricity supply, weak validation systems, probable poor monitoring of cold chain supply systems. The main objective of the study was to establish the influence of supply chain logistics in supply of safe pharmaceutical cold chain products in Pharmaceutical distributor firms in Nairobi County while the specific objectives were to determine how storage conditions in pharmaceutical distributors in Nairobi influences safety of vaccines; to determine the influence of transport systems on the safety of vaccine; to evaluate the influence of Packaging on the safety of vaccines and finally establish the extent to which technical capacity influence safety of Vaccines in pharmaceutical distributors in Nairobi. Descriptive survey design was considered because it is non-experimental and studies the relationship between non-manipulated variables in a natural setting. The study was carried out in five major pharmaceutical firms out of 16 registered cold chain pharmaceutical distributors in Nairobi County. A sample size of 67 participants was selected out of a population of 211 staff from different firms consisting of the automatically included 5 supply chain managers and 62 employees from procurement and stores department. The data was collected by use of self-administered questionnaires to the sampled respondents by a drop and pick method. The questionnaires were coded and data analyzed using Statistical Package for Social Science (SPSS V-17). Correlation analysis was done to determine the relationship between the dependent and independent variables whereby it was found that technical capacity and storage conditions have the greatest relationship and influence to the safety of vaccines. The findings were presented through figures, tables, and graphs.

**Index Terms-** Cold chain, logistics, Pharmaceuticals, Safety

## I. INTRODUCTION

In as much as globalization has made the world a global village through phone calls, emails, social networking, e-conferencing and videos that are easily transmitted in seconds, this has not penetrated other areas such as pharmaceuticals where goods have to be physically moved. Ames, (2006) emphasizes that cold chain supply requires a lot of logistical coordination and this can only be made possible by cold chain technology which has various impacts on timely delivery and quality of the pharmaceutical cold chain products and hence their potency and safety for administration to patients.

At the global perspective, Estrada, (2008) defines procurement as the acquisition of goods, services or works from an outside external source at the best possible cost to meet the needs of the purchaser in terms of quality and quantity, time, and location. The cold chain is the process of maintaining medication such as insulin, vaccines; biologicals within recommended temperatures mostly between 2°C to 8°C throughout the supply chain (Bishara, 2006). In the health sector pharmaceutical cold chain is concerned with the transportation, storage, and handling of pharmaceutical products in a safe environment from the manufacturer to the end user. Temperatures outside recommended temperature ranges may reduce potency leading to lack of desired response e.g. reduced immunity. Control of storage and transportation temperature is essential in maintaining the quality of medicines and in helping to protect patients from sub-standard or ineffective medicines that may result from inadequate control (Blake, 2008). Lack of awareness by distributors in the control of storage and transportation temperatures can have a major impact on product quality.

World Health Organization (WHO) has noted that twenty five percent of all vaccine products reach their destination in a degraded state. This according to The Medicines and Healthcare Products Regulatory Agency is due to temperature rises above desired parameters thereby contributing forty three percent of reported non-compliant cases. Worldwide vaccine-preventable diseases are responsible for about twenty five percent of the ten million deaths occurring annually for children under five years of age. Global warming makes temperature control issues a growing challenge in the cold chain supply (Bishara, 2007).

Bishara, (2007) states that according to Medicines and Healthcare Products Regulatory Authority (MHRA) of the United Kingdom, thirty two percent of all critical and major deficiencies recorded by MHRA's Good Distribution Practice (GDP) inspectors during 2005/2006 related to the control and monitoring of storage and transportation temperatures. Comparatively, forty three percent critical and major deficiencies were recorded in 2004/2005 respectively. In view of this, many countries such as Canada, Ireland, Australia, Singapore, South Korea, and European Union have issued regulations and specific guidelines that address product integrity during transportation of cold chain medicines and hence the significant reduction in deficiencies.

At the continental level, Forcinio and Wright, (2005) has noted that in lower-income countries in Africa, efforts to have an efficient cold chain supply process are often hampered by poor health delivery systems, low political commitment, low levels of investment, poorly maintained cold chains, lack of human resources, poor effective disease surveillance and reporting systems which are key components of the procurement and logistics process.

A survey by Agyekum (2012), conducted in Ghana, Kenya and Uganda indicates that an average of sixteen percent of the sampled facilities were not compliant to the guidelines laid out by regulatory authorities and fifty percent of these facilities had temperatures 4°C or more outside the recommended temperatures. For example only four per cent of facilities stored vaccines in cold boxes, while the remainder used refrigerators and storage outside the recommended range. Though significant variation was observed between the countries; twenty six percent, sixteen percent, and eight percent for Ghana, Kenya, and Uganda, respectively there remains significant room to improve cold chain supply in these countries among others in Africa (Burger, Kopf, Yoong, & Sood. 2012)

In a comparison of African countries based on their cold supply chains, it was found that Ghana had developed its cold chain supply systems and now it is able to maintain cold chain for temperature-sensitive items than Kenya and Uganda in spite of facing similar challenges. According to Agyekum (2012), this was because Ghana's regulatory Authorities have been able to develop validation methods and guidelines for the cold chain delivery system, with the goal of providing temperature assurance during the manufacturing, storage, shipping and delivery of cold chain items (Burger, Kopf, Yoong, & Sood. 2012)

The Kenyan government and several international donors that provide vaccines which are the main pharmaceutical cold chain products for the Kenya Expanded Programme for Immunisation (KEPI). These pharmaceutical cold chain products are managed and distributed through the KEPI vertical program and are stored at the central level in the KEPI cold store. KEPI has a strong information system that includes good stock control practices. This facilitates recording of vital information on vaccines on reception, during storage and when they are leaving the store for distribution.

However, it is not only KEPI that imports and distributes medical products and vaccines in Kenya as there are other players in the field. Kalunda, Nduku, and Kabiru (2012) reveal that a pharmaceutical company is a commercial business licensed

to research, develop, market and/or distribute drugs, most commonly in the context of healthcare. The pharmaceutical industry consists of three segments namely the manufacturers, distributors and retailers (Export Processing Zones Authority–Kenya, 2005).. The key players in the industry in Kenya include multinational corporations (MNC's) like GlaxoSmithKline, Bayer, Sanofi Aventis, and Pfizer while key local establishments include Dawa Pharmaceuticals Ltd, Cosmos Pharmaceuticals. They deal in brand and/or generic medications. They support the country's health sector, which is estimated to have about 8,006 health institutions countrywide (Kenya National Bureau of Statistics (KNBS), 2012).

Most of these players that are predominantly, privately owned firms in engaging in pharmaceutical products that require cold chain sometimes use equipment that are not compatible with WHO–UNICEF product information sheets (PIS) and cannot ensure the storage temperatures required for different types of pharmaceutical cold chain products. Ayaya, Liechty, Conway, Kamau, and Esamai, (2007) reasons that this may lead to poor maintenance and possible malfunction which may put vaccines at risk of exposure to unacceptable temperatures. The factors leading to this supply of not very safe pharmaceutical cold chain items has not been well identified and this research therefore seeks to establish these factors (Ministry of Health (MOH), 2004).

In Kenya the cold chain supply has generally been neglected in regard to the establishment, development, maintenance and control of the activities involved especially in the private sector which really supports the health sector mainly because the cold chain supply process involves multiple parties, high risks and high financial investments. When there is an equipment or management failure at the primary level, large quantities of cold chain products may be destroyed in a matter of a few hours (Kamau, & Mukui. 2005).

Most of these players require a cold chain logistic in order to ensure proper handling, temperature control and monitoring for safety and quality in each stage of the supply chain lest the very functions of the medicinal products and vaccines as stated by Bishara, (2006) be rendered futile. According to PPB (2013) there are 1332 registered pharmaceutical companies and chemists in Kenya, with 50 percent of them in Nairobi and only 10 percent are involved in cold chain supply and only 10 percent of those involved in cold chain supply are involved in importation and distribution to the other pharmaceuticals, the hospitals and health facilities.

## 1.1 STATEMENT OF THE PROBLEM

The importance of the cold chain is crystal clear to the government and key stakeholders within the industry based on their impact on health, very little effort is done to control the effects of supply chain logistics such as transport, storage, packaging, technical capacity and many other sensitive activities that help keep such products safe and in good quality. This is confirmed by Bishara, (2007) who asserts that pharmaceutical cold chain items like vaccines are particularly sensitive materials which, if not manufactured and shipped under stringent controls, can become ineffective or even hazardous to the consumer due to reduced potency.

Kamau and Mukui ,(2005), noted that lack of awareness by distributors in the control of storage and transportation temperatures can have a major impact on product quality by non-observance of the cold chain or inefficiency in its monitoring mechanisms. This may affect the products' therapeutic properties and consequently generate deficiency quality risks such as loss of therapeutic effects and intoxication with dire effects on the health of the users.

Storage conditions and facilities are not upto standard and there lacks a fleet of specialised transport systems to ensure no cold chain breaks during transport by doing proper monitoring of temperatures. Packaging materials used are questionable in maintain the correct temperatures and conditions to ensure safety of vaccines. Most firms also seem not to be technically capable to handle cold chain effectively to ensure their safety.

Proper packaging Regulatory and compliance issues relating to transportation, storage, packaging and technical compliance , influences the safety cold chain items to the user level are critical in this process to avoid degradation (Blake, 2008) This is why this study is timely in analysing the influence of cold chain supply logistics on supply of safe cold chain products.

## 1.2 OBJECTIVES

### General Objective

The general objective of this study was to establish the influence of cold chain supply logistics on safety of vaccines in pharmaceutical distributors in Nairobi.

### Specific Objectives

- 1 To determine how storage conditions in pharmaceutical distributors in Nairobi influences safety of vaccines.
- 2 To determine the influence of transport systems on the safety of vaccines in pharmaceutical distributors in Nairobi
- 3 To evaluate the influence of Packaging in pharmaceutical distributors in Nairobi on the safety of vaccines.
- 4 To establish the extent to which technical capacity in pharmaceutical distributors in Nairobi influence safety of Vaccines

### Research Questions

The research questions of this study were:

1. How does storage conditions in pharmaceutical distributors in Nairobi influence safety of vaccines?
2. How do transport systems of vaccines in pharmaceutical distributors in Nairobi influence their safety?
3. How does packaging of vaccines within pharmaceutical distributors in Nairobi influence their safety?
4. How does technical capability of pharmaceutical distributors in Nairobi influence safety of Vaccines

## II. LITERATURE REVIEW

The study was grounded on three theories mainly; Agency theory, Flat earth theory and the 3-dimensional theory.

### 2.1 Agency Theory

Agency theory explains relationship between two parties, mainly an agent and a principal whereby the principal delegates to the agent his powers to act on behalf, represent, and carry out transactions with a third party. In such relationships, there is often a tendency of power abuse by agents and problems arise due to agency inefficiency. Agency theory helps understand the conditions under which a supply chain member is likely to attempt to exploit other members.

The theory also guides in an investigation of the effect of such opportunism on supply chain effectiveness and how it can be prevented or minimized. The agency theory was promoted with seminal works of Max Weber (Beckert, and Zafirovski, 2006), was mostly concerned with the conflict between political master and state officials. This view was built on the foundation of the neoclassical view of organization-that views the organization as black boxes of operations, where the "relationship between performance and incentives "was overlooked (Beckert, and Zafirovski, 2006).

New institutionalism view of organization opened the black box of organizational operations and paved way for contemporary view of the agency theory. In the old institutionalism view, opportunistic behavior based on the rational system view was dominant. However, the new institutionalism view of the organizations, promotes the delegation of responsibilities and operation, through an open system view towards the environment. The agency theory – from the classical or neoclassical perspectives provides contributions to the understanding of supply chain management. Agency theory has been applied to various activities associated with supply chain management including, outsourcing (Logan, 2000; Loebbecke & Huyskens, 2009,) sourcing (Shook, Adams, Ketchen & Craighead 2009), and supply chain collaboration (Kwon & Suh, 2004). Agency theory is useful in the study of cold supply chain in the pharmaceutical industry as it informs why firms opt to use distributors or agent to supply products

### 2.2 Flat Earth Theory

Friedman, (2007) explains that there are three eras of globalization and ten flatteners which made the world smaller, making it easier to communicate and share our knowledge. The first era, called between the years 1492, when Columbus set out to discover a new trade route to the New World, and 1800, made the world fall in size from large to medium. During this period, the strength of a country was based on the number of horsepower or the number of steam engines owned, compared with other countries. The second period between the years 1800 and 2000 decreased the size of the world, from medium to low. Multinational companies were the integration force, and the power was given to a company by the level of innovation in the field of machinery and equipment.

The third globalisation era began around the year 2000. The first two eras led to globalization at the country level and, later, at the company level, this new era favored reduction to a very small world, flattening the playing field and putting the

individual in the centre Friedman, (2007). Globalization has been maintained by the action of some flattening factors that favoured the levelling of the World and the emergence of some opportunities that could increase welfare if successfully exploited.

One common misconception in cold chain supply is that product storage and distribution temperatures are the same. The idea that the products' long-term storage temperature is not the same as the distribution temperature is easily forgotten. Cold chain products was be exposed to warmer or colder conditions as it moves downstream the supply chain. Where the vaccines are taken out of the target refrigeration temperature range for a short period and later placed back to the proper conditions without compromising the product quality. In the pharmaceutical industries, we find that the stability studies are mandatory by health authorities and these studies are performed following a strict and standardized method outlined by the International Committee of Harmonization (ICH). The Quality Stability group performs these studies and the Regulatory group uses the results to establish storage temperature and product shelf life, to file the drug product registrations and to answer questions from regulatory bodies however, stability studies are lengthy and expensive and are specific to the primary container and the manufacturing site.

On the other hand, a standardized method to define the distribution temperature is not available and is common to find that many companies only perform long-term stability studies and established storage temperatures. Companies with only storage temperature have the flat-earth view because they assume that distribution temperature must be the same as the storage temperature. This flat-earth view creates many supply chain inefficiencies because of the need of extra protection due to the fear of the unknown outside the long term stability conditions.

### **2.3 Three-Dimensional Generic Theory Approach**

Efficient intra and inter organizational information management in cold chain supply has different dimensions (Althoff, Ellebrecht, & Petersen, 2005). The technical dimension implies aspects of data distribution and storage, the possibilities of data exchange and in general the technology it incorporates. Craig (2007) describes the technical dimension as a group which includes mainly visible, tangible, measurable and easy-to-change components.

Organizational structure indicates the performance of different tasks as well as activities, for example in cross-functional teams. Van der Vorst, Da Silva, and Trienekens, (2007). understands under this aspect management methods,

power and leadership structure, risk and reward structure and culture and attitude of the involved organizations describe in their techno-managerial approach a technical and an organizational or managerial perspective, respectively. Althoff, Ellebrecht and Petersen, (2005) define a third functional dimension of functional requirements which determine the information management in a quality and health management context. In relation to pharmaceutical cold chain management, mainly the proposed linkage of quality related data to other data sets at inspection and decision points may be categorized in this dimension. Safety of cold chain products is influenced by the organisation structure in terms of information sharing, technical and functional undertaking of cold chain related processes.

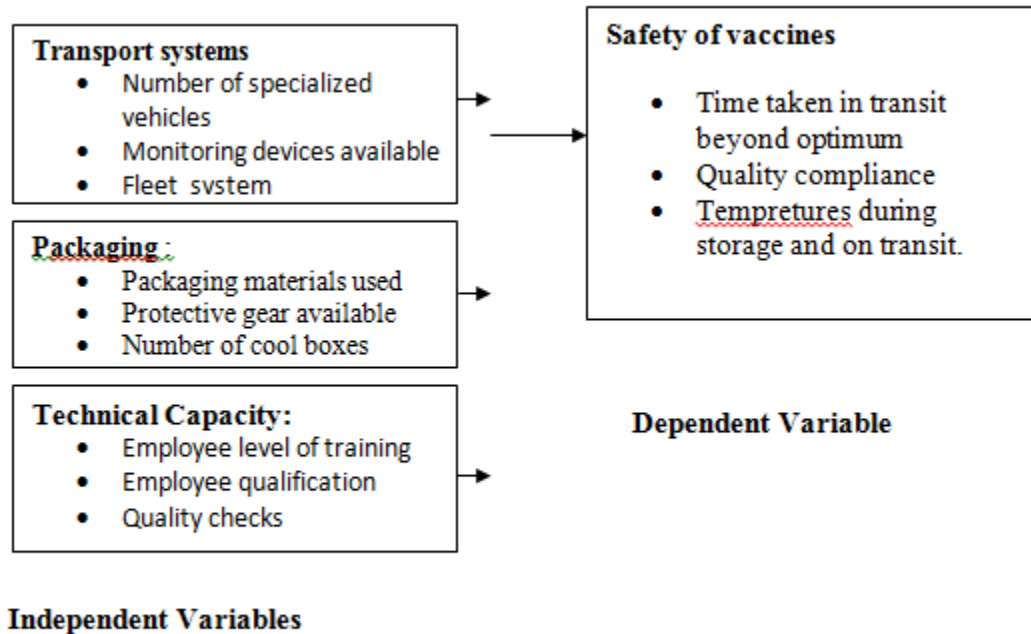
### **2.4 Conceptual framework**

The conceptual framework illustrates the relationship between the independent variable, and dependent variable. The independent variables include; storage conditions, transport systems, packaging and technical capacity which was measured, the dependent variable is safe cold chain items, which in this study is vaccines.

In Kenya very little cold chain medicine is manufactured and hence relies heavily on importation. Private suppliers receive their cold chain products from the airport cold room, transport them to wholesale storage facilities and distribute to retail pharmacies from their cold storage holding facilities. The Safety of cold chain pharmaceuticals/ vaccines is greatly influenced by variations during transport, storage conditions and facilities, handling and packaging (Bishara, 2007).

Members of the pharmaceutical supply chain have various regulatory requirements to meet while distributing, storing and handling cold chain products to ensure that the quality and efficacy of the product are not compromised along the supply chain. The cold chain system consist of a series of transport and storage links which also involve a lot of handling, designed to keep products within an accepted temperature range until it reaches the end user. Storage is a critical parameter in maintaining the quality, safety, stability and efficacy of cold chain products and must be stored in accordance with the requirements of its marketing authorization (Skuce, 2010).

The operation of the pharmaceutical cold chain management cycle is also affected by some intervening factors which are political, legal, and regulatory framework may cause delays reducing on the lead time and compromise on product quality and safety, however these intervening factors were not measured in this study.



**Figure 2.1: Conceptual Framework**

III. RESEARCH DESIGN

This study adopted a Descriptive survey design to generate answers to the research questions (Orodho, 2003). Descriptive survey design was considered because it is non-experimental and it studies the relationship between non-manipulated variables in a natural setting, it also allows the collection of a large amount of data from a sizable population in a highly economical way (Kumar. R. 2005). The data collected was descriptive in nature and was used to assess the influence of cold chain supply logistics on the safety of vaccines in Nairobi County. This design helps obtain information that describes existing phenomena by asking individuals about their perceptions, attitudes, behaviour or values (Mugenda, O. & Mugenda, and A. 2003).

**3.2 Population**

Mugenda and Mugenda, (2003) defines a population as the full set of cases from which a sample is taken. The population in this research study was drawn from Pharmacies and Poison Board registered cold chain pharmaceutical distributors in Nairobi County.

**3.3 Sampling frame**

The sampling frame for the study was drawn from the registered cold chain pharmaceutical distributors in Nairobi County . Mugenda, and Mugenda, (2003) states that a sampling frame is an index of cases from which a sample is selected. According to PPB (2013) there are 16 registered cold chain pharmaceutical distributors in Nairobi County.

**Table 1: Sampling frame**

Population Size(Firms)	Percent Sample %	Sample Size
16	30	5

The five firms are; Phillips Healthcare, GlaxoSmithKline Kenya, Novartis Limited, Laborex Kenya, and Sanofi Aventis.

**3.4 Sampling and Sampling Technique**

A sample is a representative of a population according to Mugenda, and Mugenda, (2003). Sampling facilitates the study of a relatively smaller number of units compared to the target population and therefore helps obtain data that is representative of the whole population. A non-probabilistic sampling technique,

specifically purposive sampling, was used to select the study region (Nairobi county) .Purposive sampling was appropriate in the selection of the Nairobi county region in because it allows for the selection of unique cases that are especially informative. Nairobi County being the capital city of Kenya where most of the main distributors are located (PPB, 2013).

Mugenda, and Mugenda, (2003) suggests that a sample size of 384 is representative for a population greater than 10,000

when the Z statistic is 1.96 at 95% confidence level. However the target population in this case is much less and hence followed Orodho (2005) statement that a sample of thirty percent is representative enough for a descriptive study; therefore a representative sample of five organizations was selected being thirty percent of the sixteen registered cold chain pharmaceutical distributors in Nairobi county involved in distribution to the other pharmaceuticals, the hospitals and health facilities .The five firms were selected purposively as firms that influence eighty percent of the cold chain supply market in the pharmaceutical sector as they are directly involved in the importation of vaccines (PPB, 2013). The five firms are; Phillips Healthcare, GlaxoSmithKline Kenya, Novartis Limited, Laborex Kenya, and Sanofi Aventis.

The target population was stratified into, middle level managers and operational level personnel involved in the cold

chain. For the middle level managers (departmental heads), there was automatic inclusion sampling while for the operational level personnel stratified simple random sampling was used to sample other categories of sample size to select 30 percent of the target population based on Orodho (2005) that a sample of 30 percent is representative enough for a descriptive study based on characteristics such as position and experience, among others.

The targeted population under study comprise of staffs that are involved directly or indirectly in the procurement and logistics process of cold chain pharmaceuticals from the selected pharmaceutical distributors. The sample size of 67 participants was selected from all the different firms consisting of the automatically included 5 supply chain managers and 62 employees from procurement and stores department.

**Table 2: Distribution of sample size**

Staff Category	Sampling technique	Population Size	Percent Sample %	Sample Size
Supply-chain manager	Automatic inclusion	5	100	5
Procurement team	Simple random	86	30	26
Stores-Support staff	Simple random	120	30	36
<b>Total</b>		<b>211</b>		<b>67</b>

### 3.5 Instruments

The main instrument for data collection used was a structured questionnaire.

According to Sushil (2010), a questionnaire is a method of survey data collection with a group of printed questions which are deliberately designed and structured to gather information from respondents. This study used a structured questionnaire with close ended questions standardized in order to allow for easy comparison (Mugenda, O. & Mugenda, A.2003). The questionnaires contained relevant questions which were designed with the objectives of the study in mind. The questionnaire was issued to all sampled respondents across various category spectrum, and explore perceptions and feelings, general experiences, as well as knowledge and general information on the subject under study (Mugenda,O. & Mugenda,A.2003).

### 3.6 Data Collection methods

The research data was collected from primary sources through questionnaires and secondary data reviewed from existing literature, the firms' records, published material, journals and internet sources. The questionnaires were self-administered to the sampled respondents by a drop and pick method. Permission to carry out the research and authorization letter was be received from the University prior to administering the questionnaires and the researcher also went the sampled organizations for introduction and also seek a written approval to carry out the research confidentially for academic purpose only.

### 3.7 Data analysis and presentation

The researcher used both descriptive and inferential statistics to analyze data to allow for meaningful description data collected using statistics and to compare variables numerically by

Correlation analysis. The data collected through questionnaires was coded and entered into the Statistical Package for Social Science (SPSS V-17) for analysis of quantitative data . Correlation analysis was used to establish the relationship between the independent variables which are storage conditions, transport systems, packaging and technical capacity with the dependent variable which is safety of cold chain items. The resulting correlation coefficient (R) gave the indication of the strength and direction of the relation between the independent and dependent variables where values closest to +1 indicate a strong relationship and vice versa. Inferential statistics were used to make inferences about the population and a comparison for qualitative data based on literature reviewed and industry standards already set.Analyzed data was presented using Tables, graphs and charts .

## IV. RESEARCH FINDINGS AND DISCUSSION

### 4.1Introduction

This chapter describes the analysis and methods that were used in order to answer the research questions generated from the general objective of the study which is to establish the influence of cold chain supply logistics on safety of vaccines in pharmaceutical distributors in Nairobi. Detailed descriptive statistics such as frequencies and graphs and inferential statistic such as exploratory factor analysis, Pearson's correlation coefficient the key research findings are presented.

Gay and Airasian (2006) states that data analysis is the separation of data and examining data separately. Data analysis refers to examination of information collected by ordering and

restructuring data from the field in order to grasp the overall meaning in relation to the hypothesis, the purpose of which is to illustrate the issues by making inferences.

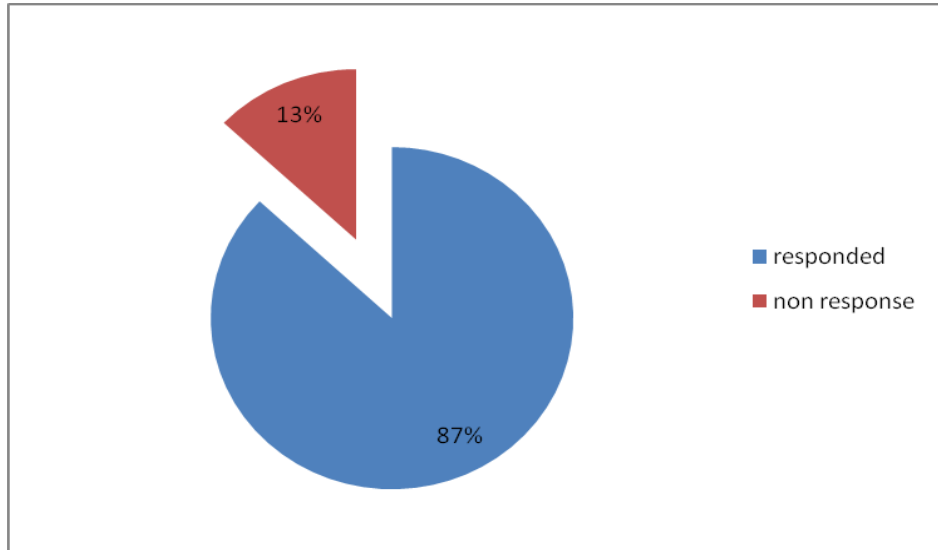
**4.2 Response Rate**

An analysis of the respondents who were responsive and non responsive was as illustrated in the table below.

**Table 4.1 Response Rate**

Rating	Frequency	Response rate %
Responded	58	87
Non-response	9	13
<b>Total</b>	<b>67</b>	<b>100</b>

**RESPONSE RATE %**



**Figure 4.1 .Response Rate**

This was to establish the response rate of the respondents from Table 4.1, the total number of that were administered were 67 and out of them 58 questionnaires representing 87% were fully answered and returned while 9 questionnaires representing 13% were not returned. The response rate was high and the findings were representative.

**4.3 Back ground Information Analysis**

The background information collected included the respondent’s position, level of education and years of experience. A pie chart was used to illustrate the study findings as shown in Table 4.2 below.

**Table 4.2 Background Analysis on respondent category**

Respondent Characteristics	Characteristics Details	Number of Respondents	Response Rate%
<b>Position</b>	Supply chain Manager	4	6
	Procurement Personnel	23	34
	Stores personnel	31	46
<b>Total</b>		<b>58</b>	<b>87%</b>

Cold chain logistics mainly involve the stores and procurement personnel with 46 % and 34% respondents respectively and 6% are their managers who oversee the cold chain operation .Below is a pie chart illustration.



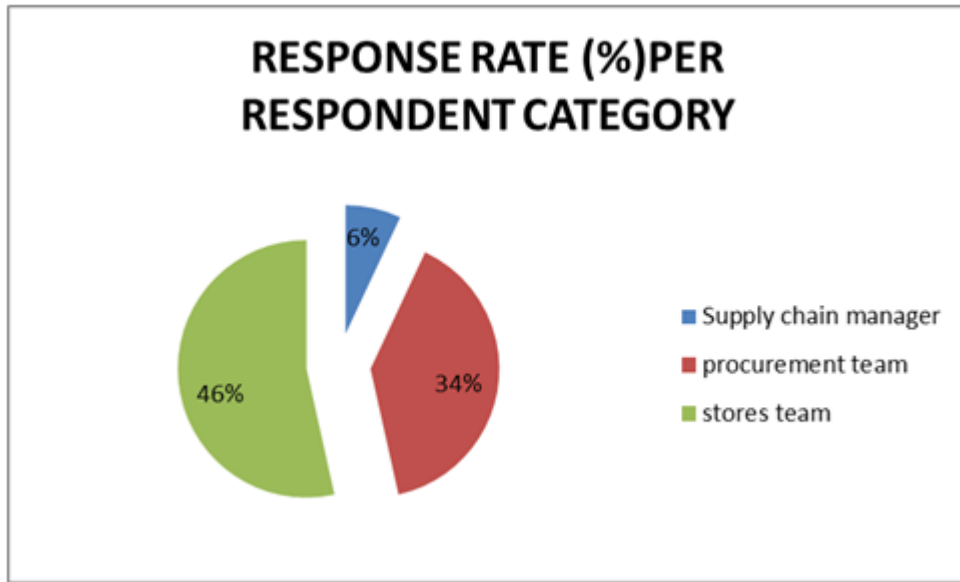


Figure 4.2 . Response Rate per Respondent Category

The researcher also sought to find out the highest level of education attained by the respondents and also if they had any special training on Cold chain.

Table 4.3 Background Analysis on Education Level

Respondent Characteristics	Characteristics Details	Number Respondents	Response Rate%
Education level	1.Primary School	0	0
	2.Secondary school	9	13
	3.Certificate	15	22
	4.Diploma	16	24
	5.Graduate Degree	10	15
	6 Post graduate degree	8	12
	7.Others (special training on cold chain)	6	9
<b>Total</b>		<b>58</b>	<b>87%</b>

Results of the study indicated that 24% had a diploma, 22% a certificate, 15% had a degree and 12% had post graduate degrees. Out of all respondents only 9% had a special training on cold chain. Education plays a very crucial role in the social-economic development and understanding and hence a high level of education depicts a higher and better understanding. In this

case, majority of the respondents have diplomas and certificates and were able to respond accurately with understanding however the very low percentage of respondents specially trained in cold chain makes their competence in cold chain operations questionable.

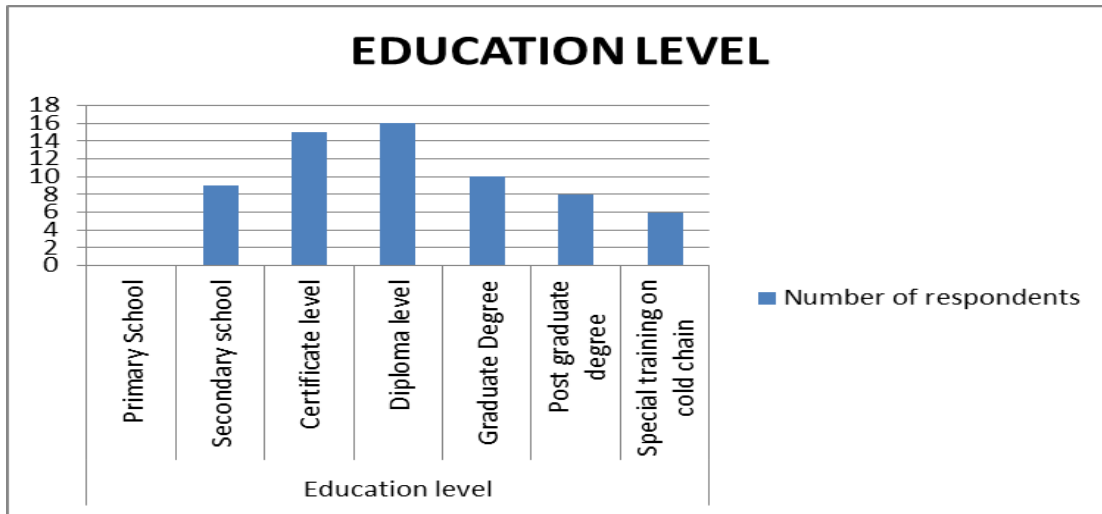


Figure 4.3 . Response per Educational level

The researcher also sought the years of experience by respondents in cold chain process

Table 4. 4 Background Analysis on Years of Experience

Respondent Characteristics	Characteristics Details	Number of Respondents	Response Rate%
Years of experience	1	11	16
	1-3	14	20
	3-5	23	34
	5-10	7	10
	above 10	3	4
	<b>Total</b>		<b>58</b>

The results revealed 54% 16% and 10%, had worked at the organizations between, 1-5 years, less than 1 year and 5-10 years respectively with only 4% with over 10 years experience . This

indicates that majority of the employees have stayed in the organizations long enough to understand the routine and cold chain operations though not specially trained

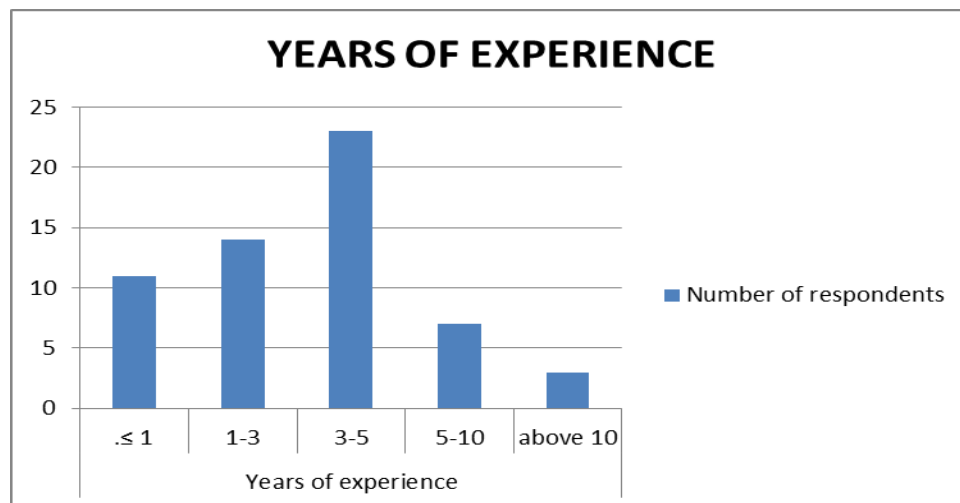


Figure 4.4 . Response per years of experience

#### 4. 4 Discussion of findings

The findings which were presented in tables and percentage frequencies were discussed as follows.

**4. 4 .1 Storage conditions and facilities and Safety of vaccines.**

The responses were generated on a five point Likert scale; whereby the respondents were required to state their level of agreement where: \*SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree f=Frequency

**Table 4.5 Storage conditions**

<b>storage conditions and facilities</b>		<b>SD</b>	<b>D</b>	<b>S</b>	<b>A</b>	<b>SA</b>
Available special storage area	F	0	9	12	31	6
	%	0	16	21	53	10
Enough storage space available	F	4	6	24	18	6
	%	7	10	41	31	10
Fully functional storage equipment	F	4	24	18	6	6
	%	7	41	31	10	10
Different storage equipment for different kinds of vaccines	F	24	18	6	10	0
	%	41	31	10	17	0
Storage equipment are regularly checked for compliance	F	30	18	10	0	0
	%	52	31	17	0	0
Existing SOPs that are followed to ensure proper storage	F	24	18	6	6	4
	%	41	31	10	10	7
Measures in place to ensure vaccines don't go bad	F	0	0	20	24	14
	%	0	0	34	41	24
Storage practices are satisfactory	F	10	18	20	3	7
	%	17	31	34	5	12
<b>Average %</b>		<b>21</b>	<b>24</b>	<b>25</b>	<b>21</b>	<b>9</b>

The first objective of the study sought to determine how storage conditions influences safety of vaccines. Descriptive statistics in form of frequencies and percentages were used to summarize the findings as shown in Table 4.5. Craig, (2007) points that maintaining correct temperatures during storage are a very important task for cold chain items. A frequency of 53% of respondents agree that there exists special storage areas, 52% of respondents strongly disagree to regular checking of equipment for compliance.41% are satisfied with the storage space available and disagree on the functionality of equipments and availability of different for different kinds of vaccines. and 41% strongly disagree to the use of SOPs in storage of cold chain vaccines.However,34% are satisfied with the storage conditions and practices in their organisations.

On average 25% of the respondents are satisfied with the storage conditions in their organisations while 24% disagree to having proper storage conditions for cold chain vaccines and only 9% strongly agree to having proper storage conditions that ensure safety of vaccines.

This means that the storage conditions are not excellent to ensure safety of cold chain items. Control of storage conditions and temperature is essential in maintaining the quality of cold chain items and in helping to protect patients from sub-standard or ineffective medicines that may result from inadequate storage control (Blake, 2008).

**4. 4 .2 Transport Systems and Safety of vaccines.**

The second objective of the study was to determine the influence of transport systems on the safety of vaccines in pharmaceutical distributor in Nairobi County.

**Table 4. 6 Transport Systems and Safety of vaccines**

<b>Transport systems</b>		<b>SD</b>	<b>D</b>	<b>S</b>	<b>A</b>	<b>SA</b>
Special Vehicles for transportation of cold chain items	F	30	18	10	0	0
	%	52	31	17	0	0
Enough vehicles to meet demand for distribution	F	0	6	30	18	4
	%	0	10	52	31	7
Transport vehicles are fitted with functional temperature and humidity monitoring devices	F	32	16	5	3	2
	%	55	28	9	5	3
Fleet system to manage distribution	F	44	6	8	0	0
	%	76	10	14	0	0
Delivery is done within recommended timelines	F	30	18	10	0	0
	%	52	31	17	0	0

SOPs are followed to ensure proper transport conditions	F	24	18	6	6	4
	%	41	31	10	10	7
Transport and distribution practices are satisfactory	F	10	18	20	3	7
	%	17	31	34	5	12
<b>Average %</b>		<b>42</b>	<b>25</b>	<b>22</b>	<b>7</b>	<b>4</b>

\*SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree f=Frequency.

The results on Table 4. 6 indicate that a frequency of 76% strongly disagree to having a fleet system that manages cold chain distribution, another 55% strongly disagree to the vehicles being fitted with functional temperature and humidity measuring devices and 52% of the respondents strongly disagree on the availability of special vehicles to transport cold chain items but are satisfied with the vehicles available to meet the demand .However, only 17% are satisfied with the deliveries being done within the recommended timelines and only 7% strongly agree to following transport SOPs while 5% of the respondents agree to having satisfactory cold chain transport systems.

On average a majority of 42 % strongly disagree to having proper transport systems to ensure safety of cold chain items. This means that the safety of cold chain items is greatly

compromised during transportation within the county because specialized vehicles should be used to transport cold chain products and be fitted with monitoring devices, temperature monitors depending on the size of the load (John, 2007). Refrigerated transport is also recommended for deliveries taking longer than three hours in transit provide assurance that temperatures in all parts of the load remain acceptable and hence vaccine potency maintained (Craig, 2007).

#### 4. 4 .3 Packaging and Safety of vaccines.

The third objective was to evaluate the influence of Packaging on the safety of vaccines in pharmaceutical distributor in Nairobi County.

**Table 4. 7 Packaging**

<b>Packaging</b>		<b>SD</b>	<b>D</b>	<b>S</b>	<b>A</b>	<b>SA</b>
Packaging SOPs exist for different cold items	F	24	13	15	6	0
	%	41	22	26	10	0
Different packaging materials for different cold chain items	F	0	11	20	22	5
	%	0	19	34	38	9
Protective gears to use during packaging	F	0	12	31	9	6
	%	0	21	53	16	10
Customers are satisfied about the packaging	F	0	15	13	18	12
	%	0	26	22	31	21
There are enough packaging equipment to meet demand	F	4	6	24	15	9
	%	7	10	41	26	16
The packaging practices are satisfactory	F	0	10	28	20	0
	%	0	17	48	34	0
<b>Average %</b>		<b>8</b>	<b>19</b>	<b>38</b>	<b>26</b>	<b>9</b>

\*SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree f=Frequency.

Descriptive statistics in form of frequencies and percentages were used to summarize the findings as shown in Table 4.7 above.

A frequency of 53% of respondents is satisfied with the protective gears provided for use during packaging and 48% of the respondents are satisfied with the packaging practises in their organisations. However, 41% of the respondents strongly disagree to existence of packaging SOPs for cold chain items but are satisfied with the packaging equipments available and 34% of the respondents are satisfied with the availability of different packaging materials for different vaccines and 31% of the respondents agree that their customers are satisfied with their packaging practises.

On average 38% of the respondents are satisfied with packaging practices for cold chain items and 26% agree that packaging practises in their organisations ensure safe cold chain vaccines. However 8% of them disagree to having proper packaging practises mainly because they do not follow any SOPs for packaging of cold chain items.

This means that proper packaging is key to ensuring delivery of safe cold chain vaccines according to Blanchard (2007), use of proper and recommended packaging material protects the cold chain items and ensures their safe delivery while use of correct protective gear protects the personnel doing the packaging of cold chain items. The study reveals that packaging procedures practised are satisfactory and delivery of safe vaccines is ensured.

**4.4.4 Technical Capacity and Safety of vaccines.**

The final objective of the study was to establish the extent to which technical capacity of pharmaceutical distributor companies in Nairobi County influences safety of vaccines.

**Table 4. 8 Technical Capacity**

<b>Technical capacity</b>		<b>SD</b>	<b>D</b>	<b>S</b>	<b>A</b>	<b>SA</b>
Staff who handle cold chain items are specifically trained	F	24	15	10	6	3
	%	41	26	17	10	5
Enough employees to handle the demand	F	4	6	24	15	9
	%	7	10	41	26	16
Equipment are regularly checked and serviced to avoid breakdown and ensure compliance	F	30	18	10	0	0
	%	52	31	17	0	0
There are enough equipment to handle demand	F	4	6	24	18	6
	%	7	10	41	31	10
There is a power backup to ensure constant power supply for equipment	F	0	0	10	18	30
	%	0	0	17	31	52
Quality checks to ensure compliance with cold chain supply regulations	F	36	18	4	0	0
	%	62	31	7	0	0
<b>Average %</b>		<b>28</b>	<b>18</b>	<b>24</b>	<b>16</b>	<b>14</b>

\*SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree f=Frequency.

The results on table 4. 8 above reveal that 62% of respondents strongly disagree to having the technical capacity to perform quality checks on cold chain items in order to ensure compliance to supply chain regulations however, 52% of respondents strongly agree to availability of constant power to avoid any outages that may compromise temperature conditions in freezers but strongly disagree to having their cold chain equipment checked and serviced to avoid breakdown . 41% of respondents have absolutely no special training in cold chain supplies process.

On average 28% of respondents strongly disagree to having adequate technical capacity to ensure safety of cold chain items in pharmaceutical distributor in Nairobi County while Only 14% strongly agree to having the technical capacity to handle cold chain items and ensure their safety.

This means that most organizations are not technically capable to handle cold chain items and ensure their safety .Technical capacity in terms of employee competence in monitoring storage and transport conditions as well as handling of equipment and cold chain items during packaging is very important in ensuring vaccine safety (Estrada, F.2008) .Other

technical issues like quality checks ,calibration of equipment, handling of the systems, correct documentation of the data, the correction of adverse events and the integration within standard operating procedures is a key issue which should not be underestimated for the safety of the cold chain supply products such as vaccines (Bishara, R.H. 2006)

**4.5 Safety of vaccines**

The safety of vaccines was the dependent variable being measured. The researcher wanted to find out the general opinion of the respondents in regards to ensuring delivery of safe vaccines by their organisations. A frequency of 62% a strongly disagree to having any quality laboratory tests being performed on the cold chain items to confirm their potency, another 59% of the respondents also strongly disagree to delivery of safe vaccines because the vaccines take longer than recommended time on transit and the recommended temperatures are neither monitored nor maintained as revealed by 34% of the respondents. Safety of cold chain vaccines seemed to be compromised because 41% of the respondents strongly disagree to being specifically trained on cold chain and they do not use any SOPs when handling cold chain vaccines.

**Table 4.9 Safety of cold chain items**

<b>Safe cold chain items</b>		<b>SD</b>	<b>D</b>	<b>S</b>	<b>A</b>	<b>SA</b>
Cold chain items do not take longer than recommended time while on transit	F	34	20	4	0	0
	%	59	34	7	0	0
Recommended temperatures are monitored and maintained while cold chain items are on transit	F	19	20	13	6	0
	%	33	34	22	10	0
Only specifically recommended packaging materials are used for specific items.	F	4	6	24	18	6
	%	7	10	41	31	10
SOPs are followed to the latter in ensuring that cold chain items maintain their integrity	F	24	13	15	6	0
	%	41	22	26	10	0
Staff who handle cold chain items are specifically trained	F	24	15	10	6	3
	%	41	26	17	10	5
Quality laboratory checks are performed to confirm potency of cold chain items.	F	36	18	4	0	0
	%	62	31	7	0	0
<b>Average %</b>		<b>41</b>	<b>26</b>	<b>20</b>	<b>10</b>	<b>3</b>

\*SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree f=Frequency.

On average 41% strongly disagree to ensuring compliance and safety of vaccines while only 20% of the respondents are satisfied with the cold chain practices in their organizations to ensure safety of vaccines .3% of the respondents strongly agree to ensuring compliance and safety of cold chain vaccines in their organizations.

This means that overall the safety of cold chain vaccines is compromised in most of our organizations and as Kamau and Mukui ,(2005), noted there is a lack of awareness by distributors on the sensitivity of cold chain items which affects the products' therapeutic properties and consequently generate deficiency quality risks such as loss of therapeutic effects and intoxication with dire effects on the health of the users. Regulatory and compliance issues relating to transportation, storage, packaging

and technical compliance , influences the safety cold chain items to the user level and are critical in this process to avoid degradation (Blake, 2008).

**4.6 Correlation Analysis**

Correlation analysis was applied to determine the relationship between independent variables; Storage conditions, transport systems, packaging and technical capacity and dependent variable; Safety of vaccines. A range of +1 to -1 was used to determine the significance of the relationship between the independent and the dependent variables as either positive or negative in the cold chain pharmaceutical distributors in Nairobi County. The table below indicates the overall correlation between the variables.

**Table 4.10 Correlation analysis**

	Pearson Correlation	Safety of vaccines	Storage conditions	Transport systems	Packaging	Technical capacity
Safety of vaccines	Rho	1				
	Sig. (2-tailed)					
	N	58				
Storage conditions	Rho	0.463	1			
	Sig. (2-tailed)	.000				
	N	58	58			
Transport systems	Rho	0.136	0.022	1		
	Sig. (2-tailed)	0.04	0.876			
	N	58	58	58		
Packaging	Rho	0.043	.331	-0.170	1	
	Sig. (2-tailed)	0.003	0.013	0.215		
	N	58	58	58	58	
technical capability	Rho	.0505	.0420	-.074	0.056	1
	Sig. (2-tailed)	.000	.774	.613	.361	
	N	58	58	58	58	58

**Table 4.11 Correlation analysis on Storage conditions**

	Safety of vaccines	Storage conditions
Safety of Vaccines	Pearson Correlation	1
	Sig. (2-tailed)	0.463
	N	58

Correlation is significant at the 0.05 level (2-tailed).

The results in Table 4.11 reveals a significant positive relationship of ( $r = 0.463$ ) between safety of vaccines and storage conditions in pharmaceutical distributors in Nairobi County. The study established that most pharmaceutical

distributors have special storage facilities but are not upto the recommended standards by regulatory bodies to ensure that cold chain items and vaccines stored are safe for consumption (PPB,2013).

**Table 4.12 Correlation analysis on Transport systems**

		Safety vaccines	of Transport systems
Safety of Vaccines	Pearson Correlation	1	0.136
	Sig. (2-tailed)		0.000
	N	58	58

Correlation is significant at the 0.05 level (2-tailed).

Table 4.12 shows a positive relationship of ( $r = 0.136$ ) between safety of vaccines and transport systems in pharmaceutical distributors in Nairobi County. This shows that safety of vaccines is not ensured in most pharmaceutical

distributors and hence the weak relationship mostly because most transport systems are not specialised for cold chain items and do not have the temperature monitoring devices.

**Table 4.13 Correlation analysis on Packaging**

		Safety vaccines	of Packaging
Safety of Vaccines	Pearson Correlation	1	0.043
	Sig. (2-tailed)		0.003
	N	58	58

Correlation is significant at the 0.05 level (2-tailed).

A positive relationship of ( $r = 0.043$ ) is shown between Packaging and safety of vaccines in pharmaceutical distributors in Nairobi County. This shows that packaging of cold chain

items is not upto standard to ensure that safety of vaccines is ensured .This is mainly attributed to the fact that SOP'S are not followed during packaging.

**Table 4.14 Correlation analysis on Technical capacity**

		Safety vaccines	of Technical Capacity
Safety of Vaccines	Pearson Correlation	1	0.505
	Sig. (2-tailed)		0.000
	N	58	58

Correlation is significant at the 0.05 level (2-tailed).

A significant positive relationship of ( $r = 0.505$ ) exists between safety of vaccines and technical capacity of most in pharmaceutical distributors in Nairobi County. The study established that most pharmaceutical distributors do not have the

technical capacity to handle cold chain items since most of them do not have the special training in cold chain and neither are equipments checked for compliance nor quality checks done to ensure safety of vaccines.



#### 4.7 Correlations summary

**Table 4.15 Correlations summary**

	R	R <sup>2</sup> (Coefficient of determination)	% coefficient of determination
Storage Conditions	0.463	0.214	21.0
Transport Systems	0.136	0.018	1.8
Packaging	0.043	0.002	0.2
Technical Capacity	0.505	0.255	25.5
<b>TOTAL</b>			<b>48.5</b>

The results of Table 4.11 above show that safety of vaccines in pharmaceutical distributors in Nairobi County is attributed to 21% proper storage conditions, 1.8% to Transport Systems which is very low as well as 0.2% to packaging and a larger percent of 25% of safety of vaccines is attributed to technical capacity. However, all these variables contribute to only 48.5% of the safety of vaccines while 51.5% of vaccine safety is influenced by other factors. The other factors that influence safety of vaccines are prevailing conditions during custom clearance which could be exposure to extreme temperatures, poor handling and storage (Kamau & Mukui, 2005). Safety of cold chain items is very critical and a 48.5% safety is not safe enough as it compromises the effects they could have on the consumers. Bishara, (2007) asserts that pharmaceutical cold chain items like vaccines are particularly sensitive materials which, if not manufactured, shipped, stored, packaged and handled under stringent controls, can become ineffective or even hazardous to the consumer due to reduced potency.

In this study, a number of objectives were set to be achieved. The first objective was to establish the influence of storage conditions of cold chain items on delivery of safe vaccines. Regarding this, it was established that upto 52% of respondents conformed there is poor validation and qualification of storage facilities and monitoring devices. There are no different storage equipment for different vaccines in upto 41% of the organizations and hence run a risk of cross contamination and temperature excursions during storage which compromises the quality of vaccine. The research confirmed that validated systems with respect to calibration of storage facilities temperature probes and sensors and thermometers are generally poor along the supply chain with only 34% having satisfactory practices.

#### 5.2.2 Transport systems

The second objective was to establish the influence of transport systems on safety of vaccines. The research confirmed that upto 76% of the firms do not have a fleet system that helps manage the distribution of cold chain vaccines. Calibration and qualification of transportation vans and carrier boxes are generally poor along the supply chain, and specialized vehicles for transport of cold chain items do not even exist in 52% of the firms and this compromise the safety of cold chain items. There are no procedures in place to verify actual temperature of cold chain medicines before taking delivery or dispatch to retail facilities and transport of vaccines does not always happen within the recommended timelines which exposes them to temperature excursions and their safety compromised.

#### 5.2.3 Packaging

Evaluation of the influence of Packaging in pharmaceutical distributors in Nairobi on the safety of vaccines was the third objective of the study and the research findings reveal that in as much as upto 41% of organisations do not follow packaging SOPs. The organisations packaging practices are satisfactory according to 48% of respondents. However, packaging practices still have to be improved and different packaging materials used for different vaccines and SOPs followed in order to avoid any compromise on the safety of cold chain items and raise the percentage of satisfactory practice to upto 75% and above to increase the confidence in delivery of safe cold chain vaccines.

#### 5.2.4 Technical Capacity

The final objective of the study was to establish the extent to which technical capacity in pharmaceutical distributors in Nairobi influence safety of Vaccines. The findings of the study reveal that no quality checks are performed on the vaccines to

### V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary of the research findings on the Influence of cold chain supply logistics on supply of safe cold chain pharmaceuticals. The chapter details the summary of the findings, conclusion, recommendation and suggestion for further studies. This chapter presents the summary of findings, conclusion and recommendations of the study. In order to rationalize the findings of the study, the chapter also discusses the findings in the light of secondary literature review from the organisations records and relate it to previous studies done on cold chain and from the current research.

#### 5.2 Summary of the Research Findings

The main objective of the research therefore was to study the influence of cold chain supply logistics on the safety of vaccines. A sample of 67 respondents was selected from the target population with similar characteristics; out of the 67 issued questionnaires 58 were filled and returned. A combination of descriptive statistics and inferential statistics were used to analyze the data.

#### 5.2.1 Storage conditions

confirm viability in 62% of the firms which means that the viability of the vaccines delivered is not confirmed. The firms technical capacity does not guarantee delivery of safe cold chain pharmaceuticals mainly because most equipment used in handling cold chain items are not regularly checked and serviced according to 52% of the respondents, hence not technically compliant. Most employees handling cold chain items are not specifically trained with only 15% agreeing to some form of training or coaching and this greatly compromises the safety of the vaccines in as much as there are sufficient equipment and there is power back up to avoid power outages to ensure that vaccines don't go bad due to temperature excursion during storage.

### 5.3 Conclusion

The overall finding of this study is that control of storage and transportation temperature, having proper storage conditions, packaging materials and technical competence is essential in maintaining the quality of cold chain pharmaceuticals and hence delivery of safe cold chain pharmaceuticals. The study findings reveal that cold chain supply logistics are poorly coordinated and not fully adhered to and hence have a negative influence on the safety of vaccines among other cold chain pharmaceutical items. This means that end users are exposed to sub-standard or ineffective vaccines and pharmaceuticals that may result from poorly coordinated cold chain supply logistics. In view of this, more effort should be made to provide proper cold chain logistics management for temperature sensitive pharmaceuticals to ensure that the quality and efficacy of the product are not compromised along the supply chain.

### 5.4 Recommendations

Relevant recommendations were made considering the findings of the study which if adopted would lead to efficient and effective cold chain supply logistics in order to ensure product safety in terms of quality, potency and efficacy and hence guarantee public health and safety.

#### 5.4.1 Storage Conditions

Storage conditions for cold chain items need to be closely monitored and improved so that the safety of cold chain items is guaranteed in having fully functional and enough storage facilities for different cold chain items because the research findings indicate that safety of cold chain items is greatly compromised in the current situation. Validation of storage facilities need to be done on a regular basis and storage temperatures checked (Bishara R.H, 2006). More storage freezers of varying temperature ranges need be purchased since all the cold chain items are not stored at the same temperatures. In view of this, proper pharmaceutical refrigerators are recommended for the storage of cold chain products. Additionally, cold rooms, refrigerators and carrier boxes should be qualified by Kenya Bureau of Standards to ensure capacity to maintain the required temperature during storage.

#### 5.4.2 Transport Systems

The transport systems for cold chain items need to be improved put and have a fleet management system for the same so that the safety of cold chain items is guaranteed in having fully functional and enough vehicles for transport of cold chain items. Temperature validation should be ensured by having special vehicles bought and fitted with the correct temperature controlling and monitoring gadgets for cold chain transport.

This is because the air within this special cold chain transport and storage equipment is circulated by a fan, which provides a uniform temperature profile and a rapid temperature pull down after the door has been opened with alarm systems to draw attention when there is temperature excursion (Blanchard, D. 2007).

All temperature probes (for cold chain mapping), sensors and thermometers must be calibrated and regularly maintained to the required standards within the travel range respectively.

#### 5.4.3 Packaging

Packaging SOP'S need to be updated and followed strictly and this therefore means that different packaging materials for different cold chain items need to be purchased. The exposure time during break bulk in packaging should be reduced by having proper equipment and protective gears for handling (Cleland, A.C, 2005). It is recommended that the organization use refrigerated packaging systems such as use of dry ice, gel pack, kryotrans, kodiak, styrofoam and enviroainers to keep the cold chain products safe and in good condition when packed.

#### 5.4.4 Technical capacity

The firm's technical capacity does not guarantee delivery of safe cold chain pharmaceuticals. This is because equipments are not technically compliant and also no quality checks are performed on the vaccines to confirm viability. This therefore suggests that special training is required for all personnel involved in cold chain sensitivity of cold chain items and hence improve their understanding and competency in handling cold chain pharmaceuticals to ensure their safety.

All equipment also need to be properly calibrated and up to standard as recommended by regulatory bodies. SOPs in place should be updated and strictly followed since; one of the challenges identified was the poor adherence and implementation. WHO cold chain management systems (GDP, GSP, etc) could also be adopted in order to adhere to some standard as recommended by regulatory bodies.

### 5.5 Suggestions for Future Study

Future studies could research on establishing the extent to which the identified logistics challenges affect cold chain pharmaceuticals potency, efficacy and quality by performing quality laboratory checks in Nairobi County. This can be achieved by sampling from known batches of cold chain pharmaceuticals with evidence and documentation that it has been distributed along the supply chain (whole, retail and end user) for traceability and be subjected to laboratory analysis. Following the analysis of secondary data from the forms records, it was noted that there are other factors that influence delivery of safe cold chain pharmaceuticals like Coordinated customs clearance and information technology which is an area of study that could reveal a lot in Cold chain studies.

Finally the role of regulatory authorities in enforcing regulatory standards to ensure compliance by cold chain pharmaceutical distributors engaged in cold chain medicines as a business is an area that needs to be explored further given that the research findings indicate very poor compliance to SOPs.

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AUTHORS

**First Author** – Monicah W. Njuguna is Laboratory Procurement personnel at an International research institute in Kenya with five years progressive experience in Procurement in the Pharmaceutical industry and Research. She has a background in Science having a Bachelors degree in Biochemistry from the University of Nairobi, Kenya. She is Student member of the Chartered Institute of Purchasing and Supply, UK and is now finalizing her Master of Science degree in Procurement and Logistics at the Jomo Kenyatta University of Agriculture and Technology, Kenya., Email: waruinu12@gmail.com

**Second Author** – Dr. Christopher J. Mairura is a full time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He is an expert in Entrepreneurship having attained a PHD in Entrepreneurship., Email: mairurac@gmail.com

**Third Author** – Dr. Kepha Ombui is a part time lecturer in the School of Human Resource and Development at Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He is a Human Resource Management expert having attained a PHD in Human Resource Management., Email: andrew.ombui@kalro.org

# Democratic Associations and Political Representation of Tribal Population in Sikkim: a Study of the Associational Activity of Bhutias and Lepchas.

Maheshwari Kharga\*, Rosden Tshering Bhutia\*\*

\*Research fellow, Centre for Political Studies, Jawaharlal Nehru University, New Delhi, India.

\*\*Assistant Professor, Department of Political Science, Sikkim Government College, Namchi, Sikkim University, India.

**Abstract-** The issue of political representation played a significant role in the unification, consolidation and reconstruction of a small Himalayan kingdom of Sikkim. Even after Sikkim's merger with India (16<sup>th</sup> April, 1975) this issue continues to be a source of contention among different communities and political parties in Sikkim. In this light, this paper examines the politics and functioning of one-man-one-vote system of political representation which replaced "communal" parity system of political representation in Sikkim. It analyses the democratic effects of tribal associations of Bhutia-Lepchas in asserting tribal identities and ensuring "genuine tribal representation" in the Sikkim Legislative Assembly. The major thrust of this study is the fundamental transformation in the nature of these ethnic associations from being discriminatory and political to becoming more exclusive and democratic.

**Index Terms-** Association, constituency, democracy, identity, minority, original inhabitants, political representation, political parties, Scheduled Tribes.

## I. INTRODUCTION

During monarchical rule (1642 to 1975) in Sikkim the Kingdom was governed by conventions and proclamations issued by the Chogyal (ruler) as he was considered to be an incarnation of God or Bodhisattvas (body of high monks) by the Sikkimese people. The Kingdom's feudal economic structure and theocratic political structure ensured representation to only Kazis (landlords) and lamas (monks) in the nominated Advisory Council of the Chogyal. Also, there were no organised pressure groups and strong political parties to ensure fair representation of all the communities. It was only in 1953 that the Executive Council assumed democratic form by including elected members apart from the nominated members in the Council. This was followed by the establishment of the State Council comprising of both elected and nominated members but the mode of election was discriminatory as candidates belonging to the majority Nepali community were to be directly elected while candidates belonging to the Bhutia-Lepcha community were to be elected in both primary and final elections.

In 1958, Article 2 (i) (b) of the Royal Proclamation issued by the Chogyal introduced the "communal" parity system of political representation in Sikkim. It ensured equal representation to all the communities in Sikkim irrespective of their population ratio. It was applicable to all the domains of the state like

representative institutions, administrative posts, welfare activities, cultural life and economic facilities but the mode of election was complicated as a candidate in order to win a seat had to secure highest number of votes from his own community and at least 15 per cent of votes from the other community. Furthermore, if the candidate failed to secure 15 per cent of votes from the other community then the candidate who secured the next highest number of votes from his own community and 15 per cent of votes from the other community was declared elected provided the difference between the number of their votes did not exceed 15 per cent of the total votes secured by the highest candidate.

Political parties in Sikkim had differing views with regard to this system of political representation. Sikkim State Congress (SSC) having Nepalis support base emphasised on abolishing it, Sikkim National Party (SNP) that was backed by the Chogyal emphasised on retaining it while Sikkim National Congress (SNC) which was an annexationist party emphasised on abolishing the monarchical rule itself. Sikkim National Congress (SNC) considered the parity system of political representation to be discriminatory and divisive based on the argument that it served the interests of only the upper strata of the society and created friction among different communities and political parties in Sikkim.

"Nepali dominated political parties" like Sikkim Janata Congress (SJC) and Sikkim National Congress (SNC) played a significant role in facilitating the replacement of "communal" parity system of political representation by one-man-one-vote system of political representation. These political parties formed a Joint Action Council (J.A.C) and concluded a Tripartite agreement in 1973 with the Chogyal and the Government of India which paved the way for the passage of 36<sup>th</sup> Amendment Act in 26<sup>th</sup> April, 1975 that not only replaced "communal" parity system of political representation by one-man-one-vote system of political representation but also ensured representation and participation of Sikkimese people in the democratic institutions of India.

Ordinance No. 7 of the People's Representation Act stipulated that under one-man-one-vote system of political representation the contesting candidate has to be from his own community and the candidate must acquire maximum votes from the entire electorate of Sikkim in order to be elected. This system of political representation reduced the number of reserved Assembly seats of Bhutia-Lepchas to twelve from fifteen and increased the number of general seats to eighteen from fifteen by abolishing the Assembly seat reserved exclusively for the

Nepalis and representing them in the general seat which even included plainsmen from India settled in Sikkim for generations. However, this system retained representation of Sangha (monk body) in the State Assembly as it represented the beliefs and culture of Bhutia-Lepchas in Sikkim. Political leaders in Sikkim have differing opinions with regard to one-man-one-vote system of political representation. Some educated leaders emphasise on its replacement by “communal” parity system of political representation as it equally represented all the communities while other group of leaders emphasise on replacing one-man-one-vote system of political representation with a more democratic formula.

## II. SCHEDULED TRIBES IN SIKKIM

Art 366 (25) of the Indian Constitution defines Scheduled Tribes as such tribal communities in India that have been declared as such by the President of India through a public notification. Its classification is done for administrative purpose by employing the criterion of primitive traits, distinctive culture, geographical location, shyness of contact with the community at large and economic backwardness. According to 2011 census report, the total population of Sikkim is 607,688 out of which 111,405 are Scheduled Tribes (STs) which account for 20.6 per cent of the total population. In 1991-2001 the state has registered 22.56 per cent decadal growth in Scheduled Tribe (ST) population. The original inhabitants of Sikkim that are the Bhutias and Lepchas constitute 63.4 per cent and 36.6 per cent respectively of the total Scheduled Tribe (ST) population of the state. Together they constitute the minority population of the state with Bhutias accounting for 16 per cent and Lepchas accounting for 14 per cent of the total population of the state.

After Sikkim’s merger with India the Scheduled Tribe Order of 1978 included other tribal groups like Sherpas, Dukpas, Tibetans, Dophthapas, Kagateys, Yolmos, Trompos and Chumbiapas in the category of ‘Bhutia’. Consequently, by 1994 around forty per cent of the Sikkimese were officially recognised as Scheduled Tribes (STs) in Sikkim. Most importantly, in December 2002 Limbus and Tamangs were recognised as Scheduled Tribes (STs) in Sikkim but till date they have not been represented as Scheduled Tribe (ST) in the Sikkim Legislative Assembly due to which they are now demanding for reserved constituencies in the State Legislative Assembly.

## III. DEMOCRACY AND ASSOCIATIONS: THEORETICAL PERSPECTIVES

Associative democrats have offered various definitions and understandings on the nature and contributions of associations to democracy. Mark E. Warren in his work ‘*Democracy and Association*’ defines association as an organisation having shared purposes and interests. He considers associations as normatively significant for extending democracy beyond the reach of tyrannical state. He highlights four inter-related features of contemporary societies such as globalisation, differentiation, complexity and pluralization to denote the significance of associations. He argues that associations became important with states losing their control over its population and resources, both

state and market employing coercive measures to mediate political conflicts which adversely affected human capacities and increasing pace of pluralization of identities caused by changing patterns of individuation (individual distancing itself from a group).

Furthermore, he argues that associations apart from producing variety of complementary democratic effects facilitates socialisation, provides direct self-governance, promotes public participation, ensures political representation, cultivates political skills and forms public opinion. The three classes of democratic effects of associational life are developmental effects on individual’s skills and orientations, public sphere effects on democratic judgements and democratic effects on the actions and policymaking of formal state political institutions. He believes that not all associations can produce all democratic effects as the democratic potential of any association depends upon their contexts or “ecology” for example identity based associations ensures representation in public spheres and fosters solidarity of the marginalized groups but it undermines the development of civic virtues or critical skills and restricts deliberation. He uses the phrase “democratic ecology of associations” to underscore the need for different democratic effects or associational mix for any association to produce all the democratic effects. He also believes that associations cannot be truly democratic as they often exclude and discriminate few.

Joshua Cohen and Joel Rogers in their work ‘*Secondary Associations and Democratic Governance*’ consider associations to be artifactual (artificial constructs) as their character, powers and patterns of interaction are determined by the structural features of political economy in which they form, public policies that are implemented and individual preferences that are formed. They argue that quasi-voluntary secondary associations mediates between individual and the state, provides alternative forms of governance (social governance, public governance and associative governance), changes the structure of group representation, ensures distributive fairness, educates citizens, fosters solidarities, forms political agendas, develops uniform standards, facilitates cooperation with private actors, provides information about social needs, promotes public deliberation, allows citizen’s participation and ensures fair representation.

Paul Q. Hirst in his essay titled ‘*Can Secondary Associations Enhance Democratic Governance?*’ considers associations as the primary means of social organization in modern pluralistic societies and better alternative to state institutions. Claus Offe in his essay titled ‘*Some Skeptical Considerations on the Malleability of Representative Institutions*’ suggests that voluntary and encompassing associations ensures effective governance by unburdening the workload of governments, allowing implementation of policy and shaping preferences of the constituent members. Iris Marion Young in her essay titled ‘*Social Groups in Associative Democracy*’ emphasises on the importance of civic associations in forming identities, promoting participation, allowing deliberation, providing opportunities, representing marginalized interests and maintaining autonomy of civic groups.

Archon Fung in his essay titled ‘*Associations and Democracy: Between Theories, Hopes and Reality*’ considers associations to be an important part of the structure of civil society that creates participatory institutions, facilitates direct

political participation of citizens, ensures freedom of association, educates and socializes citizens, offers political resistance to illegitimate authority and promotes public deliberation. He believes that the contribution of associations to democracy depends on the political context of particular societies and also the forms, purposes and membership of associations.

#### IV. POLITICAL DYNAMICS: THE ROLE OF TRIBAL ASSOCIATIONS IN SIKKIM

During monarchical rule in Sikkim there were no organised pressure groups due to poor economy, absence of industries, lack of the means of information and communication, lack of modern technology, widespread illiteracy, centralised form of governance, theocratic political structure and traditional structure of the society. There were only non-associational interest groups like the kinship groups, ethnic groups and religious groups which articulated their interests through the religious heads. In addition, to that few tribal associations like Denzong Lhade Chogpa (monastic association) which existed in the state could only indirectly influence the decision of the Chogyal.

Since late 1980s there was a cultural revival of tribes in Sikkim with different tribal groups forming tribal associations in the state. Tribal leaders belonging to Bhutia-Lepcha communities felt the need to form credible and vocal tribal associations of Bhutia-Lepchas taking into account the changed political scenario and demographic change in the state as the minority Bhutia-Lepchas felt threatened by the increasing influx of the majority Nepalis population. These newly formed tribal associations of Bhutia-Lepchas in Sikkim are mostly associational pressure groups linked with certain political parties in the state. They usually employ the technique of persuasion in articulating their interests and sometimes resort to strikes and demonstrations.

The tribal associations of Bhutia-Lepchas in Sikkim can be broadly classified on the basis of encompassing membership, the constitutive media of social interchange or reproduction and the manifest purposes or constitutive goods. Tribal associations in Sikkim were not encompassing till recently as each tribal groups had their own tribal associations for example Bhutias formed associations like National Sikkimese Bhutia Organisation (NSBO) and Bhutia Kerab Yargay Tshogpa (BKYT) while Lepchas formed associations like Mayel Lyang Tribal Organisation, Concerned Lepchas of Sikkim, Sikkim Lepcha Youth Association (SLYA) and Sikkim Lepcha Association (SLA). Few Lepcha associations in Sikkim like Sikkim Lepcha Youth Association (SLYA) disassociated themselves from the Bhutia community as they sought to liberate themselves as subordinate partners of tribal alliances by virtue of being the “most primitive tribe” of Sikkim or “sons of the soil” and the most backward community in the state. Such assertion of indigeneity (emphasis on indigenous roots) has become an important political tool for these associations in Sikkim as it facilitates political mobilisation, self-affirmation and creation of ethno-nationalist identities

But with the changed political scenario of Sikkim in the new millennium many tribal associations were formed in Sikkim which collectively represented the interests of minority Bhutia-Lepchas such as Sikkim Tribal Welfare Association (STWA),

Denzong Tribal Yargay Chogpa (DTYC), Denjong Chyarig Tsogpa (DCT), Bhutia Lepcha Protection Force (BLPF) and Sikkim Bhutia-Lepcha Apex Committee (SIBLAC). Such tribal alliances were forged by the process of “Bhutianisation of Lepchas” with Lepchas adopting Bhutia identities, Buddhist culture and Bhutia life-styles.

Warren suggests that the constitutive media of social interchange or reproduction (state, market or civil society) determines the social character, goals, capabilities and structural pressures of an association. Most of the tribal associations of Bhutia-Lepchas in Sikkim are embedded in the social media of civil society but there are also few non-political associations like Sikkim Tribal Welfare Association (STWA) and Sikkim Bhutia-Lepcha Apex Committee (SIBLAC) that are embedded in the coercive power of the state with the ruling party determining the membership of these associations by choosing their convenor, executive members and office bearers. Many prominent members of these tribal associations have joined political parties in the state to contest State Assembly election which in turn has strengthened the support base of these political parties.

Warren suggests that the kind and extent of state involvement in the operation of associations is determined by the nature of association and its constitutive media of social interchange. He argues that if an association is embedded in the coercive power medium of the state then it is most likely to intervene in its operation. Whilst associations embedded in social media of attachments facilitates identity formation, provides the principle of subsidiarity (direct collective action), promotes public deliberation, develops civic virtues but fails to effectively resolve internal conflicts and conflicts with political associations. He argues that the manifest purposes or constitutive goods determine the aims and objectives of an association. The dominant good of most of the tribal associations of Bhutia-Lepchas in Sikkim is inclusive, excludable and interpersonal in nature as they aim at ensuring genuine political representation of the original inhabitants of Sikkim (Bhutia-Lepchas). In 1983, Sikkim Tribal Welfare Association (STWA) became an intervening party to R.C Poudyal vs. Union of India case in order to justify reservation of twelve Assembly seats for Bhutia-Lepchas and lone Assembly seat for Sangha. It has also submitted a number of memoranda to the Central government with demands being raised for a suitable form of political representation, fresh delimitation of Bhutia-Lepcha constituencies, appointment of a Special Officer for the Scheduled Tribes of Sikkim and establishment of “permanent standing committees” in the Sikkim Legislative Assembly comprising of Bhutia-Lepcha Members of Legislative Assembly (MLAs).

The other classes of goods which Sikkim Tribal Welfare Association (STWA) seeks to provide are preserving the distinct and “original identity” of the Bhutia-Lepchas and protecting the special rights and privileges granted to the original inhabitants of Sikkim under Art.371 F of the Indian Constitution which allows old laws in use before the merger to continue in order to protect the original inhabitants of Sikkim. In this regard, Sikkim Tribal Welfare Association (STWA) submitted a number of memoranda to both the Central and State governments with demands being raised for granting of citizenship to “stateless persons” based on the provisions of Sikkim Subject Regulation which was in

operation before the merger, removing the names of “foreign nationals” from the electoral rolls and extending inner-line permit system in order to check the influx of outsiders. In 1988, Sikkim Tribal Welfare Association (STWA) formed a separate tribal body known as Denzong Tribal Yargay Chogpa (DTYC) in order to push forward the aforesaid demands.

Likewise, the most dominant good for Sikkim Bhutia-Lepcha Apex Committee (SIBLAC), an apex body of the Bhutia-Lepchas is ensuring fair political representation of the original inhabitants of Sikkim in order ensure their survival in the state. It demands proportionate increase in the total number of Assembly seats reserved for Bhutia-Lepchas from the existing twelve to seventeen if the Central government increases the number of assembly seats from thirty-two to forty. It also demands immediate delimitation of Bhutia-Lepcha Assembly constituencies on the basis of Art. 371 F of the Indian Constitution.

It made a boycott call on 1999 Assembly and Lok Sabha polls by holding a protest rally and one-day hunger strike in the state as a response to the ruling party, Sikkim Democratic Front (SDF) and opposition party, Sikkim Sangram Parishad (SSP) decision of fielding other tribal candidates in the reserved Assembly seats of Bhutia-Lepchas. In 2000, it submitted a memorandum to the State government demanding reservation of twelve Assembly seats for “bonafide Sikkimese Bhutia-Lepchas” and removal of other tribal communities from the category of “Bhutia”. But in its “BL manifesto” released in 2004 it made a compromising claim by excluding only Sherpa, Kagateys and Yolmo from the definition of “Bhutia” thereby, accepting five other communities within the ambit of “Bhutia”. It formed Sikkimese Nepalese Apex Committee (SNAC) in order to garner the support of the majority Nepalis population in the state with regard to the issue of restoration of Assembly seats reserved for Bhutia-Lepchas.

Whilst there are few tribal associations of Bhutia-Lepchas in Sikkim whose dominant good is social, exclusive and non-excludable in nature for example Bhutia Lepcha Protection Force (BLPF) emphasises on securing the future of Sikkim through the collective efforts of all the communities of Sikkim. It passed a number of resolutions on upholding Sikkim’s distinct identity within the Indian Union, ensuring special protection to the aboriginals Lepchas, restoring Assembly seats for Nepalese of Sikkimese origin (majority population) and granting rights to 400 families of Indian origin settled in Sikkim prior to its merger with the Indian Union.

## V. METHOD USED

This paper has done theoretical and conceptual analysis of the two inter-related and important concepts of this study that are democracy and association. It has done an analytical survey of both primary and second sources including gazetteer, official reports, memorandum, books, newspapers, journal articles and archival materials. The research procedures adopted in conducting this study are as follows:

1. Mapping associational activity of tribal associations of Bhutia-Lepchas in Sikkim;
2. Distinguishing these associations on the basis of their composition, purpose and affiliation;

3. Analysing the changing trends in the demands of these associations over the years and;
4. Questionnaire based interview of important tribal leaders of these associations.

## VI. MAJOR FINDINGS

The major findings of this study is that the tribal associations of Bhutia-Lepchas in Sikkim have failed to ensure “genuine tribal representation” of the original inhabitants of Sikkim (Bhutia-Lepchas) along the lines of Sikkim’s tradition. Parallel to this major finding this study also highlights that the “communal” parity system of political representation which fairly represented the original inhabitants of Sikkim during monarchical rule is not likely to be restored in Sikkim and the number of Assembly seats reserved for the Bhutia-Lepchas is also not likely to be increased under the present framework of one-man-one-vote system of political representation.

## VII. SHORTCOMINGS OF THE STUDY

1. This study is purely theoretical and lacks empirical findings;
2. It has not highlighted upon the tribal associations of recently recognised tribal groups in Sikkim and;
3. It has not reflected upon the ethnic associations of the majority Nepali population who comprise 70 per cent of the total population in the Sikkim.

## VIII. CONCLUSION

To conclude, most of the tribal associations of Bhutia-Lepchas in Sikkim provided goods that were excludable and individualistic in nature which threatened the very ethos of democracy but in recent years, their focus has shifted to providing more social, inclusive and non-excludable goods as they have started demanding for reservation of Assembly seats to all “bonafide Sikkimese” including the old business community residing in Sikkim prior to its merger with the Indian Union. Despite of that they have achieved limited success in accomplishing their agenda of ensuring “genuine tribal representation” in the state due to differing claims and interests of tribal associations and growing state involvement. Likewise, political leaders in Sikkim have not been able to restore assembly seats of the original inhabitants of Sikkim as laid down under the framework of “communal” parity system of political representation. They have rather fielded other tribal groups like Sherpas, Dukpas, Tibetans, Dophthapas, Kagateys, Yolmos, Trompos and Chumbiapas in the Assembly seats reserved exclusively for the Bhutia-Lepchas.



IX. APPENDIX

**PROCLAMATION OF HIS HIGHNESS MAHARAJA  
TASHI NAMGYAL  
MAHARAJA OF SIKKIM**

Dated 23<sup>rd</sup> Day of March, 1953

Whereas, it has been our earnest desire to associate our people more and more closely with the Governance of the State. And whereas, in pursuance of the said desire, village panchayats were established throughout the State. And whereas, it is considered desirable and necessary that measures should now be taken to complete the process and to realise the objective in view. Now therefore, by virtue of power vested in us under the law and usages of the State and its exercise thereof, we are pleased to proclaim and ordain, and it is hereby proclaimed and ordained as follows:-

1. This proclamation may be cited as the State Council and Executive Council Proclamation, 1953 and shall come into operation immediately on its publication in the Sikkim Government Gazette.
2. There shall be constituted a State Council for the State of Sikkim.
3. The State Council shall consist of :-
  - a) A president who shall be nominated and appointed by Maharaja.
  - b) Twelve elected member, of whom six shall be either Sikkim Bhutia or Lepcha and the remaining six shall be Sikkim Nepalese and.
  - c) Five members nominated by His Highness the Maharaja in his discretion.
4. Constituencies for the election of the members of the State Council specified in clause of the last preceding Article shall be set on territorial basis in accordance with the provisions of the Proclamation of the 28<sup>th</sup> day of December, 1952.
5. The election of the members of the State Council shall be based on universal adult franchise and shall be in accordance with the terms and conditions set forth in the Proclamation dated the 28<sup>th</sup> day of December, 1952.
6. a) A person shall not be qualified to be chosen to fill a seat in the State Council unless he satisfies the requirements prescribed in that behalf in the Proclamation dated the 28<sup>th</sup> day of December, 1952.  
b) No person shall be qualified for being chosen as and for being a member of the State Council if he suffers from any of the disqualification set forth in the Proclamation dated the 28<sup>th</sup> day of December, 1952.
  7. a) The State Council shall be summoned to meet twice at least in every year and six months shall not intervene between its last sitting in one session and the date appointed for its first sitting in the next session.
- b) Subject to the provisions of the last preceding clause, the Maharaja may at any time:-
  - i) Summon the State Council at such time and place as he thinks fit;
  - ii) Prorogue the State Council;
  - iii) Dissolve the State Council;

c) The State Council, unless sooner dissolved by the Maharaja, shall continue for three years from the date appointed for its first meeting.

8. The Maharaja may address the State Council and for that purpose require the attendance of the members thereof, or may send message to the State Council, whether in regard to a matter pending before it or otherwise.
9. Meetings of the State Council ordinarily shall be presided over by the President or in his absence by such other person as may be designated by the Maharaja in his behalf.
10. Every member of the State Council shall before taking his seat, make and subscribe before the Maharaja, an oath or affirmation according to the form prescribed for the purpose.
11. All questions at any sitting of the State Council shall be decided by a majority of votes of the members present and voting other than the President or person acting as such. The President, or person acting as such, shall not vote in the first instance, but shall have and exercise a casting vote in the case of an equality of votes.
12. The State Council shall have power to act notwithstanding any vacancy in the membership and thereof, any proceedings in the State Council shall be valid notwithstanding that it is discovered subsequently that some persons who have not been entitled so to do, sat and voted otherwise took part in the proceedings.
13. Subject to the assent of the Maharaja, the State Council shall have power to enact laws for the peace, order and good governance of Sikkim provided that the State Council shall not without the previous sanction of the Maharaja make, or take into consideration, any law affecting any matter, herein after defined as a reserved subject.
14. The following shall be reserved subjects :-
  - i) Ecclesiastical
  - ii) External Affairs
  - iii) State Enterprises
  - iv) Home and Police
  - v) Finance
  - vi) Land Revenue
  - vii) Rationing
  - viii) Establishment
15. Notwithstanding anything to the contrary contained in the last preceding article, the State Council shall have no power to discuss, to ask questions about or to deal in any manner, any of the following matters :-
  - a) The Maharaja and members of the Ruling family;
  - b) The external relation of the State, including relations with the Government of India and any commitments entered into by the Maharaja with the Government of India;
  - c) The appointment of the Dewan and of the members of the Judiciary; and
  - d) Any matter pending before a Court of law.

16. In every financial year the estimated receipts and expenditure of the State for that year shall be laid before the State Council and such estimated shall be voted upon by the State Council. Provided that always in the event of any demand in the budget estimate being rejected by the State Council, the Maharaja shall have the power to certify it and thereupon such demand shall become part of the sanctioned estimate.
17. The following expenditure shall be chargeable on the revenue of the State and shall not be subject to the vote of the State Council :-
  - a) The Civil List, including expenditure on the household department of the Maharaja;
  - b) Pay and allowance of the Dewan, the judiciary and officers on deputation from the Government of India; and
  - c) Secret and discretionary expenditure.
18. The validity of any proceedings in the State Council shall not be called in question in any court on the ground of alleged irregularity of procedure.
19. There shall be constituted an Executive Council for the State, members of which shall hold office during the Maharaja's pleasure and shall be responsible to him for the executive and administrative functions of the government.
20. The Executive Council shall consist of :-
  - a) The Dewan by virtue of the office which he holds under the Maharaja; and
  - b) Such number of elected members of the State Council as may be appointed by the Maharaja from time to time.
21. All or any of the following departments may be entrusted to the charge of elected members of the Executive Council, each of whom shall be individually responsible to the State Council for the administration of the Department entrusted to him :-
  - a) Education
  - b) Public Health
  - c) Excise
  - d) Bazars
  - e) Transports
  - f) Forests
  - g) Public Works.
22. The Dewan and the other members of the Executive Council shall exercise such powers as may be delegated to them from time to time by the Maharaja under his seal and signature.
23. All members of the Executive Council other than the Dewan but including the official members shall retire from office at the commencement of the first session of each new State Council but shall be eligible for re-appointment.
24. The Dewan shall be the President of the Executive Council and in his absence it may be presided by such person as may be appointed in his behalf by the Maharaja.
25. The proceedings and deliberation of the Executive Council shall be secret and every member thereof shall

be under an obligation not to disclose the same outside the Council.

26. Notwithstanding the provisions of the last preceding Articles, the Maharaja may veto any decision made by the Executive Council and substitute his own decision thereof.
27. The Maharaja may make rules for the regulation and orderly conduct of the proceedings of the State Council as well as of the Executive Council in general, for carrying out the object of this Proclamation.

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#### AUTHORS

**First Author-** Maheshwari Kharga, Research fellow, Centre for Political Studies, Jawaharlal Nehru University, New Delhi, India, mobile no: 9002532973, 8860894180, e-mail: [maheshwari.kharga10@gmail.com](mailto:maheshwari.kharga10@gmail.com)

**Second Author-** Rosden Tshering Bhutia, Assistant Professor, Department of Political Science, Sikkim Government College,

Namchi, Sikkim University, India, e-mail:  
rosden.tshering07@gmail.com

# Smokeless Tobacco and Rural Women: Influencing Factors towards the Usage

Robert Angkang Shimray

PhD Student Department of Anthropology, North Eastern Hill University Shillong

**Abstract-** In India the use of tobacco is varied. And the prevalence of smokeless tobacco use exceeds far more than cigarettes smoking. Conversely, as the rate of oral cancer cases are rising just as the use of smokeless tobacco especially among women, due to its social and cultural attachments, absence of social taboo and ignorant.

**Methodology:** The present study is a community based qualitative cross-sectional study primarily based on field data collected from the subjects who were 25 years old and above through structured and semi-structured interview techniques. All together 75 married women smokeless tobacco users were interviewed from 5 rural villages.

**Result:** Spit tobacco or khaini and paan masala were the predominant types of smokeless tobacco consumed by the participants. Influencing factors for their initiation of tobacco usage include toothache (50%), morning sickness (30%), and peer influence (20%). However, all these factors could be attributed to the lack of knowledge about the ill effect of smokeless tobacco and social acceptability towards its usage by the women.

**Conclusion:** The present study has indicated that ignorance about the ill effect of smokeless tobacco is the leading factor towards the alarming use of smokeless tobacco by the women in the rural areas. Hence, proper intervention through mass campaign and awareness programme about the effect of tobacco by the various agencies is an imperative measure to control this menace.

**Index Terms-** Influencing factors, smokeless tobacco, khaini, paan masala, women, Intervention.

## I. INTRODUCTION

The emergence of tobacco-related diseases is a growing public health problem. Tobacco consumption, either in smokeless form or as smoking is reported to be responsible for major non-communicable diseases namely cardiovascular diseases, chronic obstructive pulmonary disease and cancers of the lung, oral cavity, pharynx, larynx, oesophagus, stomach, pancreas, liver, kidney, ureter, uterine cervix and bone marrow (Ezzati et al, Peto, 1996). The various oral health consequences of smokeless tobacco ranges from the initial tobacco stains on teeth, periodontal diseases and tooth loss to life threatening oral cancer preceded by pre-malignant white and red lesions. A variety of tobacco uses are prevalent in India and they differ from region to region. The most widespread are chewing of betel-quid, gutkha and khaini with tobacco and this has been demonstrated as a major risk factor for cancers of oral cavity (Maher et al, 1994).

According to WHO (2012) twelve percent of all deaths in the world among adults aged 30 years and over are attributable to tobacco use and nearly six million people die from tobacco-related causes every year. If present patterns of use persist, tobacco use could cause as many as one billion premature deaths globally during the 21st century (WHO, 2011). Although most of the tobacco that is consumed throughout the world is in the form of manufactured cigarettes, smokeless tobacco now forms a significant and growing portion of global tobacco use, especially in South Asia (Eriksen et al, 2012).

Globally, cigarette smoking is the dominant form of tobacco use. But in the Indian context, tobacco use implies a varied range of chewing and smoking forms of tobacco available at different price points, reflecting the varying socio-economic and demographic patterns of consumption. Tobacco is consumed in a variety of, both smoking and smokeless forms, e.g. bidi, gutkha, khaini, paan masala, hookah, cigarettes, cigars, chillum, chutta, gul, mawa, misri, etc. Until now, the consumption of tobacco by women in India is chiefly in smokeless form. Women smokeless tobacco users are numbered in millions in India, and several million more are dependent on tobacco used in other ways. The number of women tobacco users increases daily, not only because of the India's fast-growing population, but also because tobacco is being fostered and encouraged worldwide for commercial gain and, in spite of incontrovertible evidence on the toll of death, disease, and disability that is being caused. The Indian government though has enacted a strong legislation to curb this menace in letter, it has remained ambivalent towards a problem that has implications for excise and tax revenue, health and welfare expenditure, and political expediency.

The prevalence of tobacco use in India according to GATS (2009-10) a quarter twenty six percent of all adults in India uses smokeless tobacco either by chewing, or applying it to the teeth and gums, or by sniffing. Use of smokeless tobacco is more prevalent than the smoking version and prevalence of smokeless tobacco use (26%) is far more than prevalence of smoking (14%). The extent of use of smokeless tobacco among males (33%) is higher than females (18%). Overall, 2.9% (rural, 15.1% and urban 1.2%) of women smoke and 18.4% (rural 29.3% and urban 17.7%) used smokeless tobacco. The state of Manipur where this study has been based stands amongst the five highest tobacco use in India. It has 45% of adult who consume smokeless tobacco on everyday basis with marginal differences between male (52.1%) and female (37%) tobacco users (GATS, 2009-10). As we know the effects of smokeless tobacco on the public health especially oral health is alarmingly increasing there seems to be no sign of decreasing its usage. Particularly the marginalized and disadvantaged women in rural areas the use of smokeless tobacco is increasing on everyday basis, the reasons of

which are varied and complex. Therefore, the general aim of this qualitative study is to further explore these operating factors as to why tobacco use among the women in the rural areas are increasing despite various control measures being taken up by various agencies.

## II. METHODOLOGY

The present study is a community based cross-sectional study conducted in five Tangkhul Naga (tribal) villages of Ukhrul district Manipur state. The villages are situated at the far-flung remote area from the district headquarter where access to modern facilities, health care, transport and communication, and other modern technologies are at their far reach. Their main livelihoods still depend on the traditional cultivation of paddy field and other petty trades and vegetables vendor. The participants were married women who were 25 years old and above. Selective house visits were done through the help of the researcher's field guide and those women who were willing to spare their time were interviewed. Confidentiality of the information was assured to them and interviews were conducted in a local language. All together 75 female smokeless tobacco users were interviewed through predesigned structured interview schedule. Interview schedule consist of queries such as age of initiation, influencing factors, general awareness of health hazard, and perceived harmful effect and benefit of tobacco use.

**Working definitions:** *Smokeless tobacco* - the term 'smokeless tobacco' includes a large variety of commercially or non-commercially available products and mixtures that contain tobacco as the principal constituent and are used either orally (through the mouth) or nasally (through the nose) without combustion such as, khaini, gutkha, *paan masala* with or without *zarda*, *tuibur* (or tobacco water), etc. Chewing tobacco is a sub-category of oral smokeless tobacco products that are chewed during use.

*Khaini* is a form of chewing tobacco product used mainly in India. The product typically consists of tobacco particles mixed with lime and additional flavorings. The product has a brown granular appearance and is available both in loose form and in individual portioned sachets.

*Paan masala* is a mixture of catechu, areca nuts, lime flavors and spices, which is intended to be chewed. Paan masala is sometimes mixed with chewing tobacco. The product is traditional to India, it may be handmade or pre-manufactured.

*Zarda* is a form of chewing tobacco traditionally used in India. It is made from dry, rather coarse tobacco flakes, lime and flavorings such as saffron. It may also contain vegetable dyes. It is sometimes chewed with areca nut. The product has a light brown to white course appearance.

*Gutkha* is form of chewing tobacco traditionally used in India. The product typically contains tobacco, areca nut, and catechu (acacia wood extract). Additional sweeteners and flavorings may be added. The product has a light brown to white granular appearance and is the most popular form of chewing tobacco in India. The product is also available in individual pre-packed portions.

Consumption of smokeless tobacco in the present study is defined as a regular user of tobacco in any forms other than

smoking at the time of interview. The participants of the present study have been using tobacco for the past 50-40 years.

## III. RESULTS

**Prevalence of smokeless tobacco usage:** As the nature of the present study, participants were chosen selectively meaning on the current prevailing smokeless users only, the overall prevalence rate of tobacco usage was 100% (n- 75). Besides, participants have been consuming smokeless tobacco for the past 5-40 years.

**Forms of tobacco:** The commonest forms of tobacco used by the women were khaini or spit tobacco (55%), paan masala with zarda (35%) and gutkha (10%).

**Age of initiation:** The average age of initiation is 25 years. 20 (26.6%) of them started using smokeless tobacco at the age of 17-20 years old. 40 (53.3%) of them stated using tobacco at the age of 21-25 years old and while 15 (20%) of the women users started using tobacco at the age of 26-30 years old.

**General awareness of harmful effects of smokeless tobacco:** The level general awareness of health effects of tobacco by the participants were zero percent at the time when they first started chewing tobacco. When asked whether she was aware of the health effects of smokeless tobacco, a 45 years old women said, "...no, no, nobody taught me about the bad effects of tobacco when I began to chew for the first time. Only in course of time I came to learn as it became to take toll on my health. But knowingly still I continue taking." Also 50 years old women responded with similar tone saying, "I 'm not aware of this that khaini can cause cancer or was bad for our health until now when you interview me. I just consume whenever the urgency arises." Similarly, 35 years old women when asked if she had heard from anywhere about the ill effects of smokeless tobacco described that, "when I first started to chew tobacco I was never aware of the health effects of tobacco as all my friends were chewing and they also didn't seem to know about it until recently I came to hear from my children but now I'm too late, i can't quit anymore." Like these women and many others were never aware of the health hazards of smokeless tobacco by the time they first started taking it, but only at the later stage when they have become addicted to it they were told by others. As a matter of fact, they were in complete unaware.

**Influencing Factors:** Well it is undeniable fact that no one was born chewing or smoking tobacco. This behavior or consumption habit was acquired and learned from the social and physical environment of our world. People learn and continue to take tobacco under different circumstances related to them. To understand how and why people starts using tobacco given the fact it is harmful, is not easy as it seems to appear. There are many complex factors including psychological, social and physical factor associated with it. From the present study the researcher could explore three prominent contributing factors which were reported by the participants.

**Toothache:** Tobacco use among women is prevalent in all regions of India and among all sections of society while prevalence of smoking among women is low in most areas due to social unacceptability. The use of smokeless tobacco is significantly high in the entire region particularly in rural areas. Some of the reasons for this high rate of women tobacco usage

are obvious to us. The present study reveals that the commonest reason for the women to initiate smokeless tobacco use was to relieve themselves from toothache. Out of 75 women interviewed 38 (50%) of them reportedly said that toothache was the only factor why they took up tobacco to remedied from the pain. According to their words, they have no intention whatsoever to chew tobacco before they felt their tooth pain. And since, they have never taken tobacco earlier the smell of tobacco to them was foully and unbearable. But, they said, they were compelled and had no other better option and remedy hence they have to go for it.

"...I have a toothache, and one day some women told me to patch khaini over the aching portion which they said was good and relieving. Therefore, through their advice I chewed. The first experience was awful I feel like vomiting, headache, feels like going for needs to washroom, and I slept off immediately, maybe it was for the first time that's why but to my surprise the pain seems better and subsiding. Therefore, whenever I felt the pain I started patching khaini by any means. Gradually, I began to chew like any other normal chewer without any hurdle." (45 years old)  
"The first time I ate was a horrible one, I felt headache, vomiting. But slowly as I learn to start taking little by little whenever I felt the pain I began to enjoy and realized the pleasure of chewing it. Before I started taking I really hate the smell of khaini I don't even want to go near to those friends who were taking but now I wonder how have I learn to take this khaini comfortably." (30 years old)

"If I don't take khaini the pain comes back again. I cannot bear the pain that is why I started. My friends told me that to those people who have never taken khaini not once, it works better for their toothache problem. The first time was a hard experience I got headache but I started again little by little." (44 years old)

A 70 years old woman who has been chewing khaini for the past 43 years narrated her fascinating story of how she started chewing tobacco and how much tobacco is meant to her and to her life. The kind of attachment these women have built with *khaini* is amazing, no one would have ever thought about it but they are. It is quite apparent to us that this woman had already developed a strong habit and addiction over *khaini*. While in the case of some women the addiction to tobacco was so pronounced that they even compared their habit to the relationship and attachment they have with their husband besides with their daily food.

"I have been chewing tobacco for the past 43 years but I never die as other people said those who eat or chew tobacco will die soon. During my days there was no khaini so I began with nicotine water (tobacco water also known as 'tuibur') from my parents and it makes my toothache got better. One day I went to the field without khaini where I forgot to carry, only after reaching the field site I remember that I was without it, what do I do but I have to come back to my house to collect and go back again. That is the nature of my addiction. Khaini and food are comparable they make no difference for me. Without khaini I cannot even take food out of restlessness. I love my khaini just as I love my husband."

"For me tobacco and food are equally important in my life." (60 years old)

The addiction towards smokeless tobacco was so immense, sometimes it appears their lives were dictated and entwined by and with tobacco. Their everyday actions and affairs tangled along with tobacco without which life seems to become unimaginable for them.

*Morning Sickness:* The second most common influencing factor reported by the participants was 'morning Sickness' or 'pregnancy sickness' which accounted for 30%. This group of women fervently attributed their present status of chewing tobacco to 'morning sickness'. They related that during pregnancy whenever 'morning sickness' occurred to their great surprise they began to look out for things like *khaini*, their urge to chew *khaini* became so much that without any trouble they would chew. On the contrary, they have never chewed until hitherto. Sometimes 'morning sickness' got prolonged and as they continue chewing, by the time they deliver their child they have become addicted into chewing tobacco. Eventually, they said there is nothing called quitting for them. Some of them in trying to quit started taking *paan masala* and *gutkha*. They thought and believed that chewing *khaini* comparatively more dangerous than chewing *paan*.

"I started chewing tobacco during 'morning sickness'. During 'morning sickness' I wanted to eat so much khaini and I have to eat if not I'll always keeping asking and looking for it until I have it. Some other women even smoke, drink kerosene, petrol etc. during this period. After having chewed and got what they want the craving mind and restlessness came to an end at peace. When delivered many discarded it at the same time many continue and got addicted into it." (30 years old)

"Initially I didn't chew besides, I have never tried chewing, but during pregnancy of one of my child I suddenly wanted to chew khaini and I chewed. But after coming to know the truth about tobacco I'm trying to quit. It is really hard to quit chewing tobacco or khaini. I'm eating sweets, paan to occupy my thoughts and my mouth in that way I'm trying to quit." (45 years old)

During 'morning sickness' it is believed that a woman sense of smell and sensitivity to odors tremendously increases. Therefore, their sense of smell became very sensitive and favorable to certain smell and vice-versa. And for them the smell of *khaini* tobacco *khaini* became their favorite taste. They even said that the smell of *khaini* became very sweet and pleasant to chew unlike when they were not pregnant. Although, it is subject to scientific verification why and how pregnancy and the smell of tobacco *khaini* are linked, for these women taking khaini during pregnancy really had an effect.

"I started chewing tobacco during pregnancy of my first child. When I was pregnant one of my friends was chewing khaini, maybe because of the 'morning sickness' the smell of the khaini was so sweet that I asked her to share me and I chewed and found it was so tasty and good. It was so delicious I have no idea why it happens like that." (47 years old)

*Peer influence:* Peer influence is another very important factor reported by the participants (20%) for their chewing status of smokeless tobacco. People who have friends who chew tobacco are the most vulnerable group of people. Some participants reported cases of being compelled and forced to take up tobacco. They said, they are often under pressure from their peers to take up tobacco, and to refuse would not be pleasing to their friendship therefore, they have to take up. According to the participants person having friends who chew tobacco are always at the receiving ends because most of the time they were exposed to chewing and directly or indirectly were prompted to give a try. They credited their chewing status to those friends who gave them promises like losing weight, taste, and so on. While others started out of curiosity or to please their friends and out of courtesy. Some cases are given below.

"I start taking because one of my friends forced me to chew. At first, I vomited a lot accompanied by headache but still then I continue the next time as my friends keep offering me." (27 years old woman)

"I learned to chew tobacco from my friends. When I was working in a factory we don't have much work to do so whenever my friends chew tobacco I used to take little bit of it and try it out myself. The next day came I met my friends as usual they offer me to take again. Even at home my aunty used to share me her tobacco. And this was how and why I'm still chewing until now as I have become addicted." (57 years old)

"I learn it from my close friends who were chewing tobacco by that time. One fine day she asked me to give a try with a promise of losing weight and better facial complexion and hence I tried. Initial taste was unbearable, but I can't understand myself how I could manage to learn chewing. I started chewing tobacco not because of toothache like many other used to cite. But for me it was because of my friends. My friends used to tell me to take saying that it is very tasty, 'come on have it, it's tasty'. I started just for the interest of my friends just to please them. Even now I have not suffered from toothache; it was purely friend's interest and pressure that I started." (36 years old)

Some women even reported that even if they have started taking tobacco because of their toothache they would still blame their friends who introduced them with the promise that *khaini* or *paan masala* is a good remedy for toothache. They also claimed that since every of their friends chew *khaini* because of toothache, they also started with advice from their friends that toothache can be healed by *khaini*.

"...although, I started chewing tobacco because of my toothache, it was my friends who told me that chewing *khaini* a spit tobacco is a good panacea for toothache problem. I started from there on... earlier I don't take tobacco thinking that it is bad but when people said that it is good for toothache I started taking *khaini*. *Khaini* is really bad, once a person got addicted into it he/she may find very, very hard to come out of it." (53 years old woman)

"Because my friends who were taking *khaini* used to tell me that for toothache the best remedy for cure is to patch *khaini* over the pain or affected area. I have listened to them and now it has

become a habit for me not only that I cannot concentrate on anything without chewing *khaini*." (65 years old)

*Medicinal usage:* In the early days of its discovery by Columbus the Red Indians used tobacco for various purposes including healing ailments such as earaches, snake bites, cuts and burns, respiratory diseases, fever, convulsions, nervous ailments, urinary ailments, and skin diseases, toothache and to suppress hunger and fatigue. Similarly, these women also hold a strong conception that tobacco does not only harm them but it has also medicinal effect for the case of toothache, better digestion, acts as an anti-flatulence and also for smooth defecation process. When the respondents were asked on whether *khaini*, *paan masala* or *gutkha* does actually help them in curing their toothache some of them claimed that tobacco or *khaini* had cured their toothache. While majority of them claimed that their toothaches continue to persist. They stated that tobacco chewing had never cured their toothaches though definitely, it has given them momentary relief to their pain. They all said the relief lasted only for a few half an hour to an hour. They further added, since the pain keeps coming back they had to patch *khaini* over and over again over the aching portion as there was no other available remedy except *khaini*.

"It's like because of *khaini* that I don't experience pain anymore. My toothache had completely gone."

"To me if I take *khaini* the pain immediately disappeared. For quite sometimes I take *khaini*. And now the pain has gone completely. I would give credit to *khaini* for curing my toothache."

"...*khaini* has made my teeth stronger, otherwise my teeth must have all been gone by now." (67 years old)

"Of course, momentarily *khaini* gave relief to our pain but when I threw it out, the pain appeared again and I had to patch another pinch of *khaini* over the pain portion. I if don't take the pain starts over again therefor, I have to chew again and again which ultimately led me to addiction. I don't want to chew but I can't help anymore with this addiction." (55 years old)

"The pain was unbearable that's why one day someone suggested me to take *khaini*. Accordingly, I took it and yes, it kills tooth pain somehow. Though it gave relieve for sometimes it never provide complete cure. (29 years old)

"I started chewing tobacco or patching *khaini* due to toothache. Of course, it gave relieve for few hours but to cure completely has never come about. It never cures. But now since I'm used to chewing tobacco whenever I feel the pain I used to patch it." (43 years old)

Tobacco does not only serve for toothache problem to them. For these rural women smokeless tobacco serves for different purposes in their everyday lives. The action of chewing was not only to satisfy their craving, habits and for toothache problem alone but in other utilities like better digestion, to ease flatulent etc. 30% of the participants reported that smokeless tobacco especially *khaini* helps them to relief from stomach gas, digestive problem and easy defecation.

"I feel like it is good for stomach gas and digestion. I cannot go to toilet to defecate without taking khaini in my hands." (41 years old)

"Yes, some women can't go to pass their needs to washroom without chewing it. And some other has a belief that chewing khaini is good for digestion and stomach gas." (27 years old)

"...even, it is good for passing 'no.2' and digestion. When we don't feel like passing 'no. 2' we chew khaini and it makes me better pass my needs. (32 years old woman)

"I feel like it helps in better digestion and passing my needs." (58 years old)

*Quit attempts:* Tobacco consumption over a period of time leads to chronic dependence due to highly addictive nature of nicotine. Cessation of tobacco use is an established tobacco control measure. Majority of the participants reported that they have made several attempts to quit tobacco at some point of time. Unfortunately, all their attempts were unsuccessful except, few who have quitted as they claimed their toothache was cured but still majority of them continue chewing even after their toothache. Many narrated their futile attempts, expressed remorse and desperateness for their inability to quit. They said, in addition to their toothache which was the initial factor for their initiation, addiction has made them impossible to quit.

"...you know how I quit it was because, all my teeth were gone and so do my toothache." (69 years old)

"...as long as my toothache persists I know I can never quit." (50 years old)

"After my toothache was gone, I have tried so many times to quit but this habit is so strong that I can never quit unless something would struck me. That is why sometime we women used to crack jokes like we used to advice our husband and sons not to drink, or to quit, but they may also be experiencing the same hardship just like we can't quit khaini' ha...ha...ha...ha... so we can't say anything to our husband and sons who are drinking alcohol since we also can't quit our own, ha...ha...ha... sometimes out of sickness I used to stop for a week, but soon when I get better I started again." (48 years old)

"I have tried and could stop a month but I can't quit completely because, I always remember. I think, as long as tobacco is available in the market I may continue chewing." (55 years old)

Some of the women were successful till the half way to quitting. They said after several attempts at last they could manage to stop for few weeks or months but has to return back to their earlier habit of chewing due to the their tempting friends who were still chewing tobacco, as they could not resist the prompting. While others said they have to start chewing again because their toothache problem came back again after a short period of relieve. Others still blame on the market for their unsuccessful cessation. After several failed attempts many of the participants conveyed their untold regrets about their addiction. A woman even said that she has lost all hope of ever quitting. They all voiced their dismayed attempts. The fact was that none them has ever received proper cessation advice from the professional.

#### IV. DISCUSSION AND CONCLUSION

The reasons why women started taking tobacco means many things. As for instance, tobacco companies have an interest in their product sales, governments have an interest in the tax revenue from the sale of tobacco, farmers have an interest in tobacco production, anti-smoking groups and public health professionals have an interest in tobacco use prevention, and academics have an interest in smoking as a fundable research topic and finally an individual has her own reason to start. Thus, chewing tobacco or smoking is like a playing field on which there are many players where they are intricately linked. Therefore, one has to explore from all angles in order to understand why one start taking tobacco. In the present study the three major reasons for their initiation was toothache, 'morning sickness' and peer influence similar with the studies conducted by many researcher around the world (Gupta et al, 1986; Pedenker & Gupta, 2004; Sinha, 2005; Daniel et al, 2008; Prakash C. et al, 2011; Alamgir, 2014). This is in fact the reason which may explain the use of tobacco almost exclusively in the chewing form by the women. Indian women particularly rural women have a widespread misconception that tobacco is good for toothache, gum diseases, aches in throat, ingestion. According to the reports from Global Youth Tobacco Survey (2009-10), in the Northeastern states of India, tobacco users reported significantly more often that tobacco relieves toothache and helps in 'morning sickness' as in the case of present study (Aghi, 1993; Sinha et al, 2003; Steven et al, 2010). In the present study the participants were not aware of the causes of 'morning sickness'. They all believed that 'morning sickness was caused by the baby in their worm. They have a strong perception that during 'morning sickness' whenever they craved for something to eat, chew or feels like drinking something, they believed that it was the baby who wants to eat, chew or drink. Similarly, several studies indicate that some women, including some pregnant women, perceive a benefit to using tobacco products. In India, for example, many women who chew tobacco consider it to aid in performing manual labor, suppressing hunger, reducing toothache, relieving morning sickness and controlling labor pains (Nicter et al, 1991; 2009). In countries of South Asia, particularly India, traditional values do not favor smoking by the young women, but there is no such taboo against using smokeless tobacco. Thus, most women who use tobacco use it in smokeless forms (Prakash et al, 2003). It was also revealed by the participants from the present study that use of smokeless tobacco has no social and cultural taboo. Therefore, this could be one plausible reason besides cited above factors. The use of smokeless tobacco by women is also a common cultural practice which is accepted as "normal" by men and by society at large (WHO, 2010).

Peer influence is another very important factor reported by the participants for their initiation of tobacco use. Twenty percent of the participants attributed their initiation to their friends. It has been widely reported by many studies that peer influence is an important factor for usage of tobacco among adolescents and others. Factors such as age, school grade, gender, socioeconomic status, self-efficacy, social skills and exposure to tobacco advertising, along with the prevalence of tobacco use among peers, family members and society at large, are commonly found to be associated with one's tobacco use (Sinha, 2003). In the



present study many of the participants expressed concern about their inability to quit because of their friends, as their friends were still using. Many of them who started using tobacco because of their toothache who also was advised and guided by their friends to take tobacco as a cure for toothache while others were still compelled to take up for the sake of friendship.

It is obvious from the present study that misconception about the medicinal values of smokeless tobacco particularly khaini is widely thought and believed. Apart from toothache remedy tobacco was also used to enhance digestion, reduce hunger and to assist with routine defecation as was also reported by Nicter in his study of Health Service Research in the Third World (Nicter, 1991). The use of tobacco as medicine by the Tangkhul Naga people has a long historical tradition like in the rest of the world. Before the arrival of the modern smokeless tobacco 'tobacco water' or 'nicotine water' extracted from 'kaporham' (Local name for hookah-like wooden smoking device). The tobacco smoke is passed through the water in the device and as the saturation of the nicotine level in the water is reached, it is stored for chewing. This water has been used widely by men and women of that time for various proposes such as, toothache remedy, snake bite, leech bite, anti-mosquitoes ointment, besides for other recreational purposes. But when the participants were asked whether they have seen or heard of any cases of oral cancer being caused by the 'tobacco water' the responses were all negative. Hence, we may suppose that the nature of tobacco consumption and types were less harmful than the present tobacco. Nevertheless, it is already a well-known proven fact that all forms of tobacco are harmful to our health but varies in degree of harmfulness if we are to consider the present account. The reason clearly cited by the participants for using tobacco as a medicine was absence of modern medical facilities and lack of health education; therefore, they have to go for whatever that is at their disposal.

Moreover, when we look at the percentage (2.7%) of those who have quitted in the present study it is almost negligible. It was reported that each and everyone have made futile attempts to quit while few of them could manage months. There was hardly any external assistance and advice to help them quit. Neither of them has received formal cessation counseling nor do they have ventured out for help. This clearly indicates that health care facilities and awareness about the very nature of their health soundness is very much lacking in the rural part of this region. Besides, studies have reported that women have less success in quitting; and therefore, more complex approaches may be needed to achieve better outcomes. Intensive counseling would address the circumstances that create obstacles to cessation. Awareness and advocacy are also needed (WHO, 2003).

Finally, findings from this study have important implications for tobacco control program efforts being developed by country. It is apparent from the present study that the overall understanding and the level of awareness about health risks attributable to consumption of smokeless tobacco products is at its lowest. As we know the level of knowledge of ill effects of tobacco products, individual attitude towards the use of tobacco and perception about the social acceptance are the major determinants of tobacco use. On the other hand, misconception of tobacco smoked or smokeless has medicinal value for curing or reducing discomforts such as toothache, headache, and stomach ache, 'morning sickness'. This shows that the target

population was not only unaware of oral health hazards of these habits but also they were least concerned for oral health as compared to general health. Unfortunately, the relative scarcity of oral health facilities in rural areas of India could be a factor in exacerbating this situation. Thus, it is recommended that mass health campaign concerning with dental care and 'morning sickness', and education on the health hazards of smokeless tobacco are required to control and minimize its usage for long term healthy living. This campaign should reach out to all the section of the people particularly to the rural areas.

## V. LIMITATIONS

Limitation of this study is that subjects were small in number which does not necessarily represent the whole population or the study area i.e. Tangkhul Naga community. And since interview method was used a respondent may give what is perceived as a generally desirable response because a truthful response for her would be sometimes embarrassing. To minimize this tendency, respondents were informed before each interview of the confidentiality and anonymity of the study. Every effort was made to ensure that the respondents understood that no information that they gave would be used against them.

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#### AUTHORS

**First Author** – Robert Angkang Shimray, PhD Student  
Department of Anthropology, North Eastern Hill University  
Shillong

# Ethical Hacking

Susidharthaka Satapathy , Dr.Rasmi Ranjan Patra

CSA, CPGS, OUAT, Bhubaneswar, Odisha, India

**Abstract-** In today's world where the information communication technique has brought the world together there is one of the increase growing areas is security of network ,which certainly generate discussion of ETHICAL HACKING . The main reason behind the discussion of ethical hacking is insecurity of the network i.e. hacking. The need of ethical hacking is to protect the system from the damage caused by the hackers. The main reason behind the study of ethical hacking is to evaluate target system security & report back to owner. This paper helps to generate a brief idea of ethical hacking & all its aspects.

**Index Terms-** Hacker, security, firewall, automated, hacked, crackers

## I. INTRODUCTION

The increasingly growth of internet has given an entrance passage to many things : e-commerce , email , social networking , online shopping & information distribution. As the technology advances it has its dark side; hackers. Govt. organization , private citizen & many companies of the world wants to be the part of this revolution. Being afraid of hackers as they could break into the web-server & create nuisance. To counter attack them ethical hacker's are used in the Govt. organization, companies etc. This paper describes the skills, attitude & how they helps the customer with the increasingly growth rate of internet network security has been a measure concern of Govt.& private organization. As different organization wants to take advantage of the internet but fail to do so, because of the possibility of being hacked. To minimize the risk of being hacked by the hackers the organizations realized the best possible ways to introduced the independent computer security professionals to make their way out. In computer security the ethical hackers employ's some tools & techniques that would neither damaged the system nor still information from it. Instead they would evaluate ways to secure then system & report back the owner with the threat they had found & how to cure them.

## II. HACKING

It is a technique of modifying the features of system . The person who is continuously engaged in hacking activities and has accepted hacking as their choice are called hackers.

## III. ETHICAL HACKING

Ethical hacking is the process which is focuses on securing & protecting computer system . Independent computer security professional breaks into the computer system and neither

damaged the target system nor steal the information, they evaluate target system security and report back to the owner about the threats found.

## IV. FATHER OF HACKING

In 1971, John Draper , aka captain crunch, was one of the best known early phone hacker & one of the few who can be called one of the father's of hacking.

## V. IS HACKING NECESSARY

Hacking is not what we think , It is an art of exploring the threats in a system . Today it sounds something with negative shade , but it is not exactly that many professionals hack system so as to learn the deficiencies in them and to overcome from it and try to improve the system security. Hacking is not about breaking security of computer and network. Programmers, who know different computer languages very well, they themselves define as hackers, who are good at programming. Hacking in simple words: breaking into private party in silence and enjoy it. Which logically means trying to get into some ones private account or to steal the sensitive data and do things that are illegal? Ethical hackers are the people who can create a firewall according to your knowledge and needs and protect all weak spots to protect private data from being hacked. The word hacking is not illegal, computer programmers called themselves hackers because they can break into the system and solves the problem.

## VI. ROLE OF HACKERS

Historically hackers plays a number of roles some of them are good and some of them are bad. On the one hand hackers are the programmer's to break into the system and find the problem causing the system and solve them which result in improved security. On the other hand hackers are the programmer's who break into the system and cause in security. Hacking is very important practice in the modern day society because hacker's are the experts in how the system functions and how the system can fail.

## VII. FEATURES OF ETHICAL HACKING

----- E.H. has some distinct features which when compared to security and problem scanning.

-----It is highly or completely automated.

----- E.H. typically exploits the security in order to access the data or access another system.

- It provides security to the system and network.
- It helps to exposes the true risk causing to the system or network.

## VIII. ETHICAL HACKING PROCESS

Ethical hacking needs advance planning strategic and tactical issues in the ethical hacking process should be determined , planning is important for testing.

For example: - from a simple password cracking to all out penetration test on a web application. Approval of plan for ethical hacking is essential for the process of hacking.

Sponsorship of the project is the most important step for ethical hacking process because one needs someone to protect the plan , otherwise testing can be unexpectedly called off.

A well define plan includes the following information:-

- System to be tested
- Risks that are involved
- When the tests are performed and your overall timeline
- how the tests are performed
- how much knowledge of the systems you have before you start testing
- what is done when a major threat is discovered.

## IX. EVENT&TIMELINE

1878 Teenage boys mischievously misdirect and disconnect telephone calls at Bell Telephone Company

1960 The term "hacker" is used by MIT train enthusiasts who hacked their train sets to change how they work. Later, these same enthusiasts emerge as the first computer hackers

1968 Dennis Ritchie and Keith Thompson develop the UNIX operating system, possibly the most elegant hack of all time 1969 The Advanced Research Projects Agency (ARPA) launches the first four nodes of ARPANET (the system that eventually morphs into the Internet) at UCLA, Santa Barbara, University of Utah, and Stanford

1970 Phreakers, another type of hacker, exploits the newly all-electronic telephone network to make free long distance calls 1971 Ray Tomlinson writes the first email program and uses it on ARPANET (now at 64 nodes)

1975 Bill Gates and Paul Allen form Microsoft

1976 Stephen Wozniak, Steve Jobs, and Ron Wayne form Apple Computer

1978 Randy Seuss and Ward Christiansen create first personal computer bulletin board system, still in operation today

1980 Usenet is created by networking UNIX machines via telephone

1981 Ian Murphy is the first hacker tried and convicted as a felon

1983 ARPANET splits into military and civilian sectors; the civilian sector later evolves into the present-day Internet The film *War Games* popularizes hacking Richard Stallman makes the first GNU announcement via Usenet

1984 William Gibson coins the term "cyberspace" in his novel *Necromancer*, the first hacking-related novel The most famous hacker group, Legion of Doom, is formed Steven Levy

publishes *Hackers: Heroes of the Computer Revolution*, which summarizes the hacker credo of "freedom of technology"

ARPANET 1969 Phreaker John Draper in 1970s The film *War Games* released in 1983 Gibson's *Necromancer* published 1984 .

1986 The US Congress passes the Computer Fraud and Abuse Act, the

first hacking-related legislation A small accounting error alerts astronomer and computer manager Cliff Stoll to the presence of hackers using his computer system; a year-long investigation results in the arrests of five German hackers, and Stoll later recounts the events in his book, *The Cuckoo's Egg: Tracking a Spy Through the Maze of Computer Espionage*

1988 Robert T. Morris, Jr. launches the first self-replicating worm on the government's ARPANET to test its effect on UNIX systems; he is the first person to be convicted under the Computer Fraud Act of 1986 Stoll publishes his account of tracking a hacker across multiple computer systems and countries 1989 Herbert Zinn is the first juvenile convicted under the Computer Fraud Act 1990 The Electronic Frontier Foundation is formed, in part to defend the rights of those investigated for hacking The United States Secret Service and the Arizona Organized Crime and Racketeering Bureau implement Operation Sun Devil, a twelve city multi-state crackdown and the largest hacker raid to date Electronic Frontier Foundation founded 1990 1991 The federal ban barring business from the Internet is lifted Justin Petersen, arrested three months earlier for hacking, is released from prison to help the FBI track hacker Kevin Mitnick Linus Torvalds publicly releases Linux version 0.01

1992 Mark Abene (aka "Phiber Optik") and other members of the Masters of Deception, a gang of phreakers, are arrested from evidence obtained from wiretaps. Mark Abene of Masters of Deception arrested 1992

1995 Kevin Mitnick, probably the world's most prolific and best known hacker, is arrested and charged with obtaining unauthorized access to computers belonging to numerous computer software and computer operating systems manufacturers, cellular telephone manufacturers, Internet Service Providers, and educational institutions; and stealing, copying, and misappropriating proprietary computer software from Motorola, Fujitsu, Nokia, Sun, Novell, and NEC. Mitnick was also in possession of 20,000 credit card numbers. Christopher Pile is the first person jailed for writing and distributing a computer virus. Mitnick's Wanted Poster

1997 AOHell, a freeware application that allows script kiddies to wreak havoc on AOL, is released 1998 Two hackers, Hao Jinglong and Hao Jingwen (twin brothers) are sentenced to death by a court in China for stealing ~\$87,000 from a bank in China; Hau Jingwen's sentence was upheld, while Hao Jinglong was acquitted in return for further testimony 1999 Napster begins to gain popularity; created by Shawn Fanning and Sean Parker (ages 19 and 20 at the time), Napster attracts 65 million registered users before being shut down in July of 2001.

[How To Completely Clean Your Hacked Word Press Installation](#)

Getting hacked sucks, plain and simple. It can affect your rankings, cause your readership to be exposed to virus and Trojan attacks, make you an unwilling promoter to subject material you may not actually endorse, and in many cases cause

the loss of valuable content. However, once it happens it is usually best to not procrastinate on the cleanup process, since a speedy restore will most times minimize the damage that was caused.

While almost all sources will recommend that you upgrade your Word Press to the latest version, what the majority neglect to tell you is that in most cases simply doing so will *not* prevent the attackers from getting back in, even if there are no known exploits with the latest version. The hackers may have left a back door file hidden in a directory where it wouldn't get overwritten with an upgrade, or inserted code into your theme, or simply created an account that they then granted admin privileges to. Any one of those would allow them back in, even after you patched what was wrong the first time. Therefore I am providing this step by step process on how to completely clean out and restore a Word Press installation that has been hacked.

a. Backup the site and the database.

Even a hacked copy of your blog still probably contains valuable information and files. You don't want to lose this data if something goes wrong with the cleanup process. Worst case scenario you can just restore things back to their hacked state and start over.

b. Make a copy of any uploaded files, such as images, that are referenced.

Images are generally exempt from posing a security risk, and ones that you uploaded yourself (as opposed to ones included with a theme, for instance) will be harder to track down and replace after things are fixed again. Therefore it is usually a good idea to grab a copy of all the images in your upload folder so as to avoid broken images in posts later. If you have any non-image files that could potentially have been compromised, such as zip files, plug-in, or php scripts that you were offering people, then it is a good idea to grab fresh copies of those from the original source.

c. Download a fresh version of WP, all of the plug-in you need, and a clean template.

Using the Word Press automatic upgrade plug-in does make it easier to upgrade every time a new version comes out. However, it only replaces Word Press specific files, and does not delete obsolete ones. It also leaves your current themes and plug-in in place, as is. This means that if used to upgrade a blog that has already been compromised, it can very well leave the attackers a way back in. It is best to start over from scratch as far as the files portion of your installation goes. Note that if you use the [Easy WP Word Press Installer](#) script that I wrote it saves you from having to download, unzip, and then upload all of the core Word Press files, although you will still need to grab fresh copies of the themes and plug-in that you want to use.

d. Delete all of the files and folders in the WP directory, either through FTP (slower) or through panel's File Manager (faster).

Now that you have fresh copies of all the files you need, and copied all of your uploaded images, completely delete the entire directory structure your blog is in. This is the only sure-fire way to completely remove all possibly infected files. You can do this through FTP, but due to the way that FTP handles folder deletion (ie. it walks the directory structure, stores each and every file name that needs to be deleted, and then sends a delete command for each one), this can be slow and in some instances cause you

to get disconnected due to flooding the server with FTP commands. If available it is much faster to do this through either panel's File Manager or via command line if you happen to have shell access.

e. Re-upload the new fresh copies you just grabbed.

This step should be self explanatory, but I would like to mention that if your FTP client supports it (I use [FileZilla](#), which does) and your host allows it, then increasing the number of simultaneous connections you use to upload can greatly reduce your overall transfer time, especially on servers or ISP's where latency is more of an issue than bandwidth.

f. Run the database upgrade (point your browser at /wp-admin/upgrade.php).

This will make any necessary changes to your database structure to support the newest version of Word Press.

g. Immediately change your admin password.

If you have more than one admin (meaning any user with editing capabilities), and cannot get the others to change their passwords right then, I would change their user levels until they can change their passwords as well. If there is anyone in your user list that has editing capabilities, and you do not recognize them, it's probably best to just delete them altogether. If changing passwords is something you hate doing, then maybe my new [memorable password generator](#) can make that a little less stressful for you.

h. Go through the posts and repair any damage in the posts themselves.

Delete any links or frames that were inserted, and restore any lost content. Google and Yahoo's caches are often a good source of what used to be there if anything got overwritten. The following query run against the database can help you isolate which posts you want to look at:

```
SELECT * FROM wp_posts WHERE post content LIKE '%<iframe%'
UNION
SELECT * FROM wp_posts WHERE post content LIKE '%<no
script%'
UNION
SELECT * FROM wp_posts WHERE post content LIKE '%display:%'
```

If you did not change the default prefix for Word Press tables, then you can copy and paste that directly into a query window and run it, and it should pull up any posts that have been modified to hide content using any of the methods I have come across so far (iframes, no script tags, and display: none style attributes). To get to a query window in cPanel, you would click on the MySQL® Databases icon, scroll to the bottom of the page, and then click on php MyAdmin. Once the new window or tab opens, you would click on the database in the left hand side that your blog was in, and then in the right side at the top click on the SQL tab. Then just paste the query into the large text area and hit the Go button.

Note, however, that there may be other types of injected content that I haven't seen yet, and that a manual inspection looking for the types of patterns that first alerted you to the fact that your blog was hacked is always a good idea.



## X. CRIMINALIZATION

Legislators and law enforcement began to get serious about criminalizing and prosecuting these activities in the mid-1980s. Congress passed its first hacking-related legislation, the Federal Computer Fraud and Abuse Act, in 1986. The act made computer tampering a felony crime punishable by significant jail time and monetary fines. By the mid-1990s several high-profile arrests had taken place and signalled the seriousness with which government and businesses were dealing with these activities. Kevin Mitnick, perhaps the best known hacker of this era, was arrested twice, served significant jail time, and was barred from touching a computer for several years after completing his sentence.

## XI. HACKER GOOD, CRACKER BAD

Although the term “hacker” is in widespread use, the sense in which it is employed is generally incorrect. Popular media and entertainment providers have long used it to describe anyone who tampers with a system, particularly in connection to criminal activity. This journalistic misuse of the name upset many “traditional” hackers, who responded to the vilification of their good name by offering a new term for these individuals: “crackers.” Crackers are vandals and thieves whose sole purpose is unauthorized “cracking” into secure systems for personal gain.<sup>5</sup> This darker side of hacking has three main motivations with varying degrees of harm. The most benign cracks are attempts to gain unauthorized access in order to satisfy a personal motive such as curiosity or pride. More malicious cracking seeks to gain unauthorized access in order to tamper with or destroy information. The goal of the most serious and professional crackers is unauthorized access to systems or computer services in order to steal data for criminal purposes. Systems commonly under attack are universities, government agencies, such as the Department of Defence and NASA, and large corporations such as electric utilities and airlines. Many crackers are professional criminals involved in corporate or government espionage and have links to organized crime. A relative newcomer to the “hacker” field, script kiddies are another break-off group mistakenly called hackers by the media. A lower form of crackers, script kiddies are not particularly knowledgeable about computer and networking details. Instead, they download ready-made tools to seek out weaknesses on systems accessible via the Internet. They do not target specific information or a specific

company but rather scan for opportunities to disrupt and vandalize systems. Most “hackers” and “hacking” events reported on by the popular press are actually of this type.

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## AUTHORS

**First Author** – Susidharthaka Satapathy persuing Master in Computer Application from O.U.A.T, Odisha, India in 2012-2015.He is working in the area of Ethical Hacking for last 6 months., Email: [satathysusidharthaka@gmail.com](mailto:satathysusidharthaka@gmail.com)



**Second Author** – Dr.Rasmi Ranjan Patra received Master In Computer Application With 1st Class With distinction from O.U.A.T, Odisha, India in 2001, M.Tech in Computer Science and Technology from C.E.T Bhubaneswar ,India in 2010 and PhD Degree in 2013 from Utkal University, India .He is working as Assistant professor in Department of Computer Science and Application under Orissa University of Agriculture and Technology(O.U.A.T).He has Published many papers at national /international Journals and Conferences in the areas of Sensor Network, Soft Computing, Cloud computing and Big data. Mr. Patra has authorized one book in Computer Science area., Email: [hellorasmi@gmail.com](mailto:hellorasmi@gmail.com)



# Fabrication of Hybrid Solar Dryer

Jyoti Singh, Pankaj Verma

\*M.Tech, Department of Mechanical Engineering, Babu Banarsi Das University, Lucknow, India

**Abstract-** The presents work is based on the working of dryers, the basic aim of this experiment is to design a dryer which meets the basic requirements of dryer which are improved by a modification in the design of indirect forced solar dryer. The concept behind the construction of a dryer is energy conservation and food preservation by the moisture removal process in solar dryer. In this experiment the dryer which is designed works by using solar energy as well as electrical energy that is why the name of the dryer is 'Hybrid Solar Dryer'. In this hybrid solar dryer a recirculating duct is added from the motor fan assembly to the drying chamber that the hot air which goes through the passage of air flow that is firstly hot air passes through the rectangular duct then in divergent duct and finally reaches in the drying chamber but in between them some amount of hot is wasted but by the recirculating duct this air is reutilized for heating the food product in drying chamber. After working on this dryer the drying time reduces, drying rate increases ,removal rate of moisture content increases in comparison to indirect solar dryer without air recirculation.

**Index Terms-** solar dryer, moisture content, drying rate, drying time.dew point

## I. INTRODUCTION

Drying is a complicated process involving simultaneous heat and mass transfer. The required amount of energy to dry a particular product depends on many factors, such as initial moisture content, final moisture content, drying air temperature, relative humidity and velocity.

The dryers are broadly classified as:

- (i) On the basis of their operating temperature ranges that is high temperature solar dryer and low temperature solar dryer :
  1. Air movement mode
  2. Insulation exposure
  3. Air flow direction
  4. Dryer arrangement
  5. Solar contribution
  6. Type of fruit to be dried
- (ii) On the basis of air flow:
  1. Direct Solar Drying
  2. Indirect Solar Drying
  3. Mixed Mode Solar Drying

## II. WHY SOLAR DRYER

- i. More than 20% of the total fruits and vegetables production is lost at various post harvest stages in India.
- ii. To improve the shelf life of these food products, their moisture content should be reduced to an extent so that the microorganisms can't grow.
- iii. It also saves shipping and transportation costs as volume and weight both decrease.

## A. DRYING PRINCIPLE:

"In the process of drying heat is necessary to evaporate moisture from the substance to be dried, and a flow of air is needed to carry away the evaporated moisture."

There are two basic mechanisms involved in the drying process:

1. Migration of moisture from the interior of the substance to be dried.
2. Evaporation of moisture from the surface to the surrounding air.

The rate of drying is determined by observing following parameters:

- i. Moisture content
- ii. Temperature of the substance to be dried.
- iii. Temperature, humidity and velocity of the air in contact with the substance to be dried.

## B. PHYSICS OF DRYING:

Everybody knows what is drying, but not everybody understands the physical process of drying and the lack of understanding of this process could lead to the **destruction of entire crops** during the **drying, curing and storing** processes.

Drying an object (**onions, potatoes or other produce**) is a process where the following parameters play a determining role:

1. The air temperature,
2. The relative Humidity
3. The air pressure
4. The Dew Point
5. The temperature of the product to be dried.
6. The amount of air that passes through the product.

The first 4 parameters are strictly related through 'Laws of Physics'.

In all these processes the DEW POINT plays a determining role.

### What is Dew Point?

“Dew Point is the temperature at which water vapour in a sample of air at constant barometric pressure condenses into liquid water at the same rate at which it evaporates.”

These four parameters are represented relatively through “MOLLIER DIAGRAM”.

**C.Moisture Content:** The moisture content of fresh foods ranges from 20% to 90%. Foods require different levels of dryness for safe storage. For example: the moisture content of rice must be reduced from 24% to 14% of the total weight. Therefore, drying 1,000 kg of rice requires the removal of 100 kg of water. Safe storage generally requires reducing the moisture content to below 20% for fruits, 10% for vegetables, and 10-15% for grains. If food is properly dried, no moisture will be visible when it is cut.

## III. DESIGN, FABRICATION AND WORKING

### A. DESIGN

#### (1) COMPONENTS AND SPECIFICATION

The design of this hybrid drier is divided into 3 sections:

#### Section-A: AIR REGULATION CHAMBER

This section consists of motor fan arrangement to regulate air flow and a tapered duct attached in front of it. The motor fan arrangement is mounted over a cuboid duct of length (0.5m), breadth (0.5m) & height (0.1m).

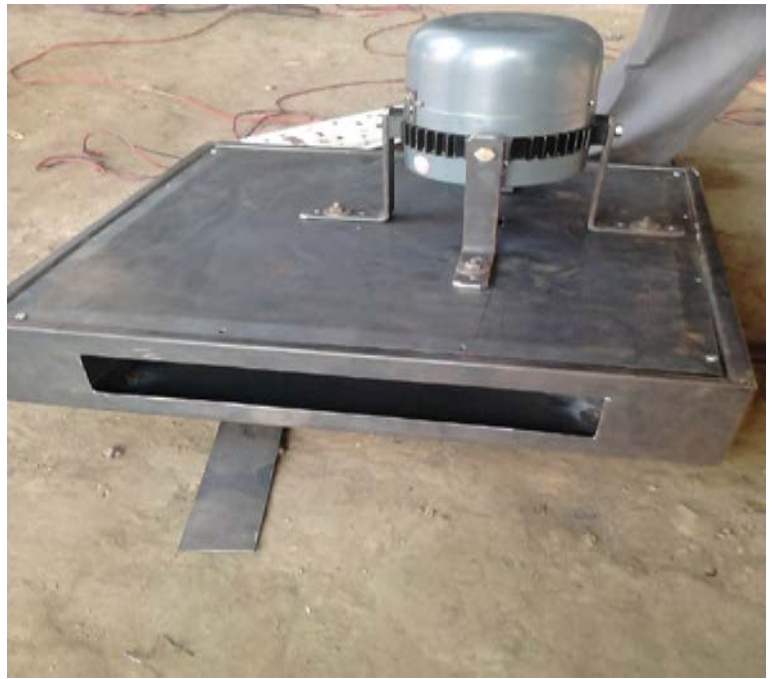


Figure 2: Motor-fan arrangement

#### (A.2) CENTRIFUGAL FAN

Specification: Dia (20cm), inward flow of air is axial, outward flow of air is radial.



Figure 3: Centrifugal fan



Figure 1: Motor-fan arrangement with tapered duct.

#### (A.1) MOTOR

Specification: 145 watt, 1440 rpm, 3 phase a.c motor.

#### (A.3) INNER CIRCULAR DUCT

Specification: It directs the flow of air.





Figure 4: **Inner circular duct**



Figure 6: **Heating chamber**

Specification: length (0.9m), breadth (0.5m) and height (11cm).

(A.4) TAPERED DUCT

Specification: length (1m), breadth (0.5m), height (0.1m & 0.05m).

Tapered duct increases the velocity of air.



Figure 5: **Tapered duct.**

(B.1) HEATING ELEMENT



Figure 7: **Heating Elements**

Specification: load (4kW)

SECTION-B: HEATING CHAMBER

Heating chamber consist of heating elements and solar collector plate.

(B.2) SOLAR COLLECTOR PLATE



Fig 8: **Solar collector plate and heating elements.**

Specification: Toughened glass(4mm), (40 X 85)cm.

The glass can handle temperature upto 250 deg celcius.

### SECTION-C: DRYING CHAMBER

The drying chamber consists of 3 horizontal trays, an outlet part for moisture removal and a hole at the bottom to avoid vacuum and a temperature sensor to measure the temperature of the hot air coming from heating chamber into the drying chamber.

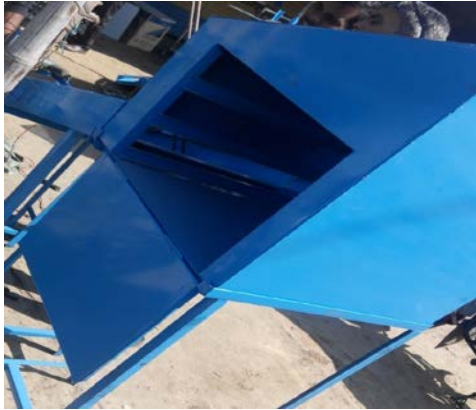


Figure 9: **Drying Chamber.**

#### (C.1) DRYING CHAMBER TRAYS



Figure 10: **Drying chamber trays**

Specification: (60 X 40) cm.  
The distance between each tray is 10cm.

#### (C.2) OUTLET PORT



Figure 11: **Outlet port**

Specification: made of steel sheet. Height (4 inch) & dia (2.5cm).

#### (C.3) TEMPERATURE SENSOR

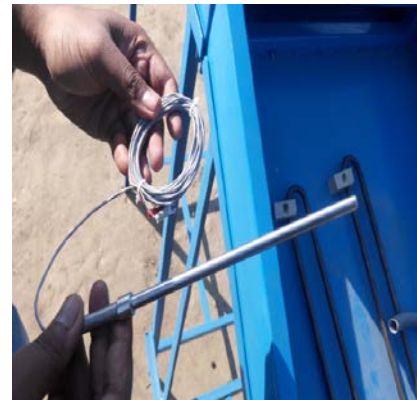


Figure 12: **Temperature sensor**

Function: To sense the temperature of the air entering the drying chamber.

#### (C.4) TEMPERATURE CONTROLLER BOX

The temperature control box is also mounted on the face of the drying chamber.



Figure 13: **Temperature Controller box set up.**

The components inside this box are:



Figure 14: **Temperature controller**

Specification: Temperature controller with adjustable temperature settings and display of (in process) temperature in the drying chamber. **Power consumption 6 VA max.**

- Row 2 temperature is the desired temperature to be set by the user.
- Row 1 temperature is the temperature of the hot air inside the drying chamber.

(b) Relay:

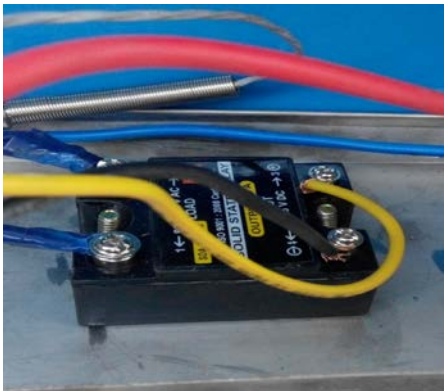


Figure 15: **The Relay**

Specification:

40amp relay is used to control and regulate the flow of current in heating coil and motor.

(c) Power Indicators:

Yellow indicator: It indicates the power supply to the device.

Green Indicator: It indicates, whether heating elements are on or off.

(d) Toggle Switch:

Used for switching the equipment on/off.



Figure 16: **Toggle Switch**

#### IV. MATERIALS USED IN THE FABRICATION

1. DUCTS:  
20 guage galvanised iron sheet.
2. RECIRCULATING DUCTS:  
24 guage steel sheet.
3. TEMPERATURE CONTROL BOX:  
22 guage steel sheet.
4. TRAYS:  
24 guage iron sheet.
5. STAND:  
Iron angles (2.5mm)
6. WIRES USED:
  - (a) 2.5 mm Teflon high temperature wire inside the heating chamber.
  - (b) 1.5 mm wires for motor – relay connection.
  - (c) 2.5 mm wires for temperature controller-heating elements connections.
7. POWER PLUG USED:  
32 ampere used.
8. POWER CABLE:  
2.5 mm used.

#### V. WORKING AND APPLICATIONS

GENERAL WORKING:

##### 1. AIR FLOW:

The air flow inside the dryer is maintained using the motor-fan arrangement. The intake of the air is axial and then it is thrown radially into the tapered duct where the velocity of the air is increased due to uniform decrement of the duct's height.

##### 2. HEATING:

Heating of the air is achieved inside the heating chamber with the help of two heating elements and the sunlight falling on

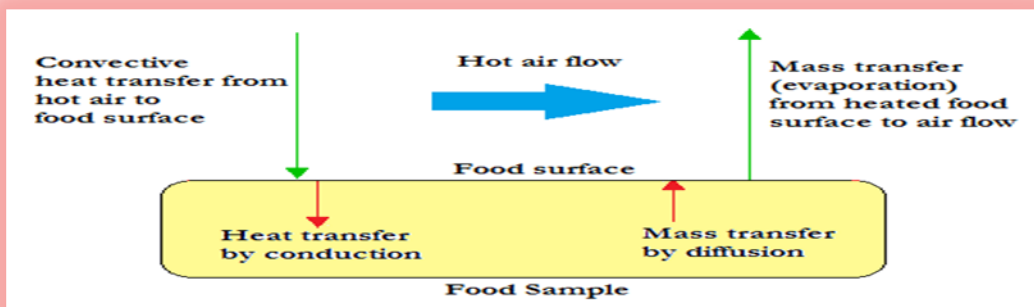


the collector plate (glass). Then this hot air goes inside the drying chamber.

### 3. DRYING:

The hot air at desired temperature enters the drying chamber and strikes the food item to be dried. Now, the drying

phenomenon of the food item is described through a schematic diagram (shown on next page) :



**Figure25: Schematic Representation of the drying phenomenon.**

### 4. MOISTURE REMOVAL:

The moisture is removed from the food item, through a outlet port at the top of the drying chamber.

### 5. HOT-AIR RECIRCULATION:

Now the hot air is recirculated into the motor fan arrangement, so as to maintain a constant temperature inside the drying chamber and the desired temperature is achieved in less time.

### 6. TEMPERATURE CONTROL:

The desired temperature can be set on the temperature controller which is connected to a temperature sensor (the sensor is placed inside the drying chamber). The controller takes the temperature input from the sensor and accordingly regulates current in the heating elements, and as the temperature exceeds the set temperature, the heating elements are automatically switched OFF, and further, as the temperature goes below the set temperature, the heating elements are again switched ON by the controller.

**NOTE:** To prevent vacuum formation inside the dryer, a small hole is given at the bottom of the drying chamber, adjacent to the opening of recirculation duct.

(E)Complete set up of hybrid solar dryer:



**Figure :26 Front view of fabricated set up**

## VI. TYPES OF USAGE

“The dryer is named “HYBRID” as the heating of air inside the heating chamber can be achieved by using solar energy, electrical energy or both together.”

### 1. OUTDOOR USAGE:

During the outdoor usage, the heating of air is achieved from the heat energy of sun rays falling on the solar collector plate, made of toughened glass. If the desired temperature cannot be achieved by the sole use of solar energy, then the heating elements can be switched ON, simultaneously to achieve a constant temperature inside the drying chamber.

### 2. INDOOR USAGE:

During indoor usage, the heating is achieved only by switching ON the heating elements.

## VII. ADVANATAGES

- Higher drying temperatures which results in shorter drying times and the ability to dry to a lower final moisture content.
- Protection from contamination by dust and from rain showers.
- Total independence from weather conditions.
- Better control of the drying process.
- Food is not exposed to direct rays of sun, which reduces the loss of colour and vitamins.

## VIII. LIMITATIONS

- Complex to construct at local workshops.

## IX. TIPS FOR BETTER OPERATION

- The collector should face south in the northern hemisphere and the north in the southern hemisphere.
- The collector should be filed away from shadows of trees or buildings for outdoor experiment.

## X. PRECAUTIONS

- The collector plate and the recirculating duct should not be touched because of their temperatures.
- The wiring inside the temperature control box should be checked from time to time.
- Gloves should be worn while taking out the trays from the drying chamber.

## XI. GOALS ACHIEVED

The main goal of designing and fabrication of current dryer was to provide enhanced efficiency of drying and maintaining the food quality of the same time.

- The solar dryer is capable to achieve higher operating temperatures by directing spent air from drying chamber of higher temperatures than the inlet air and taking advantage of hot air to achieve. Still higher operating temperatures through recirculation of air, especially that outlet air is, which is minimally laden with moisture.
- Achieving temperatures in the range 35 deg Celsius to 90 deg Celsius inside the drying chamber.
- Utilizing the solar energy as well as using heating elements to heat up the air entering the heating chamber which further increases the usability of the dryer as completed indoor usage is also possible with it.
- Better temperature control is being stabilized inside the drying chamber by setting up a temperature control box mounted on the wall of the drying chamber and the use of temperatures sensor to accurately measure the temperature of hot air inside the drying chamber and feeding input to the

control and thus allowing it. To control the current in the heating elements and the motor-fan assembly. Thus energy efficiency is achieved along with the SET temperature being maintained inside the drying chamber. Visual display of the current operating temperature and the SET temperature is also possible.

## XII. FUTURE IMPROVMENTS

Although being an efficient dryer, there are always scope for further improvements and developments by bridging the communication gap between the solar researchers and food technologists. Food technologists are not aware of the capabilities of new breed of solar dryers while solar technologists are unaware of the technical requirements of different processes followed in food processing.

Any technical project is susceptible to various modifications and alternative forms. However some suggested future technical improvements are:

1. Addition of solar panels and creating an independent electricity supplying unit to run the dryer as a whole.
2. A solenoid-valve can be attached at both the ends of recirculation duct and being controlled by a programmable humidity controlled and a humidity sensor, a display panel being set behind the solar dryer, to display the inside the humidity. It will help in stopping the recirculation of air, when the amount of moisture in the air exceeds a certain value.
3. Introduction of silica gel sheets laminated between honey comb panels for further moisture removal inside the drying chamber.

## XIII. CONCLUSION

Solar energy based technologies are currently playing an important role in food processing however they are limited micro to small scale processing. However, indirect solar drying gives no. of opportunity of using it on large scale and should be studied & in the goal of the future studies.

With changing lifestyle in India and elsewhere, there is a great demand for ready to eat (RET) foods that are also healthy and indirect solar food processing can be a major contributor to meet such demands.

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AUTHORS

**First Author** – Jyoti Singh, M.tech, Department of mechanical engineering, Babu Banarsi Das University, Lucknow, India, jyotis621@gmail.com

**Second Author** – Pankaj Verma, M.Tech, Department of mechanical engineering, Babu Banarsi Das University, Lucknow, India

# Wild Medicinal Plants in the Hill of Manipur, India: A traditional therapeutic potential.

Th. Inaocha Devi<sup>\*</sup>, Kh. Ujala Devi<sup>\*</sup> and E.J Singh<sup>\*\*</sup>

<sup>\*</sup>Institutional Biotech Hub, Presidency College, Motbung, Senapati District, Manipur, India.

<sup>\*\*</sup>Department of Botany, D. M. College of Sc. (PG) Imphal, Manipur, India.

**Abstract-** The present study revealed that a total of 100 wild medicinal plants belongs to 41 families had been collected in which 63 plants are aromatic and 37 plants are non-aromatic. In aromatic, family Zingiberaceae recorded highest plant species (13) whereas in non-aromatic, family Asteraceae shown maximum plant species (7). Out of the total medicinal plants, 20% of plants are used for treatment of diabetics, blood pressure and piles, 21% for rheumatism and gout, 9% for asthma, 6% for stone case, 2% for cancer, 16 % for cosmetics(hair lotion) and 26% for others. Some important medicinal plants which are used by the local peoples are *Zingiber cassumunar*, *Paederia foetida*, *Polygonum perfoliatum*, *Melothria purpusilla*, *Clerodendrum siphonanthes*, *Clerodendrum viscosum*, *Sida rhombifolia*, *Hiptage benghalensis*, *Litsea cubeba*, *Schefflera venulosa*, *Zanthoxylum rhesta*, *Curcuma amada*, *Curcuma caesia*, *Kaempferia rotunda*, *Hedychium marginatum*. However, *Litsea cubeba*, *Curcuma amada*, *Curcuma caesia*, *Kaempferia rotunda* and *Hedychium marginatum* are critically endangered. Living in the far interior hill environment where no immediate modern medical facilities depends mainly on plants to cure of all diseases. The increase exploitation of various indigenous wild plants by human activities arise the need for the conservation of natural bioresources at present for future generation .

**Index Terms-** Medicinal plants, Conservation, Endangered, Sadar hill.

by the herbal or pharmaceutical industry are collected from wild habitat. Manipur has rich heritage and long history on use of medicinal and aromatic plants (MAP) as medicine, cosmetics, health hygiene, toiletries, fragrance and food supplements in improving the quality of life. However, increasing demand on plants and human exploitation become a great threatening in their indigenous habitation. Medicinal plants in relation to their unutilized and conservation resource have been conducted in different parts of the world (Joy *et al.*, 2001); (Lyle, 2007); (Shankar *et al.*, 2010). Many western explorers (Clarke, 1989; Kaith, 1936) were attracted by the rich flora of the state. Some of the noteworthy account of the floristic study of Manipur had been given out by Mukherjee (1953), Deb (1961 a & b), Jain and Shukla (1979) and Phukan (1999).

In Manipur, medicinal plants are associated with folk traditions and many local physicians ( Maiba or Amaiba) depend on the medicinal plants for the treatment of disease . Still, about 1200 medicinal plants are used by practitioner in traditional herbal home remedies (Tombiraj 2011). Jain *et. al*, 2007 also reported that over 90% of villagers consult with traditional healers before attending healthcare centers. Many workers Jain *et.al*, 2007; Singh, 2011; Debala *et. al*, 2014; Leisangthem and Sharma, 2014 had studied medicinal plants of Manipur. However, the study of medicinal plants in hill districts is limited. Therefore the present study focus on identification and conservation of wild medicinal and aromatic plants.

## I. INTRODUCTION

Manipur is widely rich in biodiversity belonging to different climatic conditions varying from tropical, subtropical, and temperate zones which covers the major occurrence of medicinal plants. Medicine and Aromatic Plants (MAPs) and their derivatives are used for prevention as well as curing of human health problems (diseases and disorders) since time immemorial and there is global resurgence now in use of plant based drugs where modern drugs are either unavailable, unaffordable or unsatisfactory (Marshall,2011). The medicinal value of the drug plants are due to the presence of specific chemical substances like alkaloids, glucosides, resins, gums, tannins, essential and fatty oils etc. The main constituents of essential oils are mono and sesquiterpenes including carbohydrates, phenols, aldehydes, alcohols, ether and ketones are responsible both for the fragrance and for the biological activity of aromatic and medicinal plants (Kalemba and Kunika,2003). Most of the medicinal plants used

## II. METHODOLOGY

The present study was carried out at Sadar hill, Senapati district, Manipur and it falls at 23° 47' to 25° 41' N Latitude and 93° 61' to 94° 48' E Longitude at an altitude varying from 1061 m to 1788 m above sea level. The climate of the study site is monsoonal.

The detailed survey was conducted at different sites from January 2014 to December 2014. Survey is based on information collected from different persons like elderly men and women, herbalists, and traditional healers through discussions concerning the indigenous or traditional healing technique from medicinal wild plants. Information and voucher specimens including medicinal uses, procedure, composition, does etc. were recorded following standard field and ethno botanical methods (Jain and Rao ,1977). Collected specimens were identified with the help of experts and books such as Sinha, 1996; Singh *et al.*, 2003 and Lal and Singh, 2009.

**TABLE 1: Wild medicinal plants**

**A. Aromatic plants**

Sl. No	Botanical Name	Common Name & Local Name	Family	Flowering & Fruiting	Parts Used	Medicinal Uses
1	<i>Aquilaria agalocha</i> Roxb.	Eagle-wood & Agor	Rutaceae	May-Aug	Leaves, wood	tonic, carminative and stimulant
2	<i>Artemisia indica</i> Linn.	Worm seed & Laibakngou-nakuppi	Asteraceae	Sept-Feb	Whole plant	Stomach pain, anti-septic
3	<i>Artemisia nilagirica</i> (Clarke) Pamp. Roxb.	Indian worm wood fleavane & Laibakngou	Asteraceae	Oct-Feb	Whole plant	Tonic, anti-septic ,insect repellent
4	<i>Acorus calamus</i> Linn.	Sweet flag & Oak-hidak	Araceae	Non-flowering	Leaves, root, rhizome	Cough, fever, itching
5	<i>Ageratum conyzoides</i> Linn.	Goat weed & Khong-jai-napi	Asteraceae	Oct-July	Leaves	Hair care lotion, cough, colic, wound, gastro-intestinal diseases
6	<i>Alpina nigra</i> (Retz.) Rosc.	Shell ginger & Pullei	Zingiberaceae	May-July	Rhizome, leaves, inflorescence	Gout, colicpain, rheumatism, sex diseases
7	<i>Alpina galanga</i> Wild.	Greater galangal & Kanghoo	Zingiberaceae	May-June	Rhizome, inflorescence	Gout, colicpain, rheumatism, stimulant, carminative
8	<i>Amomum dealbatum</i> Roxb.	Bengal cardamom & Namara	Zingiberaceae	April-Aug	Rhizome, inflorescence	High B.P, constipation, stomachic, stimulant
9	<i>Acacia catechu</i> (L.F) Wild	Babul bark & Ching-gonglei	Mimosaceae	Oct-Feb	Seed, tender, pod	Ringworms, gout, muscular pain, cough, fever, piles, astringent
10	<i>Artocarpus lakoocha</i> Wall.	Monkey jack tree & Hari-kokthong	Moraceae	July-Aug	Fruit, leaves	Constipation, fever, skin diseases, tonic, heart diseases
11	<i>Aegle marmetos</i> (L). Correa	Indian bael & Hei-khagok	Rutaceae	March-June	Fruit, leaves	Diabetes, stomachulcer, dyspepsia, dysentery
12	<i>Artabotrys hexapetalus</i> (L.F.)	Tai grape & Chini-champra	Amonacea	April-May	Inflorescence, leaves	Insect repellent, cholera, perfume
13	<i>Ardisia crenata</i> Sims.	Coralberry & U-thum	Myrsinaceae	March-June	Leaves	Diabetes, urinary disorder, cough, diarrhoea
14	<i>Betula cylindrostachys</i> Gamble	Flame of the forest & Pareng	Betulaceae	March - June	Bark, small branches	Tonic, astringent
15	<i>Blumeopsis flava</i> (D. Don) Merr.	Maiden-hair fern & Haochak	Asteraceae	Oct-Feb	Whole plant	Cold, cough, bronchial congestion, skin diseases
16	<i>Clerodendrum serratum</i> (L.) Moon.	Bharmgt & Moirang-khanambi	Lamiaceae	July-Sept	Leaves, inflorescence root	Cold, cough, rheumatism, dyspepsia, asthma
17	<i>Curcuma amada</i> Rosc.	Mango ginger & Heinouyai	Zingiberaceae	Aug-Sept	Rhizome	Stomachic, carminative, healing, sprain
18	<i>Cucurma angustifolia</i> Rosc.	East Indian arrow root & Yaipal	Zingiberaceae	April-May	Inflorescence	Anti-fungal, anti-bacterial, cough, diarrhoea
19	<i>Curcuma caesia</i> Roxb.	Black zedoary & Yaimu	Zingiberaceae	Aug-Sept	Rhizome	Fever, cough, constipation,



						wellurination, sprain
20	<i>Cymbopogon flexuosus</i>	Citronella grass &Houna	Poaceae	Sept-Dec	Leaves	Throat problem, back – pain, hair care lotion
21	<i>Cynodon dactylon</i> (L) Pers.	Doob grass &Tingthau	Poaceae	Non-flowering	Leaves	Dropsy, piles, throat problem, wound
22	<i>Cinnamomum camphora</i> (Linn.) Nees and Eberm.)	Camphor tree &Karpur	Lauraceae	April-June	Leaves	Stimulant, muscular strains, rheumatism, antiseptic, hair care lotion
23	<i>Carnarium bengalensis</i> Roxb.	East Indian Copal & Mekruk	Bromeliaceae	May – July, Nov– Jan.	Leaves, bark	chronic dysentery
24	<i>Cinnamomum tamala</i> (Linn.) Nees and Eberm.	Bayleaf&Tezpat a	Lauraceae.	Feb. – Mar, June – Oct.	Leaves	Cold, cough, toothache, liver problem, urinary problem
25	<i>Cinnamomum zeylanicum</i> Breyn.	Cinnamon & U-shingsha	Lauraceae	March-Apr, June – Aug.	Bark	dyspepsia, cold vomiting, astringent carminative. cough.
26	<i>Citrus ganrhhini</i> Lush.	Citron & Hei-jang	Rutaceae	March-June	Fruit	Flavouring confectionary
27	<i>Citrus laltipes</i> DC.	Khasipapeda & Hei-ribob	(Rutaceae	March-Sept Nov.	Fruit	Anti-dandruff, good complexion, stone case
28	<i>Citrus maxima</i>	Nobaab	Rutaceae	Feb-May	Fruit	Cold, influenza, intestinal worm
29	<i>Costus Speciosus</i> (K) sm	Male bamboo & Khongbal Takhellei	Zingiberaceae	May-July	Root	Astringent, purgative, stimulant, tonic
30	<i>Eryngium foetidum</i> Linn.	False coriander & Awa-phadi-gom	Myrtaceae	June-Aug, Nov-Jan	Fruit, leaves, root	Stomach ulcer,nerve problem, muscle pain, high B.P
31	<i>Eupatorium odoratum</i> Linn.)	Maiden hair fern & Hanurei	Asteraceae	May-Aug.	Leaves	Stop bleeding, anti-dandruff
32	<i>Eucalyptus citriodora</i>	Eucalyptus & Nasik	Myrataceae	Oct-Nov.	Leaves	Healing, sinusitis, hair lotion
33	<i>Gynura cusimba</i> L.	Silk cotton tree & Terapaibi	Asteraceae	May-Aug	Leaves	Colitis, stimulant, tonic, stomachulcer, wound
34	<i>Helianthus annus</i> Linn.	Sunflower & Numit lei	Asteraceae	Sept-March	Seed, leaves	Muscular pain, kidney diseases, cold, cough, bronchitis
35	<i>Hedychium aurantiacum</i> Wall.	Cogon grass & Eengel lei	Zingiberaceae	Aug-Oct	Inflorescence, rhizome	Bronchitis
36	<i>Hedychium coronarium</i> Koenig	White ginger lily & Takhel lei angouba	Zingiberaceae	July-Aug	Rhizome	Throat problem, tonic, dyspepsia
37	<i>Hedychium marginatum</i> C.B. Clarke.	Redginger lily & Takhel-lei angangba	Zingiberaceae	July-Sept	Rhizome, leaves	Carminative, stimulant, bronchitis, tonic
38	<i>Houttuynia cordata</i> Thunb.	Molucca bean & Toningkhok	Sauraceae	July-Sept	Leaves, rhizome	Dysentery, stomachulcer, gonorrhoea, muscular pain, measles
39	<i>Kaempferia rotunda</i> (L)	Aromatic ginger & Yai tham-namanbi	Zingiberaceae	May-June	Rhizome	Sinusitis, Abortifacient, mumps, tumour, high blood pressure

40	<i>Litsea cubeba</i> (Lorus) Pers.	Tumila	Lauraceae	Nov.-Jun	Fruit, Leaves	Diarrhoea, astringent, toothache
41	<i>Lantana camara</i> Linn.	Large leaf lantana & Nongban-lei	Verbenaceae	Throughout the year	Leaves, fruit	Anti-fungal, diabetes, anthelmintic
42	<i>Magnifera indica</i> Linn.	Mango & Heinou	Anacardiaceae	April-May, Jun-Aug.	Fruit	Dysentery, diarrhoea, gastric problem, diabetes
43	<i>Mesua ferrea</i> Linn.	Iron wood & Nageshore	Clusiaceae	Oct-Aug, Oct-Dec	Seed, inflorescence	Piles, dysentery, cough, diarrhoea
44	<i>Magnolia champaca</i> (L) Baill	Fragrant champaca & Leihao	Magnoliaceae	May-Mar	Inflorescence, root	Dyspepsia, gonorrhoea, stomach complain
45	<i>Paederia foetida</i> L.	Stinkvine & Oi-nam	Rubiaceae	Mar-Oct	Leaves	Stomach disorder, piles, dysentery, paralysis, rheumatism pain, dyspepsia
46	<i>Perilla ocymoides</i> L.	Frangipani & Khamella	Lamiaceae	In cold season	Leaves, fruit	Cough, womb problem, lung affections
47	<i>Pogostemon bengalensis</i> Kuntz.	Passion flower & Lamthoiding	Lamiaceae	In cold season	Leaves, root	Hair care lotion, piles, wound
48	<i>Pogostemon parviflorus</i> Benth	Phangla & Sangbrei	Asteraceae	Oct-Dec, Dec-Jan.	Whole plant	Antibiotic to wound & cut, Piles, Hair care lotion, Colic
49	<i>Plectranthus ternifolius</i> Don.	White champa & Khoiju	Lamiaceae	Sept-Nov, Jan-Mar.	Leaves	Disinfectant, antifungicide
50	<i>Pinus kesiya</i>	Baguio pine & Uchan	Pinaceae	Feb-Mar.	Wood, leaves	Cough, headache, antibacterial
51	<i>Santalum album</i> Linn.	Sandal wood & Cha-chandan	Santalaceae	Apr-Jun.	Wood	Headache, high fever, skin diseases
52	<i>Scheffler avenulosa</i> C.B. Clarke	Needle wood & Utang	Araliaceae	Dec-Feb, Mar-Jun	Wood, leaves	Dropsy, paralysis
53	<i>Spondia spinnata</i> (Linn.f.) Kurtz.	Indian hog plum & Heining	Anacardiaceae	Mar-June	Fruit, leaves	Piles, hair growth, dysentery, gonorrhoea
54	<i>Sesbania sesban</i> (L.)	Egyptian pea & Chuchu-rangmei	Fabaceae	Mar-Sept	Seed, leaves, root	Cough, fever diabetes, epilepsy, antitumor
55	<i>Tithonia diversifolia</i>	Mexican sunflower & Lam numit-lei	Asteraceae	Sept-Feb	Leaves, seed	Gastric problem, wound, bruises.
56	<i>Toona ciliate</i> M. Roem.	Red cedar & Tairel	Meliaceae	Feb-Oct	Leaves	Skin diseases, anti-fungal, anti-bacterial
57	<i>Viola pilosa</i> Blume	Cat tail millet & Huikhong	Violaceae	Jan-Mar	Whole plant	Skin diseases, constipation, well urination, cold, cough
58	<i>Vitex trifolia</i> (L.)	Chinese chaste tree & Urik-shibi	Verbenaceae	June-Sept	Leaves	Muscular sprain, anti-fungal, anticancer, tuberculosis
59	<i>Vitex negundo</i> (L)	Chinese chaste tree & Urik-shibi	Verbenaceae	June-Sept	Leaves, root	Foetidulcer, rheumatism, tonic
60	<i>Zanthoxylum acanthopodium</i> D.C.	Winged leaf prickly ash & Mukthubi	Rutaceae	Sept-Oct, Dec-Feb	Fruit, leaves	chronic fever, indigestion, cough, bronchitis

61	<i>Zanthoxylum rhesta</i> D.C.	Indian pepper & Ngang	Rutaceae	Mar-Apr, Nov-Dec.	Leaves	Astringent, flavour, anti-inflammatory, body ache
62	<i>Zingiber capitatum</i> .	Mexican ginger & Lam-shing	Zingiberaceae	July-Aug., Oct-Nov.	Rhizome	Burns, Boils, Stomach pain
63	<i>Zingiber cassumunar</i> Roxb.	Wild turmeric & Tekhao-yaikhu	Zingiberaceae	Aug-Sept	Rhizome	Tonic, Carminative, Womb related diseases, Irregular menstruation

### B. Non-aromatic plant

64	<i>Adiantum capillus-veneris</i> (L.)	Arjunterminalia & Mayur-pambi	Polypodiaceae	Jun-Oct	Leaves	Diabetes, cough, burns, chest diseases
65	<i>Anaphalis contorta</i> (D.Don).	Cud wood & Phunil	Asteraceae	Oct-Apr	Seed, tender shoot	High B.P, intestinal disorder
66	<i>Argyrea nervosa</i> (Burm.f) Boj	Opium poppy & Pungding-uri	Convolvulaceae	Aug-Oct	Stem	Rheumatism, muscular sprain
67	<i>Bonnaya brachiata</i> (L.)	Mexicanpineapple & Kihommaan	Scrophulariaceae	Sept-Feb	Whole plant	Dysentery, asthma, urinary stone cases
68	<i>Basella rubra</i> (L.)	Indian spinach & Urok-sumbal	Basellaceae	June-Aug	Leaves, inflorescence	Constipation, gonorrhoea, suppuration, boils, muscular sprain
69	<i>Croton chlorocalyx</i>	Iton-phaibi	Euphobiaceae	May-july	Leaves	Constipation
70	<i>Clerodendrum siphonanthus</i> R.Br	Turk's turban & Charoi-tong	Verberaceae	July-Oct	Stem, leaves	Cough, fever, dysenter, asthma, bronchitis
71	<i>Clerodendrum colebrookianum</i>	Turk's turban & Kuthab-lei	Verbenaceae	Aril-Feb	Leaves	Cough, skin diseases
72	<i>Clerodendrum viscosum vent</i>	Turk's turban & Kuthab-ukabi	Verbenaceae	Jun-Sept	Tender leaves	Diabetes, high B.P, asthma, bronchitis
73	<i>Cuscuta reflexa</i> Roxb.	Climbing hemp weed & Uri-sana-machu	Convolvulaceae	Non-flowering	Stem	Jaundice, chronic fever, liver diseases
74	<i>Dryopteris marginata</i> (Wall) Christ	Worm seed & Lai-chankhrang	Polypodiaceae	Non-flowering	Leaves	Boils, burns, dysentery
75	<i>Euphorbia euterophylla</i> (L.)	Taro & Pakhang-leiton	Euphorbiaceae	Throug hout the year	Whole plant	Asthma, dysentery, mouthsore, genitorurinary tract diseases, skin diseases
76	<i>Eupatorium nodiflorum</i>	Ngai-camphor & Tamulangthrei	Asteraceae	Jan-April	Leaves	Stomach ulcer, fever, cough
77	<i>Equisetum debile</i> Roxb.	Horse tail & Lai-utong	Equisetaceae	Mar-Nov	Whole plant	Gonorrhoea, small pox
78	<i>Eclipta alba</i> (L.) Hask.	Long pepper & Uchi-sumbal	Asteraceae	Throug hout the year	Leaves	Toothache, cough, fever, liver enlargement
79	<i>Fagopyrum esculantum</i> Moeuch	Buck wheat & Wakha-yendem	Polygonaceae	July-oct	Leaves	Diabetes, kidney diseases
80	<i>Galinsoga parviflora</i> Cav.	Cocklebur & Hamengsampak pi	Asteraceae	Throug hout the year	Leaves	Dysentery, boils, fever, small pox

81	<i>Hiptage benghalensis kurz.</i>	Red cedar & Madhabi	Malpighiaceae	Mar-Apr	Leaves	Chronic, rheumatism, asthma, skindiseases, insecticide
82	<i>Jatropha curcus(L )</i>	Physic nut & Awa-ke-ge	Euphorbiaceae	July-Sept	Leaves	Cough, dysentery, fever
83	<i>Linaria ramosissima (L.)</i>	Indianpenny wort & Nungai-peruk	Scrophulariaceae	July-Nov	Fruit,leaves	Urinary stone case, anthritis, diarrhoea
84	<i>Mikania scandens Wild</i>	Climbing hemp weed & Uri-hingchabi	Asteraceae	Aug-Sept	Leaves	Dysentery, wound, ringworm, other skin diseases
85	<i>Melothria perpusilla (Blume)</i>	Stinking passion flower & Lam-thabi/paba sari	Cucurbitaceae	Jun-Sept	Whole plant	Jaundice, kidney affection, highfever, diarrhoea
86	<i>Mallotus phippensis Muell.</i>	Kamala tree & Ureirom-laba	Euphorbiaceae	July-Nov	Seed	Abortifacient, skin diseases
87	<i>Marsilea minuta (L.)</i>	Water clover fern & Ishing-yenshang	Marsileaceae	Jun-Sept	Whole plant	Insomnia, paralysis, urinarydisorder, haemorrhage
88	<i>Nasturticum indicum (L.)</i>	Khasi pine & Uchi-hangam	Brassicaceae	Apr-Sept	Whole plant	Urinary disorder, kidney stone case
89	<i>Plantago erosa Wall</i>	Gurjan tree & Yempat	Plantaginaceae	Jun-Feb	Leaves, seed, root	Fever, boils, muscular sprain, gout
90	<i>Passiflora edulis Sims</i>	Wild passion fruit & Lam radhika-nachom	Passifloraceae	May-Oct	Leaves, fruit	High B.P, tonic, stimulant
91	<i>Portulaca oleracea (L.)</i>	Common purslane&Leiba k-kundo	Portulacaceae	April-Aug	Whole plant	Gonorrhoea, diabetes, burns, liver diseases
92	<i>Polygonum perfoliatum (L.)</i>	Litchi & Lil-har	Polygonaceae	May-Sept	Leaves	Injuries, wound, emollient
93	<i>Ranunculus scleratus (L.)</i>	Blister butter cup & Kakyel-khujil	Ranunculaceae	Throug hout the year	Leaves, inflorescenc e	Urinary disorder, blisters, skin diseases, tonic, rheumatism
94	<i>Spilanthes acmella Hook.f.</i>	Horse tail & Lallu-kaoba	Asteraceae	Throug hout the year	Inflorescenc e, leaves	Jaundice, cut, injuries, sore throat
95	<i>Sonchus asper</i>	Male bamboo & Khom-thokpi	Asteraceae	Dec-May	Leaves	Wound, skin itching
96	<i>Sida rhombifolia (L.)</i>	Broom jhutesida & U-hal	Malvaceae	Jun-Dec	Leaves	Rheumatism, tuberculosis, urinary disorder
97	<i>Thevetia neriifolia (J)ex Steud</i>	Yellow oleader & Utong-lei	Apocynaceae	Mar-Jun	Leaves, root	Purgative, narcotic, tumours
98	<i>Verbena officinalis (L)</i>	Vervain & Tharoi phijhub	Verbenaceae	May-Aug	Leaves	Astringent, rheumatism, leucodermal infection
99	<i>Wendlandia glabrata DC.</i>	Ivy like fig & Pheija	Rubiaceae	Feb-June	Shoot ,inflorescenc e	Cough, dysentery
100	<i>Xylosma longifolia Clos</i>	Pomelo & Nong-lei shang	Flacourtiaceae	Aug-Oct	Leaves,fruit	Piles, stomach pain, anti-bacterial

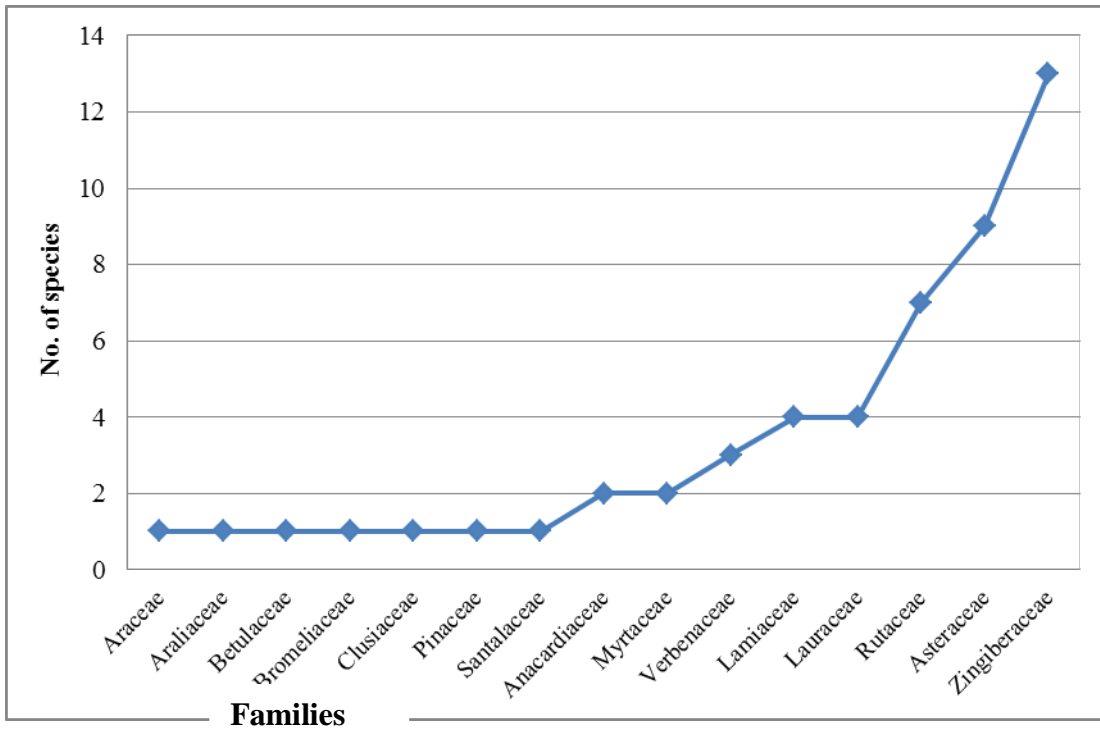


Fig. 1: Family dominance curve of the wild aromatic plants.

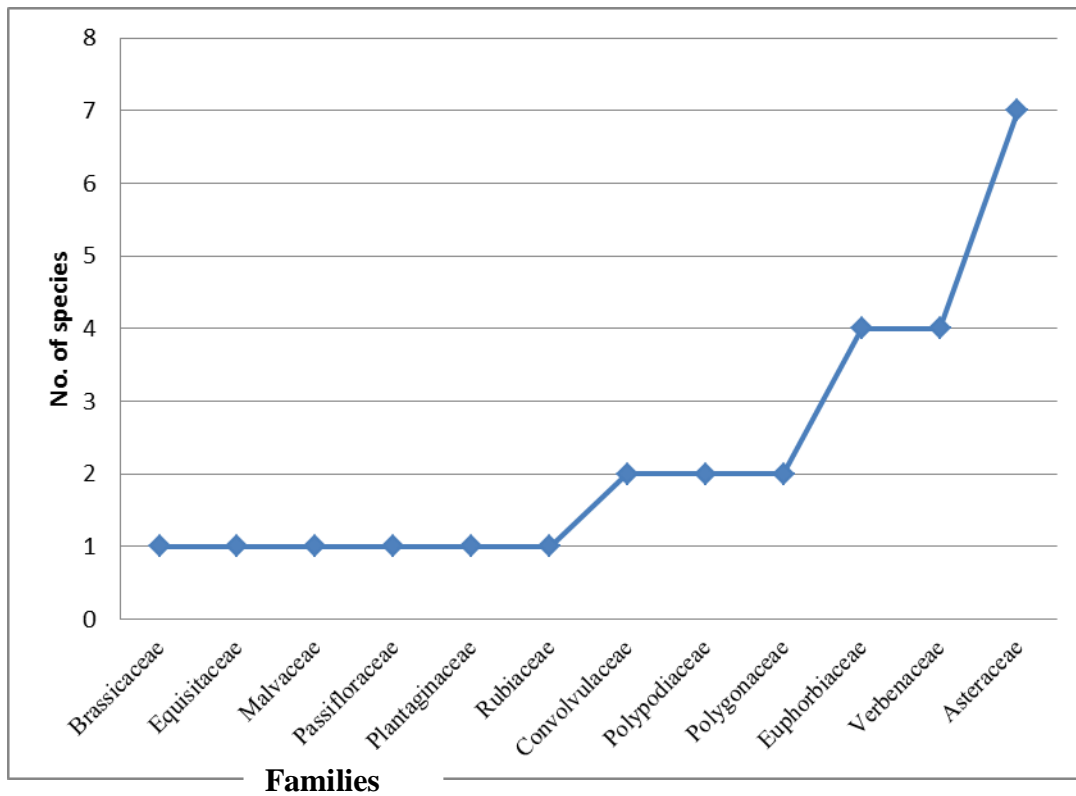
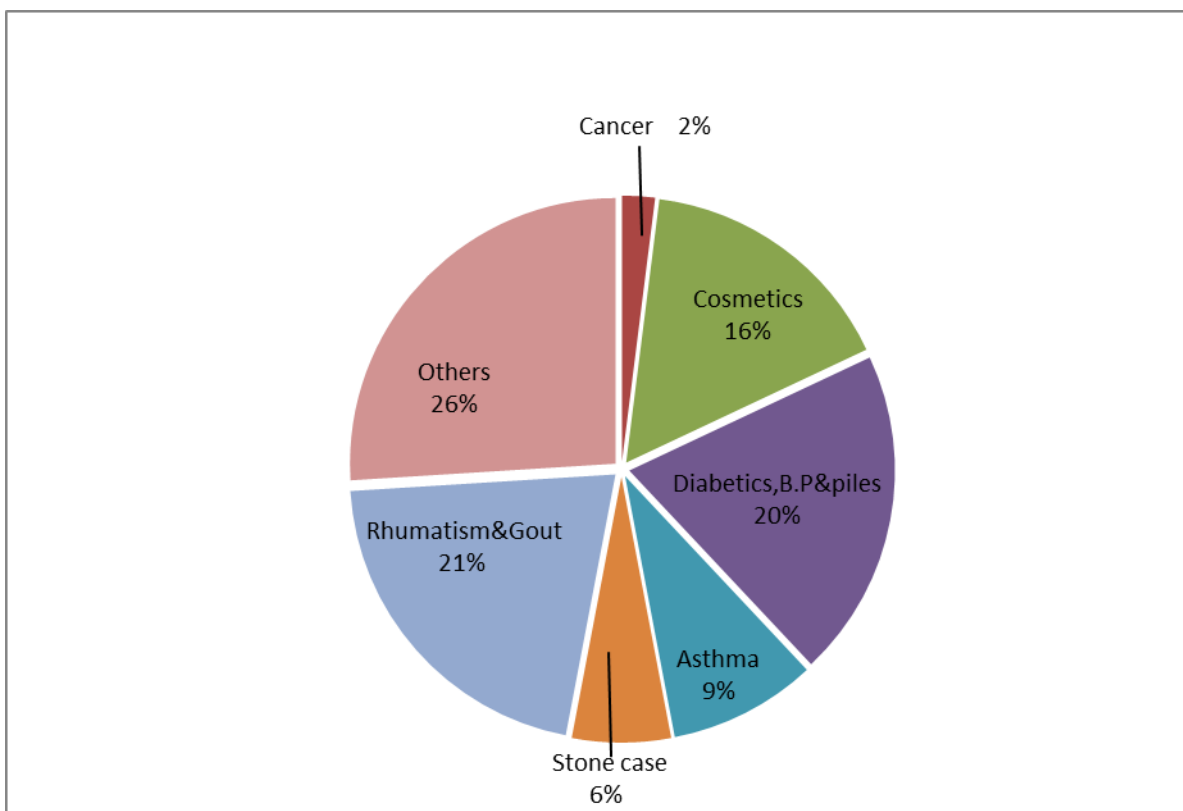


Fig. 2: Family dominance curve of the wild non-aromatic plants.



**Fig. 3: Percentage of plants use as cosmetics and medicine for different ailments.**

### III. RESULTS AND DISCUSSION

The investigation reported, altogether 100 species of wild medicinal plants belonging to 41 families were collected (Table 1). Based on the smell, plants are categorised as aromatic (63) and non-aromatic (37). In aromatic (Fig.1), family Araceae to Santalaceae recorded one species each then gradually increases till Zingiberaceae and it shows the highest plant species (13). In non-aromatic plants (Fig 2), family Asteraceae shows maximum plant species (7) than the remaining families. Highest species in Zingiberaceae and Asteraceae might be due to the favourable climatic and soil condition of the study sites. sare shown in figure 3. In this, plants used for treatment of diabetics, blood pressure and piles recorded 20 percent, asthma 9 percent, stone case 6 percent, rheumatism and gout 21 percent, cancer 2 percent and others 26 percent. However, cosmetic is 16 percent. Some of the important medicinal wild plants which used by the local people are *Zingiber cassumunar*, *Paederia foetida*, *Polygonum perfoliatum*, *Melothria perpusilla*, *Clerodendrum siphonanthos*, *Sida rhombiliatum*, *Hiptage benghalensis*, *Clerodendrum viscosum*, *Litsea cubeba*, *Schefflera venulosa*, *Zanthoxylum rhesta*, *Curcuma amada*, *Curcuma caesia*, *Kaempferia rotunda*, *Hedychium marginatum*. However, *Litsea cubeba*, *Curcuma amada*, *Curcuma caesia*, *Kaempferia rotunda*, *Hedychium marginatum* are critically endangered. Such plants are still growing wild and over exploited. These wild plants with high commercial value are also threatened by many factors. It is suggested that an urgent need to explore ethno medicinal

potential of the area and to identify the more plants of therapeutic properties and the plants for their uses.

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#### AUTHORS

**First Author** – Thangjam Inaocha Devi, Institutional Biotech Hub, Department of Botany, Presidency College, Motbung, Senapati District, Manipur. India., E-mail : inaocha24@gmail.com

**Second Author** – Dr. Kh. Ujala Devi, Institutional Biotech Hub, Department of Botany, Presidency College, Motbung, Senapati District, Manipur. India., E-mail : khujaladevi@gmail.com

**Third Author** – Dr. E.J Singh, Department of Botany, D. M. College of Sc. (PG) Imphal, Manipur.India.

**Correspondence Author** – Dr. Kh. Ujala Devi, Institutional Biotech Hub, Department of Botany, Presidency College, Motbung, Senapati District, Manipur, India., E-mail : khujaladevi@gmail.com, Contact no. +919856242221/+918257929388.

# Geophysical Investigation of the Subsurface Condition of the Permanent Site of Federal University Lokoja, Kogi State

\* Dr. M. O. Aku, \*\* Mr. L. I. Gani

\*Department Of Physics, Bayero University Kano

\*\*Department Of Physics, Federal University Lokoja

**Abstract-** A geophysical investigation of the subsurface condition of the Permanent Site of Federal University Lokoja, Kogi-state was carried out using electrical resistivity method with the aim of studying the subsurface geologic layers, with a view to determine the aquiferous zones, their depth and the thickness of the geologic layers. Vertical electrical sounding (VES) using Schlumberger array was conducted at twenty (20) VES stations along four profiles with the aid of ABEM SAS 300C terrameter and the field data obtained analyzed using computer software, IPI2win. The VES results revealed the heterogeneous nature of the subsurface geological sequence to contain four layers; topsoil (sandy and clayey laterite), weathered layer, partly weathered or fractured basement and fresh basement with two aquiferous zones (weathered basement and fractured basement). The resistivity value of the topsoil layer varies from 20Ωm to 250Ωm with thickness ranging from 1.0m to 3.0m, the weathered basement has resistivity value ranging from 25Ωm to 300Ωm and thickness between 2.0m to 41.5m, the partial/fractured basement has resistivity value of 100Ωm to 600Ωm with thickness of 5.0m to 50m across most part of the area. Lastly the fresh basement has resistivity of 900Ωm and above with infinite depth. However, the depth from the earth's surface to the aquiferous zone varies from 10m to 50m and the overburden in the area is low.

**Index Terms-** Geophysical Investigation, Subsurface, Electrical Resistivity, Aquiferous Zone and Basement.

## I. INTRODUCTION

Geophysical surveys are generally identified by the property being measured—namely, electrical, gravity, magnetic, seismic, thermal, or radioactive properties. The electrical method is also subdivided into resistivity, induced polarization, and self polarization methods. Electrical resistivity methods of geophysical survey have been used for many decades in hydro geological, mining and geotechnical investigations following the accessibility and availability of its instrument and interpretation software. Vertical electrical sounding (VES) is an electrical resistivity method for measuring vertical changes of electrical resistivity (Todd, 2004 and Anomohanran, 2013). It detects the surface effects produced by the flow of electric current inside the earth.

A hydro geophysical investigation for groundwater in Lokoja metropolis, Kogi state, central Nigeria was carried out

using vertical electrical sounding (VES) with two aquifer types delineated. An unconfined aquifer was found within the weathered basement and the second aquifer was found at the weathered/fractured basement. These aquifers are thin in some of the localities while in others they are appreciably thick, hence enormous groundwater storage and discharge capacity is observed (Omali, 2014). Other researcher, who conducted similar research using electrical resistivity method includes; (Emenike, 2001), (Obiora *et al*, 2005), (Anudu, 2011), (Ezomo, *et al*. 2011), and (Jatau *et al*, 2013).

The Felele community of Lokoja where the study area is situated is facing an increase in human population since the situation of the state polytechnic and the permanent site of Federal University Lokoja (study area) in the community. The area has no access to the township pipe-borne water as the residents of the area depend on untreated surface water, hand dug wells and private water supplies for their domestic activities. So to abate this problem of water scarcity and structural collapse in the permanent site of Federal University Lokoja (study area) which is a developing area, the need for a geophysical investigation of the subsurface condition arises. The study area is located at Felele - Lokoja, Kogi state, Nigeria, off Lokoja-Okene road. It is at the north western part of mount Patti, it lies between mount Patti and Agbaja plateau at latitude 07° 50' 05" N to latitude 07° 54' 04" N and longitude 06° 40' 22" E to longitude 06° 42' 02" E.

This study is aimed at using electrical resistivity method to study the subsurface geologic layers of the basement complex terrain of the study area in order to determine the aquiferous zones, identify their depth and to delineate the various lithologies within the study area for future exploration of groundwater and construction purpose.

## II. GEOLOGY AND HYDROGEOLOGY OF THE STUDY AREA

The permanent site of Federal University Lokoja has almost the same geology as Lokoja in general. It is dominantly underlain by the Precambrian basement complex and part of the area is underlain by cretaceous sediments which uncomfortably over lay the basement complex. The study area is composed of the following; fieldspathic sand stone and siltstones, biotite hornblende gneiss and magmatite. The climatic data from the Nigeria metrological agency (NIMET, 2011) indicates that the study area falls within the tropical climate zone and is



characterized by two distinct seasons; rainy season (April to October) and dry season (November to March). Mean annual temperature oscillates between 26°C (July or August) to 35°C in February or March while relative humidity ranges from 50- 63% (NIMET, 2011). The vegetation in the study area is classified as guinea savanna grassland characterized by shrubs with scattered orchard bush. The area is generally drained into river Niger due to the moderate sloping nature of the land.

### III. ELECTRICAL RESISTIVITY THEORY

This method measures the subsurface resistivity by considering the flow of a continuous current through an isotropic homogeneous media which forms an electric field  $E$  around the current source as in (figure 1). The current density  $J$  and electric field  $E$  are related through ohm's law.

$$J = \sigma E \tag{1.0}$$

where  $E$  is the electric field (V/m) and also the potential gradient,  $\sigma$  is the conductivity (is the reciprocal of resistivity  $\rho$ ) and is measured in Siemens per meter (S/m). Considering the flow of current around electrodes which introduces current  $I$  at the surface of a uniform half-space (figure 1). Equation 1.0 gives

$$E = \rho J = -\nabla V = -\frac{dV}{dr} \hat{r} \tag{2.0}$$

$J$  is the current density and is equal to current  $I$  divided by the surface area, which is  $2\pi r^2$  for a hemisphere of radius  $r$  formed around each electrode. Therefore the potential at any point in the medium or on the boundary is given by

$$V = \frac{\rho I}{2\pi r} \tag{3.0}$$

$r$  is the distance from the electrodes. For an electrode pair with current  $I$  at electrode A, and  $-I$  at electrode B (Figure 1), the potential at a point is given by the algebraic sum of the individual contributions (equation 4.0).

$$V = \frac{\rho I}{2\pi r_A} - \frac{\rho I}{2\pi r_B} = \frac{\rho I}{2\pi} \left[ \frac{1}{r_A} - \frac{1}{r_B} \right] \tag{4.0}$$

$r_A$  and  $r_B$  = distances from the point to electrodes A and B

In addition to current electrodes A and B, Figure 1 shows a pair of electrodes M and N, which carry no current, but between which the potential difference  $V$  may be measured. Following the previous equation, the potential difference  $V$  may be written.

$$\Delta V = V_m - V_n = \frac{\rho I}{2\pi} \left( \frac{1}{AM} - \frac{1}{BN} + \frac{1}{BN} - \frac{1}{AN} \right) \tag{5.0}$$

where  $V_m$  and  $V_n$  are potentials at M and N respectively. AM, BM, BN, AN, are distances between electrodes A and M, B and M, B and N, A and N respectively. Equation (5.0) can be written in terms of the resistivity  $\rho$  as

$$\rho = \frac{\Delta V}{I} \left[ \frac{1}{AM} - \frac{1}{BM} + \frac{1}{BN} - \frac{1}{AN} \right] = K \frac{\Delta V}{I} \tag{6.0}$$

where  $k$  is the geometric factor from the bracket in equation 6.0 above that is

$$K = \frac{1}{AM} - \frac{1}{BM} + \frac{1}{BN} - \frac{1}{AN} = \pi \left( \frac{AB^2}{MN} - \frac{MN}{4} \right) \tag{7.0}$$

The resistivity in equation (6.0) above represents that of a homogeneous or uniform earth surface measurement. Whenever these measurements are taken over a real heterogeneous earth surface, equation 6.0 represents apparent resistivity of the earth with the symbol  $\rho_a$  which has no relation to the actual value of

resistivity in a heterogeneous earth. The apparent resistivity may be greater, less or equal (in rare case) to the actual resistivity in a heterogeneous earth (Keller, 1966).

### IV. METHODOLOGY

The use of ABEM SAS 300C terrameter was employed during the survey to carried out twenty (20) vertical electrical soundings (VES) along four profiles with five VES points on each profile using the Schlumberger electrode array (figure 1) at 20 VES points within the study area, with each VES point on a profile spaced 25m apart from each other. At each VES point a global positioning system (GPS) was used as a first step to measure the longitudes, latitudes and elevations. With the aid of the terrameter, 10amp current was sent into the ground at each  $AB/2$  and  $MN/2$  distance of the electrodes and the value of the resistance was displayed automatically on the terrameter and recorded. The maximum current electrode spacing ( $AB/2$ ) is 100 meters. The resistivity data were analyzed using IPI2win and SURFER version 11 computer software.

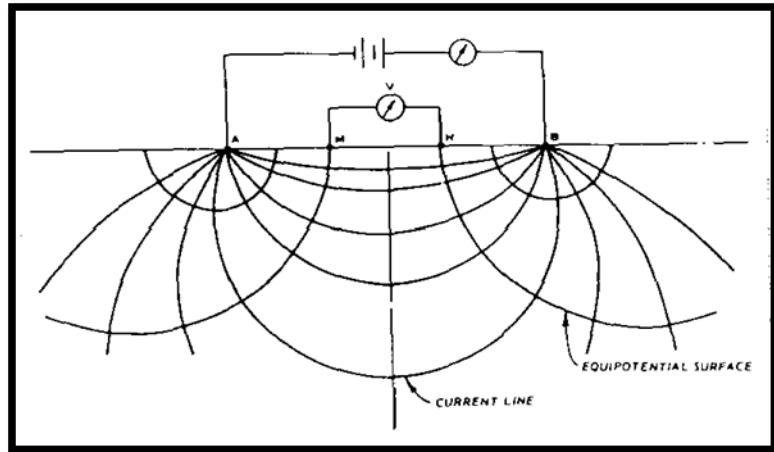


Figure 1: Potentials and Current Lines for Current Electrodes A and B on a Homogeneous Half-Space

### V. RESULTS AND DISCUSSION

The data obtained from each VES point were recorded as in table I. using the equation 7.0, the geometric factors  $K$  in meters were calculated as a function of electrode spacing and multiplied by the resistance values  $R$  recorded to obtain the apparent resistivities  $\rho_a$  in ( $\Omega m$ ). Thus, putting the resistivity values and electrode spacing into IPI2win (computer programs) the sounding curves were obtained. Lastly the geologic sections for each profile figures (2, 3, 4, and 5) were obtained by putting the information from the sounding curves in SURFER V.11 software.

In Profile 1 (Figure 2), the first layer which is the top soil has resistivity values ranging from 50-240 $\Omega m$ . It is evident that this layer does not consist of the same material across the entire length of the profile. The thickness of this layer ranges from 1.0m - 2.6m. This layer composed mostly of sandy/clayey soil with rich organic materials, hence the low resistivity within the layer. The second layer is the weathered basement which is

composed mostly of loss gravel, sandy soil and clayey. The resistivity within this layer is about 100-240Ωm. And have an average thickness of 13.0m with wider depth at VES 2. The third layer is the partial weathered basement composed of mostly sand stone, gravel and sandy soil. This layer has a thickness of about 10-40m, at VES point 2 and 3, the layer extend beyond 50m. The resistivity value within this layer indicates that is it good for groundwater exploration. The last layer is the fresh basement (bedrock) with resistivity value of 1000Ωm and above. The layer is clearly seen at the first VES point and at a distance of 50-100m along the profile line.

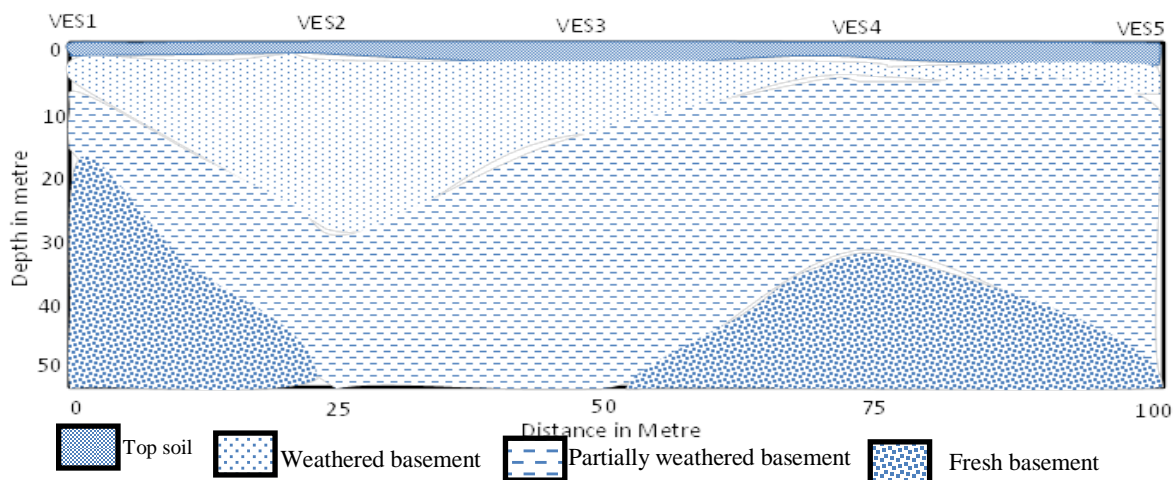
In profile 2 (figure 3), the first layer has thickness of about 1-3m with resistivity value of about 20-150Ωm. This is the top soil. The low resistivity within this layer indicates the high concentration of organic material. The second layer which is the weathered basement has an average resistivity value of about 240Ωm and thickness of about 4.0m. The third layer is the partial weathered basement composed mostly of gravel and sand stone. It has an average resistivity value of about 300Ωm. This layer is generally seen occupying the entire section. And it serves as a good groundwater aquifer within the area. The last layer is visible at a depth of about 35.0m at 0-25m along the profile, it is the fresh basement.

In profile 3, (Figure 4) the top soil has an average resistivity value of about 80Ωm and thickness of about 1.5m. This layer is rich in organic compounds, hence the low resistivity. The second layer is the weathered basement. Weathering of the basement is high in this section hence the deepening of the layer at a distance of about 25-75m along the profile line. The third layer is the partial weathered basement; it starts from the beginning of the profile at a depth of about 10.0m to a distance of 75.0m along the profile. It has average resistivity value of about 270Ωm. It will serve as a good aquifer for groundwater as it extends beyond 50m across most of the profile line. The last layer is the fresh basement visible at a distance of 75-100m along the profile line and at a depth of about 25.0m.

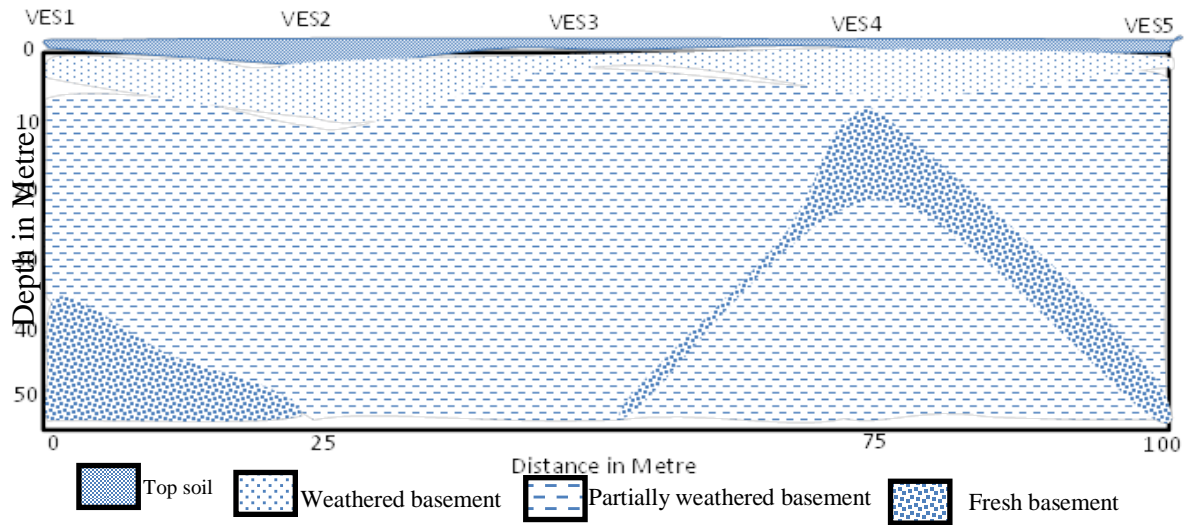
In profile 4 (figure 5), the first layer is the top soil composed mostly of loss sandy soil/clayey soil and gravels. It has average resistivity value of about 150Ωm and thickness of about 1.7m. The second layer has a thickness of 2.0m from the surface, this is the weathered basement. The resistivity values ranges from 100-250Ωm. The third layer has a thickness of about 30.0m at a distance of 25-100m along the profile line. This layer extends beyond 50.0m as shown in the section at a distance of 0-25m. The fresh bedrock is evidence at a distance of about 25-100m along the profile.

**Table I: Resistivity data for VES 1, Profile 1:**

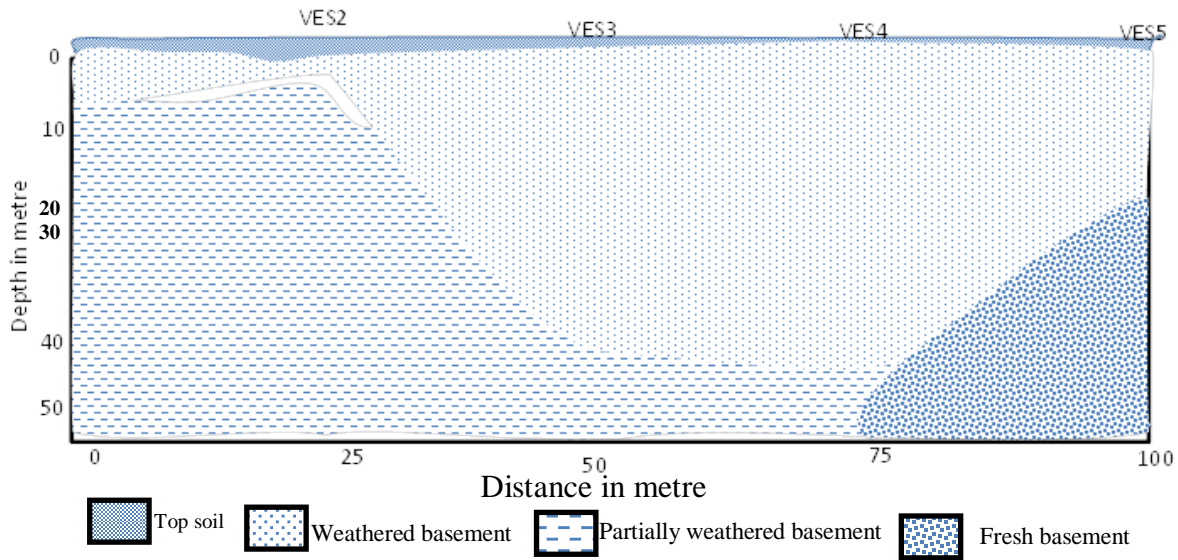
S/No	AB/2	MN/2	R (Ω)	ρ(Ωm)
1	1	0.5	169.0	398.84
2	3	0.5	17.4	478.15
3	5	0.5	3.6	276.68
4	8	0.5	0.73	146.13
5	10	0.5	0.45	143.46
6	15	0.5	0.24	166.55
7	20	0.5	0.11	141.84
8	20	5.0	0.87	102.80
9	25	5.0	1.08	203.47
10	30	5.0	0.84	231.34
11	40	5.0	0.46	225.52
12	50	5.0	4.17	3240.72
13	60	5.0	0.32	353.60
14	80	5.0	0.39	784.69
15	100	5.0	0.41	1312.37
16	100	10	0.71	1108.22



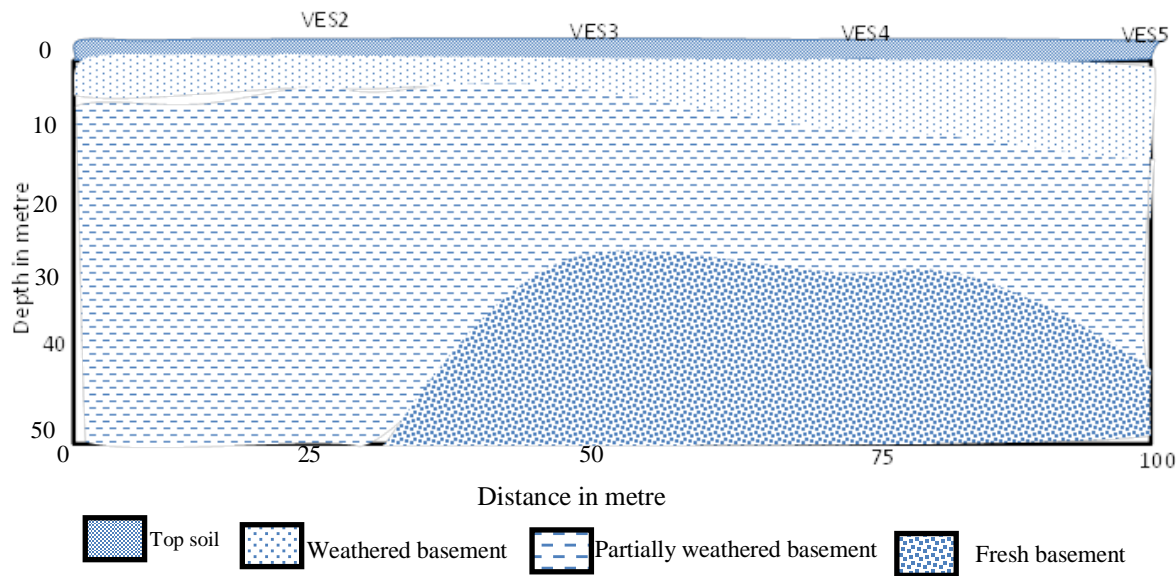
**Figure 2: Geological section along profile 1**



**Figure 3: Geological section along profile 2**



**Figure 4: Geological section along profile 3**



**Figure 5: Geological section along profile 4**

## VI. CONCLUSION

The survey shows that there are four geologic layers in the study area. The layers sequence delineated are the topsoil, weathered basement, partially weathered/fractured basement and fresh basement. The topsoil has a resistivity value of 20-250Ωm and thickness of 1.0m to 3.0m; the weathered basement (second layer) is 2.0m to 41.5m thick with a wide domination at profile 3 (figure 4) and resistivity value between 25-300Ωm; the third layer (partially weathered/fractured basement) has resistivity value ranging from 100-600Ωm with thickness of 5.0m to 50m across most part of the area and the fourth layer is the fresh basement with resistivity of 900Ωm and above with infinite depth. It forms the bedrock of the study area but represents a small part of the area across the profiles. The study also delineates two aquifer types in the area, they are the weathered basement aquifer and partially weathered basement aquifer but most of the groundwater aquifers are located within the partially weathered basement at a good depth of about 40m. No major fractures within the area that will pose treat to groundwater due to contamination, so exploration of groundwater, structure construction of all kinds without serious excavation of the subsurface and further studies are recommended.

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## AUTHORS

**First Author** – Musa Ogah Aku, (Ph.D), Bayero University Kano, moaku.phy@buk.edu.ng

**Second Author** – Mr. Lukman Inuwa Gani, (M.Sc), Federal University Lokoja, ganilukman11@gmail.com

**Correspondence Author** – Mr. Lukman Inuwa Gani, ganilukman11@gmail.com, lukman.inuwa@fulokoja.edu.ng, +2347037775819 or 08117477748



# Design of an Efficient Automatic Repairing System

A.Muthumanicckam M.E, R.Sornalatha,M.E

Assistant Professor, Department of Electronics and Communication Engineering, Shanmuganathan Engineering College, Pudukkottai

**Abstract-** Self-repairing digital systems have recently emerged as the most promising alternative for fault-tolerant systems. The proposed system is developed for automatically detect the fault and correcting it in digital system with high efficiency using self-repairing technique. It composed of structural layer and gene control layer. The structural layer consists of working modules, spare modules and their interconnections. In these system, each module of our system connecting with four spare modules for replacing faulty working modules at four times. Gene control layer controls the operation of modules. The module is the encoded data, called the genome, contains information about the function and the connection. Therefore, a faulty module can be replaced and the whole system's functions and connections are maintained by simply assigning the same encoded data to a spare (stem) module. The gene control layer determines the neighboring spare module in the structural layer to replace the faulty module without collision. We verified the self repairing digital system mechanism by simulating the system in Xilinx software.

**Index Terms-** Dynamic routing, redundancy, self-repair, stem cell.

## I. INTRODUCTION

Reliability has always been an issue with electronic systems ever since the first electronic systems were designed. Electronic systems are so fragile that affect the whole system when a single problem is occur. Devising fault-tolerant system that can deal with such problem has been a considerable challenge. The project "Design of an efficient self-repairing digital system" has the interesting field namely Testing of VLSI circuits which are in the field of Engineering. Testing is the process of exercising a product and analyzing its resulting response to check whether faults are introduced during the manufacturing or operation phase. Testing is needed for circuit manufacturers must thoroughly test their products before delivering them to customers. The causes of circuit can be divided into two main categories design errors and manufacturing defects.

The self-repairing circuit can recover from a fault by isolating the faulty block. And differentiating the spare block which contains the same genetic code previously held in the faulty block. In this system a small part (faulty cell) of the system only need to be change. Moreover this system can recover a working cell several times. During the early stages, if fault occur in digital system whole system get affected. It can be corrected by replacing faulty blocks and the rerouting is made for normal operation using triple modular redundancy [1], self healing approach [2]. It takes long time and also large part of the

circuit must be replaced even if a small part in the module is malfunctioning. Essential procedures of self-repair, cell replacement and rerouting process are highly complex. So implementation is very difficult in this situation.

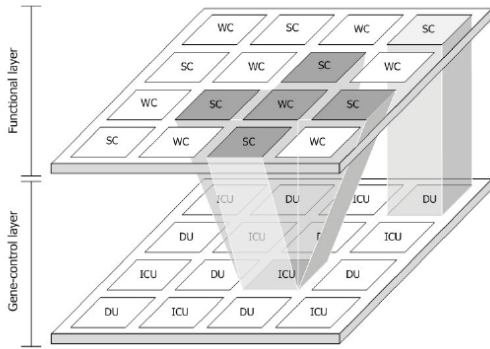
The proposed system simplifies the self-repairing mechanism and also it gives enough efficiency when number of hardware increases. While adding spare modules it ensuring good fault-coverage. Self-repairing system composed of structural layer and gene control layer. Structural layer consist of both working cell (WC), spare cell (SC) and their interconnection. Gene control layer consist of Index Changing Unit (ICU), Differentiation Unit (DU). It determines the proper spare module in the structural layer to replace the faulty module without collision. This self-repairing mechanism is operated in parallel. So, even several faults occur in different modules at same time, the system can recover them.

We consider a Full adder is a working cell. This paper is organized as follows. Section II presents the overall mechanisms between components in the proposed system. Section III and IV describes the functional layer and gene control layer of new self repairing architecture. In Section V the comparison with existing approaches are explained Section VI, the proposed system is implemented in XILINX and the experimental result is illustrated. Section VI summarizes the proposed system and describes future studies.

## II. OVERVIEW OF THE PROPOSED SELF-REPAIRABLE DIGITAL SYSTEM

Self repairing mechanism consists of two layers, Structural layer and Gene-control layer which are shown in fig. 1. The structural layer consists of working modules, spare modules and their interconnections. The module has a basic structure, encoded data and fault detection unit. Each cell has identical structure, and modules are classified as working cell, spare (stem) cell or isolated cell. Each and every WC has four neighboring SC's. Similarly every SC's connected with four sides of WC's. The gene control layer determines the neighboring spare module in the structural layer to replace the faulty module without collision. The gene control layer is positioned in parallel with structural layer. It composed of index changing unit and differentiation unit. Gene control layer controls the operation of cells in the structural layer.





**Fig. 1. Proposed self-repairing digital system. Overall architecture and related cells between the functional layer and the control layer.**

**III. NEW SELF-REPAIRING ARCHITECTURE: FUNCTIONAL LAYER**

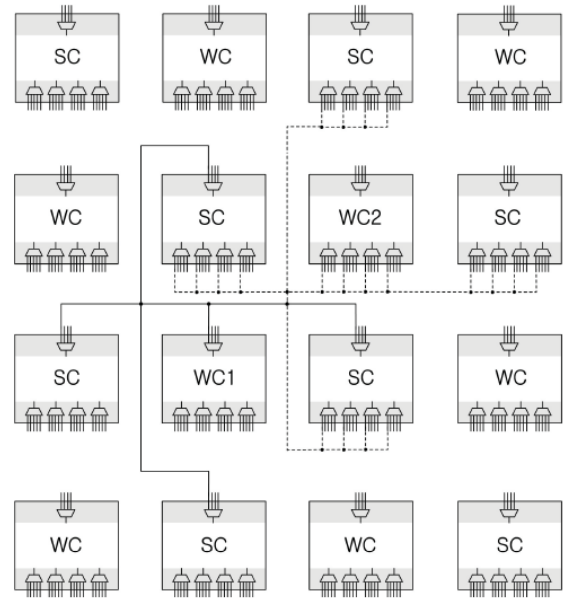
Structural layer is also called a functional layer. This structural layer composed of several working modules, spare modules and the routing architecture between cells. The module has a basic structure, encoded data and fault detection unit. Each cell has identical structure, and modules are classified as working cell, spare (stem) cell or isolated cell. Each and every WC has four neighboring SC's. Similarly every SC's connected with four sides of WC's.

In the event of fault occurrence WC can be replaced by any of the available SC from four neighboring SC's. Consider SC1, SC2, SC3 and SC4 are placed left, down, right and top side of WC respectively. When WC gets fault it replaced by SC1 (left SC). If SC1 is busy with some other WC's, then the faulty WC is replaced by SC2 (down SC). It is an anticlockwise operation.

The WC has some encoded data, which is available in all four neighboring SC's. Because of this reason WC can be replaced by any available neighboring SC for normal fault free operation. A WC can be replaced up to four times even though the number of SC's is similar to the number of WC's

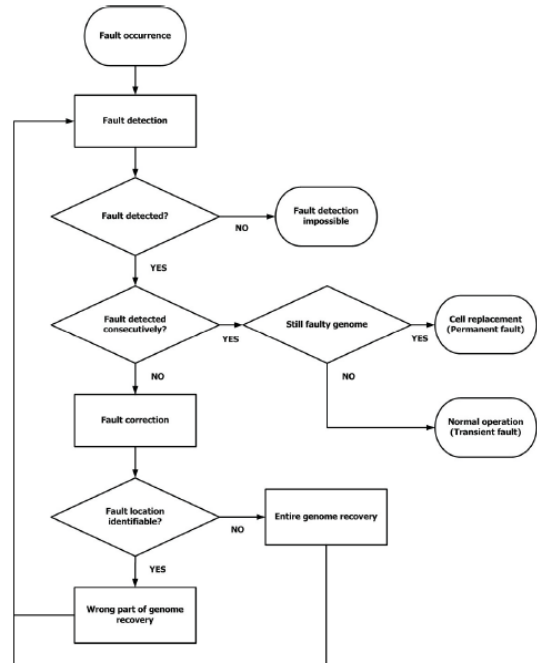
**A. Routing architecture**

Fig. 2. shows how the WC's and SC's are arranged for this self-repairing mechanism. While two WC's can be replaced by neighboring SC's WC2 gets input from the output of WC1. WC1 connects its output with four neighboring SC's in the same way WC2 receives its input from output of WC1. This connection between WC1 (SC's of WC1) and WC2 (SC's of WC2) is made dynamically by input selection MUX. This connection is controlled by encoded data of each cell. Each WC has four MUX. In case of WC1 is connected with WC2 through the first MUX, the remaining inputs and outputs of cells connected to the wire are disconnected. After replacing the WC1 and WC2 with spare cells SC1 of WC2 receives input from SC of WC1 output. Hence the routing architecture has an efficient in a complex circuit also.



**Fig.2. Artificial routing architecture, the proposed connection from WC1 to WC2 by a connecting solid line and dotted line.**

Many systems are affected by soft memory errors than the hardware failure. Fault detection unit is mainly for detecting the fault and correcting it. Flow chart of fault detection and correction operation is shown in fig. 3. There are three types of physical faults. Permanent fault: A hardware malfunction that always occur when a particular set of conditions exists, and that can be made to occur deliberately, in contrast to a sporadic fault. Intermittent fault: It is a malfunctioning of a device or system that occurs at intervals, usually irregular. An intermittent fault is caused by several contributing factors. Transient fault: It is a fault that is no longer present if power is disconnected for short time and then restored.



**Fig.3 Flow chart of fault detection and correction.**

IV. NEW SELF-REPAIRING ARCHITECTURE:  
GENE-CONTROL LAYER

The gene control layer is positioned in parallel with structural layer. It composed of ICU and DU. Gene control layer controls the operation of cells in the structural layer. Every ICU is the responsible for every WC and its four neighboring SC's. DU is assigned proper SC for fault recovery by replacing SC from WC. When the fault occurred, it propagates to the ICU. ICU changes the SC's index bits and isolates the WC. Then DU in the SC differentiates the SC from the faulty WC.

Every SC has index bit, which is in the gene control layer. Index bit shows the state of each cell in structural layer. There are three types of index bits changing during runtime. The index bits for each SC in gene control layer are shown in table. I. State bit: It shows the spare cell is available are not.

Direction bit: It shows the direction of spare cell

Differentiation bit: It differentiate spare cell from WC.

State bit	Stem cell		0
	Working or Isolated cell		1
Direction bits	The direction of the WC for which stem cell is differentiated	Left	00
		Down	01
		Right	10
		Up	11
Differentiation bit	No change		0
	Differentiate the stem cell		1

Table 1 Index bits for each stem cell in gene-control layer

A. Index changing unit

The ICU operation is explained in table.4.2. Here W is the functional cell and LS, DS,RS and TS are left spare cell, down spare cell, right spare cell and top spare cell of W respectively. After receiving fault signal from the structural layer all the possible changes of index bits is shown in table. II

The condition for the change	state before fault					state after fault occurrence															
	Fault signal					state bit					differentiation bit					direction bit					
	W	LS	DS	RS	TS	W	LS	DS	RS	TS	W	LS	DS	RS	TS	W	LS	DS	RS	TS	
1						0					1										
1						1	0					1									01
	1					1	0					1									01
1						1	1	0				1									10
	1					1	1	0				1									10
		1				1	1	0				1									10
1						1	1	1	0			1									11

Table 2 Index changing unit

In table.4.2 the first line delivers the condition for the change (W=1) fault will be present, the state bit before the fault

occurrence (LS=0) left spare cell is free, the direction bit after the fault occurrence (LS=1) W is replaced by LS, and direction bit is changed to 01 for next time fault occurrence.

B. Differentiation unit

The state before the differentiation			The state after the differentiation	
Differentiation bit	direction bit	state bit	state bit	direction of WC for SC substitute
1	00	0	1	right
	01			top
	10			left
	11			down

Table 3 Differentiation unit

Every SC has a DU, which differentiates SC with WC and differentiation bit. If the differentiation bit of the spare cell is changed to "1" while having the direction bits of "10," the spare cell is differentiated into a cell like the WC, which is located on the right side.

V. COMPARISON WITH EXSISTING APPROACHES

A. Triple modular redundancy

In [computing](#), triple modular redundancy, sometimes called triple-mode redundancy, (TMR) is a [fault-tolerant](#) form of [N-modular redundancy](#), in which three systems perform a process and that result is processed by a majority-voting system to produce a single output. If any one of the three systems fails, the other two systems can correct and mask the fault. The TMR concept [1] can be applied to many forms of [redundancy](#), such as software redundancy in the form of [N-version programming](#).

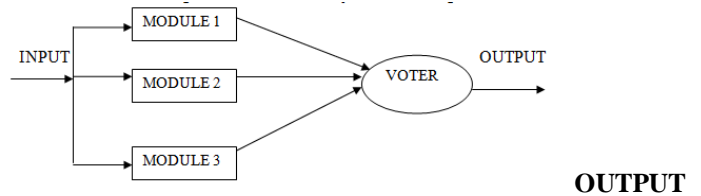


Fig. 4. Triple Modular Redundancy

In TMR, three identical logic circuits (logic modules) are used to compute the same set of specified Boolean function. If there are no circuit failures, the outputs of the three circuits are identical. But due to circuit failures, the outputs of the three circuits may be different. A voter circuit is used to decide which of the circuit's output the correct output is. The majority voter output is 1 if two or more of the inputs of the majority voter are 1; output is 0 if two or more of the majority voter inputs are 0. The disadvantage of this system is to cover the fault once. If all the three modules are faulty, then this system does not produce the correct output.

B. Muxtree method

A multiplexer is a device that selects one of several [analog](#) or [digital](#) input signals and forwards the selected input into a single line. In this method, a digital circuit is converted into an array of



MUXTREE cells and the initial connection information among the MUXTREEs is encoded as a gene in each MUXTREE cell.

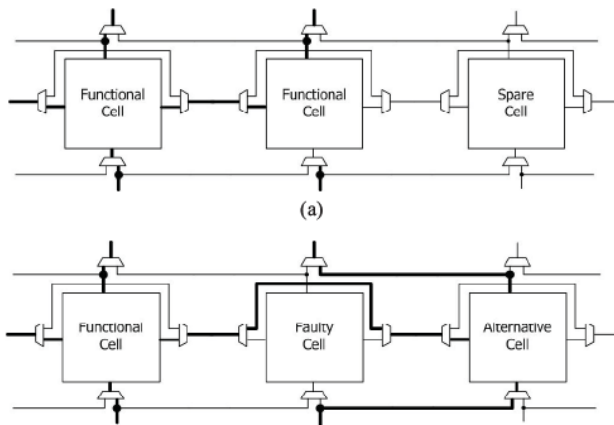


Fig. 5. Rerouting in the MUXTREE approach.

This system consists of molecular level, cellular level and organ level. In the MUXTREE system, if a fault cannot be recovered at the molecular level, it can then be recovered at the cellular level by replacing the faulty cell with an SC[3]. Although this allows the MUXTREE system to recover multiple faults, it requires many SCs. The disadvantage of this system is it consumes long time to recover faults and it has less fault coverage.

C. Self-healing system

Self-healing system is one of the fault tolerance techniques [2]. Router cells do not exist in the original circuit, which has no self-repairing property, and hence the router cell as well as the spare cell is considered as overhead in the analysis. The self-healing approach has a router cell that helps the system bypass a faulty cell after replacement of a cell. If a functional cell [F2 in Fig. 6(a)] is substituted by a spare cell [S1 in Fig. 6(a)], the router cell connects the output of the functional cell [F1 in Fig. 6(b)] to the new functional cell [F2 in Fig. 6(b)] [7].

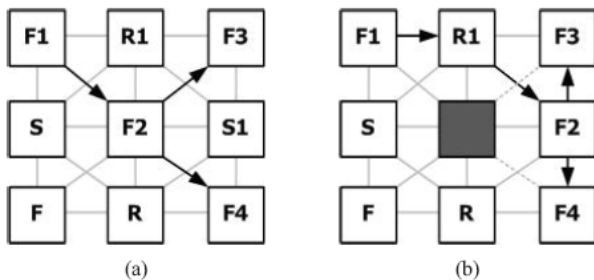


Fig. 6. Rerouting in the self-healing approach. (a) State before the fault occurrence. (b) State after the fault occurrence

The disadvantage of this system is if the router cell fails, it stops its operation and the efficiency cannot be achieved.

VI. EXPERIMENTAL RESULT

Fig. 7 shows the basic structure of every working cell. That working cell may be any kind of combinational circuit. Here the basic structure of working cell is full adder. The full adder consists of three inputs a, b and cin and two outputs sum and carry. A full adder adds binary numbers and accounts for values carried in as well as out. A one-bit full adder adds three one-bit numbers, often written as A, B, and Cin. A and B are the operands, and Cin is a bit carried in from the next less significant stage. A full adder can be constructed from two half adders by connecting A and B to the input of one half adder, connecting the sum from that to an input to the second adder, connecting Ci to the other input and OR the two carry outputs. A full adder can be implemented in many different ways such as with a custom transistor-level circuit or composed of other gates.

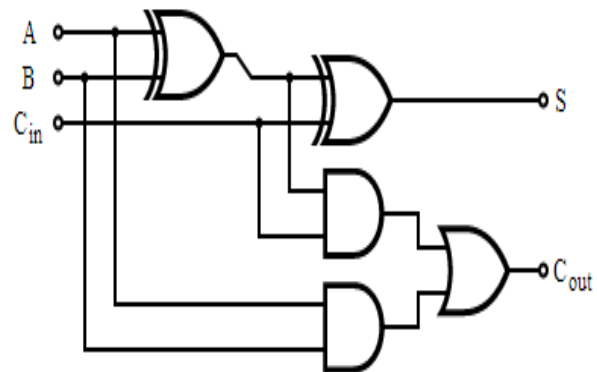


Fig. 7. Structure of full adder.

If that full adder working cell is faulty, then it can be replaced by the stem cell. That stem cell contains the same circuit as that of the working cell. An SC can be replaced by any of its four neighboring WCs for fault recovery. For example, the working cell full adder goes faulty; the WC is replaced by the left side stem cell SC00. Fig. 8 show the faulty WC is replaced by SC00.

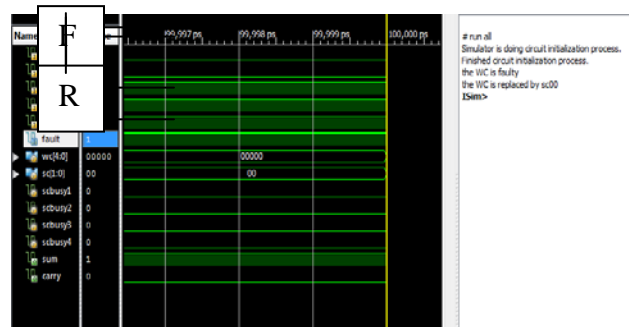


Fig. 8. Screen shot for faulty WC is replaced by left SC

VII. CONCLUSION

In this project a new self repairing digital circuits provides good fault coverage. This system detects any type of faults and corrects it. It uses four stem cells for every WC. Fault in the WC can be detected by fault detection unit and it propagates to the index changing unit. It has three index bits for changing the

direction and state of the fault. The differentiation unit differentiates SC from the faulty WC. If any SC is busy the faulty WC is replaced by some other SC. So the faulty WC is replaced by SC without collision. In this system there is no need of dynamic routing, reconfiguration and rerouting.

While adding additional stem cells for more number of fault recoveries efficiency is achieved. Our future goal is to develop self repairing digital circuits using six stem cells.

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#### AUTHORS

**First Author** – A.Muthumanicckam M.E., Assistant Professor, Department of Electronics and Communication Engineering, Shanmuganathan Engineering College, Pudukkottai, muthumanicckam@gmail.com  
**Second Author** – R.Sornalatha, M.E, Assistant professor, Department of Electronics and Communication Engineering, Shanmuganathan Engineering College, Pudukkottai, rslece@gmail.com

# Exploring Internet of Things (IOT) To Improve IT Professional

Syed Muhammad Syed Omar, Darul Mutakin Ahmad, Mafaisu Chewae, Jamaludin Ibrahim

Kulliyah of Information & Communication Technology, International Islamic University Malaysia

**Abstract-** The world has dramatically evolved since the initial introduction of Internet as people, processes, data, and 'things' are becoming more and more connected. This era is also called the Internet of Everything (IOE) which has led to a significant effect on individuals, businesses, communities, and countries. This transition has brought an explosive development of Internet of Things (IOT) where 'things'; possibly an objects, people or animal are connected over a network with the ability to transfer data by utilizing unique identifiers provided. When it comes to IOE, it is important to think transformational in order to understand what the connected devices involved will be and what business opportunities they will create. A major change to the tech job landscape is just one big aspect of these new business opportunities emerging. Moreover, IOT can also possibly applicable to influences in IT professional practice mainly in development processes, service's delivery, project management and IT consultancy. Therefore, this paper aims to discuss on Internet of Everything (IOE) technology and its challenges for IT professional practices. Furthermore, this paper will emphasize on IT professional improvement and values that can be brought by IOT technology.

**Index Terms-** Internet of Everything, Internet of Things, IT Professional, IT ecosystem, Technology.

## I. INTRODUCTION

The Information Technology (IT) professionals are people who directly work with IT as their main profession. They are extremely needed by people from every other profession as IT is needed to support most of the business processes exist today. The birth of the Interconnected World Wide Networks (Internet), few decades ago had changed the world. The way of how business processes are conducted has been improved significantly by the Internet. At the present time, started with the invention of Personal Computer (PC), online business transaction applications, Internet connection enabled mobile phones, and then recently smart phones that are connected to the Internet support many major activities of urban citizens. This situation however still does not benefit the Internet optimally. People still look at the Internet as a communication medium which related to several limited applications such as PC and smart phones only. As the capability of technology advanced progressively, the need to extend the scope of Internet usage to its optimum level has become vital. The advance extended use of the Internet brings us to the world where every devices and tools around us able to bridge integration directly through their own Internet connection or in a simple words "everything is connected to the Internet".

The Internet of Everything (IoE) which was first introduced as the Internet of Things (IOT) is a phenomenon by which the Internet usage integration trend on smart phones and other smart devices such as smart television and smart refrigerator be brought forward intended to reach the optimum use of the Internet. The term internet of things (IoT) was coined in 1999 by [1], a British technology pioneer who helped develop the concept [2] which was however in the early years mostly referred as Radio Frequency Identification (RFID) chip embedded objects using the Internet as the communication, [3] [4]. According to [5], the early Innovation of IoT is credited to the MIT's Auto-ID Lab on researches that were focused on the electronic identification of objects. These facts explained to us that in the early innovations of the IoT, it was not only the efforts on the extension of the normal Internet towards the optimum use of it rather it was also on the advanced development on the optimum use of devices, tools, machines and etcetera which can simply be referred as "objects" to improve the quality of our life. Therefore optimum use of the Internet and the objects here refers to the fully connected internet environment through objects which supports almost every single activity of a better lifestyle of mankind.

Further, according to Cisco Internet Business Solutions Group [6], in 2008, the number of objects that have Internet connection are outnumbered the mankind and from and this fact is strengthened by a prediction conveyed by [7], a market research firm, has predicts that more than 30 billion devices will form an IoT by 2020". This shows that the environment that we are living today already moving towards the ubiquitous of internet connection or conceptually, things around us are connected with active information interactions through the Internet. This environment is called the Internet of Everything (IoE).

Apart of that, IoT has also led to noteworthy effects on businesses, education, and communication processes of individuals, communities, and countries. They [8] took the change brought by the Internet usage today as an argument stated that by having a mass Internet connection of things have a potential to change our lives via the wide attention that is given and as well as enormous number of application from different fields. This explosive development transition improved the approach on how the 'things' which are including man, animals, plants, machines, and the environments interact with each other. According to [9], in order to have an extended value chain created on IoT technologies, China promotes the IoT-related manufacturing, communication and service industries and has scaled up the applications of the technology. Furthermore, preliminary applications are made in several fields including

transportation, logistics, finance, environment protection, healthcare and national defense.

Furthermore, they [10] mentioned that a fact has been explained by (IoTWorld ,2010) stated that in China alone, with the annual growth rate of over 30 percent the IoT technology applications is expected to reach \$114.38 billion by 2015. This fact indirectly tells us an unexpected high demand on IoT might be facing us as China market is a big market of the World with a lot of channels linked to almost everywhere on the Globe. Despite of the worries that might drive people away from IoT, it is an irrefutable norm that consumer negative perceptions will be disappeared sooner as the IoT technology is supporting their daily life and they perceived the usefulness of it. This can be supported by one of the situation told by [11] which explained that IoT technology can enable smart fridge to monitor the food consumption available in the storage autonomously. In addition, according to [12] listed the several scenarios and application that could contribute to trillion sensor market scaled (table 1) and stated that ,” Growth in today’s high volume applications alone will be insufficient to create a trillion sensor market and new applications will be vital”. All these indicate that there will be many new business opportunities by the phenomenon of IoT and all those new and existed business are in need to be properly managed by IT professionals.

Function	Sensor Application
Feeding the world	Smart agriculture, e.g. monitoring soil conditions, nutrient concentrations, climatic variables, fertilizers and pesticide levels; highly automated and robotic farming; smart sensor tags on farm animals; remote sensing, etc.
Health care	Fixed, portable, disposable and wearable sensors for heart rate, blood pressure, breath and blood analysis, disease diagnosis, etc. including systems to care for a growing ageing population and the chronically ill.
Transportation	Sensors in road vehicles, ships and aircraft; smart and interactive public and personal transportation networks; traffic pollution monitoring; monitoring the integrity of bridges, railway tracks and roads, etc.
Communications	Sensors in phones and computers, telecommunication networks, satellites, telemedicine, interactive home entertainment systems, etc.
Function	Sensor Application
Housing and built environment	Smart and conventional homes; the emerging IoTs; smart cities; monitoring the integrity of buildings and infrastructure; pollution monitoring; earthquake and flood prediction, etc.
Supply and utilities	Sensors used in the provision and distribution of water, gas and electricity, including photovoltaic, wind and other clean energy sources; liquid and solid waste disposal and recycling; pipeline and power line monitoring; smart grids, etc.

**Table 1. The several scenarios and application that could contribute to trillion sensor market scaled.**

A very interactive world is fashioned that instead of people be the main medium for 'objects' to get connected to each other via the Internet, every of the 'objects' can interact among them and process the information to commit their tasks directly even without human intervention. It is deniable that whenever a new technology invented and introduced to the world, IT professionals are required to get themselves aligned with the particular new technology as soon as the first day society got interacted with it. Moreover, the number of IT professionals needed for particular technology in every different domain is growing as more people embraced to use the technology. Therefore, the successfulness of IT professionals to play their roles in the new technology IoT is exceedingly determines the successfulness of IoT itself. Thus, the discussion on the IoT challenges and improvements should benefits the preparation and realizations on the requirements for IT professionals to manage the IoT and later IoE in the best efforts.

## II. IOT CHALLENGES FOR IT PROFESSIONAL

It could be undoubted that the advanced technology especially in terms of IoT technology has been involved widely from millions to billions or might be trillions devices in the future generation. As a result, there will be significant effect on numerous aspects as well as IT professional, infrastructure, industry standards, security, and business models throughout the whole IT ecosystem [13]. Perhaps, it cannot be forecasted that how much IoT will be advanced, but its implicative effect that could be known is on computing and networking system especially in terms of people who join in the IT ecosystem. Therefore, these effects will bring several opportunities and chances for IT companies, enterprises, developers, investors, and startup entrepreneurs in the future and will hold significant values to them [13].

### A. DRIVERS FOR CHANGE AS IOT INVOLVES

Once organizations need to enhance their performance or ability regarding to IoT, they should know the implications and clues of the IoT technology as guidance before they involve with IoT. According to [13], there are several key drivers to take consideration as IoT implementation:

- A smaller, lower power and less expensive devices which allowed more distributed networks to be set up. The community can now embrace not just computational devices but also all types of devices and sensors, chosen to be deployed to get closer to “the edge” of IoT.
- The devices and sensors enable the gathering of more granular data faster. Machine sensors can now report on conditions or even take immediate action in near real time. Previously, it only gathered data and stored it in a database for daily or weekly review and kept static.
- All granular data act as Big Data on steroids which further accelerate the need for thorough analytics. The analysis then put a best on examining insightful

questions to provide actionable answers for decision making.

- The IoT devices has produced new use cases, new applications, new architectures, new protocols and finally inspiring new standards. For example, company like Octoblu has emerged to address the need for cross-device integration.
- The new use cases then will penetrate different consumer journeys and unique value propositions that will spur the establishment of new innovative business models.
- The new business models will stimulate new markets and strengthen existing industries through creative annihilation which then providing new opportunities for the entire IT ecosystem.
- Through these innovations, some companies will transform from hardware, software or systems companies into service-oriented companies that provide consultancy service. Companies that are not acclimating to the new realities quickly, will be acquired or fade away.

### B. KEY CHALLENGES

In this section, we will discuss on IoT's challenges which could encounter the IT professional to develop and service to their customers. The important challenges will include robust connectivity, Use Accountability (Ethic), useable security, information models and accountability (Ethic).

**Robust connectivity.** The basic principle for making IoT happen is connecting things among them. The factors that challenges the connectivity and make the engineering to be a tough is to work and develop on energy harvesting devices because the current objects and devices have a limited energy supply and have not a stable internet connection. Thus, they have to develop the devices to increase connectivity through self-catering energy mechanisms [14]. Then he stated also we need a standard of way for things can talk each other. For instance, replacing TCP/IP with IPv6.

**Useable security.** According to [15], the security is huge umbrella and it is a dominant thing in terms of Internet of Thing (IoT). Imagine that if your devices that contain of relevant information is lacking of security, what will happen to your information, for example what is good if our smart home can unlock by anyone [15]. It is the challenges for IT professional to handle that kind of problem. There are three specifics, Authorization which to ensure the sending and receiving a stream data between IoT devices has appropriate authorization. Open port which means it is not to be open port out to the internet and we need bisectional communication. Encryption which describe the encryption between devices and server that needed by IoT [15]. Furthermore, IoT connected devices together, it provides more decentralized entry points for malware. Less expensive devices that are in physically compromised locales are more subject to tampering. More layers of software, integration middleware, APIs, machine-to-machine communication, etc. create more complexity and new security risks [13].

**Information Models.** In terms of IoT, it is important to convert the physical world into a form that can be controlled by IT. To do that, the information model is needed, which is

knowledge transfer into software. For example, connected home application that needs various information models like rooms, floors, and functions to be accessed. For the IoT, we have to get used to constantly using these information models and blending them with lessons learned from operations. At this point, the model becomes part of reality and reality becomes part of the model – which is basically the IoT: connecting the virtual with the physical world [14].

**Accountability (Ethic).** Accountability has the potential to show stopper for IoT because trust is significant part in the IoT which interconnect to accountability. In the line of code, we can not only shutdown the internet and examine the accident, but we have to find the root cause of defect. This is because line code is a supper connected with billions of devices and users. Therefore, with many of stakeholders from software agents to operators, service providers, system builders, programmers and users, the way that can accountability in the IoT is by creating trust-building mechanisms that are not focused on single-company or personal responsibility but on collective accountability [14].

### III. IT PROFESSIONAL PRACTICE IMPROVEMENT THROUGH IOT

The IOT is a technology which expected to bring immense opportunities in the upcoming future which can be useful to improve IT professional practice because the expanding nature of IT forces IT professional to be highly adaptable to every changes and development. Furthermore, IOT is an innovative technology which can contribute to the improvement of workplace and marketplace [10], assuming the state of IT professional. The improvement of IT professional practice through IOT can be achieved in several domains:

#### A. STRATEGIC IT PLANNING

The IOT will change the way the company operate as well as to improve their products and services in order to attract and acquire users through extrinsic and intrinsic motivation of IOT [10]. IT plan or project initiated in a company would not be the same as before because the emergence of IOT will trigger an IOT integration plan to the underlined plan. IT professional in the company is responsible in identifying the area in which IOT can add value to the business and customers', ensuring by the end of the day it is aligned with company priorities and strategies. The strategies may include important business objectives of the company such as to reach new customers, provide new services, speed up the operation, reduce costs, optimize resources, etc. because nowadays, companies are viewing technology in a brand new way especially how to increase their relevance to their clients and strengthens those relationships [16].

#### B. BUSINESS PROCESS IMPROVEMENT/REENGINEERING

The current business process of a company may not efficient as they expected as efficiency played a vital role in delivering products and services. In this case, companies has to constantly monitor to ensure they are keeping up with technology changes and investing right technology in a right time in order to help deliver the best results [17]. Thus, the company has to undergo an improvement to their current business process. IOT technology has to be part of company consideration when they are intended to initiated new business process improvement

(BPI) and business process reengineering (BPR) project to current business process. The IOT incorporated with the BPI or BPR has to meet the business objectives, serving customers better and improve operation, not just a wasteful technology experiment. In other word, IT professional plays a role in integrating the existing systems, data and infrastructure such as ERP, CRM, mobile apps, website, networks, support systems, etc. with the introduced IOT technology. This is most probably makes the BPR planning become more complicated as we obviously must considering more medium of integration that involves for reengineering.

### C. IOT AS NEW VENTURE OPPORTUNITY

As the IOT advancement gradually increases for the past decade, it provides new opportunity for new industry player to endeavor the IOT service offering. IT consultant in the field of IOT has a huge potential to growth in the near future because the rapid development IOT-related industries such microcontroller, sensor, cloud computing, big data, radio-frequency identification (RFID), etc. Despite that, large companies such as Cisco, GE, and Huawei, and government initiative like Industrie 4.0 by German government, have drawn their effort to accelerate the utilization of IOT in order to create new revenue streams and improve quality of life for citizens and consumers [18]. Those efforts will boost the IT industry as a whole and create opportunity for IT consultant to prosper due to strong support from large industry player and government. In addition, an IOT consultant obviously needed as IOT becoming "a must" in any upcoming product and service in the near future.

### D. IT OUTSOURCING MONITORING

To outsource an IT business process or a project does not means that company's IT professional do not have to monitor the process and project development progress. With IOT, companies will have a better way to monitor the outsourced business process. Apart from that, whenever a company decided to go for separated outsources vendors for certain part of their project, the IOT enables the testing for the integration to be done directly through Internet as every separated part can have IOT system of their own. IOT integration can become reliable and efficient communication tool for outsourced vendors to proof their capabilities to deliver the service level agreement that both parties have agreed upon because communication is crucial for a successful service delivery [19]. Thus, IT professional have to maintain a good relationship between company and outsourced vendors so that inefficient will not jeopardize company vision and goals.

## II. CONCLUSION

IT professional has been a key role in an organization whether they are the internal or external entity of an organization. As the frequency of new technology invention growing rapidly, the need for IT professional increased as well. Their contribution becoming more crucial with the emergence of IoT technology which enhance the connection and communication of not only human but also devices and other objects or 'things'. The IoT technology has extended the scope of IT professionals' role. The enhancement of IoT in communication integration among 'things'; has opened up new

business opportunities in which a good professional practices are needed. In addition due to the ubiquitous coverage of IoT, the effect also influences all of major domain of IT professional such as development processes, service's delivery, project management and IT consultancy. The study has discover the importance for an organization but most importantly the IT professional to embrace the IOT technology in the strategic level and operational level of the business so that it can achieve the targeted vision and goals.

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#### AUTHORS

**First Author** – Syed Muhammad Syed Omar, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: syedmuhammadalattas@gmail.com

**Second Author** – Darul Mutakin Ahmad, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: darul\_mutakin@yahoo.com

**Third Author** – Mafaisu Chewae, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: faaizoon@gmail.com

**Fourth Author** – Jamaludin Ibrahim, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: jamal55@gmail.com

# Use of Digital Signature with Diffie Hellman Key Exchange and Hybrid Cryptographic algorithm to Enhance Data Security in Cloud Computing

Mrs.Mamatha\*, Mr.Pradeep Kanchan\*\*

\* Department of CSE, NMAMIT, NITTE

\*\* Department of CSE, NMAMIT, NITTE

**Abstract-** Cloud computing is the relevant technology for this decade. It allows users to store huge amount of data in cloud storage and use as and when required, from anywhere in the world, through any kind of terminal equipment. Since cloud computing relies on internet, cloud data will be forced to contend with security issues like privacy, data security, confidentiality, and authentication. In order to get rid of the same, a variety of encryption algorithms and mechanisms are used. This paper, introduces use of hybrid cryptographic algorithm blended with digital signature and Diffie Hellman key exchange.. The hybrid algorithm is designed using the combination of Advanced Encryption Standard (AES) and Data Encryption Standard (DES) encryption algorithm to protect confidentiality of data stored in cloud. Even if the key in transmission is hacked, the facility of Diffie Hellman key exchange render it useless, since key in transit is of no use without user's private key, which is confined only to the legitimate user. This proposed architecture of hybrid algorithm makes it tough for hackers to crack the security and integrity of the system, thereby protecting data stored in cloud.

**Index Terms-** Cloud Computing, AES Algorithm, Data Confidentiality, Hybrid algorithm.

## I. INTRODUCTION

Cloud computing is straightforwardly internet computing and the internet is seen as collection of clouds, thus the word cloud computing can be defined as making use of the internet to provide technology enabled services to the needy people and organizations. Many enterprises makes use of cloud computing in order to improve their way of working which implies sharing of computing resources to handle applications. Cloud computing provides services at different abstraction levels, namely Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS) and also offers reduced capital expenditure, operational risks, complexity and maintenance, and increased scalability.

Since cloud computing rest on internet, so security issues like user privacy, data theft and leakage, eavesdropping, unauthenticated access and various hackers' attacks are raised. These security issues of authentication, privacy, data protection and data verification are solved by the widespread adoption of cloud computing. Hence to get an overwhelmed acceptance to cloud computing in finance, market and industry as well, we have proposed a secure architecture for it. Under the above

mentioned title, this paper incorporates three security control mechanisms via authentication, Encryption and data verification technique in to a single standalone system. Hence it is a three ways protection scheme wherein digital signature is used for authentication, encryption algorithm is used to provide session encryption key and to encrypt user data file, which is to be saved in cloud and to verify integrity of user data trusted computing is used.

### A. Need of Hybrid Cryptographic Algorithm

A Computer Network is a group of autonomous computing nodes connected to each other, which uses protocols with mutually agreed set of rules and conventions, to interact with one-another and allow resource sharing among a wide range of users in a predictable and controllable manner. Communication has a major impact on today's business and is desired to communicate data with high security. With the rapid development of network technology, internet attacks are also increased, the traditional encryption algorithms is not sufficient for today's information security over internet, so we propose this hybrid Cryptographic Algorithm.

## II. PROBLEM STATEMENT

With cloud computing, organizations can use services and data stored as and when required at any physical location outside their own control. This facility raised the various security issues like privacy, confidentiality, integrity etc., and demanded a trusted computing environment wherein data confidentiality can be maintained. To get rid of the same and to induce trust in the computing, there is need of a system which provides authentication, verification and encrypted data transfer, hence maintaining data confidentiality.

## III. PROPOSED SYSTEM

In the proposed architecture, we are using three ways of protection scheme. Firstly, to generate keys for key exchange step, Diffie Hellman algorithm is used. Then digital signature is used for authentication, there after user's data file is encrypted or decrypted using hybrid encryption algorithm. With hybrid algorithm data will be uploaded into cloud server by double encryption. Initially data will be encrypted using AES algorithm and again re encryption will be done by 3DES and similar lily data will be downloaded from the cloud server by decrypting the file as exactly reverse of encryption process. All this is



implemented to provide trusted network at the server end. For the same reason two separate servers are maintained, one for encryption process known as (trusted) computing platform and another known as storage server for storing user data file. When a user wants to upload a file to the cloud server, first key are exchanged using Diffie Hellman key exchange at the time of login, then the client is authenticated using digital signature. Finally user's data file is encrypted using hybrid encryption algorithm and only then it is uploaded to Cloud Storage server. The client can download the same file, from Cloud server. When a user logs in, first encryption keys are exchanged, file to be downloaded is selected, authentication takes place using digital signature and hybrid algorithm is used to decrypt the saved file and client is allowed to access the file.

$$L1 = f(R0) \text{ ----- (1)}$$

$$R1 = \text{AES}(f(L0) \text{ XOR } f(R0)) \text{ ----- (2)}$$

The user gives the plain text where the plain text is divided into two halves L0 and R0 of 128 bits each. Each half is then again divided into two halves i.e. LL0 and LR0 from L0 and from R0 we get RL0 and RR0 of 64 bits each respectively. DES algorithm is then applied to all the halves which are generated that is LL0, LR0, RL0 and RR0 using the key given by the user. There is also a provision of using two different keys. If the user selects two keys option at the time of encryption the two different keys are used, one key is used DES encryption and the other key is used for AES encryption. If the user selects one key option at the time of encryption then the same key is used for 3DES and AES encryption. The output of 3DES encryption text is of 192 bits each. Since DES encryption is applied on four quarters each quarter generates an output of 192 bits. The output of LL0 and LR0 is clubbed together to form f(L0) and the output of RL0 and RR0 is clubbed together to form f(R0). The length of f(L0) and f(R0) is 384 bits each. Once we have got f(L0) and f(R0) they both are then XOR with each other i.e. f(L0) XOR f(R0). The length of the output will be same as the length of the input that is 384 bits. The result is then given to the AES algorithm where the result is encrypted using the key provided by the user. The key can be same or different as mentioned above. The output length of the AES encrypted text is 704 bits. The f(R0) can be termed as L1 and the AES encrypted text can be termed as R1. Both L1 and R1 are then clubbed together to give the cipher text of 1088 bits. The Decryption process is exactly reverse of the encryption process.

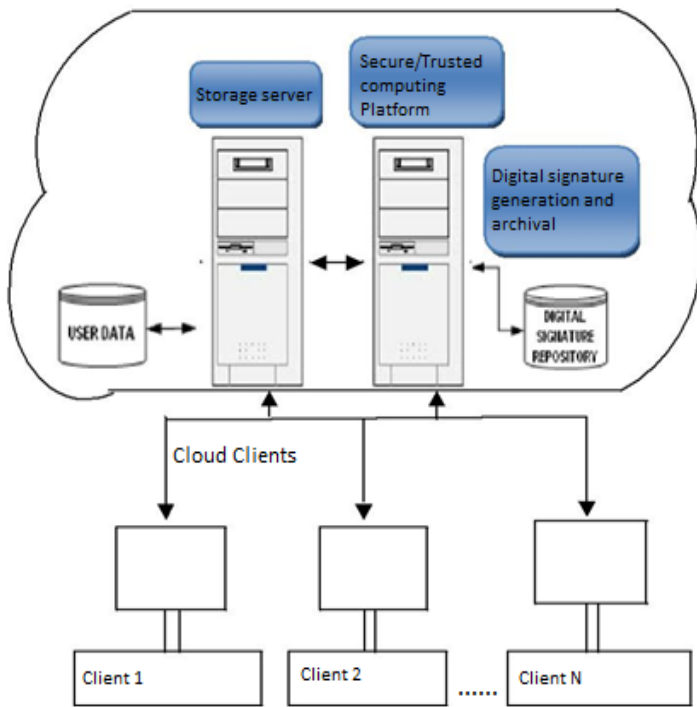


Figure 1: Proposed Architecture

Execution Steps

1. Sign up
2. Login from TCP
  - 2.1 Key Exchange – Diffie Hellman
  - 2.2 Digital Signature –SHA-I
3. Uploading / Downloading Data Encryption- Hybrid
4. Data is stored / retrieved from Storage server
5. Logout.

A .Concept of hybrid AES- DES

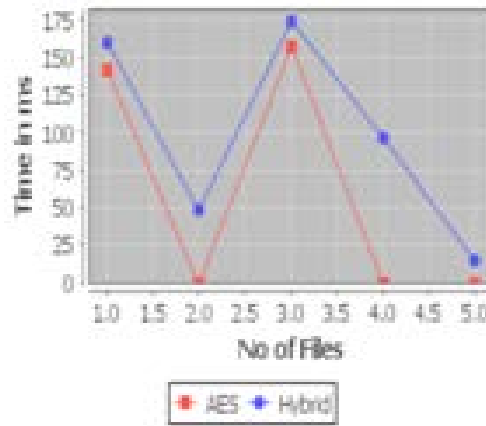
The idea of a hybrid based AES-3DES can be constructed with reference to basic DES Feistel equations. The repetition of these equations is based on the number of rounds as adapted by the Feistel network, which in the case of DES was standardized for 16 rounds. However, by incorporating the AES within this yields the following results.

IV. EXPERIMENTAL RESULTS

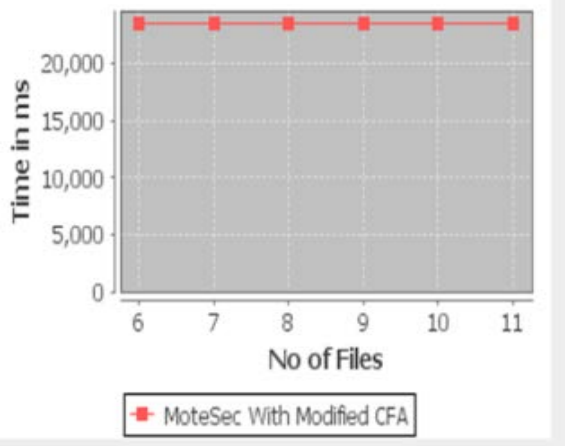
The hybrid model involves more computations as compared to AES or 3DES alone. The graph shown in (i) specifies the time taken to upload and download data to the cloud server using AES (A) and Hybrid (H) algorithm. For example it takes 142 milliseconds to upload /download file 1 to the cloud server, whereas by using hybrid algorithm it takes 160 milliseconds to upload /download the same file. Hence we can say that the encryption time for the hybrid model is much greater than the time for AES or DES alone. The graph in (ii) and (iii) shows the performance of number of files being uploaded and downloaded with respect to time. The combined effect of uploading and downloading files to the cloud server is shown in the graph (iv). Thus it can be inferred that the hybrid model will take longer time to be broken by the cryptanalyst.

i)Time taken in mili seconds for AES and Hybrid algorithm

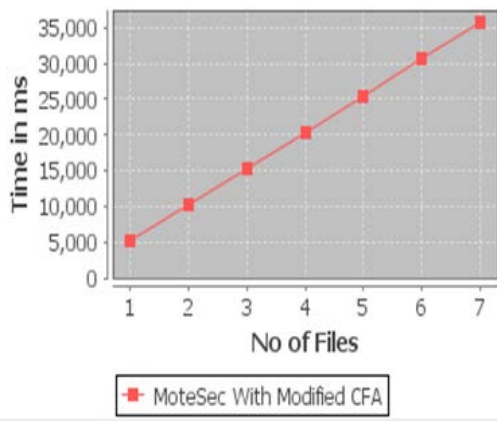
A#1#142  
 H#1#160  
 A#2#110  
 H#2#149  
 A#3#157  
 H#3#174  
 A#4#170  
 H#4#197  
 A#5#100  
 H#5#115



ii) Upload time in ms



iii) Download time in ms



iv) Upload and Download time in ms

### V. CONCLUSION

This paper uses combined concept of AES and 3DES to obtain a hybrid model which can be used for uploading the data into the cloud server by encrypting data and downloading the data from cloud server by decrypting the same data. Nowadays as the power of computers is growing day by day, it is very important to design strong encryption algorithms. Thus the hybrid model gives a better non linearity to the plain AES and as it is merged with 3DES, there is better diffusion. Hence the possibility of an algebraic attack on the hybrid model is reduced.

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### AUTHORS

**First Author** – Mrs.Mamatha, B.E,(M.Tech), NMAMIT,Nitte and [salianmamatha@gmail.com](mailto:salianmamatha@gmail.com).

**Second Author** – Mr.Pradeep Kanchan, B.E,M.Tech, NMAMIT,Nitte and [pradeepkanchan@nitte.edu.in](mailto:pradeepkanchan@nitte.edu.in).



# sPatient Safety and Erroneous Medication in Healthcare Organisation : A Learning Lesson

Dr (Major) Shishir Basarkar

Chief Operating Officer, Marble City CARE Hospital, Jabalpur (MP) , India

**Abstract- Objective :** The ultimate goal of drug therapy is to achieve predetermined therapeutic outcomes which improves a patient's quality of life while minimizing patient's risks which may be known or unknown. The incidents and hazards which results from such risk have been defined as medication errors. The need of study of medication error was felt to study prevalence of medication errors, to estimate the present magnitude and sensitise concerned staff to prevent these errors.

**Methods :** Prospective study was conducted at multispecialty tertiary care hospital for a period of four months to collect data regarding all incidences of medication errors occurred during the hospitalization of patients. The study population was employees of the hospital who were involved in patient medication. All medication errors occurred during study period were analysed to find out root cause and all related data were captured.

**Results :** During the study period total of six hundred eighty five patients were observed for any medication errors of any kind and relevant data was collected. From collected data following types of medication errors were detected and taken in to consideration. Based on demographic status of the patient who encountered medication error during their hospitalization duration male patients 68.75% while female patients were 31.25%. Out of sixty four medication errors during study period the omission error was in 28.12% cases. Maximum errors 28.12% were detected in the month of June and minimum 20.31% in September. Majority of medication errors were due to antibiotics 21.87% followed by NSAIDs 18.75%. During the study it was also found that four patients had medication errors more than one time. one patient faced medication errors Three times while other three patients encountered medication errors twice.

**Conclusion:** The outcome of study showed that medication error was found to be 9.3% seems not quite high however aim of study was to sensitise the concerned staff members involved in patient care about the errors in the vital part of the patient management and if not vigilant the incidence may get higher and lead to life threatening event.

**Index Terms-** Drug Therapy , Hazards, Hospitalised Patients, Incidence , Medication Errors, Outcome

## I. INTRODUCTION

The goal of Medication to the patient is an integral part of the patient care and is done so as to achieve defined therapeutic outcomes which improves a patient's quality of life while minimizing patient's risks whether known or unknown ,

associated with therapeutic use of drugs and other pharmaceutical agents. the incidents and hazards which results from such risk have been defined as adverse drug misadventures which includes medication errors. (1)

The subject of Medication errors has received more national and international recently in view of patient safety and accreditation quality management process and system. The medication administration errors were used by researchers studying the quality of the output of drug distribution system back in 1960's when the unit dose drug distribution system was being developed and this was it is considered as any deviation from the prescriber's written order or as entered in to a computer system by the prescriber

Medication error is defined as ' The failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim.'(2) **it can also be defined as** ' Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional , patients and consumer' (3)

These events may be related to the professional practice , healthcare product and procedures as well as system. The iatrogenic injuries which are resultant of medication errors are world wide well known phenomenon and is common, costly and clinically important. In 1990 Richard Clark published the very first study which looked at error rates in clinical diagnosis. Since then several studies have looked in to medication errors which is going to continue to be a problem in healthcare industry. It is estimated that the annual cost of drug related morbidity and mortality is nearly \$177 billion in USA. Though the exact data in India is not available however approximately 7,000 deaths occur each year and medication errors occur in one every five doses of medication given in the hospital. There is at least one death occur each year per day and 1.3 million people are injured each due to medication errors (4)

Incidence rate of medication errors among admitted to hospital is about 28% and hence are very much preventable. (5)

Medication errors increase cost , significantly prolong hospital stay and increase the risk of death almost two folds. several easily identifiable factors associated with large population of medication errors includes inadequate knowledge regarding drug therapy (age, allergy to particular drug, impaired renal function, appropriate dose calculation, drug nomenclature etc).(6)

Other most common factors which contribute to medication error include lack of drug information , incorrect diagnosis, drug-drug related interaction , dose miscalculation, incorrect drug administration and lack of patient education on medication, miscommunication of drug order resulting from poor handwriting , missing information when the drug is packed in to

smaller units, external factors such as interruption, work load, job related stress, improper training or education and sound alike look alike (SALA) packaging of medications. (7)

The National Coordinating Council for Medication Error (NCCMER) defines medication error as being "any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient or consumer." Such events may be related to professional practice, healthcare products, procedures, and system including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration on documentation education monitoring and use. (8)

Phillips J et al did a retrospective analysis of medication errors between 1993-1996 and found that the most common types of errors were from wrong route of administration (9.5%), over dose (36.4%), wrong drug (19%), and administering improper dose (40.9%) The investigators also found that the most common causes of errors were performance and knowledge deficits (44%), and communication errors (15.8%). (9)

Medication errors directly impact the lives of the patients. It also leaves a lasting negative impression on the minds of the people about the hospital. These Medication errors can be broadly be classified in to five categories –

1. prescription errors
2. transcription errors
3. dispensing errors
4. administration errors
5. documentation errors

these medication errors are strictly dealt in patient safety point of view also and hence these can be further be subclassified as –

1. wrong form
2. wrong drug
3. wrong route
4. wrong rate of injection / ingestion
5. wrong time
6. wrong dose
7. wrong monitoring
8. wrong reporting
9. wrong preparation
10. wrong patient
11. wrong frequency
12. wrong scheduling
13. wrong administration
14. wrong documentation
15. wrong transition of medication
16. wrong reconciliation

Besides these medication errors other possible errors are –

1. extra dose of same medication
2. extra medicine of same group
3. administration of drug which is either stopped or withheld
4. allergic information not documented
5. inadequate or no supervision on self medication by patient
6. drug given but not documented or vice versa

## 7. mistake of omission or commission

Though they are preventable however sporadic incidences of medication errors do occur in every healthcare facility. Hence in order to reduce the incidences of medication errors it is essential to know more on the type of medication errors and the stages at which they take place. the medication ordering system has many components and breaches in these processes leads to medication errors, which can cause harm to patients.

The sequencing of medication of patient involves prescription of medicine by clinician, transcription the order, sending order to pharmacy, dispensing the medication from pharmacy to the ward or department, administration of medicine to patient, documentation of medication and assessing its effect. In this whole process each step is likely to have potential to cause medication error.

In November 1999 the Institute of Medicine in USA issued a report on patient safety with special reference to medical errors and titled "To Err is Human : Building a Safer Health System" and this report drew attention world over and resulted in increased awareness towards medical errors. This also enhanced the efforts towards patient safety. This report also became inspiration for the Institute for Healthcare Improvement's 100,000 Lives Campaign. (10)

From the patient safety and quality point of view all medication errors mandatorily need to be documented on prescribed form and analysed because by doing so will help the organization in avoiding errors, advance understanding of the short lapses and interference that lead to errors and also help to maintain public confidence in the healthcare system. (11)

The medication errors need to be prevented through effective control system. All staff who are involved in patient care are to be equally involved in medication safety as well and bring out ways and means to reduce medication errors. All the incidences which are related to medication error are due to less awareness about the hospital policies and training to staff on medication safety because all the staff involved in medication need to know the intricacies of patient medication hence mantle the responsibility.

Due to world over increasing emphasis up on quality patient care and patient safety issues it has become all the healthcare facilities to quantify the problem of medication errors and take essential steps to improve the quality of patient safety and patient care delivery. The details about the errors can be collected from various sources of patient care like medication charts, prescription letters etc. Investigating the incidence, type and nature of medication errors are very crucial to prevent them.

The purpose of the study was to identify and evaluate the incidence and types of errors and to assess the severity of medication errors level of patient safety.

## II. MATERIALS AND METHODS

A thorough search of literature was done to find out various types of medication errors which occurred world over. During the literature review a in depth familiarisation with various aspects of medication errors was done and prospective study was done in the tertiary care hospital at Mumbai (Maharashtra).

**Study Design :** It was a prospective type of study in which admitted patients receiving medication during their stay in the hospital were studied.

**Time Duration of Study :** The total duration of study was four months from 01.02.2014 to 30.05. 2014.

**Sample Size :** Total six hundred eighty five patients medication process was studied as all admitted patients, irrespective of speciality, were followed irrespective of their duration of stay in the hospital.

**Exclusion Criteria :** Patients who refused to take medicines were excluded from study

**Inclusion Criteria:** All indoor patients who were admitted during the period of study .

**Research Design :** The methodology of discovering medication errors was done through various techniques namely direct observation, medical rounds to wards and pharmacy, quality circle rounds, motivation of staff, vigilance, counseling of staff, patient education, in patient case records, physician orders, medication audit etc.

**Techniques to study Medication Errors :-** The medication errors was detected with the help of following techniques –

1. Chart review
2. personal interview with staff
3. Incident reporting as a patient safety initiative and quality management process

4. motivated staff self reporting about medication error
5. dose checking by pharmacists on routine round
6. doses return to pharmacy
7. nurses / RMO'S shift change report
8. routine medical round and getting feedback from patient , families and staff members
9. routine Mediation audit by pharmacist and surprise audit by nursing superintendent or medical superintendent

### III. RESULTS

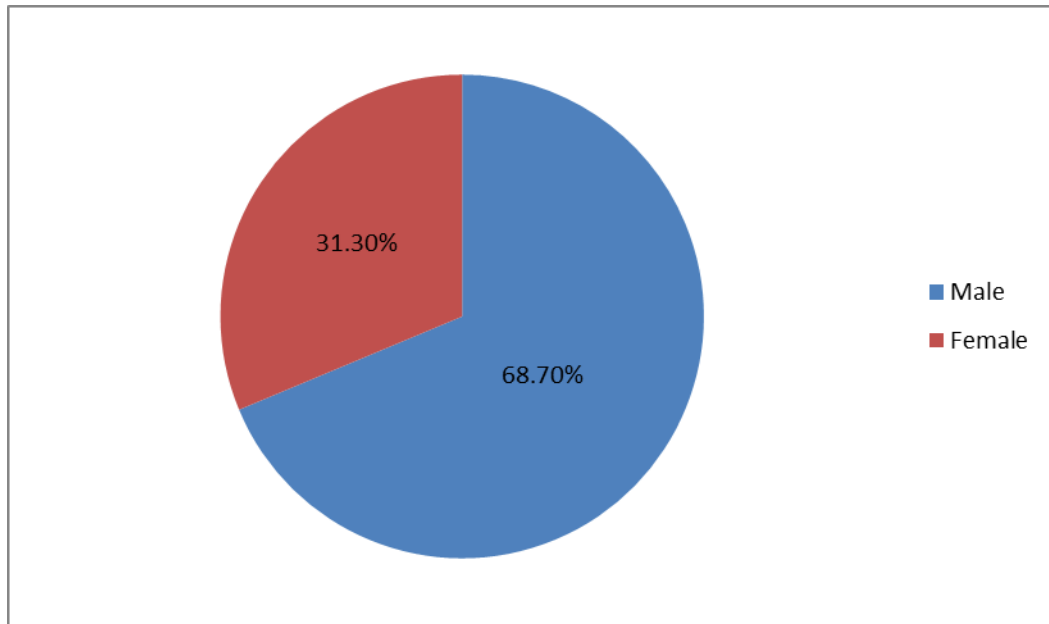
During the study period total of 685 patients were observed for any medication errors of any kind and relevant data was collected. From collected data of total 64 incidences of Medication errors following types of medication errors were detected and taken in to consideration.

Out of 64 incidences of medication errors which were identified 05 (08.6%) were less than 20 years of age, 19 (35.8%) were in the age group of 20-40 years , 26 (41.1%) patients were in the age group of 40-60 years, and 14 (20.7%) were more than 60 years of age. [Table – 1]

**Table -1 Demographic distribution for the cases of Medication Errors**

Variable	Age less than 20 years		Age 20 -40 years		Age 40 – 60 years		Age more than 60 years		Cumulative %
	n	%	n	%	n	%	n	%	
N = 685	59	8.6	245	35.8	276	40.2	105	15.4	100
ME = 64	5	8.0	19	30.2	26	41.1	14	20.7	100

Based on demographic status of the patient who encountered medication error during their hospitalization duration female patients were 31.3% while male patients 68.7%. [Figure – 1]



**Figure -1 Demographic Status of the patients**

While taking in to the account the type of medication errors the omission error was in 18 (28.1%) cases. This was followed by other types of medication errors which are described in the following table [Table-2]

**Table 2 - Summary of Medication Errors**

Type of Error	No of errors	Percentage (%)	Cummulative Percentage (%)
Omission of drug	18	28.1	28.1
Wrong time of drug administration	09	14.0	42.1
Wrong dose of drug	07	10.9	53.0
Wrong documentation	07	10.9	63.9
Wrong frequency of drug administration	05	07.8	71.7
Unordered drug given by nursing staff	05	07.8	79.5
Wrong dispensing of drug	05	07.8	87.3
Wrong route chosen for drug administration	03	04.6	91.9
Wrong drug administered	03	04.6	96.8
Wrong patient	02	03.1	100

The analytical study of medication errors on month wise distribution in June it was found to be 18 (28.1%), July 16(25.1%), August 17(26.5%) and in September it dropped down to 13 (20.3%). [Table - 3]

**Table -3 Medication Errors as they were detected month wise**

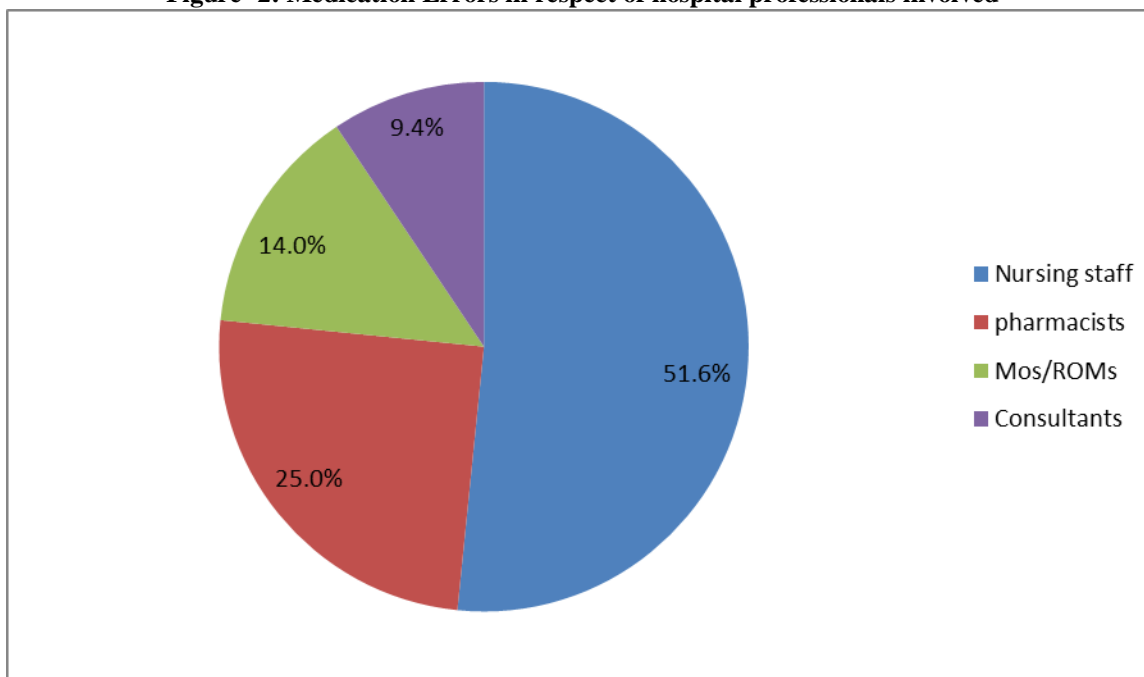
Months	Number of Medical Errors (n)	Percentage (%)	Cumulative Percentage (%)
Feb 2014	18	28.1	28.1
March 2014	16	25.1	53.2
April 2014	17	26.5	79.7
May 2014	13	20.3	100

Out of total medication errors during study period 06 (09.4%) caused by consultants, 09 (14.0%) caused by medical officers/ RMOs, 33 (51.6%) by nursing staffs and 16 (25.0%) by pharmacists. [Table - 4], [Figure-2]

**Table -4 Medication Errors in respect of hospital professionals involved (N = 64)**

Professionals	Number of medical errors (n)	Percentage (%)	Cumulative Percentage (%)
Consultants	06	09.4	09.4
Medical Officers / RMOs	09	14.0	23.4
Nursing Staff	33	51.6	75.0
Pharmacists	16	25.0	100

**Figure -2: Medication Errors in respect of hospital professionals involved**



The root cause analysis for available data for medication error so as to identify the cause which most directly responsible for the medication error. With increasing awareness towards the patient safety on medication and being mandatory as per accreditation processes like NABH and JCI all the events which

are of concern towards patient safety need to be analysed so as to pin point the cause in the complete cycle of medication of the hospitalized patient. The results which were obtained on the root cause analysis of the medication errors are summarized in tabulated form. [Table – 5,6]



**Table -5 Medication Errors According to Major causes related to professionals (N = 64)**

Professionals	Cause	Number of medical errors	Percentage (%)	Cumulative Percentage (%)
Nursing staff (n = 33)	Untrained nursing staff	07	22.4	22.4
	High activity duty hours	10	30.3	52.7
	Repeated distraction	16	47.3	100
Phramacist (n = 16)	Illegible handwriting	07	43.7	43.7
	High work load	03	18.7	62.4
	Generic drugs	02	12.5	74.9
	Repeated distraction	04	25.0	100
Medical Officer / RMOs (n = 9)	Unfamiliar Drugs	03	33.3	33.3
	High Duty working hours	04	44.4	77.7
	Repeated distraction	02	22.2	100
Consultants (n = 6)	Verbal orders	04	66.6	66.6
	Unclear medication orders	02	33.3	100

**Table -6 Medication Errors According to Type of Medication Error (N = 64)**

Type of Error	Subtype of Error	Number of cases (n)	Cumulative numbers of cases (n1)	Percentage (%)	Cumulative percentage (%)
Prescription Error 6 (9.3%)	Verbal orders	4	4	66.6	66.6
	Unclear medication orders	2	6	33.3	100
Transcription Error 16 (24.9%)	Illegible handwriting	7	13	43.7	43.7
	Medication order on wrong chart	4	17	25.0	68.7
		3	20	18.7	87.4
		2	22	12.5	100
Dispensing Error 17 (27.8%)	Wrong dispensing of drug	4	26	23.7	23.7
	Incorrect dose	5	31	29.4	53.1
	Required drug not dispensed in time	6	37	35.2	88.3
	Incompatible drug dispensed	2	39	11.7	100
Administration Error 25 (38.3%)	Medication not given to patient	8	47	32.0	32.0
	Wrong medication	5	52	20.0	52.0
	Wrong time	3	55	12.0	64.0
	Wrong dose	1	56	04.0	68.0
	Wrong frequency	1	57	04.0	72.0
	Wrong route	2	59	08.0	80.0
	Medication given even after it is ordered to stopped	1	60	04.0	84.0
	Medication to wrong patient	1	61	04.0	88.0
	Documentation of medication not done	3	64	12.0	100

Maximum number of medication errors were due to antibiotics 14(21.8%) followed by NSAIDs 12(18.8%),gastrointestinal 11(17.3%),cardiovascular 07(10.9%),diuretics and respiratory 05 (07.8%),steroids 04(06.4%), and lastly antidiabetics and anticoagulants 03(04.6%). [Table-7]

**Table - 7 Medication Errors According to Class of Medication (N = 64)**

Medication Class	Number of Medication Error (n)	Percentage (%)	Cumulative Percentage (%)
Antibiotics	14	21.8	21.8
NSAIDS	12	18.8	40.6
Gastrointestinal	11	17.3	57.9
Cardiovascular	07	10.9	68.8
Diuretics	05	07.8	76.6
Respiratory	05	07.8	84.4
Steroids	04	06.4	90.8
Antidiabetics	03	04.6	95.4
Angicoagulants	03	04.6	100

During the study it was also found that 4 patients had medication errors more than one time. one patient faced medication errors 3 times while 3 patients encountered medication errors twice.

#### IV. DISCUSSION

The complexity and dynamism healthcare organisations poses threat of making any error during patient care sometimes may become very serious thus threatening to life of patient. The medication is an integral part of patient care and error in medication can be source of significant morbidity and mortality in healthcare settings. (12)

In India irrational use of drugs is common and this has led to antibiotic resistance, adverse drug reaction medication errors and other drug related problems. (13)

Drug therapies are important part of medical care, contributing to medication errors and other drug related problems. keeping up with the growing number of prescription medications is a major challenge for the physicians, pharmacists, as well as medical and nursing staff working in healthcare facilities. At all levels the attention need to be shifted from medication itself to interaction between medication and patients. In India till recent years the concept of medication errors was taken very lightly however with the introduction of accreditation process under NABH, JCI the healthcare facilities have become more vigilant and serious about recognizing and analyzing medication errors.

A medication error is an episode associated with use of medication which is very much preventable by placing a system to control it. The medication process is a complex process consist of various attributes and the chances of errors increase because of lack of control on these attributes which are like prescription, transcription, dispensing, administration and lastly documentation.

The demographic report of study showed increased occurrence of errors in male patients 44 (68.7%) over female patients 20 (31.3%) which is similar to study conducted by Jerry Phillips et al in analysis of mortalities associated with medication errors which cited male predominance over females.(14)

The study brought out that omission error 18 (28.1%) was the most common error encountered was the most common of all errors occurred and is consistent with study conducted by Leelavathy D Acharya et al.(12) but inconsistent with studies conducted by Almut G Winterstein et al where prescription error was found to be the most common among all types of medication errors. (15)

Highest incidence of medication error was found among the patient age group of 30 -40 years in Massachusetts Board of Registration in Pharmacy (16) while in present study the highest incidence was found to be in age group of 40 – 60 years of patients which is similar to study conducted by Leelavathy D Acharya et al (12) which indicates that more patient of age group of 40 – 60 years visited the healthcare facility during the study period

On analyzing the medication errors on monthly basis it is revealed that in the initial month it was 18 (28.1%) which decreased in subsequent month to 16 (25.1%) and to rise again and fall thereafter so it has low and bounce phenomenon

however the lowest incidence was found to be in the month of September when it touched 13 (20.3%)

The analysis of medication errors occurred at the end of professional engaged in patient care brings out that out of 64 medication errors occurred during study period 33 (51.6%) errors were due to nursing staff of which 16 (47.3%) were due to repeated destruction of staff attention at workplace by either patients or family members, 10 (30.3%) were during high activity duty hours while 16 (47.3%) were caused by untrained nursing staff. Pharmacists were cause of medication errors in total 16 (25.0%) which on further analysis found to be because of illegible handwriting of clinicians in 07 (43.7%) cases, 04 (25.0%) because of repeated destructions at work place, 03(18.7%) errors caused during high work load period while 02 (12.5%) were because of lots of generic drugs. Medical officers / RMOs were involved in total 09 cases of which 33.3% (03) errors were due to unfamiliarity of RMOs to hospital formulary while 44.4% cases were occurred in high workload duty hours of morning shifts and 22.2% (02) cases were cause by repeated destruction at workplace by various factors related to patient, families and staff members. The involvement of the Consultants in causing medication errors was found to be in 06 cases of which 04 (66.6%) were caused by verbal orders by them to staff and 02 (33.3%) were caused by unclear medication orders to staff.

In the study where 64 medication errors were observed the most common error was found to be medication administration error 25 (38.3%) followed by in descending order of frequency are medication dispensing error 17 (27.8%), transcription error 16 (24.9%), 06 (9.3%) which is similar to study conducted by Clyde D ford et al on study of medication error in community hospital. (17)

The study revealed that antibiotics 14 (21.8%) was the most commonly error encountered followed by NSAID 12 (18.8%) and GI medication 11 (17.3%) these findings are inconsistent with study carried out by Jerry Phillips et al (14) which showed that largest number of medication errors occurred with the drugs of central nervous system followed by antineoplastic and cardiovascular system.

#### V. CONCLUSION

The prospective study on erroneous medication which was conducted concludes that incidence was found to be 9.3% seems not quite high and there was no fatal event as well. However the objective of study was to sensitise the concerned staff members involved in hospitalized patient about the errors in the vital activity of the patient management and if not vigilant and preventive steps not taken in time then the incidence may get higher and lead to life threatening event too. Each one has to play an important role in early detection and timely prevention of the medication error so as to improve the quality of Patient care and impart in patient safety. The study also enforce the need of development and establishment of drug protocols, hospital formulary and medication prescription policy in the hospital.

**Conflict of Interest :-** None declared

**Limitation of the study :-** The present study has limitations of duration and number of patient followed.

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## AUTHORS

**First Author** – Dr (Major) Shishir Basarkar

**Designation** : Chief Operating Officer

**Affiliation** : Marble City CARE Hospital, Jabalpur (MP) , India

**Residential Address** : Flat No. 2 , Datt Enclave, Napier town, Jabalpur (MP), India

**Mobile** : +918878940585

**Email** : [shishirbasarkar@yahoo.co.in](mailto:shishirbasarkar@yahoo.co.in)

# A Review on Reactions and Applications of Oxazolones

Prof.L.N.Sharada \*\*,Y.Aparna \*, M.Saba, S.N.T Sunitha, Lakshmi Viveka

\*\*Department of Chemistry, Osmania University

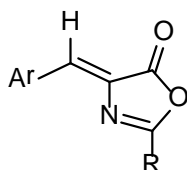
\* Research Scholar, Department of Chemistry, Osmania University

**Abstract-** 2-Oxazolin-5-Ones(azlactones) are multifunctional compounds and are known to react at C=C,C=N,C=O bonds. These participate in a number of replacement reactions, cycloadditions, other type of reactions as well as dimerisation reactions leading to formation of a variety of heterocyclic compounds. This review attempts to present the prolific development in recent years exclusively in the chemistry of 2-Oxazolin-5-Ones and gives a critical and unified account of these in the heterocyclic Chemistry.

**Index Terms-** Azlactone, acetylcholine receptors, Photoswitches, Hydrolases, diazocarbonyls, reactive polymers.

## I. INTRODUCTION

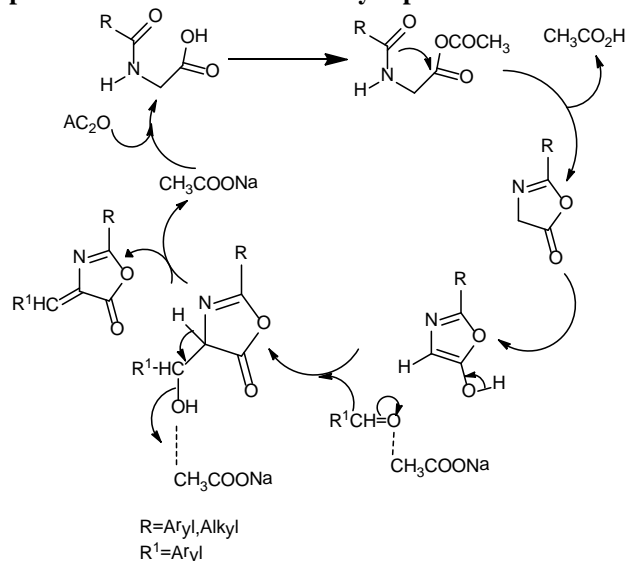
Azlactone provides a basic skeleton structure and also is a part of great importance for its drug characteristics. The basic nucleus imidazole emerges from the drug intermediate Azlactone. First Ploch<sup>1</sup> reported its formation by the acetic anhydride mediated condensation of hippuric acid with benzaldehyde. Erlenmeyer established the structure and named it as 'azlactone'.



These compounds exhibit important biological activities such as antimicrobial<sup>2</sup>, antibacterial<sup>3</sup>, analgesic<sup>4</sup>, antifungal<sup>5</sup>, anticancer<sup>6,7</sup>, anti-inflammatory<sup>8</sup>, neuroleptic<sup>9</sup>, sedative<sup>10</sup>, antidiabetic<sup>11</sup> and antiobesity<sup>12</sup>. Azlactones are important intermediates in the preparation of several chemicals including Aminoacids<sup>13</sup>, peptides<sup>14</sup>, some heterocyclic precursors<sup>15</sup> as well as coupling and photosensitive devices for proteins<sup>16</sup>. They exhibit promising photophysical and photochemical activities<sup>17,18,19</sup> and as P<sup>H</sup> sensors<sup>20</sup>.

During the past few decades, Many research papers have been published in the area of Erlenmeyer synthesis by using different methods such as usage of catalysts like Al<sub>2</sub>O<sub>3</sub>, organic bases, supported heteropolyacids, Yb(OAc)<sub>3</sub>, Ca(OAc)<sub>2</sub>, Bi(OAc)<sub>3</sub>, H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub><sup>21,22,23,24,25,26</sup>. The Erlenmeyer azlactones are 5 membered heterocyclic compounds containing N and O as heteroatoms. The C-2 and C-4 positions of azlactones are crucial for their various biological activities<sup>27</sup>.

## Proposed Mechanism for Erlenmeyer plochl reaction

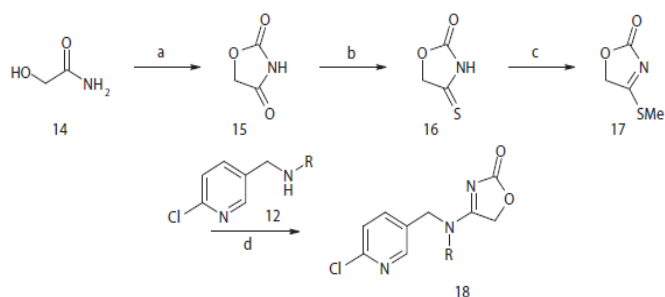


## Scheme 1

### Discovery, Synthesis and evaluation of N-substituted amino-2[5H]-oxazolones as novel insecticides activating nicotinic acetylcholine receptors

There has been a renewed interest in searching for novel neonicotinoid insecticides to overcome resistance while maintaining attractive physical properties and biological profiles<sup>28,29</sup>. Inspired by N-substituted enaminolactones which as potent insecticides<sup>30</sup>, W.Zhang et al prepared N-substituted amino-2(5H)-oxazolones a novel class of insecticides acting as nicotinic acetylcholine receptor (nAChR) agonists which show potent activity against hemipteran insect species<sup>31</sup>.

4-Amino-2(5H)-oxazolones were prepared by cyclization of **14** glycolamide with diethyl carbonate in the presence of potassium tert-butoxide in methanol at 80°C generated **15** oxazolidinedione. The amide carbonyl group of dione was then selectively converted into a thiocarbonyl group when treated with Lawesson reagent in toluene, 110°C giving the product **16** 4-thio-oxazolidine-2-one. This thioamide was further converted into **17** 4-methylsulfanyl-5H-oxazol-2-one in presence of MeI, NaOAc, dichloromethane and subsequent displacement with required **d** secondary amines and chloroform at 61°C gave desired product 4-amino-2(5H)-oxazolones.

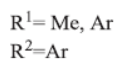
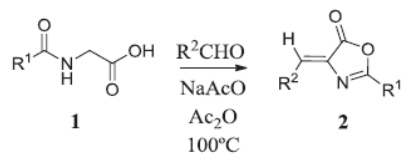


**Scheme 2:**  
**Oxazolones as photoswitches**

The synthesis and applications of molecular photoswitches, their use to modify the properties of complex systems has been extensively studied<sup>32</sup>. Molecular switches could be classified based on the stimulus used to induce the nuclear motion involving light, chemical or electrochemical energy or the reaction that takes place like ring closing/opening or bond isomerisation in most cases. Light activated switches that perform a c=c photoisomerisation<sup>35</sup>, azobenzene<sup>34</sup>, overcrowded alkenes<sup>35</sup> and retinal-based switches<sup>36</sup> have been applied in many different technological applications.

I.Funes-Ardoiz et al reported<sup>37</sup> a new family of switches inspired in the green fluorescent protein(GFP), obtained from aequorea Victoria jelly fish and its optical properties are determined by a photoexcitable green light emitter chromophore<sup>38</sup>

Benzylidene-Oxazolones have been used as precursor for the synthesis of GFP derivatives and their photoisomerisation is already known<sup>39,40</sup>. The recent results on the photophysics and photochemistry of Benzylidene-Oxazolones are presented<sup>41</sup>



Benzylidene-Oxazolones **2** are good moieties for efficient photoswitches as they are easily synthesised, feature good photoisomerisation quantum yields and are thermally stable<sup>36</sup>.

A 0.01M solutions of different photoswitches **2** in acetonitrile and irradiated with wavelength 350nm until the PSS(Photo Stationary state) is reached.

Photostationary state for molecular photoswitches **2** irradiated at 350 nm

Entry	R <sup>1</sup>	R <sup>2</sup>	Compound	Ratio at PSS	
				% Z	% E
1	Me	<i>p</i> -BrPh	<b>2a</b>	54	46
2	Me	<i>p</i> -Tol	<b>2b</b>	75	25
3	Me	<i>p</i> -MeOPh	<b>2c</b>	42	58
4	Me	<i>o</i> -MeOPh	<b>2d</b>	41	59
5	Me	<i>p</i> -NO <sub>2</sub> Ph	<b>2e</b>	76	24
6	Me	<i>p</i> -CNPh	<b>2f</b>	62	38
7	Me	Ph	<b>2g</b>	70	30
8	Ph	<i>p</i> -BrPh	<b>2h</b>	36	64
9	Me	<i>o</i> -Br	<b>2i</b>	40	60
10	Ph	<i>p</i> -NO <sub>2</sub> Ph	<b>2j</b>	80	20
11	Ph	<i>p</i> -CN	<b>2k</b>	55	45

If the substituent of phenyl group in R<sup>2</sup> is an electron donor group, such as methoxy, the percentage of E-isomer at the PSS increases. When an electron withdrawing group such as nitro, there is no significant change in the isomers ratio compared with **2b** if substituent R<sup>1</sup> is modified from Me to Ph and R<sup>2</sup> remains the same, the percentage of E-isomer at the PSS significantly increases.

The two isomers(Z and E) of compounds **2g**(R<sup>1</sup>=Me, R<sup>2</sup>=Ph) and the compound **2a**(R<sup>1</sup>=Me, R<sup>2</sup>=*p*-BrPh) in deoxygenated acetonitrile and trans-stillbene in deoxygenated hexane was used to measure the fluorescence lifetime, which showed low quantum yield(0.005). This shows that isomerisation process is not affected. Although structurally similar to the GFP chromophore, the modifications introduced in the compounds under study turned them into efficient photoswitches.

The substantial conformational changes associated with E/Z isomerisation have attracted attention to 4-Benzylidene-Oxazolones as potential molecular switches in biomolecular photo control<sup>42</sup>.

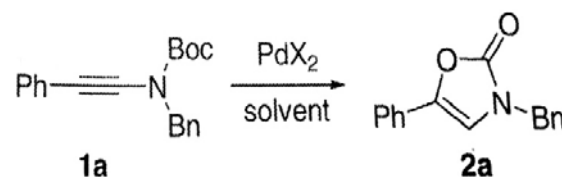
**Scheme 3**  
**Pd-catalyzed cyclization of N-alkynyl tert-butylloxycarbamates with oxazolones**

The development of general and practical procedures for the synthesis of oxazolones is highly desirable as they are an important class of heterocyclic compounds occurring in many natural products and pharmacological active molecules.

The traditional method utilises Lewis acid or base catalyzed condensation of 1,2-aminoketones with carbonyl compounds<sup>43</sup>. A promising method for the synthesis of oxazolones came from the groups of Hashmi and Gagosz<sup>44</sup> where they reported an approach of 3,5-disubstituted oxazolones via Au-Catalyzed transformation of N-alkynyl tert-butylloxycarbamates. More recently Lautenes and co-workers described an elegant synthesis 3,5-disubstituted oxazolones by the Pd-catalyzed reaction of β,β-dibromoamides<sup>7</sup>. Z.Lu et al(Zenghui Lu, Xiaowei Xu, Zhaozhen Yang, Lichun Kong, Gangguo Zhu. Tetrahedron Lett.2012,53,3433-3436) reported simple and efficient method for the synthesis of highly functionalized oxazolones including 3,5-disubstituted and 3,4,5-trisubstituted oxazolones<sup>45</sup>.

**Synthesis of 3,5-disubstituted Oxazolones**

Screening of the reaction conditions<sup>3</sup>



Entry	Catalyst	Solvent	Yield <sup>b</sup> (%)
1	Pd(OAc) <sub>2</sub>	THF	70
2	/	THF	NR
3	Pd(MeCN) <sub>2</sub> Cl <sub>2</sub>	THF	77
4	Pd(PhCN) <sub>2</sub> Cl <sub>2</sub>	THF	75
5	PdCl <sub>2</sub>	THF	72
6	PdBr <sub>2</sub>	THF	69
7	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	THF	79
8	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	Dioxane	54
9	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	CH <sub>3</sub> CN	48
10	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	CH <sub>2</sub> Cl <sub>2</sub>	47
11	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	CH <sub>3</sub> OH	38
12	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	Toluene	50
13	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	HOAc	35
14	Pd(CF <sub>3</sub> CO <sub>2</sub> ) <sub>2</sub>	EtOAc	84

<sup>a</sup> Reaction conditions: **1a** (0.25 mmol) and Pd catalyst (0.013 mmol) in 1 mL of solvent at 40 °C for 5–8 h.

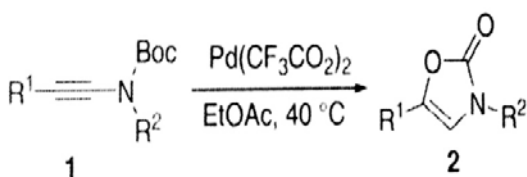
<sup>b</sup> Isolated yields.

## 2a=3,5-disubstituted Oxazolones

The oxazolone product **2a** was isolated in 70% yield by treating **1a** 5 mol % of Pd(OAc)<sub>2</sub> in THF at 40<sup>o</sup> C for 8 hrs. It is found that 5 mol % of Pd(CF<sub>3</sub>CO<sub>2</sub>)<sub>2</sub> as catalyst and with use of EtOAc as the solvent at 40<sup>o</sup> C produced 3,5-disubstituted oxazolones in 84% yield.

**Table 2**

Synthesis of 3,5-disubstituted oxazolones **2<sup>a</sup>**



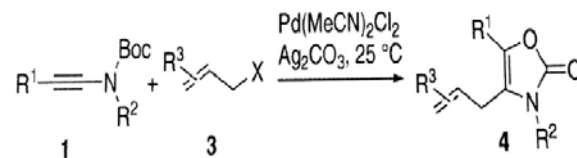
Entry	<b>1</b>	R <sup>1</sup>	R <sup>2</sup>	Yield <sup>b</sup> (%)
1	<b>1a</b>	Ph	Bn	84 ( <b>2a</b> )
2	<b>1b</b>	4-F-C <sub>6</sub> H <sub>4</sub>	Bn	72 ( <b>2b</b> )
3	<b>1c</b>	4-Cl-C <sub>6</sub> H <sub>4</sub>	Bn	80 ( <b>2c</b> )
4	<b>1d</b>	2-Cl-C <sub>6</sub> H <sub>4</sub>	Bn	78 ( <b>2d</b> )
5	<b>1e</b>	4-Br-C <sub>6</sub> H <sub>4</sub>	Bn	83 ( <b>2e</b> )
6	<b>1f</b>	3-Br-C <sub>6</sub> H <sub>4</sub>	Bn	88 ( <b>2f</b> )
7	<b>1g</b>	4-Me-C <sub>6</sub> H <sub>4</sub>	Bn	78 ( <b>2g</b> )
8	<b>1h</b>	4- <i>t</i> -Bu-C <sub>6</sub> H <sub>4</sub>	Bn	83 ( <b>2h</b> )
9	<b>1i</b>	4-MeO-C <sub>6</sub> H <sub>4</sub>	Bn	80 ( <b>2i</b> )
10	<b>1j</b>	3,4-MeO <sub>2</sub> -C <sub>6</sub> H <sub>3</sub>	Bn	82 ( <b>2j</b> )
11	<b>1k</b>	2-Naphthyl	Bn	75 ( <b>2k</b> )
12	<b>1l</b>	<i>n</i> -C <sub>8</sub> H <sub>17</sub>	Bn	63 ( <b>2l</b> )
13	<b>1m</b>	TBSO(CH <sub>2</sub> ) <sub>2</sub>	Bn	70 ( <b>2m</b> )
14	<b>1n</b>	TES	Bn	NR
15	<b>1o</b>	Ph	Ph	77 ( <b>2o</b> )
16	<b>1p</b>	Ph	<i>n</i> -Bu	71 ( <b>2p</b> )
17	<b>1q</b>	Ph	Cy	72 ( <b>2q</b> )

<sup>a</sup> Under the optimal conditions.

<sup>b</sup> Isolated yields.

Ynamide **1a** was treated with 3 equiv of allyl chloride **3a** as well as 1.5 equiv of K<sub>2</sub>CO<sub>3</sub> and 5 mol % of Pd(MeCN)<sub>2</sub>Cl<sub>2</sub> in EtOAc the desired 3,4,5-trisubstituted oxazolone **4a** was generated in 45% yield, together with the formation of 27% of **2a** when substrate **1a** was treated with 20 equiv of allyl chloride **3a** and 5 mol % of Pd(MeCN)<sub>2</sub>Cl<sub>2</sub> using K<sub>2</sub>CO<sub>3</sub> as a proton scavenger, the yield of 3,4,5-trisubstituted oxazolone **4a** was obtained 72% yield. When 1.5 equiv of Ag<sub>2</sub>CO<sub>3</sub> the yield was enhanced by 87%.

**Table 3**  
Synthesis of 3,4,5-trisubstituted oxazolones **4<sup>a</sup>**

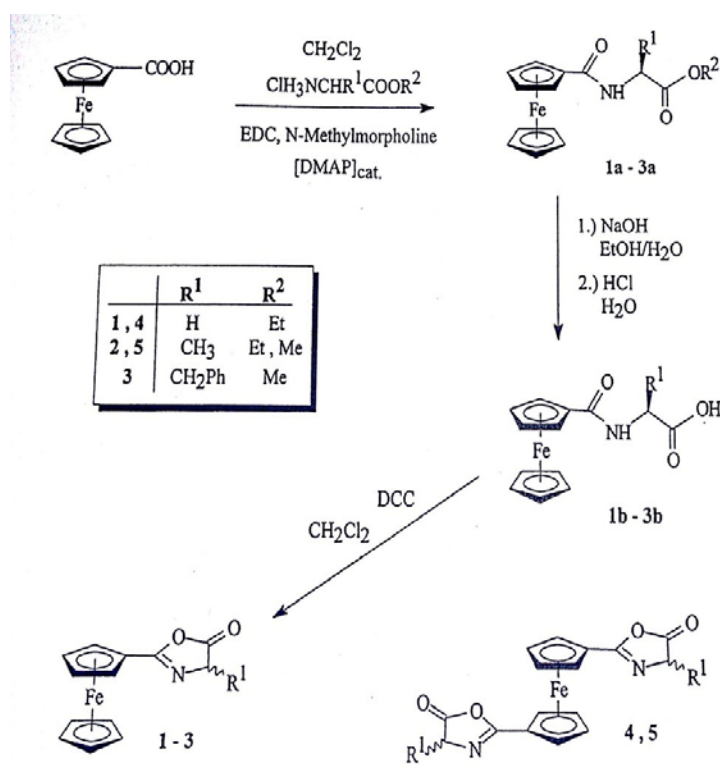


## Scheme 4:

### Ferrocenyl-Oxazolones as N and C donors in Pd(II), Pt(II) and Ir(III) complexes and ferrocenyl dipeptides.

Metal complexes of Oxazolones can provide information on the coordination chemistry of N-heterocycles. Moreover ring opening<sup>46</sup> of organo metallic oxazolones gives rise to peptides attached to a metal. In continuation of studies on oxazolone metal complexes<sup>47</sup> the synthesis and reaction of 2-ferrocenyl substituted 5(4H)oxazolones are reported<sup>48</sup>. These are starting materials for the synthesis of racemic<sup>49</sup> or optically active<sup>50</sup> ferrocenyl alanine which was incorporated into peptides to follow their redox properties<sup>51</sup>. The 1,1'-ferrocenyl bis(alanine) is available from 1,1'-diiodo-ferrocene<sup>52</sup>

Ferrocenyl- $\alpha$ -amino acid esters **1a-3a** were synthesized from ferrocene carboxylic acid and  $\alpha$ -amino acid esters, according to published procedures (scheme1)<sup>53</sup>. The first compounds of this type were reported by Schlogl<sup>54</sup>

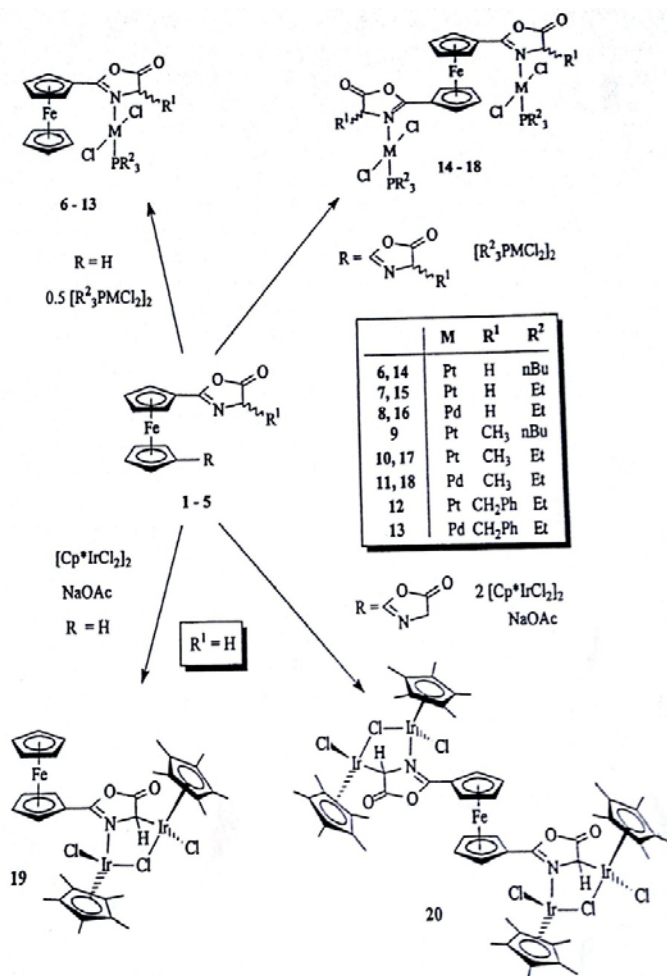


Scheme 1.

The synthesis of a new series of N-coordinated oxazolone complexes **6-18** was achieved by W. Bauer et al<sup>55</sup> atom as donors. The reaction of **1** and **4** with the chloro bridged half sandwich iridium complex [Cp\*IrCl<sub>2</sub>]<sub>2</sub> leads to  $\alpha$ -metallation



of the oxazolone ring to give the C,N and chloro bridged trinuclear and pentanuclear complexes **19** and **20**.



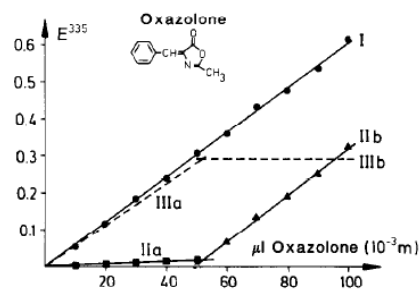
A solution of the appropriate chlorobridged tri-alkylphosphine complex in CH<sub>2</sub>Cl<sub>2</sub> was treated with a slight excess of the corresponding 2-ferrocenyl-5(4H)-oxazolone **1-5**. After 3-4 hr stirring at room temperature, the solution was concentrated in vacuo and an excess of diethyl ether was added. The precipitate was centrifuged off and solution was evaporated. The residue was taken up in CH<sub>2</sub>Cl<sub>2</sub> and added dropwise to an excess pentane. The product was centrifuged off, washed twice with pentane and dried in vacuo for 50°C for several hours.

**Scheme 5:**  
**Active site titrations of Hydrolases using Oxazolones as substrates**

Oxazolones are used as substrates for enzymes<sup>56-60</sup>. The stability of the acyl enzymes formed by the oxazolones is sufficient for active site titrations and the spectral changes upon the hydrolysis of the oxazolones to dehydroamino acids are large enough for precise measurements. The Oxazolones greatly differ in solubility. Some of them are soluble in water and others in organic solvents like dimethyl sulfoxide. Baese and Havsteen<sup>61</sup> tested a variety of oxazolones in various solvents in active site titrations of  $\alpha$ -chymotrypsin, trypsin, carboxypeptidase and aminopeptidase. The results were obtained with a single enzyme in solution which are equivalent

from those gained when a related enzyme also was present in the reaction mixture and the analytical precision, also with enzyme mixtures, equalled that offered by classical substrates.

Titration of the active site of  $\alpha$ -chymotrypsin with MBO(2-methyl-4-benzylidene-oxazolone) at pH 5.0 and 19°C is demonstrated below. The theory of active site titrations is described by Schonbaum et al<sup>62</sup>. The effect of deacylation was eliminated by extrapolation to zero time.



Titration of the active site of  $\alpha$ -chymotrypsin with MBO at pH 5.0 and 19°C. Symbols: ●, I; ■, IIa; ▲, IIb. I, Concentration dependence of the extinction of the oxazolone in the absence of the enzyme. II, Steady-state extinction after addition of the enzyme. The intersection between the segments a and b defines the equivalence point. III, Lines derived by difference measurements.

From the titration curve it is observed that the active site normality using oxazolones was within the experimental error independent of the method employed. The pH dependence was tested in the range from 5.0 to 8.0. It was less than 2.2%. Since many biological samples contain several related hydrolases, some of which are only present as impurities, the extent of the interference due to cross reactivity was investigated. This potential source of error remained for the oxazolones below an acceptable level of 1-2%. Even when the hydrolases were present in equimolar concentrations as evidenced from the following table.

Active Site Titrations of Chymotrypsin (CT) in the Presence of Trypsin (T) at pH 5.0 and 19°C

Substrate	$\lambda$ (nm)	$\Delta E$	$n_{CT}$ ( $\mu$ M)	$E_{CT}^{CT+T}$	$E_{CT}^{CT}$	$n_{CT}$ ( $\mu$ M)	$m_T$ ( $\mu$ M)	Purity of CT (%)
MBO	335	0.271	13.4	1.416	0.724	14.6	19.7	91.7
MBO	335	0.265	13.1	1.590	0.704	14.3	25.5	91.6
MNBO	380	0.247	13.1	1.418	0.731	14.7	19.7	89.1
MNBO	380	0.244	12.9	1.400	0.719	14.5	19.6	89.0

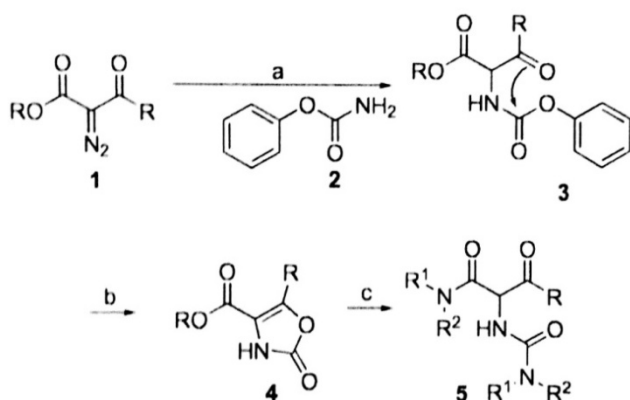
MBO=2-methyl-4-benzylidene-oxazolone  
MNBO=2-methyl-4-(4'-nitrobenzylidene)-oxazolone

**Scheme 6:**  
**Solid phase synthesis of oxazolones via Wang resin bound diazocarbonyls**

The solid phase organic synthesis (SPOS) plays a vital role in conveniently handling large number of synthetic intermediates<sup>63</sup>. M. Yamashita et al harnessed the synthetic utility of diazocarbonyl compounds<sup>64</sup> in order to prepare a set of biologically privileged 'lead-like' scaffolds. The author focused on application of polymer-bound  $\alpha$ -diazo- $\beta$ -ketoesters<sup>65</sup> as key building blocks for the diversity-oriented synthesis (DOS)<sup>66</sup> of a series of heterocycle libraries, including Oxazoles<sup>67</sup>, indoles<sup>68</sup>, imidazolones and imidazoles<sup>69</sup>, and pyrazinones and pyrazines<sup>70</sup>.

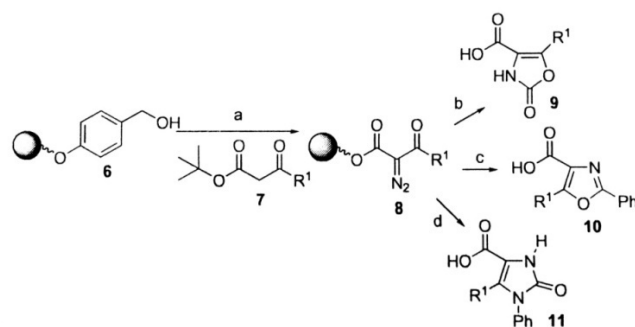


A Novel and efficient N-H insertion strategy for the synthesis of oxazolones from diazocarbonyls has been devised by M.Yamashita et al. Additionally, in order to synthesize oxazolone arrays using solid-phase synthetic methodology, an alternative TFA (trifluoro acetic) labile linker strategy was developed; the Wang resin bound diazocarbonyl substrates were also shown to be of great utility in the preparation of oxazoles and imidazolones.<sup>71</sup> M.Yamashita et al found that phenyl carbamate **2** is an excellent coupling partner when reacted with diazocarbonyls (scheme 1). Moreover treatment of this intermediate **3** with mild base afforded the ring closed oxazolone products **4**. However, when this chemistry was applied to a solid phase approach, the aluminium amide cleavage conditions gave ring-opened urea products **5**.



1. a) Rh<sub>2</sub>Oct<sub>4</sub> (2mol%), **2** (3equiv), toluene-dichloroethane 1:1, 80°C; (b) <sup>i</sup>Pr<sub>2</sub>EtN (3equiv), toluene, reflux, 6h; (c) R<sup>1</sup>R<sup>2</sup>NH (3equiv), AlMe<sub>3</sub> (3equiv), toluene, 100°C, 16h

Wang resin bound substrates were investigated and found to be ideal substrates for oxazolone synthesis. The Wang bound β-ketoesters were synthesized using a transesterification reaction. A mixture of Wang resin **6** and <sup>t</sup>Bu-β-ketoesters **7** was heated to reflux in toluene, after washing, standard diazotransfer conditions provided the corresponding Wang resin-bound α-diazo-β-ketoesters **8**. This building block **8** is treated with phenyl carbamate **2** in the presence of rhodium octanoate catalyst to give the N-H insertion products that were treated sequentially with <sup>i</sup>Pr<sub>2</sub>EtN and TFA to provide oxazolones **9**. Key building blocks **8** were also used to synthesize a series of oxazoles **10** and imidazolones **11** using an N-H insertion/cyclodehydration strategy. For the oxazole synthesis, a primary amide was used as the insertion component, the heterocycle ring was closed using Burgess reagent, and the oxazoles **10** were obtained by cleavage with TFA. In the case of the imidazolones, a primary urea was used as the insertion component, the product from this reaction was treated with TFA to achieve both cyclization to the imidazole and cleavage from the resin in one pot. Each of the oxazolones **9**, oxazoles **10**, and imidazolones **11** cleavage products were assessed by HPLC.



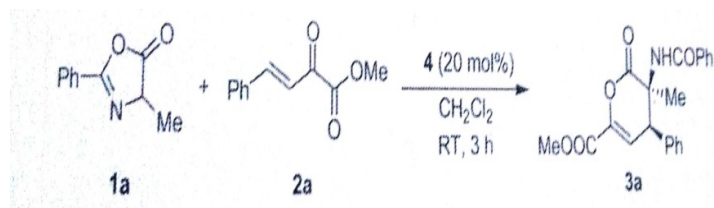
(a) (i) **7** (3equiv), toluene, reflux, 16h; (ii) dodecylbenzenesulfonyl azide (3equiv), Et<sub>3</sub>N (3equiv), toluene, 24h; (b) (i) Rh<sub>2</sub>Oct<sub>4</sub> (2mol%), **2** (3equiv), toluene, 70°C, 1h; (ii) <sup>i</sup>Pr<sub>2</sub>EtN (3equiv), toluene, reflux, 6h; (iii) TFA, rt, 3h; (c) (i) Rh<sub>2</sub>Oct<sub>4</sub> (2mol%), PhCONH<sub>2</sub> (3equiv), toluene-dichloroethane 1:1, 80°C, 1h, 70°C, 1h; (ii) Burgess reagent (3equiv), THF, μW, 100°C, 10 min; (iii) TFA, rt, 3h; (d) (i) PhNHCONH<sub>2</sub> (3equiv) toluene-dichloroethane 1:1; 80°C, 1h; (ii) TFA, rt, 3h.

#### Scheme 7:

#### Asymmetric cycloaddition reaction of oxazolones with β,γ-unsaturated α-keto esters by using cinchona alkaloids as catalysts.

Y. Ying et al reported the cycloaddition of β,γ-unsaturated α-keto esters with oxazolones<sup>72</sup>

With commercially available cinchona alkaloid catalysts, the reaction is completed within several hours at room temperature to provide highly functionalized δ-lactones with adjacent α-quarternary-β-tertiary stereocenters in highly yields and enantioselectivities. The reaction of 4-methyl-2-phenyloxazol-5(4H)-one **1a** with (E)-methyl-2-oxo-4-phenylbut-3-enoate **2a** was selected. commercially available quinine **4a** was used as catalyst which gave the desired product **3a** with 82% yield and 70% ee with exclusive diastereoselectivity<sup>73</sup>.



This reaction provides an easy access to highly functionalized chiral δ-lactones with adjacent α-quarternary-β-tertiary stereocenters.

#### Scheme 8:

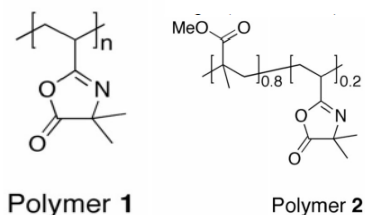
#### Nano-Imprinted Thin Films of Reactive, Azlactone-Containing Polymers

Fredin et al reported an approach to the introduction of nanoscale and microscale topographic features into thin films of reactive, azlactone-containing polymers. They demonstrated that (i) Nano-imprint lithography (NIL) can be used to imprint films of reactive polymers **1** and **2** using methods developed for the imprinting of nanoscale and microscale topographic features into conventional, non-reactive polymers, (ii) the azlactone groups in these materials do not degrade or react substantially during the imprinting process, and (iii) the resulting topographically

patterned films can be chemically functionalized post-fabrication by treatment with either small molecules or polymers containing primary amine groups.<sup>74</sup> Methods for the chemical functionalization of surfaces have led to significant progress toward the design of functional biomaterials and provide useful tools for understanding the chemical interactions between cells and surfaces that drive or guide cellular response<sup>75-88</sup>. The work reported was based upon the results of numerous past studies describing the influence of surface topography on cell behaviour<sup>89-92</sup>. Advances in the field of lithography have yielded methods for the transfer of nanometer-scale features to polymers and other soft materials that could prove useful for addressing and investigating several of the goals outlined<sup>93-95</sup>.

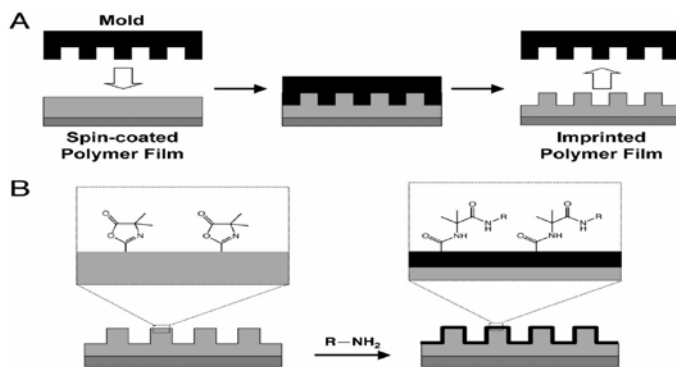
The methods that have been developed for the transfer of nanometer-scale features into soft materials are by using nano-imprint lithography (NIL)<sup>96-99</sup>. NIL is a process in which a master (e.g., silicon, typically prepared *via* conventional lithographic techniques) is pressed into a thermoplastic material heated above its glass transition temperature ( $T_g$ ). When the thermoplastic is cooled below  $T_g$ , the master is removed, leaving the negative relief of the master in the imprinted material.

Fredin et al conducted an initial set of experiments to determine whether thin films of polymers **1** and **2** could be imprinted with features having micrometer- and nanometer-scale dimensions. Thin films of polymers **1** and **2** (e.g., ~200 nm thick) were spin-coated from solutions in ethyl acetate onto planar silicon and glass substrates and imprinted using methods for NIL.



Polymers **1** and **2** can be cast as thin films and have glass transition temperatures of approximately 101 °C and 96 °C, respectively, which are in the range of temperatures commonly used for NIL.

To determine whether the azlactone groups of imprinted films were available for reaction at the surface after imprinting, films of polymers **1** and **2** were imprinted with the pattern of lines 2 μm wide described above and were subsequently exposed to a small molecule fluorophore functionalized with a primary amine group. Fluorescence micrographs of imprinted films of polymers **1** and **2**, respectively, that were treated with a drop of an aqueous solution of tetramethylrhodamine (TMR) cadaverine for one minute and then soaked in deionized water for three hours to remove unreacted fluorophore. Fredin et al observed that the fluorescence associated with the film of polymer **1** appears brighter than the fluorescence associated with the film of polymer **2**. This result is consistent with the large difference in the amount of azlactone groups in the homopolymer (polymer **1**) relative to the copolymer (polymer **2**), and suggests that it may be possible to tune the amount or density of reactive functional groups at the surfaces of these films for particular applications by control over the structures and compositions of the polymers used to form the films.

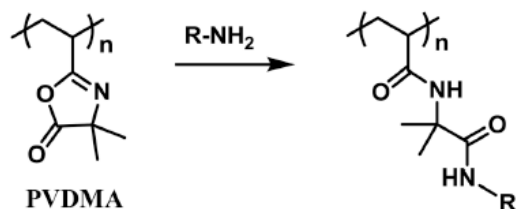


**Scheme 9:**  
**Functionalization of Fibers Using Azlactone-Containing Polymers**

Buck and Lynn reported an approach to the functionalization of fibers and fiber-based materials that is based on the deposition of reactive azlactone-functionalized polymers and the 'reactive' layer-by-layer assembly of azlactone-containing thin films. They demonstrated (i) that the azlactone-functionalized polymer poly(2-vinyl-4,4-dimethylazlactone) (PVDMA) can be used to modify the surfaces of a model protein-based fiber (horsehair) and cellulose-based materials (e.g., cotton and paper), and (ii) that fibers functionalized in this manner can be used to support the fabrication of covalently crosslinked and reactive polymer multilayers assembled using PVDMA and poly(ethyleneimine) (PEI). The growth, chemical reactivity, and uniformity of films deposited on these substrates were characterized using fluorescence microscopy, confocal microscopy, and scanning electron microscopy (SEM)<sup>100</sup>.

The azlactone-functionalized polymer poly(2-vinyl-4,4-dimethylazlactone) (PVDMA; Eq. 1) can be used to fabricate covalently crosslinked polymer multilayers by reactive layer-by-layer assembly with poly(ethyleneimine) (PEI), a hyperbranched polymer that contains primary amine-functionalized end groups<sup>101-103</sup>. The approach to layer-by-layer assembly reported here exploits the reactivity of polymers containing azlactone functionality. Azlactone-functionalized polymers react rapidly with a range of different amine-functionalized nucleophiles (Eq. 1) and can be used to synthesize a broad range of functional materials; the broader reactivity and general characterization of azlactone-functionalized polymers has been reviewed comprehensively<sup>104</sup>. Several recent studies have demonstrated the use of azlactone-functionalized polymers to design reactive interfaces and tailor the physicochemical properties of surfaces<sup>105-112</sup>.

Azlactone-functionalized polymers have been used in polymer layers<sup>111,112</sup>, bulk thin films<sup>113</sup>, and reactive polymer multilayers<sup>101-103</sup> useful for the immobilization of proteins<sup>102,106-109</sup> and other molecules<sup>101-103,105,110-113</sup>.



**Eq.1**

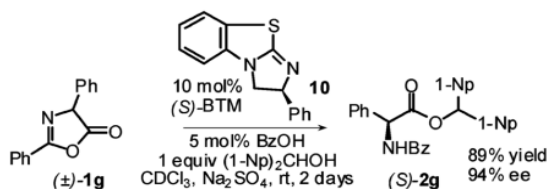
PVDMA= poly(2-vinyl-4,4-dimethyl azlactone)

**Scheme 10:**

**Dynamic Kinetic Resolution of Azlactones**

Yang et al proposed a new highly enantioselective method for the DKR(Dynamic Kinetic Resolution) of azlactones. It is especially suited for the C4-aryl-substituted substrates, thus complementing the previously available enzymatic and non enzymatic protocols. Dynamic kinetic resolution (DKR)<sup>114</sup> of azlactones<sup>115</sup> by way of their enantioselective alcoholysis provides an attractive approach to the asymmetric synthesis of  $\alpha$ -amino acid derivatives.

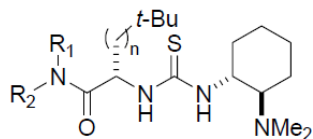
Enantioselective acyl transfer catalyst benzetotramisole (BTM) has been found to promote dynamic kinetic resolution of azlactones providing di(1-naphthyl)methyl esters of  $\alpha$ -amino acids with up to 96% ee<sup>116</sup>.



**1g** =2,4-diphenylazlactone

**2g**=di(1-naphthyl)methyl esters of  $\alpha$ -amino acids

A highly efficient alcoholytic ring opening of azlactones was effected with the bifunctional Organocatalyst given below.



**R<sub>1</sub> = Me, R<sub>2</sub> = Bn**

The level of enantioselectivity of the product esters obtained is the highest ever achieved in the chemically catalyzed DKR of azlactones<sup>117</sup>. A fairly broad range of azlactones containing both aliphatic and aromatic substituents was employed in the DKR.

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#### AUTHORS

**First Author** – Y.Aparna, M.Sc(Chemistry), Research Scholar, Osmania University, Hyderabad. [aparnayeddala@gmail.com](mailto:aparnayeddala@gmail.com)  
**Second Author** – Prof L.N.sharada, BOS Chairperson, Department of Chemistry, Osmania University, [lnsharada@gmail.com](mailto:lnsharada@gmail.com)

**Correspondence Author** – Y.Aparna, [aparnayeddala@gmail.com](mailto:aparnayeddala@gmail.com), 9948336906, [lnsharada@gmail.com](mailto:lnsharada@gmail.com).



# A Study on Symptoms and Preventions of Employee Absenteeism

N.Silpa, B.Masthanamma

Assistant Professor, Department of Business Administration, Annamacharya P.G college of Management Studies, (Affiliated to JNTU, Anantapuramu), Rajampet, Andhra Pradesh, India.

**Abstract-** Absenteeism is a habitual pattern of absence from duty or obligation and it has been viewed as an indicator for poor individual performance. A high degree of absenteeism and turnover can cause serious problems for business like Absenteeism hurts productivity, costs money, affect performance and impact the morale of the rest of employees. A satisfactory level of attendance by employees at work is necessary to allow the achievement of objectives and targets by a department. So the present paper looks at the causes of absenteeism and its ranks and what employer can do to reduce Absenteeism rates in organization.

**Index Terms-** Absenteeism, Causes, Costs money, Hurts productivity, Poor individual performance.

## I. INTRODUCTION

Absenteeism is the failure of employees to appear on the job when they are scheduled to work. Employees who are away from work on recognized holidays, vacations, approved leaves of absence, or approved leaves of absence would not be included. Employees, who quite without notice are also counted as absenteeism until they are officially removed from the payroll, Absenteeism are becoming a serious practice in labour oriented industries.

Absenteeism is serious workplace problem and an expensive occurrence for both employers and employees seemingly unpredictable in nature. A satisfactory level of attendance by employees at work is necessary to allow the achievement of objectives and targets by a department. Employee absenteeism is the absence of an employee from work. It is a major problem faced by almost all employees of today. Employees are absent from work and thus the work suffers. Absenteeism of employees from work leads back logs, pilling of work and thus works delay.

Employee absenteeism can be defined as stress that leads to work exhaustion. Sadly, it is the most gifted and committed employees that tend to burn out first. Because of their high standards and tendency towards perfectionism, these employees end up burning the candle at both ends. It refers to workers absence from their regular task when he is normally schedule to work.

In other words, it signifies the absence of an employee from work when he is scheduled to be at work. Any employee may stay away from work if he has taken leave to which he is entitled or on ground of sickness or some accident or without any previous sanction of leave.

Absenteeism is always expressed in terms of percentage. For calculating absenteeism information about the number of persons actually reported or work are required. The rate of employee absenteeism is expressed using the following formula: Absenteeism = man shifts lost in hours/total man shifts scheduled to work in hours\*100.

## 1.2 Review literature:

1. Chandramouli And M.C.Sandhyarani: A Study On Absenteeism, They Found That The Low Wages, Work Load, Celebration Of Festivals, Unaware Of Authorized Leave Etc. The Company Has To Make The Employees To Go With An Authorized Leave Or Else Providing Counseling Services To The Employees By Making Them Aware Of These Leaves Would Bring Down The Absenteeism In The Industry.

2. Denise Baker-McClellan, Kay Greasley, Jeremy Dale And Frances Griffith: Absence Management And Presenteeism,(2010) They Were Analyzed Presenteeism Is A Complex 'Problem' And That It Is Not A Single One-Dimensional Construct, But Is Continually Being Shaped By Individual And Organizational Factors. In Addition, They Found That Performance And Well-Being Are More Closely Related To The Organizational Reaction To Presenteeism And Absenteeism.

3. Trong B. Tran And Steven R. Davis:(2013) Employee Absenteeism And Group Performance, They Confirms That The Markov Chain Model Gives A Reasonable Approximation In Modeling The Relationship Between Staffing Level And Organization Performance In The Case Where Workers May Be Leave From The Work Place. The Model Does Seem To Overestimate The Probability Of Accepting Work And The Utilization.

4. C.Swarnalatha And G.Sureshkrishna:(2013) Absenteeism – A Menace To Organization In Building Job Satisfaction Among Employees In Automotive Industries In India, Absenteeism Results In Financial Losses Both Because Of The Resultant Reduction In Productivity And The Cost Of Sick Leave Benefits Or Others Are Paid As Wages For No Work. Absenteeism Reduces The Satisfaction Level Of The Employee And Makes Him Unsecured About His Job In The Organization.

5. Prakash K. Kannan:(2012) A Study On Absenteeism Of Employees Among Food Retailing In Coimbatore, Their Study Concludes That Absenteeism Can Be Reduced To A Great Extent If The Management Takes Initiative In Making The Workers Feel Responsible Towards Their Job By Introducing Various Motivational Schemes.

6. B. Anderson & D.J. Geldenhuys: The Relationship Between Absenteeism And Employer-Sponsored Child Care (2011), The Results Indicate A Significant Negative Relationship

Between Onsite Employer-Sponsored Child Care And Absenteeism.

Regarding The Influence Of Demographical Variables, Significant Differences Were Found With Respect To Absenteeism-Based Marital Status And Age, While No Significant Difference Was Found With Respect To Absenteeism Based On Gender And Race.

7. M.S.Vijaya Rao And Dr. S.Sheela Rani: A Study On Employee Absenteeism Insundaram Brake Linings Ltd., Chennai(2012) The Study Analyses The Various Factors That Lead To The Employee Absenteeism - Like Lack Of Raining, Quality Of Work Life, Policies regarding Promotion, Incentives, Benefits That Can Reduce The Attrition And Absenteeism And To Increase The Productivity And Turnover Of The Organization.

8. Merrelyn Emery: The Turnover And Absenteeism Problems (2010) Employees Want Intellectual Satisfaction And A Reasonable Quality Of Life. Instead, They Are Blamed For Problems Caused By Bureaucratic Structure And Treated As Inadequate Human Beings.

9. R. Suresh Babu And Dr. D. Venkatramaraju: A Study On Employee Absenteeism In Indian Industry (2011), A Satisfactory Level Of Attendance By Employees At Work Is Necessary To Allow The Achievement Of Objectives And Targets By A Department.

10. John H. Kerr And Marjolein C. H. Vos: Employee Fitness Programmes, Absenteeism And General Well-Being (1993), No Significant Differences In Self-Confidence Between The Groups Were Obtained, But Significant Differences In Perceived Physical Fitness Were Apparent.

11. C.S.C. Kumar, N.V.R. Naidu: Absenteeism Through Six Sigma Methodology(2012) The Results After Implementing The Lean Six Sigma Methodology, That Absenteeism Can Be Really Controlled With The Involvement Of Management.

## II. RESEARCH METHODOLOGY

### 2.1 NEED FOR THE STUDY

Absenteeism has wide implications to both the company and employees. The company suffers with the problem of scheduling its production activities and meeting the target. The employees will also suffer because of absenteeism. Their commitment towards the organization and to their jobs decreases. Their moral will go down. Their contribution to the organizational goods decreases. This will create a distance between the employees and the management.

### 2.2 STATEMENT OF THE PROBLEM

Absenteeism is the one of the great disasters faced by all the organizations in the modernized world which results in turnover. So the term has to reinvest so many accounts. People not only used to leave the organization due to the personal reasons, the main reasons are all about the industrial environmental factors.

### 2.3 SCOPE FOR THE STUDY

Study of absenteeism among industrial worker is not only from view point of but it is important from the view point of moral of employees. Even through the effect of good moral of employees, may not be calculated in terms of costs, but it should

be say that it is important than cost. There is a clear relationship between employee's attitude and absenteeism. Because of job satisfaction and rate of absenteeism are related to each other. So employee attitude and employee moral are the important points. Labor is the human factor and therefore not only economic but should consideration shall also be taken into account in the discussion of problem connected in the absenteeism has been continuous to be one of the major labor problem in the Indian industries.

### 2.4 OBJECTIVES OF THE STUDY

- To know the causes or symptoms of employee absenteeism.
- To study variation in the perception of absenteeism.
- To suggest measures or Preventions for reducing employee absenteeism.

RESEARCH DESIGN : Descriptive Research  
SAMPLE DESIGN : Simple random sampling  
SAMPLE TECHNIQUE : Questionnaire method  
SAMPLE UNIT : The Andhra Pradesh Mineral Development Corporation Limited.  
SAMPLING SIZE : Sample size is 120 employees.  
SOURCES OF DATA COLLECTION : Primary sources

### 2.5 HYPOTHESIS:

**Ho:** Stress in work is not the cause of employee absenteeism.

**Ho:** Lack of job satisfaction is not the cause of employee absenteeism.

**Ho:** Personal problems are not the cause of employee absenteeism.

**Ho:** Poor working conditions are not the cause of employee absenteeism.

**Ho:** Unsatisfactory housing is not the cause of employee absenteeism.

**Ho:** Alcoholism is not the cause of employee absenteeism.

**Ho:** Safety measures are not controlling the employee absenteeism.

**Ho:** Disciplinary action is not control the employee absenteeism.

**Ho:** More wages & allowances are not reducing the employee absenteeism.

### 2.5 ANALYSIS OF FRAME WORK

- MEAN
- CHI-SQUARE TEST
- CORRELATION

### 2.6 LIMITATIONS OF THE STUDY

Some of the respondents did not respond to the questionnaire, because they feel it disturbance to their busy work.

Some of the respondents have fear while filling the questionnaire. The questions are about concern secret information.

III. DATA ANALYSIS

3.1. The following table which shows the symptoms of absenteeism and its ranks:

S.NO	STATEMENTS	MEAN	RANK
1	Stress in work	2.983	14
2	Excessive work load	3.100	13
3	Lack of job satisfaction	3.824	5
4	Poor supervision	3.717	7
5	Poor physical fitness	3.767	6
6	Inadequate leadership	3.833	3
7	Personal problems	3.533	9
8	Boredom on the job	3.933	2
9	Transportation problem	3.650	8
10	Poor working conditions	4.067	1
11	Unsatisfactory housing	3.383	10
12	Alcoholism	3.117	12
13	Inadequate leave facilities	3.217	11
14	Low level of wages	3.835	4

**Interpretation:** The above table3.1 shows the symptoms of absenteeism and its ranks. The major symptom of absenteeism is poor working conditions it is indicated by the rank-1 it consists of the highest mean value i.e. 4.067 and stress in work is indicated by rank-14, it consists of least mean value i.e. 2.983.

3.2The following table which shows the preventions of employee absenteeism and its ranks:

S.NO	STATEMENTS	MEAN	RANKS
1	Housing	3.583	7

	accommodations		
2	Pleasant working conditions	4.083	3
3	Safety measures	3.900	5
4	Incentives	4.124	2
5	Disciplinary actions	3.883	6
6	More wages and allowances	4.133	1
7	Fringe benefits	4.017	4

**Interpretation:** The above table3.2 shows the preventions of absenteeism and its ranks. The first preventive measure of absenteeism is more wages and allowances it is indicated by the rank-1 it consists of the highest mean value i.e. 4.133 and housing accommodations is indicated by rank-7, it consists of least mean value i.e.3.583.

3.3 The following table which shows the chi-square test:

S.NO	STATEMENTS	P VALUE
1	Stress in work	28.207 <sup>a</sup>
2	Lack of job satisfaction	21.904 <sup>a</sup>
3	Personal problems	23.795 <sup>a</sup>
4	Poor working conditions	22.313 <sup>a</sup>
5	Unsatisfactory housing facilities	42.753 <sup>a</sup>
6	Alcoholism	39.705 <sup>a</sup>
7	Safety measures	24.520 <sup>a</sup>
8	Disciplinary action	34.472 <sup>a</sup>
9	More wages & allowances	41.372 <sup>a</sup>

**Interpretation:** The above table3.3 shows the chi square calculated values of statements at 12 degree of freedom, at 0.05 level of significance is 21.03, where the chi-square calculated value is greater than table value the Ho is rejected, H1 is accepted that indicates the above statements positively accepted by employees.

3.4Correlation between Perception on Absenteeism and Age, Marital Status

		Variation in the perception on absenteeism	Age	Marital status
Variation in the perception on absenteeism	Pearson Correlation	1	.409**	-.445**
	Sig. (2-tailed)		.000	.000
	N	120	120	120
Age	Pearson Correlation	.409**	1	-.500**
	Sig. (2-tailed)	.000		.000
	N	120	120	120
Marital status	Pearson Correlation	-.445**	-.500**	1
	Sig. (2-tailed)	.000	.000	
	N	120	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).



**Interpretation:** The above table 3.4 which shows Correlation between Perception on Absenteeism and Age, Marital Status. There is a positive Relation between Perception on Absenteeism and Age.

#### IV. CONCLUSION

The study Concluded that Employee Absenteeism in APMDC Ltd even doing well. Still it has to undergo slight modifications. The working conditions of the company are poor, the workers cannot adjust themselves with the company's working conditions and social and religious functions divert the workers attention from the work. Employee absenteeism is the important aspect from the part of the organization to be considered as the total production capacity depends upon the employees. Any organization needs to take measures to arrest absenteeism. It is necessary to identify the various reasons of absenteeism and implement measures. Such measures are like management should provide the incentives, housing facilities, pleasant working conditions, and improve transportation facilities and leave facilities.

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#### AUTHORS

**First Author** – N.Silpa, Assistant Professor, Department of Business Administration, Annamacharya P.G college of Management Studies, (Affiliated to JNTU, Anantapuramu), Rajampet, AndhraPradesh, India, Email: silpalipi@gmail.com  
**Second Author** – B.Masthanamma, Assistant Professor, Department of Business Administration, Annamacharya P.G college of Management Studies, (Affiliated to JNTU, Anantapuramu), Rajampet, AndhraPradesh, India, Email: masthani9090@gmail.com

*“Put me back in my skin!”*

## Children’s Perceptions of Mixed Reality Play

Linda McConnon\*, Craig Vear\*\*

\* School of Arts, De Montfort University, Leicester, United Kingdom

\*\* School of Arts, De Montfort University, Leicester, United Kingdom

**Abstract-** This article reports on child-focused reflections from research findings of a year-long investigation working with primary school aged children and young people in England exploring mixed reality play. 58 children and young people were engaged in the project and actively participated in 29 focus group interviews over time. Thematic qualitative analysis revealed five broad features of mixed reality play from a child’s perspective: dimensional embodiment, creating worlds, dramatizing and gaming, agentic action and inside and outside spaces. Through the adopted lens of children’s reflective engagement, this article hypothesises that mixed reality presents an environment for digital natives (Prensky, 2001) to play openly and creatively, and puts forth an argument for new technological opportunities and transformations of pedagogic practice.

**Index Terms-** Mixed reality, digital play, creative learning, children’s voice, technophenomenology

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### I. INTRODUCTION

This article reports and analyses the reflective discussions of primary school aged children and young people in England participating within a year-long investigation exploring mixed reality play. This is based on a larger body of work conducted at De Montfort University (Al-Salloum, et al., 2015; Vear & McConnon, 2015 forthcoming). The focus of this paper is to probe more deeply and report children’s understanding and perceptions of mixed reality play, thus the capturing of their authentic voices by engaging them as active participants was an essential part of the research. Children’s voices are legitimized as windows into their realities; their ideas and interpretations about play and physical activity are grounded in lived experiences that adult researchers often assume to know, but rarely access in a meaningful manner (Anthamatten, et al., 2013). Through the adopted lens of children’s reflective engagement, this article hypothesises that mixed reality presents an environment for digital natives (Prensky, 2001) to play openly and creatively, and puts forth an argument for new technological opportunities and transformations of pedagogic practice.

### What is Pop Up Play?

The genesis of this research project was in response to a national call from the Digital R&D Fund for the Arts. The aim of the fund was to bring together an arts organisation, a technologist and a research partner in a co-operative partnership. De Montfort University, together with The Spark Arts for Children and Dotlib Ltd created an immersive learning environment for children using a mixed reality system titled *Pop Up Play*. *Pop Up Play* has been developed, tested and designed for use in schools, arts venues, libraries and museums. The system works by capturing images (live and still) relating to museum exhibits, theatrical productions, children’s books or curriculum topics and using *Pop Up Play*, projects them into a space. Video cameras and motion-tracking then place the participants into these projected worlds for creative play and open-ended learning. *Pop Up Play* engages children and young people physically, kinesthetically and emotionally. As the play advances possibilities broaden when tracking systems replace the children’s image with that of an avatar, a self-drawn puppet, a film or book character, turning their actions into those of the Gruffalo for example. Through carefully managed workshop activities the participants become invested in these imaginary dimensions and the possibilities of digital play. This enabled an investigation into how the mixture of augmented and virtual reality can be used as a tool to engage young minds in creative play within immersive technology and to understand their perspectives of this experience.

### Play for education

However difficult play is to define, it remains a core feature of many educational curricula, and is considered key to teaching and learning in a wide variety of classrooms and arts education contexts. According to McInnes, et al. (2013) ‘the construct of playfulness is argued to be an attitude of mind which indicates the approach taken to an activity. It is thought to be important for development and learning by promoting enthusiasm, motivation, willingness to engage in an activity and flexibility of thought (Dewey 1933; Lieberman, 1977)’. Anna Craft coined the concept of ‘possibility thinking’ (PT) to denote the shift from ‘what is’ to ‘what might be’. She argued it is therefore at the heart of all creativity and that in the case of young children involves their transitioning from ‘what is this?’ to ‘what can I or we do with this?’ as well as imagining ‘as if’ they were in a different role (Craft, 2011). Play is thus proposed as ‘logically necessary’ to PT (Craft, 2001). In digital play children’s creative imagery is built on what is noticed, valued, and understood within engagement and participation in culture and complex social

relations between peers and practitioners. A key consideration for creative practitioners, and a necessary component of the enabling environment, is the opportunity for exploratory, combinatory play. Therefore, new technology needs to work flexibly to address old forms of interaction and springboard transformational practice and digital pedagogy in the classroom, rehearsal room, gallery space or library (Al-Salloum, et al., 2015). Children are engaging with a greater degree of sophistication in digital platforms; DSI consoles, Wii, iPads etc., irrespective of economic, social or cultural contexts. The gaming industry has exploded into the mainstream and this brings with it an online community that engages in conversation, learning, skills sharing and problem solving. In 2010 Jane McGonigal posed the question: 'what if we could harness gamer power to solve real-world problems?' According to McGonigal gaming can 'make a better world'. Through mass collaboration and a social fabric weaved through shared experience of 'missions' gamers adopt urgent optimism to take on challenges which enthralls and empowers them to be able to succeed. Similarly, interactive books are hugely popular with children as it makes story reading active rather than passive. In a recent *Pop Up Play* stakeholder consultation, one Head Teacher said that "teachers will soon be moving away from teacher white boards to use tablets and interactive TV and there will be a need and desire to push the technical boundaries further - making the visual experience more engaging by drawing on all of the senses. The trend clearly defines a space where children exist and demonstrate an appetite to engage in mixed realities to enhance learning and personal experiences" (Vear & McConnon, 2015 forthcoming).

### **Embodiment in mixed reality play**

Moving in physical spaces when interacting with digital image can provide greater embodiment for the user into these worlds and thus enhances their personal experience. Rogers, et al. (2002) state that 'embodiment refers to immanent presence, compared with interacting with more abstract representations such as interface metaphors that conventional computer-user interactions provide (Dourish, 2001)'. This duality means that when learners participate in a virtual environment, they are simultaneously interacting in two worlds - the online (virtual) environment and the offline (real-world) environment (Feldon & Kafai, 2008). According to Rogers, et al. (2002):

From a theoretical point of view, we can consider a potential distinction as being that between (i) the "real" world in which spaces and artefacts are acted on by conventional physical actions and where the user's understanding is, therefore, in terms of general causal models of the world, and (ii) the "virtual," in which a different, set of causal models operate and action is arbitrarily coupled to the properties of the perceived world.

*Pop Up Play's* focus within this area of discourse was to understand the affectual processes of being taken (incorporated) into the mixed reality realm, and simultaneously, having it meet the learners own 'real-world' play reality. This manifest itself through stimulating a sense of liveness between the in-screen image and in-space body, in such a way as they were perceived as coexisting in the here-and-now (Auslander, 2008). Andy

Lavender describes this as the 'experience of being submerged in an environment, which we know is not actual but which nevertheless feels 'real'', and presents the participant with a 'frisson of perceptual instability' (Lavender, et al., 2011). Additionally, these factors offer the learner a unique experience by presenting an opportunity for the embodied participant to witness themselves in-play in an-other world - such as under the sea, or on the moon - which is none-the-less felt or emotionally engaging as a "real" experience (Morie, 2007).

### **Impact and perspectives**

Acknowledgement is made to studies that concentrate on the effective use of technological tools in learning to enhance cognitive development (e.g. Sternberg & Preiss, 2013). However there is not scope in this article to broaden this review beyond the focus of the research project which specifically focused on children's perspectives of mixed reality play. Currently, the literature researching the impact and perspectives of new types of mixed reality play with children and young people is scant as issues of time spent online and digital safety have dominated the field. In the USA, focus group interviews with children and young people about perceptions and awareness of digital technology highlighted four themes: (1) an awareness of digital devices; (2) a sense of temporal displacement; (3) social functions; and (4) a palpable sense of risk associated with using them (Hundley, 2010). In the British classroom, Hall and Higgins (2005) examined students' perceptions of interactive white boards (IWBs) on the premise that since 1997, the UK government has invested huge amounts of money in ICT in the education sector, including IWBs, in the belief that their use in the educative process will raise attainment among British school children. They found that students seem to enjoy in particular the multi-media capabilities of the technology, especially the visual aspects (colour and movement), audio (music, voice recordings, sound effects) and being able to touch the IWB. All pupil groups mentioned the multi-media aspects of the IWB as advantageous especially in engaging and holding their attention. In Hong Kong, Ahn, et al. (2013) also reported capturing the attention of the children during robot-assisted augmented reality play and demonstrated improved learning effects when compared to conventional play in language and creativity. This was attributed to the operational flexibility, novelty, and robotic mediation as well as capturing the attention of the children. From the children's perspective, they reported that their listening ability seemed to have been strengthened and focused by the robotic narration ("it sounded as if coming from the robot"), and special sound effects synchronized with the actor's actions. In terms of language expression, seeing themselves in the screen augmented as different story characters encouraged the children to actively participate, imagine their roles, and verbalize such feelings, even as an audience (Ahn, et al., 2013). A common notion in the literature is that the digital environment is especially important for engaging and encouraging co-operative and collaborative pupils. Through digital play, learners are afforded more control over their environment (Larsen McClarty, et al., 2012). Without such agency, behaviours and attitudes to school and learning appear to decrease; in reality pupils have less control over their environment and hands on practical application, the negative impact of which leads to disengaged learners (e.g. Kettlewell, et

al., NFER 2012). However McInnes, et al. (2013) state that ‘studies have repeatedly shown that many teachers are not comfortable with play and child-led activities, and that play is held in low esteem compared to activities which are seen as work (Bennett, Wood, & Rogers, 1997; King, 1978)’. A far cry indeed from the experiences and viewpoints expressed by *Pop Up Play* practitioners and teachers who evaluated children and young people’s engagement as intuitive, describing it as ‘of their world’ (Vear & McConnon, 2015, forthcoming). Indeed several *Pop Up Play* stakeholders discussed this phenomenon using the digital-natives epistemology, in so far as they felt that ‘the children took control’, and that ‘they were teaching us’. The findings from Vear and McConnon’s (2015) research also suggest that a new ontology of practice has been developed in order to accommodate the innovative nature of digital creative play. This was particularly apparent when experienced practitioners were asked to describe the transformational practices within their delivery of the case studies; they were adamant that it was a new practice with its own signatures and propositions. The implications for practice are clear insofar as this new and innovative form of mixed reality play calls for a greater understanding of the impact on its users and definitions of their experience. Indeed according to McInnes, et al. (2013) ‘traditionally definitions of play have been based on adult perceptions of the observable play act. However, play may be most beneficial when it is considered as an approach to a task, and based on a definition of play from the child’s perspective’.

II. METHODOLOGY

The project adopted action-research methods from two different perspectives: in-vitro (outside looking in) and in-vivo (inside looking out). These methods were chosen in order to gain knowledge through action, and were concerned with the nature of the action as a thread of investigation leading to new knowledge that has operational significance for the field. As such, this method tested the *Pop Up Play* system, whilst exploring and measuring the transformational affect upon its (real-world) users.

**Sample**

The sample consisted of six settings from our stakeholder research partners ranging from schools to libraries, museum and art gallery partners, specifically: Mellor Community Primary School, Leicester; Three Ways Community Special School, Bath; Dovelands Primary School, Leicester; Braunstone Library at the BRITE Centre, Leicester; New Walk Museum and Art Gallery, Leicester; and Embrace Arts, Leicester.

**Participants**

Throughout the project the team worked with 58 children and young people, both boys and girls. The youngest participant was 4 years old and the eldest participant was 11 years old. Table 1 shows the breakdown of participants. The children from Three Ways School were from mixed age and mixed ability classes with moderate learning difficulties. The children who participated at Braunstone Library and New Walk Museum were taking part in a series of summer workshops, and the children who participated in a partnership with Embrace Arts were all home educated.

**Table 1: Participants**

Setting	Number of Participants	Age Range
Mellor School	8	8 to 9 years old (Year 4)
Three Ways School	21	6 to 11 years old (Year 3-6)
Dovelands School	8	9 to 11 years old (Year 5&6)
Braunstone Library	8	6 to 10 years old
New Walk Museum	5	4 to 8 years old
Embrace Arts	8	7 to 11 years old

**Ethics**

Ethics were negotiated between all parties and agreed with the University of De Montfort Research Committee and adhered to the Ethical Guidelines for Educational Researchers (BERA, 2011). The procedures included issuing a plain language statement and written parental consent form to all participants informing them of the aims and anticipated outcomes of the research. The right to abstain or withdraw from the project at any time was upheld. Both raw and analysed data material was participant anonymised and stored in a secure project-specific data system.

**Process**

The *Pop Up Play* project was split across nine work packages (March 2014 to March 2015). They were composed of four phases of testing and consisted of a combination of workshops or one-off residencies (see Table 2):

- Case Study 1. June - July 2014
- Case Study 2. August 2014
- Case Study 3. November - December 2014
- Case Study 4. January 2015

**Table 2: Sessions and residencies**

Setting	Sessions & Residencies
Mellor School	6 weekly sessions
Three Ways School	2 x 6 weekly sessions
Dovelands School	3 day residency
Braunstone Library	1 day residency
New Walk Museum	1 day residency
Embrace Arts	3 day residency

**The Sessions**

The sessions lasted between 45 and 90 minutes on average, with 45 minutes defined as a suitable duration for the SEN learners. Using a range of practitioners, these sessions presented a variety of themes throughout the workshops, with media and pedagogic design varying throughout and across each session (see Table 3 for examples).

**Table 3: Examples of media themes, workshop styles and pedagogy**

Media Theme	Workshop	Pedagogy
War Horse	Drama Play	Actor
Alice in Wonderland	Being in the Story	Narrator
City, Underwater, Space	Paper Play	Orchestrator
Pirates	Shoe Box Worlds	Demonstrator
The Art Gallery	Puppetry	Facilitator
Words and Letters	Gaming	Co-Constructor

**Data Collection Methods**

Data was collected by the following methods:

- Pupil feedback - voice recorded
- Still photographs
- Video film footage - capturing action and narrative (for reflection)

After each *Pop Up Play* session, the participants were given the opportunity to discuss their thoughts and feelings about their experience. In total 29 focus group interviews were conducted, and documented using a variety of styles and conventions; e.g. voices were recorded and photographs taken of any drawings, diagrams and written notes made.

**Data Analysis Procedure**

Focused analysis of the children’s perspectives was achieved through systematic qualitative thematic examination derived from the source material gathered during each feedback session. The inductive process consisted of combining open and axial coding elements. The early stages of the process formed an open coding strategy through searching the data for emergent categories. The open codes were clustered into themes and refined by axial coding seeking relationships, links and associations between them. Full details of this process and the findings can be found in the full research report <https://www.dora.dmu.ac.uk/handle/2086/10769>.

**Rigour**

The project team sought to maintain quality and trustworthiness in terms of credibility and dependability by triangulating findings. The team upheld protocols and procedures making each stage of the project transparent by sharing weekly insights and findings via a blog. Cross-reference between blogs validated that the data was an accurate and true reflection of the facts and narratives as presented to the researchers.

**III. FINDINGS**

At the core of the design of *Pop Up Play* is a new software innovation which is made up of three main components: visual system, audio system and lighting system, as such the participants found it “amazing”, “fun” and “cool”.

Children were excited and enthused about the possibility of exploring and playing with new technology:

- “We want to explore different stuff – we want more than the everyday basics”
- “Today I felt happy and lucky that we are the only ones in the entire school doing the Pop Up Project”



Figure 1: Multiple components used in live play

This section will present a thematic qualitative analysis of the child-centred experience of mixed reality play using their authentic voices, thus getting to the heart of what is meaningful within the fun, amazing and cool. This process of critically analysing the children’s recorded understandings and perceptions of a mixed reality play experience exposed levels of authentic evaluation, pointing to epistemological appropriate language and areas of interest (i.e. the values our digital natives find in mixed reality play). Engaging the children and young people as active research collaborators, and valuing their perspectives, revealed five broad features of mixed reality play: dimensional embodiment, creating worlds, dramatizing and gaming, agentic action and inside and outside spaces. The purpose of this process was to understand how these foci could provide a framework for future investigations in mixed reality creative play (discussed in detail below in Section 4, Discussion).

**Dimensional Embodiment**

Dimensional embodiment is a term applied to this research to discuss the learner’s phenomenological transformation of the sense of Self (Merleau-Ponty) and Being (Heidegger) within the multiplicity of experience afforded within the mixed reality realms of *Pop Up Play*. It focuses on the incorporation of the sense of self within these realms and acknowledges a non-hierarchical co-operation of being simultaneously situated between the virtual and the real. In gaming theory Gordon Calleja suggests that ‘incorporation operates on a double axis: the player incorporates (in the sense of assimilation or internalization) at the same time as being incorporated (in the sense of corporeal embodiment) through the avatar in that environment’ (Calleja, 2011 p:211) and that the difference between ‘embodying as a state of being’ and ‘embodying as an act’ is a useful way to frame the multitude of experiences within the *Pop Up Play* world. Through this thematic qualitative analysis, children described experiencing mixed reality play across three levels of dimensional embodiment: mirror, connector, and avatar. Mirroring was manifest when children recognized their image as their own when it appeared in the screen. They took time to study their reflections and engaged

themselves by experimenting with different movements, each time examining the image's reaction to action. One child described their mirror image as "a shadow of me" following them wherever they went, and others took pleasure in exploring what it felt like to see themselves in different places:

"I want to see myself, my real self"

"I liked being myself"

"That's me playing on the screen on my own – I was in the war"



Figure 2: Mirror

Connector was recognized by the children as the next level of dimensional embodiment affording them a deeper level of engrossment (Brown & Cairns, 2004 in Farrow & Iacovides, 2014). In this level, digital play was extended by attaching objects, such as a bird or moving fish, to a limb of the player's mixed reality image, thus children saw themselves as interacting with something else, e.g. making the fish swim around the ocean. Children described this mode as "getting attached to things that are actually on the screen and making them move – when you move they move." Children used 'on, in and with' to talk about their connective experiences.

"If you have a sword on the screen someone can hold it and like actually do it" [waves arm around]

"I wanted to be in the bubble"

"I enjoyed playing with the bird"

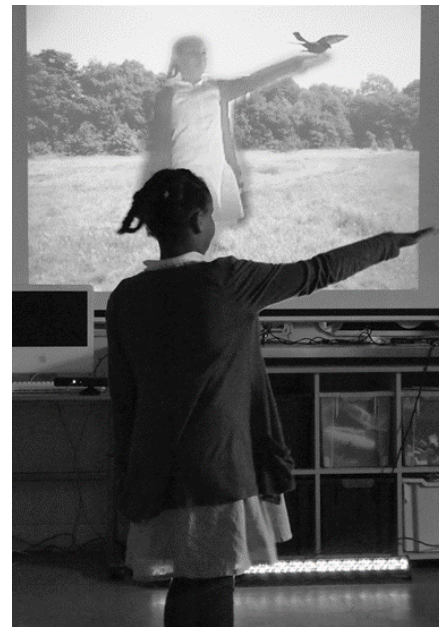


Figure 3: Connector

The final level of dimensional embodiment was found as being an avatar. Children described experiencing "being something different" and "not myself" when deeply immersed in this form of digital play. The *Pop Up Play* technology, complete with full biped puppet controls of skeletons, monsters and animals (utilising the sophisticated Kinect system for full-body tracking) thus gave the children the perception that they had fully disappeared and had become something or someone else in the screen.

"I'm disappeared"

"I felt like I was really a bird, we vanished and it was amazing"

"My favourite bit was when I was the monster because you get to be someone that you have never been before"



Figure 4: Avatar



### Creating Worlds

Throughout thematic qualitative analysis, three strands were found relating to the theme of creating worlds in mixed reality play: unique places and spaces, self-made drawings and models, and realistic media, scenes and sounds. Children told us that they thought *Pop Up Play* means “to be able to pop up wherever you want.” During reflections a broad range of unique places and spaces were discussed by the children and the team made it possible to visit these during the project. Some children talked about the ability to visit family and friends who had moved far away, others said they would like to pop up in well-known landmarks, television studios and computer games, and others wanted to experience what it would be like to be able to visit places in their community on their own. The young people also discussed the future possibility of creating telematics engagement to enable collaboration across locations.

“I’d go to my brother’s house down in Bournemouth coz I ain’t seen him in ages”

“Iconic...like you know this place, a lot of people know this place but hardly anyone gets the opportunity to step foot inside this place”

“To the bus stop”

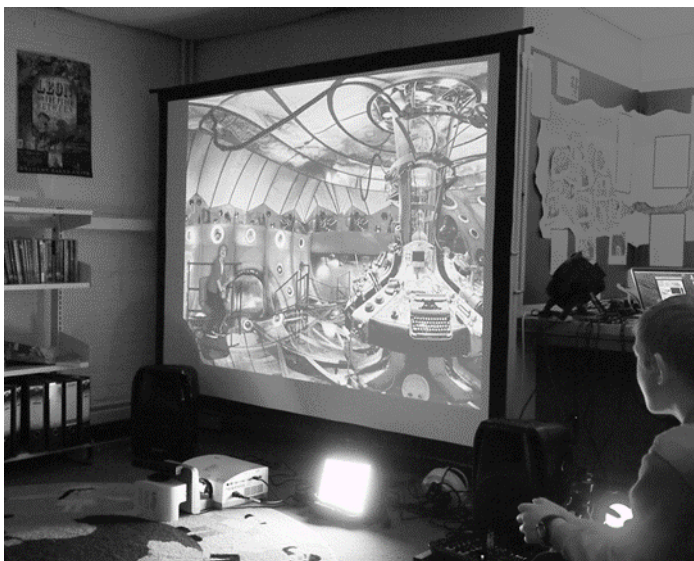


Figure 5: Inside the TARDIS

Creating worlds using self-made drawings and models was very popular with the children and widely discussed as a powerful tool for encouraging freedom of expression. However, some children said that they preferred working with just a white screen so that they could “add stuff into it” and imagine what they could put into their new worlds. Being inside self-created imagery featured strongly throughout the project as children thought of new ways to innovate with the technology and use it to explore their own creations.

“In my picture it’s all 2-D and flat, I would like to be in a space where everything was 3-D”

“I like the bit where we made the sculptures, seeing it in the screen, I pushed it forward and it came out of the white and appeared”

“I like doing this [making Lego]. You can build stuff. If you made a ship or a vessel you could place it on that thing [the web cam] then you could put yourself on it like you are actually on the boat”



Figure 6: Sculpture making

The realistic media, scenes and sounds loaded into the *Pop Up Play* system was featured as a key element of mixed reality play for the children in this project. Many children talked about the ways in which different scenes gave them ideas about their actions and behaviours and how they could construct the different visual and auditory elements to create their own games and theatre backdrops that enabled them to have an authentic experience.

“I liked the battle, the lamp and the sirens”

“I felt happy today because when we were on the board we got a bird and a horse with the sound effects. I liked the horse and tweeting sounds, it was like there was a real horse and a real bird”

“I found it interesting and a lot more fun because you can set the scene”



Figure 7: Experiencing the First World War with sirens and gunfire

### Dramatizing and Gaming

When reflecting with the children about the uses of mixed reality play, all discussions included elements of interactivity – i.e. what can be done with the technology. One girl reported: “it’s helping you with your creative mind and making it expand to a whole other level.” Interestingly ‘uses’ seemed to be split between dramatizing (persona and narrative exploration) and gaming (defining and making rules). The physical and social nature of play was woven between both of these themes, with some children reporting “you have to pull together.” The use of drama in *Pop Up Play* is seen as promoting narrative, language, and encouraging enthusiastic readers of literature. The children elaborated on this adding in the elements of imaginative and dramatic story-telling and went further to suggest that they would like to use *Pop Up Play* to make their own creative products.

“We should make our own videos, like Frozen”

“I like being on the boat, the big boat, there was storm, rain, all the water was going on the boat and I got wet!”

“I’m gonna do like get puppets with the monster, it will be funny. Like hey do you want to get married [told in a high voice] I’m going to kill you [told in a scary voice]”



Figure 8: Acting as pirates

In *Pop Up Play* a sense of gaming was manifest due to the technical hardware employed and the interactivity of screen and self. As such, the facilitators encouraged children to think about goals, rules, levels of participation and feedback. This built on work by McGonigal (2011) who discusses these as the defining traits of a game. The children in this project also said that for them it included excitement, skill and reward.

“I like N and J...when he went under his arm and looked sideways from there and it worked I pushed him away and got him, I like working with someone”

“I loved it when we were in the maze, the firewall; it made me feel like argh!”

“An animated background is impressive so that you can interact with it, so if you went like this [moves arm] and hit a balloon it would then pop”

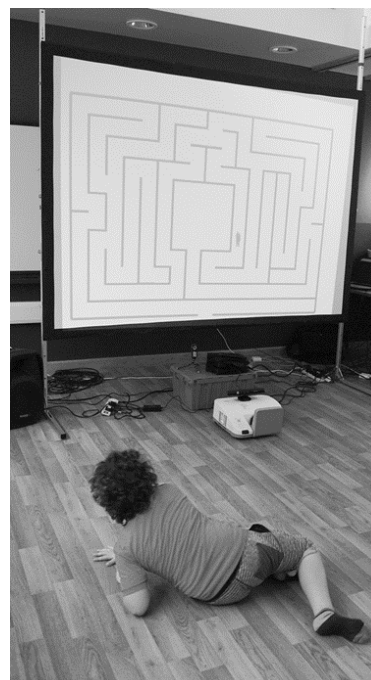


Figure 9: Playing the maze game



### Agentic Action

Several themes relating to agentic action were embedded in the data from the thematic qualitative analysis. Agentic action refers to the individual making decisions in order to engage within the collective social structure, in *Pop Up Play* this is through the use of technology. Within *Pop Up Play* there is a degree of reflexivity constantly evolving between the individual and the collective and the children used the technology to carry out their agentic actions by exercising their control of the system, scale and animation. Children talked about the power of play through using the technology, and commented on the ‘use-ability’ of the system and in particular the ease of use of the iPad and the freedom that they felt they had been afforded in the project to explore its capabilities rather than being instructionally told what to do.

“I like controlling it”

“Simple to understand, hard to master”

“It’s like with these things you usually have to have someone there explaining it to you, whereas with this you can just explore and do it”

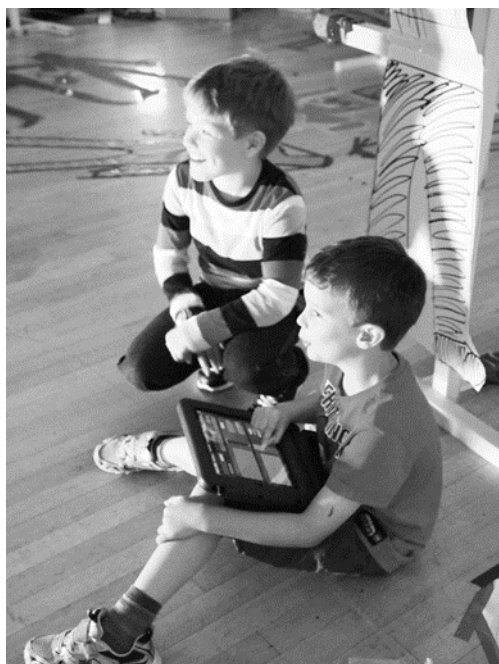


Figure 10: Controlling the iPad

Scale was reported by the children as a particularly strong aspect of *Pop Up Play*, and manipulating and controlling objects. For example, being able to control size and objects on the iPad - making their-selves bigger and smaller, or manipulating what their friends were seeing and experiencing when they were playing.

“You get eaten by a fish and the person with the tablet makes you so small it looks like you have been eaten by the fish”

“There is a tablet, then someone stands there and they can move left and right, but the person with the tablet can also move them around and change their size”

“All the pictures, I liked messing it around and making the rainstorms and making you teeny so you drown, drown in a puddle!”



Figure 11: Scaling down size

Children articulated their fascination about the live, moving visual elements in *Pop Up Play*, especially flying and animation. All of the children who participated in the project reported that these were new and exciting elements of digital play.

“I liked it when things were moving and it wasn’t just standing still”

“I liked flying because it’s not normally something you do everyday”

“I think the best thing is how we manipulated it so that I could be the animation”

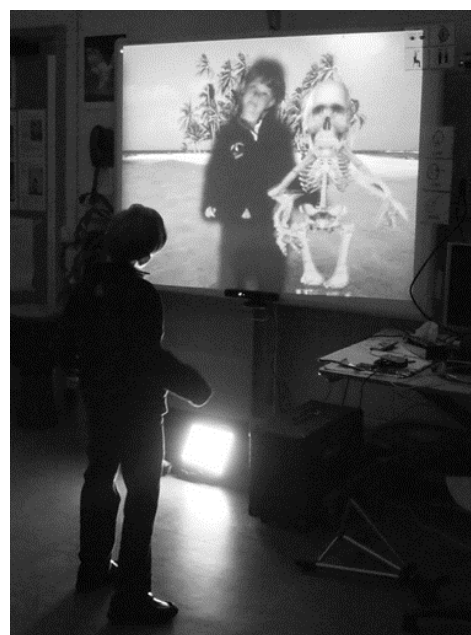


Figure 12: Moving a biped puppet

### Inside and Outside Spaces

The children and young people that participated in this project grasped the concept of mixing realities with ease describing these as inside and outside spaces. They had a real sense of when they were immersed in the thick of the action and enjoyed combining ‘real’ and digital elements, using props, dressing up, or taking part in a sensory experience, e.g. tasting limes, anchovies and ship biscuits in a dockyard scene whilst seagulls screeched overhead. One boy came up with an idea for going into and out of the system:

“Reality when we switch it off and deality [sic] when we switch it on”

“I got to play with the iPad and make different creatures, different, sizes and different sounds. I thought that it was really good and fun because it can make you go out of reality and then you can just go back into reality whenever you want”

“We are outside but we are not actually outside, we are inside, it made me feel a bit weird at first”

Children also talked about *Pop Up Play* in class and at home. Some brought objects and ideas from ‘outside’ into the sessions, thus there was always a sense of inside and outside fluidity.

“I liked drawing the pictures outside and then making them go on the screen”

“I liked it when you got the item from the bag and you went into the screen and played with the item it was really fun”

“I want to do like when we go outside we have a pirate ship that we could go in. Yeah coz we are pirates in here and we got a pirate ship outside”

from a Child’s Perspective

The findings presented in this visual representation demonstrate that mixed reality *Pop Up Play* from a child’s perspective manifests as a combination of overlapping elements. Found to be at the core was dimensional embodiment which held together the inter-relationships between the five broad features of mixed reality play. The fluid dynamics reflect a nature of play which affords multiple possibilities framed by inside and outside spaces.

### IV. DISCUSSION

One of the most exciting outcomes of this period of investigation was the theoretical solutions the participants offered when they discussed their incorporation into the mixed reality world. Of course, these were not based on rigorously challenged discourse and evidence, but do offer an insight into the deep and meaningful workings of their minds, and their rationalisation of where, and how, they perceived their *Self* and *Being* whilst playing in *Pop Up Play*. Interestingly, the findings presented in 3.1 (above) have much in common with technophenomenological philosophy, especially the writings of Don Ihde, and address the heart of this philosophy that Amelia Jones discussed as the ‘metaphysical transcendence of mind-expanding machines’ (Jones, 1998 p:205). This was particularly prevalent during the in-action play where our participants were recorded saying:

“Bring her back!”

“Put me normal!”

“I don’t want to be eaten by the fish!”

“Put me back in my skin!”

If we correlate the reflections of the learners with Don Ihde’s argument that ‘when we humans use technology, both what the technology “is” or may be, and we, as users undergo an embodying process – we invent technologies, but they “reinvent” us as well’ (Ihde, 2007 p:243). Furthermore, taking into account Gallagher’s description of ‘embodiment as the ‘property of our engagement with the world that allows us to make it meaningful’ it is possible to consider that these participants understood mixed reality technophenomenal immersion as when ‘the lived body is “in tune” with the environment’ (Shaun Gallagher, 2004 p:277). Therefore, extending the thematic qualitative analysis of the child-centred play-experience, a taxonomy of mixed reality experience may look like this:

- Mirror Perception Stage: “I see myself, over there, now”
- Surrogacy Perception Stage: “That is me, over there, now”
- Hyper (Dimensional) Perception Stage: “I am this, here, now”
- Techno-phenomenological Being (after Amelia Jones): “This is me, here, now”

This, of course, needs further investigation and expansion especially if we are going to correlate this with further theory from gaming immersion, such as ‘how, indeed, does one *suspend* disbelief when one is so *extended*, physically as well as affectively and imaginatively, into a game?’ (Callija, p:181). One solution is offered by Callija’s taxonomy of dimensions with

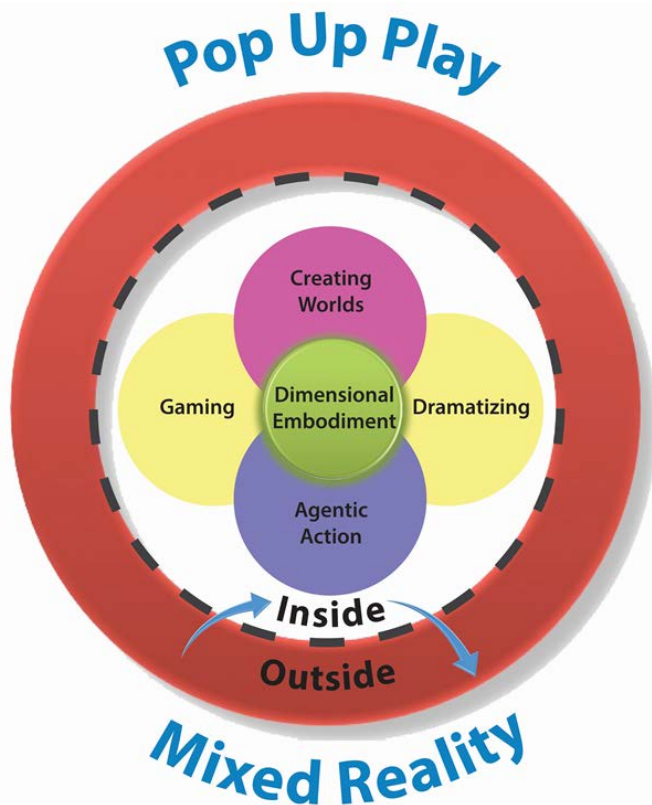


Figure 13: Visual Representation of Mixed Reality *Pop Up Play*

which to consider narrative/experiential trajectories through gaming, as it appears to be a perfectly suited solution to track mixed reality play over time, and traversing dimensional embodiment (discussed above in Section 3).

**Kinesthetic** - all modes of avatar/media control including the foreground and background images. **Spatial** - spatial control, navigation, and engagement; how the process is internalized and perceived and then represented in the mixed reality. **Shared** - player awareness, relationships and interaction with other agents (human, embodied avatar and background texture). **Narrative** - engagement with the stories written into the game and those that emerge from the player’s interaction. **Affective** - emotional engagement and development, understanding and rationalizing. **Ludic** - engagement with the choices that are in the game; the game design and mechanics and their ethical/moral perceptions (Calleja, 2011).

As reported by the children and young people in this project, the physical and social nature of play was woven between the main themes highlighted during discussions of the potential uses of *Pop Up Play*. Some children were noted as saying “you have to pull together.” In live-action play children also said:

“Can we get more than one person in and see what it looks like?”

“My group has good ideas”

“We need more people to make a wall of fuzz! Can we make a chain?!”

“I want to work with Boy B”

Taking part in shared experiences in *Pop Up Play* affords children the opportunity to operate as a team, some with pens, others with cameras. Children pose questions and offer solutions to problems. Through co-operative and collaborative endeavours they develop ideas and progress explorative learning and reflection (see Vear & McConnon, 2015 forthcoming). Vear and McConnon also dispel the myth that digital play is not simply using a computer screen and a keyboard. *Pop Up Play* affords its users an opportunity to visit unique places and engage in a wide variety of roles and activities. Throughout the project Vear and McConnon took a very broad view of the roles and activities manifest when children engaged in *Pop Up Play*, and grouped those together through an inductive and deductive process (see Table 4).

**Table 4: Roles within mixed reality play Vear & McConnon (2015 forthcoming)**

Player	Constructor	Observer Silent & Vocal	Technologist
Play Director	Music Maker	Describer	Technologist-
Visual Director	Sound Maker	Distant -	Assistant
Performer	Puppeteer	Director	Technologist -
Actor	Visual Artist	Visual - Director	Observer Camera - Controllor

Children’s in-action play quotes when ‘in role’ were recorded:

“Can I be the technologist and the player at the same time?”

[Player]

“We are going to put some sound effects on!” [Constructor]

“He’s moving the shark, but playing hide and seek” [Observer - describer]

“Copy me!” [Observer - visual director]

“I made you teeny!” [Technologist]

Vear and McConnon (2015 forthcoming) reflected on the manifestation of roles, noting that communications opportunities were present throughout. Through repeated testing it became evident that there were dual roles and mixed reality entry points, thus the taxonomy of roles was clustered into zones of activity: playing, constructing, observing and technologizing. Furthermore, as an extension of the inside-outside inter-relationship (discussed above) it is important to note that Calleja (2011) similarly refers to macro and micro engagements within game engagement as an essential perspective. Calleja, discusses the inside experience of play (micro) as the ‘broader motivations that attract players to games to the moment-to-moment engagement of game-play’ (Calleja, 2011 p:40). And outside (macro) as the ‘factors that shape the player’s opinion and disposition toward the game that derive from thoughts, plans, feelings, and expectations both prior to and following the game experience’ (Calleja, 2011:39). With this in mind Vear and McConnon related this to mixed reality play as ‘the macro world of looking in; a liminal world of transition into the particular zones; and a fluidity of individual engagement in and out and between each one of them’ (Vear & McConnon, 2015 forthcoming). *Pop Up Play* therefore affords the opportunity for every participant’s learning journey to be uniquely different.

## V. CONCLUSION

This article examines how children and young people conceptualize mixed reality *Pop Up Play*; what aspects of this type of play are important to them, and how this offers possibilities in guiding their play-activities. Through the adopted lens of children’s reflective engagement this work seeks to contribute to a view of mixed reality play as a manifestation of a combination of overlapping elements with dimensional embodiment at its core. The fluid dynamics reflect a nature of play which affords multiple possibilities framed by inside and outside spaces where a wide variety of places, roles and activities are experienced. According to Jung and Jin (2014) ‘although studies have shown a close link between play in young children and children’s learning in social skills, school adjustment, and language learning (Bodrova & Leong, 2003; Bredekamp & Copple, 2009), practicing and future teachers may feel uncertain about applying play in early childhood programs because of the increased demand for accountability and prescribed curriculum in today’s educational settings.’ The challenge faced by many teachers and practitioners is to move away from traditional adult definitions of play and understand play from the child’s perspective (McInnes, et al., 2013). This article demonstrates the importance of understanding mixed reality play from a child’s perspective and is documented to offer new technological

opportunities and transformations of pedagogic practice. *Pop Up Play* allows teachers, librarians, or arts practitioners to re-imagine their learning offer, creating packages to support learning, reader development, live performance or an art exhibition (Al-Salloum, et al., 2015). The assembling and disassembling of cultural products re-positions the teacher and student as co-directors and co-editors of their social world (McWilliam, 2010). Through the use of digital media this enables changing the pedagogical focus from the teacher to the learner. Hall & Higgins (2005) quote 'Sousa (2001) and Walker-Tileston (2004) [who] point out that children of the 21st century have been part of a multi-media world from birth and as a result they are comfortable with such technologies and this experience can be exploited in the learning environment.' *Pop Up Play* therefore advocates for a shift away from traditional roles in the classroom and is a landmark contribution to education futures.

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#### AUTHORS

**First Author** – Dr. Linda McConnon Ph.D, De Montfort University, [linda.mcconnon@btinternet.com](mailto:linda.mcconnon@btinternet.com)

**Second Author** – Dr. Craig Vear PhD, De Montfort University, [cvear@dmu.ac.uk](mailto:cvear@dmu.ac.uk)

**Correspondence Author** – Dr. Linda McConnon Ph.D, De Montfort University, [linda.mcconnon@btinternet.com](mailto:linda.mcconnon@btinternet.com)

# Forest Sub Regions of the world and Population: Prioritization of Forest Sub Regions of the World (1990-2020)

Narender Kumar

Rollta India Ltd, Senior Executive, 160101, Chandigarh

**Abstract-** In general the relationship of human being with natural resources is not in good health. The forest as it is enviable natural resources also suffers in relationship. Forests on the mercy of human being therefore the study have been taken to conclude the forest and population relationship. The study is carried out for forest sub regions and their prioritization for further planning and management.

**Index Terms-** forest cover, population, rural population.

## I. INTRODUCTION

From few centuries human societies are exploiting the natural resources for socio-economic purpose. Forest as a natural resource has always been used and exploited by human societies at large.

Therefore, the survival without forest is merely a dream for human civilization. But in recent time decline in forest area is devastating the lively-hood of millions of people who are heavily dependent on forest and on forest resources directly or indirectly.

Despite human efforts, global forest has declined by 30 percent while 20 percent degraded for the period 2000 to 2010 ([WRI research](http://www.wri.org)) [1]. With the fact of declining and degraded global forest cover, one billion people globally depend on forests for their livelihoods as on dated 2010 (<http://www.wri.org/our-work/topics/forests>) [2]. Along with above facts, in 2010, 60 percent of global forest cover lies in 7 Countries ((Russia, Brazil, Canada, the United States, China, Indonesia, and the Democratic Republic of Congo (formerly Zaire) (<http://www.globalchange.umich.edu>) [3]. From 2000 the annual average net loss has reached to 5.2 million hectare globally (FAO, 2010b) [4].

As the above facts and facets indicate importance of forest and their condition at present, it is necessary to make an effort to visualize the facts which are affecting forest. Therefore, the study is an attempt to present facts in understanding the relationship of forest area and population aspects. This may help to find out the gaps in forest change and impact of population as factor. Therefore study may help in generating some valuable figures to adhere some polices and suggestions.

### i. Study Area

The World has been taken as study area. Further the World has been divided into 6 regions and 12 sub-regions (<http://foris.fao.org>) [7]. The administrative boundaries which were not taken for study due to no data value for any time period

excluded from the study. Another exception made for the forest sub region the Antarctica which is not viable or forest and population growth and is with much land area. Due to these facts the Antarctica forest sub region seems to contribute more to the total land area, rather than other factors considered for study.

## II. OBJECTIVES:

In the light of above given explanations for study below given objectives have been considered:

To evaluate the decade wise forest status at global scale.

To find out the relationship between forest area and population dynamic at forest sub region of the world.

To find out priority forest regions and forest sub region for action and policy making.

## III. METHODOLOGY:

The entire approach of the study is based on secondary data. The source of data is taken from World Bank website (<http://api.worldbank.org>) [5]. The data have been filtered as per the objectives of the research paper for a period of 1990-2020. The mapping and integration of tabular data with spatial world vector map (<http://thematicmapping.org>) [6] have been done in Arc Map version 9.2, GIS software. After that the data have been analyze and synthesize for different aspects such as InDIp, DIPr, and PD with projected values for 2020.

To make study remains unbiased therefore the data of administrative boundaries which does not have data for any decade are excluded from the study [Appendix 1]. The data for forest sub region the Antarctica also have been excluded from the study as it has merely share of world forest and population.

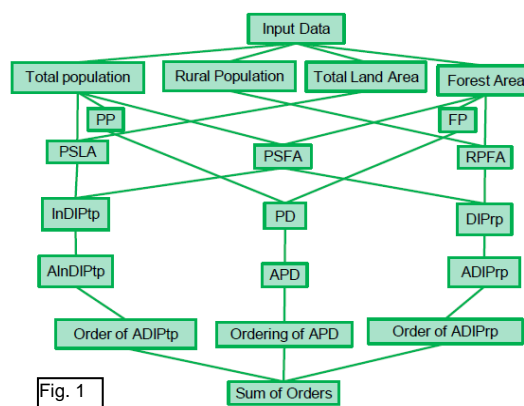


Fig. 1

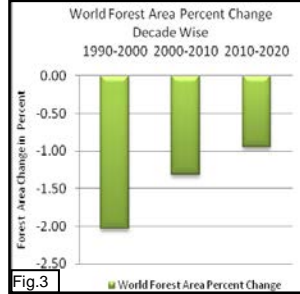
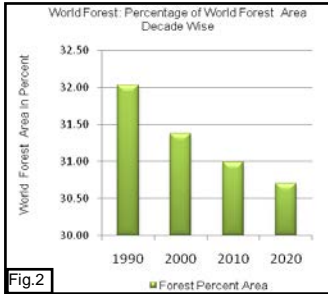


IV. RESULTS

i. World Forest

The area under forest in the world is changing and declining rapidly. In 1990 it was 32.03 percent forest area which would be 30.70 percent in 2020 [Fig. 2]. Therefore a sharp decline of 1.33 percent would be from 1990 to 2020 [Fig.3] and is matter of much concern.

The decline in forest area in 1990-2000 was 2.03 whereas it was 1.31 percent in 2000-2010 and it would be .95 for the period 2010-2020 [Fig 3]. The percent in decline shows the decline is coming down but it seems to too far from gain in forest area at global scale.



ii. World Forest Area and Population

It is well known fact that population dynamics in number affects forests as the forests are taken by human being as resources.

From 1990 to 2010 a similar trend was in spread of population on forest area and land area but in 2020 in would seem to be change as world population shows change in per square km spread of population [Fig.4]. In 1990 the ratio of population on forest per sq km and population on total land area was 1:3.15 which would be 1:3.20 in 2020. The rise in ratio indicates rise in population and decline in forest area. At global level the growing gap of both is an indicator of more pressure on forest area in near future

To precisely measure the relationship of population and forest area DIPrp (Differentiate Index of Rural Population) have been developed for Rural Population and InDItp (Differentiate Index of Total Population) for Total Population. The value near to 1 indicate more rural population spread on forest area whereas far value shows lesser spread of rural population on forest area. For InDItp near to value 1 is considered as more suitable condition for forest and far values to 1 has been taken as unfavorable condition for forest.

The below given DIPs have been calculated:

*InDItp = The InDIP is a result of Population Spread on Total Area (PSLA) to the Population Spread on Forest Area (PSFA).*

$$InDItp = \frac{Population\ Spread\ on\ Total\ Land\ Area\ (PSLA)}{Population\ Spread\ on\ Forest\ Area\ (PSFA)} * 100$$

Where <sup>1</sup> PSLA= Total Population/ Total Land Area and <sup>2</sup> PSFA= Total Population/ Total Forest Area

Same Index also been applied for Rural Population Spread on Forest Land to the Total Population Spread on Forest Land and it defined as:

*DIPrp = The DIP is a result of Population Spread on Total Forest Area (PSFA) to the Rural Population Spread on Forest Area (RPSF).*

$$DIPrp = \frac{Population\ Spread\ on\ Forest\ Area\ (PSFA)}{Rural\ Population\ Spread\ on\ Forest\ Area\ (RPSF)} * 100$$

Where <sup>1</sup> PSFA= Total Population/ Total Forest Area and <sup>2</sup> RPSF= Total Rural Population/ Total Forest Area

Then Average for InDItp and DIPrp for the period 1990-2020 have been calculated and termed as *AInDItp* and *ADIPrp*.

*AInDItp = Total of InDIP for a point of periods 1990-2020/(number of points of periods)*

*ADIPrp = Total of InDIP for a point of periods 1990-2020/(number of points of periods)*

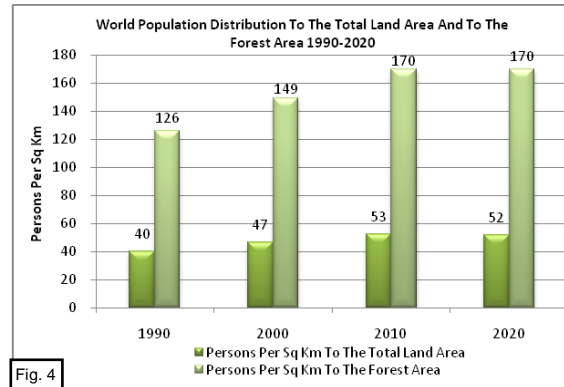


Fig. 4

a. World Forest Area and Total Population

In respect to the total population, in 1990, InDItp (Inverse Differentiate Index of Total Population) was 0.320 whereas in 2020 it would be 0.307 [Fig. 5]. But in 2020 it would not be a tremendous change in pattern of the population spread on forest area and on land area in the world. In 1990 the condition of forest area was in favor besides to other time period.

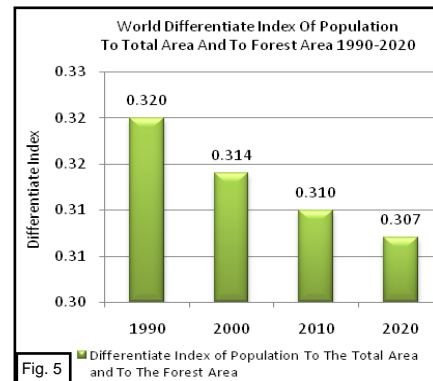


Fig. 5

b. World Forest Area and Rural Population

The DIPrp (Differentiate Index of Rural Population) shows the gap between spread of total population to the forest area and rural population to the forest area. The values for world statistics far from 0 and starts from 0.5 or near to 0.5 shows more rural population proportion in population structure and hence more pressure and spread on forest land. It indicates forests are on edge of rural population [Fig. 6]. From 1990 to 2010 the differences seems to be reducing but after 2010 (0.486) it would

seems be again (0.503) in 2020 [Fig 6] as an indication of rise in rural population in the world.

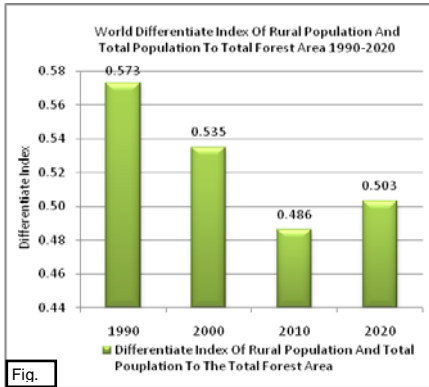


Fig. 6

### iii. World Forest Sub Regions and Population

#### a. World Forest Sub-Region and Total Population

As it is clear from the world statistics that the InDIPTp (Inverse Differentiate Index of Total Population) has decreasing trends means adverse effect on forest area. At a glance of forest sub regions, the sub regions varies in InDIPTp from 0.536 (South America) to 0.038 (Western and Central Asia) in 1990. It would be remain as a trend for 2020 as 0.490 and 0.040 respectively. Excluding East Asia with InDIPTp 0.17 in 1990 to moving to 0.24 in 2020 other forest sub regions are either has constant value or moving far from value 1. The most decreasing value for sub region is Central America which had 0.51 in 1990 and was 0.43 in 2010. It may follow the similar trend with 0.34 in 2020 [Fig. 7]. The same trends are also confirmed by the values for AInDIP [Fig. 12].

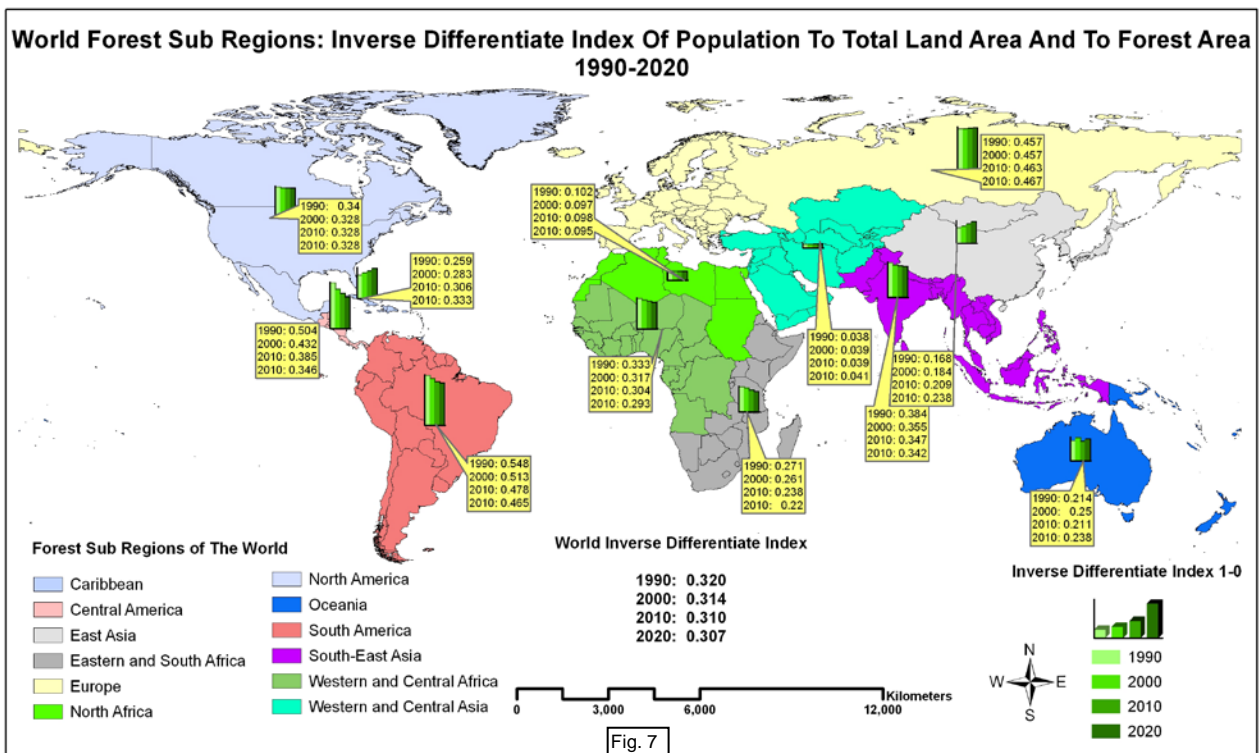


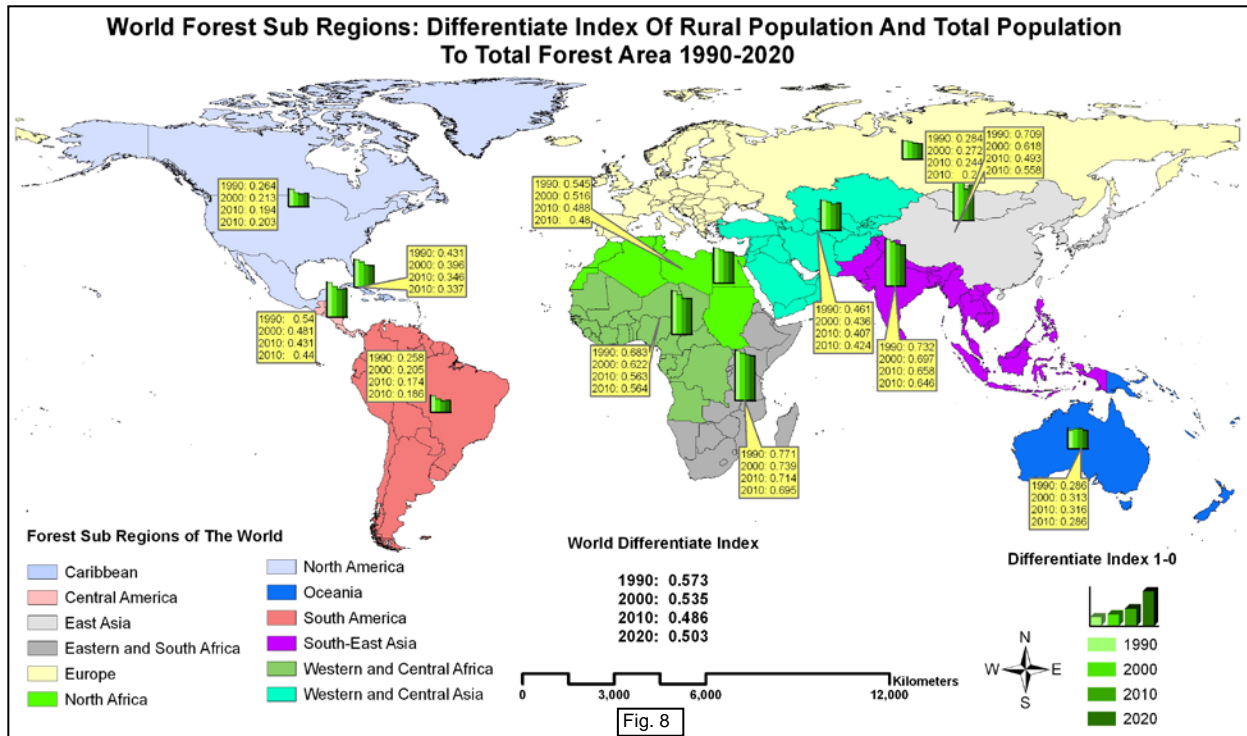
Fig. 7

#### b. World Forest Sub-Region and Rural Population

The forest sub region North America has lowest rural population impact on forest with value of 0.26 in 1990 which would be 0.20 in 2020. The DIPRp indicates ¼ of total population was rural population in 1990 and in 2020 it would be 1/5 which is matter of much concern at global scale [Fig.8]. Whereas, most affecting sub region is Eastern and South Africa which had 0.77 DIPRp in

1990 which was approximate triple to the North America Europe and North America stands on 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> position from top, whereas from the bottom, Eastern and South Africa stands on 1<sup>st</sup>, South, East Asia, and East Asia stands 2<sup>nd</sup> position [Fig.8]. In support of InDIPTp and DIPRp, another effort have been made to evaluate the situation or relationship of forest and population by using resultant which is based on percent difference in forest to the population from the world total.





The Percent Difference is outcome of:

$$PD = \text{Forest Percent} - \text{Population Percent}^{**}$$

$$*\text{Forest Percent} = \frac{\text{Forest Area of Sub Region}}{\text{Forest Area of World}} * 100$$

$$**\text{Population Percent} = \frac{\text{Population of Sub Region}}{\text{Population of World}} * 100$$

After that average for 1990 to 2020 have been calculated as mentioned below:

Average of PD (APD) for the period 1990-2020,

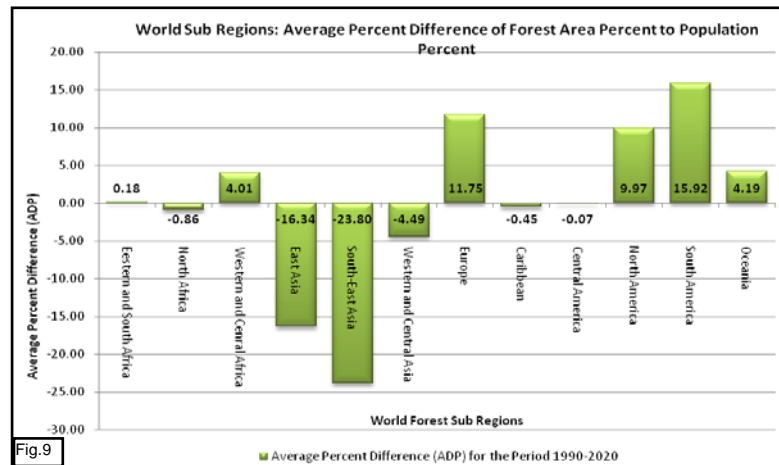
$$APD = \frac{\text{Total of PD}}{\text{number of points of periods}}$$

The two sub-regions South-East Asia, East Asia which makes 15.27 percent area of the world has 53.20 percent of population in 1990 and would be 52.99 percent in 2020 of world population and had 12.42 percent forest area in 1990 which would be 14.04 percent in 2020 [Fig.9]. Both the sub regions from 1990 to 2020 come in PD (Percent Difference) between -40.78 to -38.96 respectively [Fig.9]. Both the regions shows increase in population percent and decrease in forest percent and both stood high with -ve APD of -40.14 for the period of 1990-2020 [Fig. 10]. In contrast to the above, the three sub regions, Europe, North America and South America, has 46.42 percent of total world area and has 27.99 percent population in 1990 and would be 24.66 percent in 2020. These three forest sub regions shares 63.11 percent forest area in 1990 and would have share 63.56 percent forest area of the world in 2020 [Fig. 9].

These three regions shows increase in forest percent with increase in population percent and in fact these three sub regions stood high with positive APD of 37.64 for 1990-2020 [Fig. 9].

On the basis of ADP, the ADP for the period of 1990-2020 varies between -23.80 percent in 2020 to the 15.92 percent in 1990. Out of 12 forest sub regions, 6 sub regions has -ve values (-0.08 to -23.80) whereas 6 regions has +ve values (0.18 to 15.92) [Fig. 9].

The South East Asia sub region stands low with -23.80 APD and East Asia follows the previous with -16.34 APD for the period 1990-2020 but the trends are bitter for the region Asia as its third forest sub region Western and Central Asia trailing the both forest sub regions (South East Asia, and East Asia) with -4.49 [Fig. 10]. The three Forest Sub Regions of Forest Region are making Asia as forest region more sever in population spread and in lesser forest area. Whereas, Forest Region Africa is on second to forest region Asia but it also has some positive APD in Western and Central Africa (4.01 APD) [Fig. 9].



The other aspect of forest sub region /forest region South America has 15.92 APD which is much higher than else. The forest sub region /forest region Europe with 11.75 APD stands second from the top order. Besides, these trends the forest region North Central America differs in trends for in its forest sub regions, excluding North America with 9.97 other two sub

regions has -ve values i.e. -0.45 and -0.07 for Caribbean and Central America respectively [Fig. 9].

The 6 forest sub regions of the world which has -ve ADP value comprises of 30.58 percent of total land area of the world and 62.75 percent total population of the world. On other hand the forest sub regions which comes with +ve ADP shares 69.42 the world land area and 37.24 of world total population.

The above indicates that 1/3 land area of the world supports 1/6 of the population and hence have forest sub regions with -ve ADP and on the other hand forest sub region with +ve ADP has 1/7 land area of the world supports ¼ of the world population. Therefore, a relationship has come out with the help of ADP.

### V. CONCLUSIONS

At forest regions, South America and North Central America comes on the first and second position. In contrary to it Asia stands to last [Fig.10]. But for Africa as it is ahead to Oceania is sign of relief. But as the gap between first (6) and last (10) position is almost double is matter of concern at global level and shows imbalances in world forest distribution, total population distribution and rural population distribution [Fig. 10].

**Fig. 10. World Forest Regions: Ordering of ADP, InDIptp and DIPrp for the period of 1990-2020**

Forest Region	ADP 1990-2020	Order ADP	Average InDIptp 1990-2020	Order InDIptp	Average DIPrp 1990-2020	Order DIPrp	Sum of Orders 1990-2020
South America	15.92	1	0.50	4	0.20	1	6
North Central America	9.45	3	1.05	1	1.08	4	8
Europe	11.75	2	0.46	5	0.26	2	9
Africa	3.33	5	0.67	2	1.85	6	13
Oceania	4.18	4	0.23	6	0.30	3	13
Asia	-44.63	6	0.60	3	1.72	5	14

To come to a conclusion, ordering of the forest sub-region were been carried out to find out which forest sub region has favorable figures in respect to the world totals and to their own totals. In carrying out the ordering the number 1 to 12 have been given to all sub regions as per ascending numbers, excluding AInDIptp which has descending numbering. After that total of order numbers given for ADP, AInDIptp and ADIPrp have been summed up. The emerging fact indicates that South America with total of 3 comes on first place which has topmost favorable population and forest relationship. The forest region/sub region,

Europe with total of 7 and North America with total of 10 are following the South America but with wide gap of double to triple difference of totals from South America. These three forest sub regions have most favorable condition for forest in case of forest area, total population, and rural population.

In a sharp contrast to South America, Europe and North America the forest sub regions East Asia, North Africa and Western and Central Africa stated their position 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> from bottom with totals of 30, 28, and 28 respectively [Fig.11].

**Fig. 11. World Forest Sub Regions: Ordering of ADP, InDIptp and DIPrp for the period of 1990-2020**

Forest Region	Forest Sub Region	ADP (1990-2020)	Order ADP (1990-2020)	AInDiptp (1990-2020)	Order InDiptp	ADIPrp (1990-2020)	Order DI Prp	Sum of Orders
South America	South America	15.92	1	0.50	1	0.20	1	3
Europe	Europe	11.75	2	0.46	2	0.26	3	7
North Central America	North America	9.97	3	0.33	5	0.22	2	10
Oceania	Oceania	4.18	4	0.23	9	0.30	4	17
North Central America	Central America	-0.08	7	0.42	3	0.47	7	17
North Central America	Caribbean	-0.45	8	0.30	7	0.39	5	20
Africa	Western and Central Africa	4.01	5	0.32	6	0.61	10	21
Africa	Eastern and South Africa	0.18	6	0.25	8	0.73	12	26
Asia	South-East Asia	-23.80	12	0.36	4	0.69	11	27
Asia	Western and Central Asia	-4.49	10	0.04	12	0.43	6	28
Africa	North Africa	-0.86	9	0.10	11	0.51	8	28
Asia	East Asia	-16.34	11	0.20	10	0.60	9	30

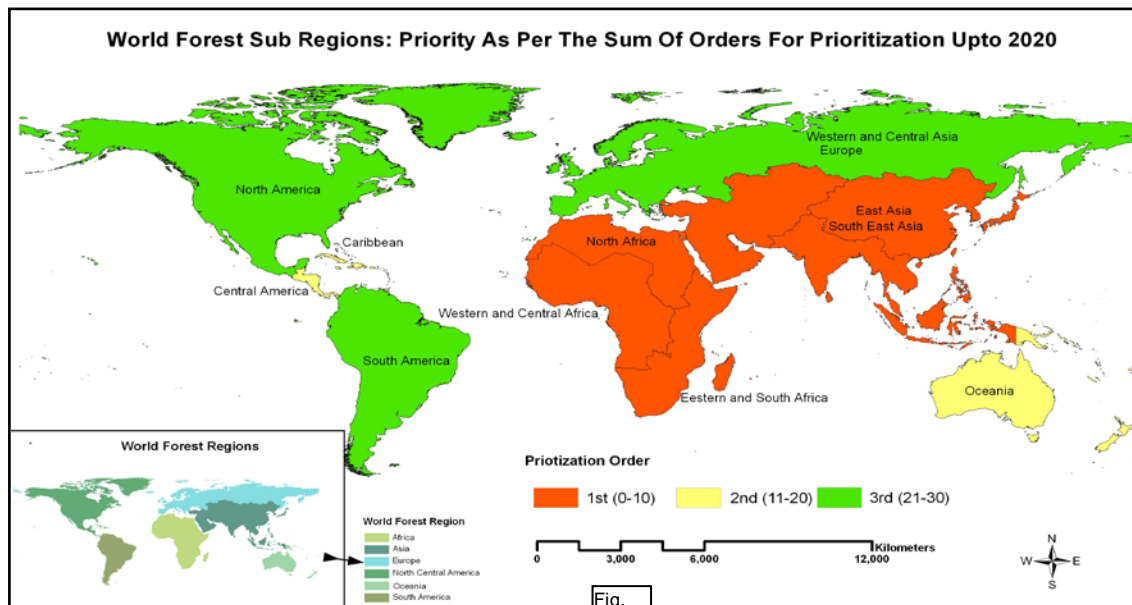
The top 1<sup>st</sup> and bottom 1<sup>st</sup> has 10 times difference in total of orders. The study clearly indicate sub regions of Asia and Africa starts from the bottom and reaches to half, any sub region from fails to make any position among top five even. Therefore, these regions come with more total population or more percent of rural population and with less forest area as the total of order values indicates.

The above facts indicates imbalance in forest area and distribution of total population and rural population. The rural population which is taken as directly dependent on forest might be the matter of much concern in forest management.

Further as per the results, the forest sub regions of the world have been categories in three categories which is based on sum of orders. Therefore, priority sub regions for policy making and for taking action are on the list. As the indicators indicate East Asia, North Africa, Western and Central Asia, South East

Asia, Eastern and South Africa, Western and Central Africa respectively can be selected for any action and policy implementation [Fig.11]. To define the priority pattern of the forest of the world, the all forest sub regions have been categories in three categories [Fig.12]. The pattern indicates the need to starts from Africa and Asia forest regions. The more over the concern able is the coming of Oceania at 2<sup>nd</sup> place in priority. Therefore, in terms of area, 36.72 percent of the land area of the world needs immediate concern for forest. The world has 7.10 percent land area as 2<sup>nd</sup> priority regions. Whereas, 56.18 percent land area of the world showing good indication as it comes in 3<sup>rd</sup> priority.

Summing up, the population is determining the forest area of the world and it need immediate control over population of the world which will be in favor of the world along with the management, and protection of forest area



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AUTHORS

**First Author** – Narender Kumar, \*Rolta India Ltd, Senior Executive, 160101, Chandigarh.

Annexure1

Sr. No.	Country Name	Forest Sub Regions	Land Area 2010
1	Belgium	Europe	30280.00
2	Luxembourg	Europe	2590.00
3	Marshall Island	Oceania	180.00
4	Northern Maria	Oceania	460.00
5	Palau	Oceania	460.00
6	Curacao	North Central America	444.00
7	Sint. Maarten (Dutch)	North Central America	34.00
8	Saint. Martin (French)	North Central America	54.00
9	Hong Kong SAR	East Asia	1042.00
11	Monaco	Europe	2.00
12	San Marino	Europe	60.00
13	Kosovo	Europe	10887.00
14	Qatar	Western and Central Asia	11590.00
15	Bermuda	North Central America	50.00
16	Cayman Islands	North Central America	240.00
17	Macao SAR, Chi	East Asia	28.00
18	Singapore	South East Asia	700.00
	<b>World Total</b>		<b>59101.00</b>

	<b>World Percent</b>		<b>0.05</b>
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**List of abbreviations:**

*APD: Average of PD*

*ADIPrp : Average of DIPtp*

*AInDIPtp: Average of InDIPtp*

*DIPrp : Differentiate Index of Population (Rural population)*

*InDIPrp: Inverse Differentiate Index of Population (Total population)*

*PD: Ppercent difference*

*PSFA: Population Spread on Forest Area*

*PSLA: Population Spread on Total Land Area*

# Contraceptive Technology and Human Development

Aena Goel\*, Avadh Singhal\*\*

\* Social Science, Indian Institute of Technology, Delhi

**Abstract-** This paper discusses the impact of Contraceptive Technology on human development. It starts with establishing contraceptives as technology and then evolution of the technology and role of various actors and institutional policies is discussed. The role of market force driven diffusion and various social and technical barriers that affected the diffusion are also discussed. This paper establishes that public sector incubation becomes necessary in the development of health related technologies that impact a wide socio-economic strata and offer minimal financial returns in the early stages. It also discusses the role of firms and social marketing in large scale dissemination of technology. It also brings out that gender oriented development and policy shaping becomes important in case of contraceptive technology. Also, lessons from Arnulf Grubler's concepts of technological life cycle have been drawn to analyse the present stage of development of the Contraceptive Technology.

**Index Terms-** contraceptive, human development, diffusion, STDs.

## I. CONTRACEPTIVE AS TECHNOLOGY

Contraceptive is a device or drug that prevent pregnancy by interfering in the natural process of ovulation, fertilisation and implantation. Until recently scientific contraception methods were based on the realisation that pregnancy can be controlled by preventing the amalgamation of male and female reproductive fluids. Contraception emerged as technology when scientists turned their attention to ovulatory cycle of females and hormonal control of reproduction of both sexes.<sup>[2]</sup>

## II. HISTORICAL PERSPECTIVE

To truly talk about the history of contraception, we need to understand the context of its usage which is the basis of human reproduction and dates back to the era when humans started to live in a social environment but official records can be traced back to 1550 BCE during Mesopotamia and ancient Egypt when people used honey, acacia leaves, lint and other plants with contraceptive properties to be placed in vagina to block sperm by covering the mouth of the womb.<sup>[3]</sup> For centuries, mankind has tried to prevent pregnancy by the simple and direct procedure of withdrawing penis from vagina.

A major breakthrough in contraceptive technology came when birth control became an issue during the 19th century and people started realizing the necessity of controlling population growth. Before 1960, men and women had only a few options like sterilization, reversible methods such as condom and withdrawal for men and periodic abstinence for women that had a high probability of failure which led scientists to turn their attention to

the modern scientific understanding of reproduction process to develop effective and safer contraceptive techniques.

## III. 1950s TO PRESENT: EVOLVING TECHNOLOGY

### A. First Contraceptive Revolution (1950-1970)

Contraceptive revolution began with patent filing for norethindrone by Carl Djerassi in 1951<sup>[4]</sup>. The revolution led to the invention of oral contraceptives and intrauterine devices, which separated reversible contraception from the act of coitus and the market was centralised to US. Watkins in her book *On the Pill: A Social History of Contraceptives, 1950-1970* points out "the climate of the 1950s favoured scientific and technological solutions to social problems."<sup>[5]</sup> It was a part of post-world war II 'pharmaceutical revolution' enthusiasm.

US government and other governments started funding contraceptive research to bring improvement in the delivery of hormonal contraception and development of implants and injectable in order to enhance the quality and range of contraceptive options available to men and women. In 1950's many feminists like Margaret Sanger and Katherine McCormick fought hard for the development of oral contraceptives. McCormick which is presently one of the Fortune top 100 companies contributed millions of dollars for research and development of the pills.

Many large pharmaceutical companies especially US firms started sponsoring contraceptive research and development. Even though the field was culturally sensitive and did not offer corporate security, the market demand and technological potential motivated the developers to engage in the development and production of new oral contraceptives. R&D time was shorter and patent life was longer because the regulatory requirements were fairly lenient and clinical studies were less sophisticated.

The family planning programmes and policies of 1960's shaped the revolution. In May 1960 Food and Drug Administration (FDA) approved Envoid as birth control pill<sup>[6]</sup>. The popular press or media played a central role in the spreading awareness about the technology, in early 1960's it acted as source of enthusiasm and in later toward 1970s also brought health concern to public attention.

The main role of the first contraceptive revolution was to initiate the research in contraception technology and to incorporate family planning in population control public policies.

### B. Changing Technology Dynamics (1970-1990)

Oral contraceptive side effects and negative medical reports led to the 2nd stage of contraceptive research and development. Public perception of the pill and IUD had become quite negative.

R&D time got extended from 10 to 17 years because of more stringent regulatory requirements resulting in greater R&D costs and reduction in effective patent life<sup>[7]</sup>. Liability insurance also had become essentially unavailable in the United States resulting in many firms leaving the market.

However, something of a substitution effect and growing interest in family planning in developing countries drew the US agency for International development (USAID) into the field motivating research activity in universities and non-profit organizations. The Centre for Population Research at the National Institute of Child Health and Human Development (NICHD) became major source of contraceptive research because of raising sexual health concerns in US. In 1972, the World Health Organization's (WHO) special program of Research, Development and Research Training in Human Reproduction was established. Manufacturing facilities were set up in over 20 developing countries on recognizing the long-term profit potential in such markets. Also, research indicated that IUD risks had been overestimated which motivated the Europeans to return to the method. By the end of 1980, most of the innovation in contraceptive research resided in Europe<sup>[8]</sup>.

In the early 1990s, withdrawal of large companies from contraceptive production propelled many small companies to enter into the research, development, production and distribution of contraceptives. Increased collaboration between public and private organizations resulted into a new pattern of funding agencies, basic research facilities, university based scientists and clinical trial organizations. Generally the funds moved from the government funding agencies and private foundations to university research centres, non-profit research organizations and small research firms.

This period mainly saw the rise of public funding and non-profit organisations involvement, stringent medical regulation and exodus of large firms from the sector. Reputation of oral contraceptives revived with reduction in side effects using mini pills, lower dose and multi phasic oral contraceptives and appreciation of secondary health benefits.

### *C. Women Centric Agenda and Sexual Health*

Concept of gender and sexual health safety is quintessential in policies deriving development of contraceptive technology. Women's health advocates got concerned about the unresponsiveness of developers to the voices of women themselves, their needs and priorities. It was realized that women were under represented in scientific bodies. So talented young women scientists were motivated and encouraged to enter into the field of reproductive research. Community advisory groups constituting the representatives of the affected groups became very important in research and technology introduction and development. Most pharmaceutical bodies working in this sector started including both women and men in decision-making positions about the development of contraceptive products.

"In 1994, the International Women's Health Coalition prepared a Women's Declaration on Population Policies, which highlighted the ethical principles, minimum programme requirements, and necessary conditions for their implementation (IWHC 1993)"<sup>[8]</sup> and 180 countries which participated in the International Conference on Population Development in Cairo in

1994 agreed on the declaration. The Cairo Program of Action laid out a 20-year plan, nations have agree to increase their collective financial commitment to improve the reproductive health care and meeting the unmet need for contraception; maternal mortality reduction; HIV/AIDS prevention; and promotion of education and literacy. The total costs adds up to \$22 billion by 2015, with developing countries meeting two-thirds of the cost themselves.<sup>[9]</sup>

In 1998, US Food and Drug Administration (FDA) created an office of Women's Health whose main function was to ensure that FDA was appropriately approving pharmaceutical products. FDA was respected as a stringent drug regulatory authority as it filed products with whose means companies were able to sell their products to the world's largest market.

US National Institute of Health produces guidelines for basic and clinical research in USA such as proper analysis of different potential effects of drugs on women and men. Institutional Review Boards have increased vigilance on studies related to reproductive-health products. World Health organization with support of major international development organizations such as USAID, DFID and others regularly bodies update and publish the standards and guidelines for family planning products and services which are recognized as basis for national planning in the field of family planning around the world thus creating global standards for sexual and reproductive health products and services.

### *D. Withdrawal and Return of Large Firms*

Legislative bodies and civil courts in countries laid strict rules for organizations to place safety and fundamental human rights at the top of their priority list and the consequences of ignoring professional ethics and best practices would have financial costs for them. Thus, largely legal and organizational laws shaped the field of contraceptive development. Funding for reproductive health services shifted from international donors to national governments as the technology progressed.

But many pharmaceutical companies started leaving the area of discovery and development of contraceptive technology because of uncertainty in financial returns and the threat of lawsuits in developed countries. They also faced religious opposition and litigation worldwide. In particular, IUDs faced most of the rebellion, while oral contraceptives managed to survive in the market. As such, the climate for diffusion looked bleak. However in the late 1990s, AIDS epidemic brought back their attention to reproductive health services.

The consumer base began to change rapidly. The fertility rate continued to decline in developed countries and decreased rapidly in developing countries, whereas the number of women using contraceptives increased with equal speed. This demand fuelled the need for more and better contraceptives. Many corporations devoted themselves to the discovery, development and commercialization of new pharmaceuticals. Increase in the regulation of pharmaceuticals and changing economic environment stressed a global view of pharmaceutical market. With the economic improvement in developing countries and the introduction of market economics, global companies began to take part in this expanding market. The new consumer oriented products with good financial returns incentivised the investments



by large firms in the technology and it accelerated the research and development in the technology.

#### IV. MARKET EVALUATION

“The global contraceptives market was valued at USD 16.0 billion in 2011 and is expected to grow at a CAGR of 5.5% from 2012 to 2018, to reach an estimated value of USD 23.3 billion in 2018”.<sup>[10]</sup> Although it is expected that by 2050 population growth rates will decline to the replacement levels but it is also predicted that total world population will reach to 8.9 billion in that year. More than 26 billion new couples will need contraceptives in the next half century.<sup>[11]</sup>

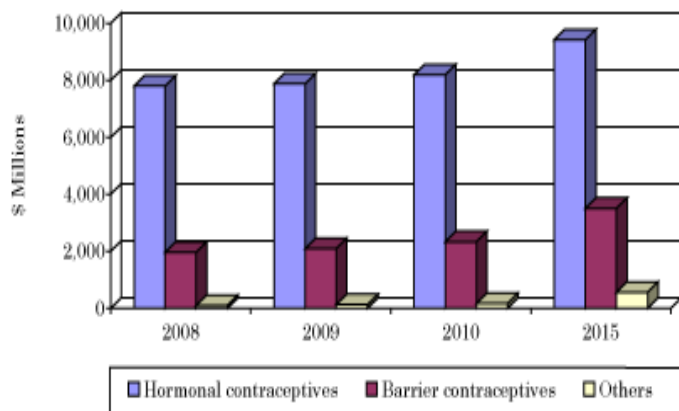


Fig 1. Worldwide revenue of contraceptive market<sup>[12]</sup>

The highest demand is for hormonal contraceptives with 78% share in total global contraceptives sale with annual CAGR of 2.8% in 2009. With the research and development of Oral Contraceptive pills, they have become the easiest and reliable method of contraception followed by injectable and topical drugs. The Barrier methods which includes methods that act as barrier between male sperms and female eggs are cheap but lesser effective. But these are better in terms of side effects and also prevent STDs. These barriers are generally male and female condoms. The barrier contraceptives have smaller share but have higher CAGR of 8.5 %. There are some other methods such as spermicides, Trans-dermal package which are new and are not diffused properly. Others also include methods such as terminal sterilisation which include vasectomy and tubectomy, IUCs etc.

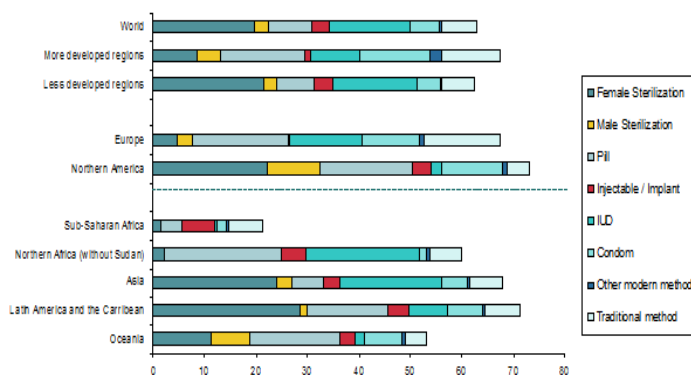


Fig 2. Worldwide Contraceptive Prevalence<sup>[13]</sup>

The cultural, regional and social environment plays an important role in defining the volume of the market. Though the global share of hormonal contraceptives is more than 78% but this trend is followed regionally in North American and European markets where the health care standards are the best in the world. In Japan condoms and abortions are common. In China coil is used and oral pill has minimal usage. In sub-Saharan Africa implants and injectable contraceptives account for 38% and oral pill 26%. In central and south Asian countries including India sterilisation account for 64 % and pill adding only 12%. “Among the world’s poorest 69 countries, a study by the Population Reference Bureau showed that sterilisation was most widespread at 17 per cent of women using modern methods, followed by oral contraceptives at 7 per cent, injectables and then intra-uterine devices (IUDs) at just over 5 per cent, with condoms at nearly 4 per cent.”<sup>[10]</sup>

#### V. EMERGING MARKETS AND DIFFUSION

As per WHO report there are about 220 million women who want to delay their pregnancy but have unmet contraceptive needs and developing regions such as sub-Saharan Africa south east and central Asian countries top the list.<sup>[37]</sup> A report created by the Guttmacher Institute in New York stated that new methods of birth control are out of reach of 148 million women in three regions of Africa and Asia where there are 49 million unintended pregnancies every year resulting in 21 million abortions. The study also states, “sub-Saharan Africa, south central Asia and Southeast Asia are home to 69 percent of women in the developing world who have an unmet need for a modern method, seven in 10 women with unmet need in the three regions cite reasons for non-use that could be rectified with appropriate methods and are emerging markets for contraceptive technology”<sup>[14]</sup>

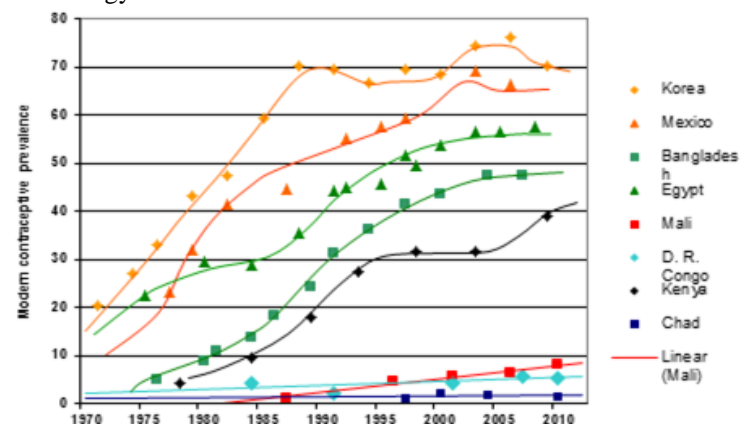


Fig 3. Contraceptive technology diffusion curves<sup>[38]</sup>

“The use of modern contraceptive methods, including voluntary sterilization, has generally increased rapidly over the past 30 years, especially in emerging economies with strong family planning programmes. However, progress has stalled in many low-income countries. The use of modern contraceptive methods has changed little in the past decade throughout much of sub-Saharan Africa, and is still low (less than 10 per cent in many countries).”<sup>[15]</sup> The process of diffusion for contraception is thus



going through the adolescent phase in low income countries but in emerging countries it has already picked up good speed.

The developing world is the main future market for the contraceptive technology. The return of big firms, increasing prevalence of Sexually Transmitted Diseases and its awareness among potential users through innovative social marketing and advertising, improving sale and distribution systems, changing socio-cultural environment in developing nations and, increasing population and governmental efforts to curb it will drive contraceptive market growth in near future.

By 2025, the customer base for contraception will likely be comprised of 2500 million women<sup>[16]</sup>. Contraceptive use is increasing among young women. Increasing young women education and awareness about the need of contraception fuels this demand.

## VI. SOCIAL MARKETING AND DIFFUSION

Social dynamics play an important role in the diffusion process of any technology, but more so in the case of contraception. The mechanisms of information flow and demonstration effects are essential for diffusion. Therefore, social marketing measures have been used in developing countries to accelerate diffusion. For instance, in 1968, the Government of India initiated a social marketing programme for contraceptives in the area of family health and welfare, with the launch of “Nirodh” brand of condoms.<sup>[17]</sup> By the early nineties, many Social Marketing Organizations (SMOs) such as HLFPT, PSI, Parivar Seva Sanstha, DKT India, PHSI, HLL started springing up with funding from government and other organizations.<sup>[18]</sup> The Ministry of Health and Family Welfare (MoHFW) of India now identifies social marketing as a key approach for providing accessible and affordable contraceptive products to low-income families and vulnerable groups. Elsewhere, various social marketing strategies being adopted include behaviour change communication, capacity building, networking, community mobilization, policy advocacy, and mix usage of media. Social Marketing of Contraceptives mainly consists of three factors, “Contraceptive branding, the development of a commodity logistics system and a sustained marketing campaign.”<sup>[19]</sup> Market research shows that local implementation and adaptation of brands is very important and multiple brands should be designed so as to appeal and accommodate various cultural mind-sets.

## VII. DISTRIBUTION SYSTEMS

Distribution systems differ from country to country depending on fertility preferences of the women with unmet need for contraceptive technology. Today, non-clinical delivery systems have developed more because of the inability to expand clinical-based system since clinical based distribution systems heavily rely upon existing health facilities and require the help of private physicians. Non-clinical delivery systems have different modes of operations such as commercial distribution, community based, village based, contraceptive retail sail programs, and household distribution.

### A. Commercial Distribution Systems

In commercial distribution system, the contraceptives are given to the distribution network like pharmacies, local boutiques and village centers at low subsidized price or no cost so that they can further sell it to the consumer at a low price. Little money that is generated from sales is returned back to the program to lessen program costs. NGOs such as Rockefeller and Bill & Melinda Gates Foundation have contributed millions of dollars for supply of contraceptives in developing countries.<sup>[20]</sup>

### B. Community Based Distribution Systems

In community based distribution system, canvassers are identified, contacted, trained, and supplied with contraceptives so that they can sell it to the local people who want them. These canvassers may be village elders, midwives, merchants or volunteers willing to take responsibility for tasks such as contraceptive storage and transmittal of family planning education and information. Various households are visited to identify the clients.

To improve the distribution systems, innovative advertising methods have been developed which make discussion and purchasing of contraception more comfortable among people. The public policy domain is also crucial sale or distribution. The policies keep changing over the time in order to make contraceptive technology more readily accessible to people. Some examples of changes are integrating family planning services into the existing health services, elimination of requirements for prescriptions of pills and incorporation of paramedical personnel into the family planning delivery system in order to overcome scarcity of medical doctors and pharmacies in rural areas.

## VIII. FEEDBACK AND LEARNING

Feedback from the user is an important criterion that affects further innovation and diffusion because ultimately it is the user who chooses an appropriate contraceptive technology with which he/she is most comfortable culturally and ethically and also about which he/she is well informed regarding its safety and side effects. Hence, opinions are sought from the contraceptive users on the type of product they wish to see in the market. Program managers and service providers have informed that affordable products that are highly effective, reversible, easy to use, have secondary health benefits and are controllable are desired by users. With prevalence and awareness of STDs and present inefficacy of contraceptives to provide both protection and efficiency, there is a demand for dual contraceptive technology. Also, it has been observed that people readily accept vaccinations and injections because of their past experience with small pox vaccinations and injections but no such vaccination exists as of now that can provide protection against pregnancy. Such feedbacks are taken into account for further innovation in contraceptive technology for better human development.

## IX. PRODUCT INNOVATION

As a result of feedback obtained, several new products have been launched into the market during the last few years like implants, medicated intrauterine systems (IUS), and transdermal patches with longer duration of action, new oral contraceptive pills and contraceptive vaginal rings. The new oral contraceptive pills are based on newer progestin synthesized in the last decade. They have higher anti-ovulatory action and are more accepted and tolerated by the users. They also provide additional health benefits such as prevention of salt and water retention that reduces symptoms of bloating, weight gain and increase in blood pressure. The contraceptive vaginal ring has the advantage that it gives women a prescription for a full one-year of supplies thus reducing the return visits for resupplies. Also it does not need any specific clinical training of health providers since women can themselves use it. The current contraceptive methods have additional benefits like improvement in menstrual bleeding patterns, alleviation of acne, premenstrual syndrome and protective effect against endometrial cancer. New technologies like Jadelle, Norplant, Evra and Copper-T 380 IUD have been recently developed.<sup>[21]</sup> Some contraceptive technologies that are presently under development include transdermal gels or sprays. Also, Contraceptive Technology that can provide protection against unwanted pregnancy as well as sexually transmitted diseases is advancing.<sup>[22]</sup>

## X. BARRIERS AND CONTROVERSIES

### A. Religious and Cultural Barriers

Family planning methods of couples are deeply influenced by cultural and religious beliefs. These factors become more important in the developing countries. An analysis done by National Family Health Survey in India for Muslims and Non-Muslims brought out the result that Muslim women have greater opposition to family planning. They prefer to use temporary methods of contraception while the National Family Planning Program promotes sterilization. Further, they prefer to utilize private-sector services while the program relies on public sector services for family planning.<sup>[23]</sup> Many people especially some Hindu families believe that having large families provide status and security. Women are believed to be unclean during their menstrual period because they bleed. This leads to the non-acceptability of contraceptive methods, especially the ones that cause bleeding like IUD.

In Latin American countries, church prevented the adoption of contraception methods.<sup>[1]</sup> In such countries, it was the physicians who spread awareness regarding the contraception technologies because of large number of women coming to them with health issues after poorly performed abortions. In South central Asia, Southeast Asia and Sub Saharan Africa, religious prohibition, cultural and social beliefs account for 16% of unmet need of women for modern contraceptives.<sup>[24]</sup>

There have been a lot of controversies over the coverage of women's contraception methods by health insurance companies in developed countries too because of conflicts between religious motives and the rights, beliefs and health care needs of people that further act as a barrier for contraceptive usage. Traditional attitudes and laws governing sales and use of contraceptives can

create political difficulties in the advertisement of contraceptives while taking approval from the government. Also, the "Clinicians who develop a heightened sensitivity towards their patient's cultural orientation can enhance the opportunity for a successful outcome and ensure that the care delivered is congruent with that patient's values and beliefs".<sup>[25]</sup>

### B. Barriers in Developing World

Apart from Regional and Cultural barriers, the major barrier to contraceptive technology in the developing world is limited choices available which are not able to meet everyone's needs. People are poor due to which they are not able to afford suitable latest contraceptive technology. Unavailability of trained health care officials is another barrier. Because of lack of awareness regarding the systematic usage and side effects of the contraceptive, people fear using them. There is a lack of knowledge among people regarding family planning services.

### C. Barriers in Developed World

Significant unmet need for contraception is a problem in developed countries as well. Apart from that, barriers are mainly due to requirement of prescription for the use of contraceptive technology although researchers suggest that there is little need for a routine physician's involvement. Sometimes poor quality of available services and labeling on the product based on outdated data misinforms both the public and health care providers thus preventing many users from using contraceptive technology. Media influences, fear and misconceptions about contraceptives also add to the barriers.

### D. Gender Based Barriers

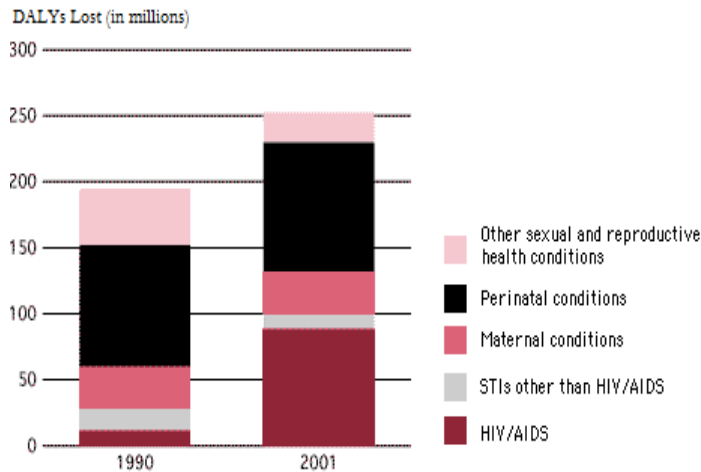
Earlier there was a huge difference in the attitude of men and women towards contraception. It was seen that women were usually concerned about the side effects and the psychological changes that contraception might bring while men were concerned about how contraception would affect the sexuality and sexual intercourse. In male dominated societies, males usually disapproved the use of contraception probably because they feared that their partners would become sexually unfaithful once they started using contraception and they might lose control over their wives' sexuality.

However in recent years, Social scientists have observed a shift in men's attitude about the impact of their role in their partner's sexual health and benefit. Men and women think that they should share the responsibilities mutually for contraceptive use. They have started to consider male contraception as well, as another option. The idea of male pill, which can suppress sperm production, is being floated around.

## XI. IMPACT ON HUMAN DEVELOPMENT

"Human development is a process of enlarging people's choices. The most critical ones are to lead a long and healthy life, to be educated and to enjoy a decent standard of living."<sup>[26]</sup>  
"Worldwide, pregnancy-related conditions and STIs account for one-third of the global burden of disease among women of

reproductive age (15-44) and one-fifth among the total population.”<sup>[9]</sup> The contraceptive technology plays an instrumental role in family planning, population control, prevention from sexually transmitted diseases, improving sexual and reproductive health, empowerment which directly or indirectly expands choices and contributes significantly in improving well-being of human beings. “The international community has agreed that reproductive choice is a basic [human right](#).”<sup>[12]</sup>



Note: DALYs = disability-adjusted life years. Fig 4<sup>[9]</sup>

#### A. Tackling Sexually Transmitted Diseases

The Sexually Transmitted Infections and Venereal diseases are transmitted by sexual intercourse with infected person or through any other medium through which bodily fluids are exchanged such as using infected needles. STDs/STI are basically of two types bacterial and curable such as chlamydia, gonorrhea, and syphilis and viral, which can't be cured, only their symptoms can be treated such as HIV/AIDS, HPV. “Globally, 35.3 million [32.2–38.8 million] people were living with HIV at the end of 2012. An estimated 0.8% of adults aged 15–49 years worldwide are living with HIV”<sup>[27]</sup>. HIV is primarily transmitted through unprotected sexual contacts. The protected/safe sex refers to the use of contraception by individuals involved in sexual activity. Barrier methods of contraception has major potential of reducing the spread of STDs. Hormonal contraceptives don't provide protection against the risk of STDs but most of the married couples rely mainly on Oral Contraceptives and are highly prone

to STDs. Dual protection by using both hormonal contraceptives (implants, pills) and barrier methods (condoms) offer the best protection. The relevance of the contraception and STDs is also a driver for the development of the technology as STDs and specifically AIDS is a major health issue and significantly affect human development which bring public funding by governmental and non-profit organizations for the development of the contraceptive technology.

#### B. Contraceptives and Family Planning

“For every \$1 spent on family planning, \$4 are saved on education, public health and water and sanitation.”<sup>[28]</sup> Family planning services are defined as "educational, comprehensive medical or social activities which enable individuals, including minors, to determine freely the number and spacing of their children and to select the means by which this may be achieved.”<sup>[29]</sup> It is achieved mainly by using contraceptive technologies along with sexuality education, pre conception counselling etc. Promotion of Family planning practices and availability of contraceptive methods is essential for well-being of women health and a couple can make informed and planned choice about their sexual life and parenthood responsibilities. It also helps in development of communities and better allocation of public funds. “The total medical cost for a pregnancy, delivery and care of a new born in the United States is on average \$21,000 for a vaginal delivery and \$31,000 for a [Caesarean section](#) as of 2012. In most other countries the cost is less than half. For a child born in 2011, an average US family will spend \$235,000 over 17 years to raise them.”<sup>[30][31]</sup>

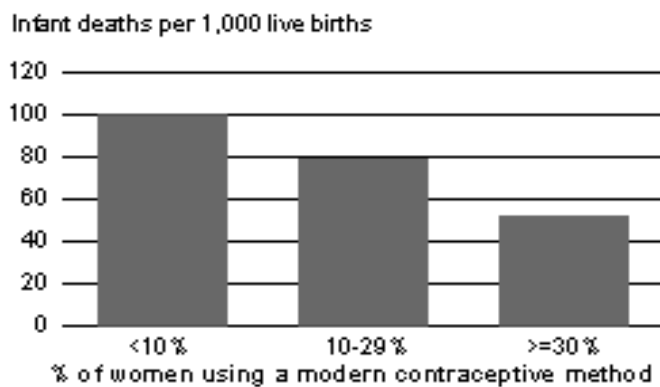
#### C. Prevention Of Pregnancy Related Risks In Women

Family planning allows a women or couple to decide the gap between two births and also helps in controlling the number of births. The child birth has direct effect on a women's health. It also helps in decreasing the abortion rates which adversely affects the women's health and also helps in avoiding early child bearing. “Globally, the total number of maternal deaths decreased by from 543 000 in 1990 to 287 000 in 2010. Likewise, global MMR declined from 400 maternal deaths per 100 000 live births in 1990 to 210 in 2010. The latter represents an average annual decline of 3.1%.”<sup>[32]</sup>The report points out that family planning, better contraception and improved health care facilities are the main reasons for the decline.

#### D. Reduced Infant Mortality Rate

The main reason for infant mortality is ill timed and closely spaced pregnancies, and family planning helps in preventing this. It also helps in reducing the adolescence pregnancies which lead to birth of preterm or low weight babies which have higher rates of neonatal mortality. The contraception or family planning also reduces the births to older age women which also leads to high infant mortality rate. The development levels are also indicative of Infant mortality rate. "On average, 61 babies die for every 1,000 live births in developing countries, compared with eight deaths per 1,000 in developed countries; in some developing countries, the rates are much higher than the average."<sup>[33]</sup>

**Contraception's Role As contraceptive use increases, infant mortality declines.**



Source: All data are from Demographic and Health Surveys; averages based on 49 countries.

**E. Human Population Control**

Population Control are the practices of artificially altering the rate of human population growth. Family Planning and Contraceptives become very important in devising policies for the reducing the population growth rate. "Family planning is key to slowing unsustainable population growth and the resulting negative impacts on the economy, environment, and national and regional development efforts."<sup>[37]</sup> The figure shows that as the contraceptive prevalence increases the Total Fertility Rate (TFR) decreases and TFR is closely related to the long term population growth rate.<sup>[34]</sup>

**F. Empowering People and Enhancing Education**

Family Planning enables people to make informed choices about their sexual health. It enhances the educational

opportunities for women and increases their participation in the

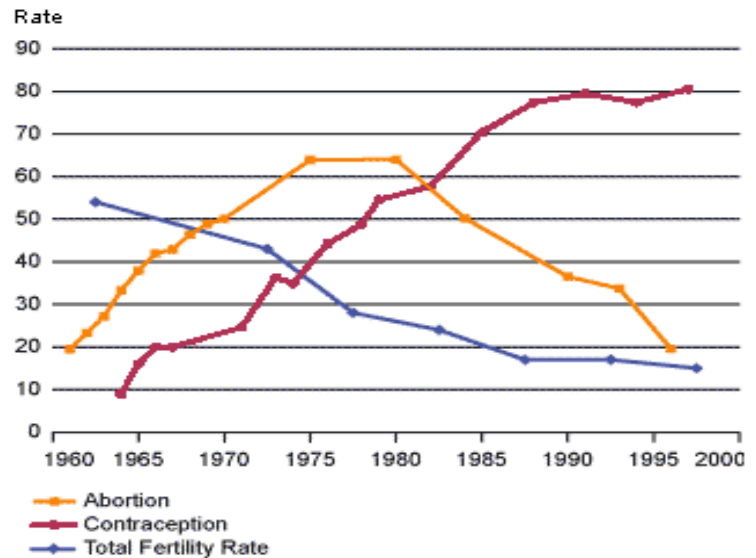


Fig 6. South Korean Experience [35]

Note: Abortion rates are expressed per 1,000 women of reproductive age, contraceptive prevalence per 100 married women of reproductive age and TFRs per 10 women.

public life including economy. "Improved maternal health means fewer orphans and more time for and greater ability of mothers to care for and nurture their children."<sup>[9]</sup> An educated mother has better information about health, which leads to well being of both mother and child. Also, smaller family enables parents to invest more in one child. "Children with fewer siblings tend to stay in school longer than those with many siblings."<sup>[37]</sup>

**XII. S CURVE ANALYSIS OF CONTRACEPTIVE TECHNOLOGY**

Contraceptives Diffusion curves showed a steady growth in 1970-1990 for which universities and public funding and non-profit organisations were the main actors and regulatory health institutions defined law and policies for the development of technology. The large firms left the market because of strict regulations which explains the decline in contraceptive prevalence in the early 1990s. But the AIDS epidemic and new developing countries' contraceptive needs created the strong market force which brought back large firms to the technology and awareness campaigns and New Millennium Plans also brought public funding in the process. As we saw in the case study that the contraceptive technology is still in the phase of product innovation based on feedbacks, has increasing growth rates, many new firms are still entering the field and the technology development and diffusion is still hugely dependent on the public institutional policies. Also, technology has not achieved global standardisation and cost-effectiveness which are major characteristics of the maturity phase of technology. It's fair to conclude from the above arguments and Arthur Grubler's concepts of technological life cycle<sup>[36]</sup> that Contraceptive Technology is still in the second phase (adolescent phase of diffusion) of its development.

In conclusion, the impact of contraceptive technology has been significant on the human development not only because of its direct effect on improving health and population control but also due to the many indirect ways in which it gave gender parity a new dimension and triggered many lasting social changes. Though the contraceptive technology is still in its development phase, it has effected and improved many human lives and is key for solving major health and population growth problems. It is a technology that will have its utility and usability as long as human race exists on the face of planet earth.

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## AUTHORS

**First Author** – Aena Goel, Bachelor of Technology, Engineering Physics, Indian Institute of Technology Delhi, [aena goel@gmail.com](mailto:aena goel@gmail.com).

**Second Author** – Avadh Singhal, Bachelor of technology, Electrical power, Indian Institute of Technology, [avadh singhal@gmail.com](mailto:avadh singhal@gmail.com).

# Applying New Trust Requirements in 3GPP Mobile Systems for Improved Subscriber Identity Privacy

Mr.Somnath B.Thigale\*, Prof.Amit R.Sarkar\*\*

\* B.E.CSE, MBA (HR), Pursuing M.E. CSE, from SVERI'S COE Pandharpur.

\*\* B.E.CSE, M.Tech CSE, Assist.Prof., at SVERI's COE Pandharpur.

**Abstract-** Evolution in Cellular networks has observed through various generations, starting with 1G, followed by 2G and then by 3G, cellular networks have come a long way. A recent technology that has marked the beginning of 4G is Long Term Evolution (LTE).

While transmission technologies, authentication mechanisms, confidentiality protection, etc., improved significantly through the generations, not much has improved with regards to the subscriber's identity privacy, and LTE is no exception. Much of this could be due to the trust model adopted in these networks. Introduction of sensitive services like mobile-banking, mobile commerce, etc., has increased the importance of identity privacy by many folds. Identification of threats like location tracking and comprehensive profiling where data about movement, usage, etc., of a subscriber is collective and linked to his/her identity to explore various attacks is quite shocking. In this paper, we tried to propose a new trust model for strengthening identity privacy in cellular networks; it has an additional capacity to enhance interoperability among different cellular operators. We also propose a security extension that adopts this trust model to improve identity privacy and interoperability in LTE. A formal analysis of the extension proves that it meets its security goals.

**General Terms:** Wireless networks, 3GPP, Authentication, Authorization, Privileges & Security

**Index Terms-** Cellular networks, Trust model, Long Term Evolution, Authentication and Key Agreement, Identity privacy.

## I. INTRODUCTION

**W**e In all cellular networks, a common basic architectural framework is used; in which, three parties are involved viz. and User Equipment (UE), the Home Network (HN) and a Serving Network (SN). The UE that a subscriber owns is registered with the HN. The association between the UE and the HN is created from the moment the subscriber procures a Subscriber Identity Module (SIM) from the HN and fits it into his/her UE. The HN offers services to its registered UEs through SNs that are located within or outside its own service area. Communication between the UE and the SN happens through radio link, whereas communication between the SN and the HN happens through wired medium. The radio link is considered vulnerable to various kinds of attacks as it is too open by nature for comfort of challenger, whereas the wired link is considered secure [9].

In order to uniquely identify a subscriber for authentication, authorisation and billing purposes, the HN assigns a unique permanent identity called International Mobile Subscriber Identity (IMSI) [5] to the UE. The IMSI is valuable information that should not be accessible to anyone except the HN. Its compromise will expose the subscriber to threats like location tracking and comprehensive profiling where data about movement, usage, etc., of a subscriber is amassed and linked to his/her identity to explore various attacks at a later time.

For the UE to access a particular service, it has to go through an Authentication and Key Agreement (AKA) procedure. During an AKA, the UE has to send a service request along with its identity to the SN. The SN in turn, obtains relevant authentication data from the HN by presenting the identity that it received from the UE. It then authenticates the UE using a challenge response mechanism [14].

Due to the current trust model adopted by cellular networks, there are occasions during identity presentation in the AKA procedure, when the IMSI needs to be transmitted to the SN in clear text through the vulnerable radio path [11]. Moreover, the current trust model requires the SNs to be considered trustworthy, undermining the threat that a compromised third party SN may pose. Such requirement demands unconditional trust and thus limits interoperability.

Understanding above scenario we would like to propose a new trust model that has the potential to not only enhance identity privacy, but also to boost interoperability among cellular operators. We also propose a security extension that implements this trust model in LTE. A formal analysis of the extension is performed to prove that it meets its security goals.

The rest of the article is organised as follows: in section 2, we discuss the current trust model; in section 3, we propose a new trust model; in section 4, we present the security architecture of LTE; in section 5, we discuss Evolved Packet System AKA (EPS-AKA) protocol: the AKA protocol adopted in LTE; in section 6, we discuss the identity privacy related vulnerabilities present in EPS-AKA; in section 7, we propose a new security extension for EPS-AKA; in section 8, we discuss the strong points of the proposed extension; in section 9, we perform a formal analysis of the proposed extension; With the reference of paper [1] we will implement the proposed model in section 10, After implementation results are collected in section 11 finally, we conclude the paper in section 12.



## II. CURRENT TRUST MODEL

In the current trust model, the following trust requirements with reference to the permanent identity of a subscriber exist.

UE → HN: As the UE is registered and has a direct service agreement with the HN; it is bound to fully trust the HN with its IMSI.

HN → SN: Since HN serves its subscribers through SNs; the HN confers full trust in the SN with regards to the IMSI of a subscriber. For authentication, authorisation and billing purposes, the IMSI is exchanged unabated between the HN and the SN.

UE → SN: This trust relation is a transitive outcome of the previous two trust relations; because of which, the UE fully trusts the SN with its IMSI and it transmits its IMSI immediately upon receiving a request from the SN.

From the above trust requirements, one can easily understand that even though the SN may belong to an entrusted third party cellular operator, the UE and the HN is required to confer unconditional trust on it. As a result, there exist several vulnerabilities, which an adversary may explore to compromise identity privacy of the subscriber. Moreover, such trust requirements are impractical in today's context when multiple cellular operators need to interoperate among each other to offer wider coverage to the subscribers. Roaming agreements with third party operators to provide service in a location where an operator has not set up its own infrastructure is a common practice. Thus, the need of the time is a paradigm shift that looks at the trust issues from a different perspective: a perspective that gives more emphasis on issues like privacy and interoperability.

## III. PROPOSED TRUST MODEL

In this section, we propose a new trust model that is more flexible compared to the current trust model adopted by the cellular networks. In this, there is only one trust requirement, which is as follows:

UE → HN: The UE should trust only the HN with which it is registered and no one else. The IMSI should not be shared with any third party and in no situation should leave the UE or the HN.

The above trust model will strengthen identity privacy, as the IMSI is not shared with anyone except the HN. It will also improve interoperability among cellular operators, since the requirement to trust the SN with respect to the permanent identity is totally relaxed. In order to adopt this model to provide improved identity privacy, an alternate mechanism for identity presentation, which can be used in all situations when an IMSI is used, otherwise, has to be formulated. To adopt this model even with respect to confidentiality and integrity protection of user data, end to end application layer based ciphering and integrity protection solutions like IPsec can be used [12]. With cellular networks gradually moving towards all-IP, such solutions will not be too hard to implement.

## IV. SECURITY ARCHITECTURE OF LTE

Fig.1. Simplified Architecture of LTE.

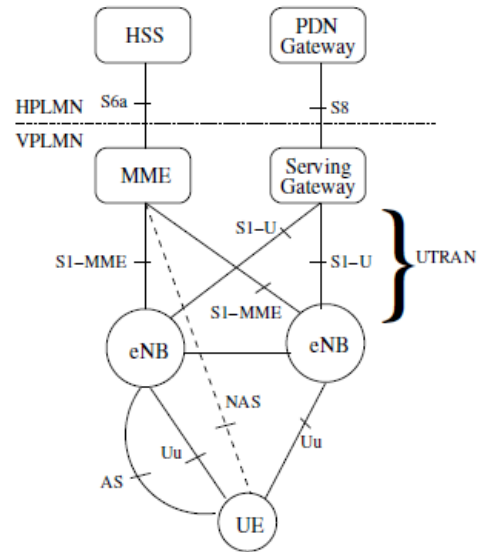


Fig. 1 depicts a simplified view of the roaming security architecture of an Evolved Universal Terrestrial Radio Access Network (E-UTRAN) [3] that serves as the core of LTE. In this, we show only the key elements associated with the AKA procedure used in LTE. Each and every user is registered with a Home public Land Mobile Network (HPLMN) (which, is the HN of the user) with their subscription and profile information stored in a Home Subscriber Server (HSS). In the Visiting Public Land Mobile Network (VPLMN) (which, is the SN of the user), the User Equipment (UE) connects with an evolved NodeB (eNB) through the Uu interface, for attach, Tracking Area Update (TAU) and service requests. eNB is the new enhanced Base Transceiver Station (BTS) that provides the LTE air interface and performs radio resource management for the evolved access system. An eNB is connected with one or more Mobility Management Entities (MME) through the S1-MME interface. The MME is the key control node for the LTE access network and is responsible for authenticating the user by interacting with the HSS. For obtaining authentication data, the MME communicates with the HSS through the S6a interface. There are two layers of security between the UE and the E-UTRAN. The first layer is called the Access Stratum (AS) which protects the Radio Resource Control (RRC) plane signaling and the User Plane (UP) data between the UE and the eNB. The second layer is called the Non Access Stratum (NAS) which protects the control plane signaling between the UE and the MME. UE has access to packet data through the Packet Data Network Gateway (PDNGW) via the Serving Gate-way (SGW).

## V. EPS-AKA

EPS-AKA [3] is the AKA procedure used in LTE; it produces keying material forming a basis for UP, RRC, and NAS ciphering keys as well as RRC and NAS integrity protection

keys. EPS-AKA during the initial connection and successive connections are as follows:

### 5.1 The Initial Connection

For the initial connection (when the subscriber switches on the UE for the first time), the UE transmits an attach request to the MME. Since the UE does not have a temporary identity at this moment, its IMSI is included in this request. The EPS-AKA procedure during the initial connection is as follows:

(1) The MME invokes the procedure by requesting authentication data from the HSS. The request shall include the IMSI and the SN/MME identity.

(2) Upon receipt of the request, the HSS assembles a Universal Mobile Telecommunication System - Authentication Vector (UMTS-AV) [1]. An UMTS-AV contains a random part RAND, an authenticator token AUTN used for authenticating the network to the UE, an expected response XRES, a 128-bit Integrity Key IK, and a 128-bit Cipher Key CK.

$$\text{UMTS-AV} = (\text{RAND}; \text{AUTN}; \text{XRES}; \text{CK}; \text{IK}) \quad (1)$$

The AUTN contains a sequence number SQN used to indicate freshness of the AV. An EPS-AV is then derived from UMTS-AV by replacing CK and IK with a Key for

Access Security Management Entity (KASME). To derive KASME, a Key Derivation Function (KDF) [2] is used that take the following input parameters: CK, IK and SN/MME Identity. Thus,

$$\text{KASME} = \text{KDF}(\text{CK}; \text{IK}; \text{MME-identity}) \quad (2)$$

$$\text{EPS-AV} = (\text{RAND}; \text{AUTN}; \text{XRES}; \text{KASME}) \quad (3)$$

The HSS then sends EPS-AV back to the MME.

(3) After receiving EPS-AV, the MME extracts RAND and AUTN from it and sends them to the UE as a challenge. A Key Set Identifier (KSIASME) is also sent along with the Challenge. The purpose of the KSIASME is to make it possible for the UE and the MME to identify aKASME without invoking the authentication procedure. This is used to allow reuse of the KASME during subsequent connections.

(4) At receipt of this message, the UE runs UMTS algorithm [1] to verify that AUTN is correct and hereby authenticates the network. If AUTN is incorrect, the UE rejects the authentication.

If AUTN is correct, the UE computes RES, IK and CK (using UMTS algorithm). It then derives the KASME from the newly computed IK and CK. The UE then responds back to the MME with a user authentication response message that includes the computed RES.

(5) Finally, MME checks whether RES is equal to XRES. If so, the authentication is successful. If not, the MME sends an authentication reject message towards the UE.

At the end of a successful EPS-AKA, a KASME is shared between UE and MME. A hierarchy of keys are then generated from the KASME [2] to be used for protection of the NAS and the AS. The MME then allocates a fresh temporary identifier called Globally Unique Temporary Identity (GUTI) [4] to the UE by initiating a GUTI reallocation procedure through the NAS. During the GUTI reallocation procedure, the MME sends GUTI

Reallocation Command to the UE and the UE returns GUTI Reallocation Complete message to the MME. A new GUTI shall be sent to the UE only after a successful activation of NAS security. A mapping between the GUTI and the IMSI of the UE is maintained at the MME. The purpose of the GUTI is to provide an unambiguous identification of the UE, so that the subscriber's permanent identity (i.e., the IMSI) is not revealed. Entire part is considered with reference [1].

### 5.2 Subsequent Connections

For subsequent connections (during attach requests, Tracking Area Updates (TAU) and service requests), identity presentation of the UE is accomplished by transmitting a GUTI through the radio path. The KSIASME is also sent along with the request. Before transmitting, the UE integrity protects the request using NAS security. Upon receipt of the connection request, the MME identifies the corresponding KASME with the help of the received GUTI and the KSIASME. The MME then checks the integrity protection of the message. If the integrity check succeeds, the MME, depending on the MME policy, may either decide to reuse KASME that was established during a previous AKA (without invoking a fresh authentication procedure) or may decide to go for a fresh EPS-AKA that will result in the establishment of a new KASME. In order to carry out a fresh EPS-AKA, the MME locates the IMSI of the UE in its local database through the IMSI-GUTI mapping and continues in the same manner as the initial connection (discussed above). In order to reuse a KASME a fresh set of keying material is derived from the KASME. Thus, the need to perform frequent AKA runs has been reduced in EPS through the use of a more elaborate key hierarchy. In particular, connection requests can be authenticated using a stored KASME without the need to perform a fresh AKA. Several successive connections may be secured through re-derived security contexts from the current KASME. Entire part is considered with reference [1].

## VI. IDENTITY PRIVACY RELATED VULNERABILITIES IN EPS-AKA

In EPS-AKA, a GUTI that is obtained in the previous connection (as explained in section 5.1) is transmitted instead of the IMSI for identity presentation. The purpose of the GUTI is to provide an unambiguous identification of the UE that does not reveal the subscriber's permanent identity (i.e., the IMSI). In spite of this security arrangement, there are occasions when the IMSI may be transmitted in clear text. Some of the identity privacy related vulnerabilities in EPS-AKA are as follows:

—During the very first attach procedure the IMSI has to be transmitted in clear text (TS 33.401 [2] section 5.1.1), since no GUTI is available for identity presentation at this stage.

—The IMSI has to be transmitted in clear text through the radio link as and when the MME requests for it. The MME has provision to make such a request when it cannot map the received GUTI with the corresponding IMSI. For instance, whenever the UE visits a new MME and the new MME can-not acquire the IMSI of the UE from the old MME. Such a recovery mechanism provides an opening for a fake MME to compromise subscribers IMSI [9].



—The SN, whose trustworthiness we question, has full knowledge about the IMSIs of all subscribers to whom it provides services.

—The responsibility of creation and allocation of temporary identities (i.e., GUTI) are assigned to the MME, whose trustworthiness can itself be questioned.

Moreover, it is clearly evident that the trust model adopted in LTE is the current trust model discussed in section 2. Therefore, all the identity privacy related vulnerabilities and interoperability related drawbacks discussed in section 2 exist in LTE as well. Entire part is considered with reference [1].

## VII. SECURITY EXTENSION FOR EPS-AKA

In this section, we propose a security extension for EPS-AKA to achieve improved identity privacy and enhanced interoperability in LTE. The extension protects the permanent identity of a sub-scriber in the radio path as well as in the wired path. Knowledge of the IMSI of a subscriber is restricted only to the UE and the HE. In the extension, a Dynamic Mobile Subscriber Identity (DMSI) is transmitted by the UE instead of the IMSI. The role of the DMSI is to randomize and mask the IMSI so that an adversary having access to a particular DMSI cannot link it with any subscriber or any previous communication. This extension is based on our work that was presented in [7]. For successful functioning of the security extension the following operator specific random number and functions are used:

RIC: Random number for Identity Confidentiality (RIC) is a random number that uniquely identifies a UE within a particular HE for an epoch of time. RIC is used to compute a DMSI as  $DMSI = MCC||MNC||RIC||ERIC$  (4)

Where, MNC, MCC and ERIC stands for Mobile Network Code, Mobile Country Code and Encrypted RIC (explained later in equation 16) respectively. Size of RIC (b) in bit should be lesser than 128 bits and shall be determined by the operator depending on the subscriber base of the HE. A RIC of size b provides a pool of  $n = 2^b$  unique RIC values. A fresh not-in-use RIC called RICFresh is chosen every time a new EPS-AV is generated at HSS. RICFresh is then cryptographically embedded into the RAND of EPS-AV. The resultant random number after embedding RIC into RAND is called Embedded RAND (ERAND). Only UE having the knowledge of the long term shared keyKi is capable of extracting RIC from the ERAND. Multiple (m) RICs comprising of the fresh and few previously generated RICs (RICNew;RICPrev;RICOld, etc.) are maintained at the HSS against a particular IMSI in order to ensure robustness of the protocol even when an AV gets lost in transit (or due to some reason does not get utilised). Such an arrangement ensures that a mapping between the RIC that is currently stored at the UE and the corresponding IMSI is always maintained at the HSS. An additional RIC called RICInUse is maintained at the HSS. RICInUse enables the MME to uniquely identify the UE as long as the later continue to stay within the former's service area.

fi: This function returns a RIC that can be used to uniquely identify an UE. This is done by randomly selecting a not-in-use RIC from the RIC-Index, the later being an index for the HSS's

local database consisting of  $n = 2^b$  unique RIC entries arranged in ascending order (Fig. 2), b being the number of bits in RIC. Each RIC entry in the RIC-Index has a pointer called IMSI-Pointer against it. A RIC that is already allotted to some UE, will have its IMSI-pointer pointing to that particular row in the HSS's database, which contains the IMSI of the concerned UE. A null pointer against a particular RIC in the RIC-Index denotes that the particular RIC is (not-in-use) not allotted to any specific UE and is free to be used.

$$RIC = fi(RIC-Index) \quad (5)$$

fe: This function embeds RIC into RAND to produce ERAND, using the long term shared secret key Ki as parameter.

$$ERAND = feKi(RIC;RAND) \quad (6)$$

fx: This function extracts RIC from ERAND, using the long term shared secret key Ki as parameter.

$$RIC = fxKi(ERAND) \quad (7)$$

Example algorithms for fe and fx are proposed in [6].

fn: This function takes in a 128 bit ERAND and the secret key Ki as parameter and encrypts a 32 bit RIC to produce a 128 bit output called Encrypted RIC (ERIC).

$$ERIC = fnKi(RIC;ERAND) \quad (8)$$

fd: This function decrypts ERIC by using Ki as parameter to produce RIC.

$$RIC = fdKi(ERIC) \quad (9)$$

fs: This function stores a freshly generated RIC (RICFresh) against a given IMSI in the HSS's database. In order to make space for RICFresh, the oldest RIC stored against the corresponding IMSI is freed up. For example, for  $m = 3$  with RICNew;RICPrev and RICOld as the RICs stored against the corresponding IMSI, the oldest RIC (i.e., RICOld) is returned to the pool of not-in-use RICs by setting a null pointer against it in the RIC-Index. RICOld is then replaced by RICPrev, and RICPrev is replaced RICNew. Finally RICNew is replaced by RICFresh. An entry in the RIC-Index against the IMSI-Pointer of RICFresh is also made accordingly.

$$RICOld:IMSI-Pointer = null \quad (10)$$

$$RICOld = RICPrev \quad (11)$$

$$RICPrev = RICNew \quad (12)$$

$$RICNew = RICFresh \quad (13)$$

fm: This function moves a given RIC (say RICp) from its current location to RICInUse in the HSS's database. When RICp is passed as parameter, fm searches for it in the RIC-Index. The IMSI-Pointer against RICp in the RIC-Index leads to the IMSI to which RICp is allotted. The particular RIC field (ie.RICInUse, RICNew, RICPrev, RICOld, etc.) in the HSS's database against which RICp is stored is then located. If RICp is found in the RICInUse field, no updation is required and the function quits. Otherwise, if RICp is found in a RIC field (say RICc) other than RICInUse, than all the RIC fields older than RICc are set to null. The RIC values in these older fields are then returned to the pool of not-in-use RIC by setting their IMSI-Pointers to null in the RIC-Index. The value in RICc is then copied into RICInUse. And finally, RICc is also set to null.

For example, for  $n = 3$  with RICNew;RICPrev and RICOld as the RICs stored against the corresponding IMSI, if RICp is found in RICNew then:

- RICPrev = RICOld = null (14)
- RICPrev:IMSI-Pointer = null (15)
- RICOld:IMSI-Pointer = null (16)
- RICInUse = RICNew (17)
- RICNew = null (18)

A summary of all the cryptographic functions used in the extension is presented in table 1.

**Table 1. Cryptographic Functions**

fi	Returns a not in use RIC from the RIC index.
fe	Embeds RIC into RAND to Produce ERAND
fx	Extracts RIC from ERAND.
fn	Encrypts RIC to produce ERIC.
fd	Decrypts ERIC to find RIC.
fs	Stores a fresh RIC in the HSS's database.
fm	Moves a specified RIC from its current location to the RICInUse field in the HSS's database.

An ERAND (Say ERANDFirst) that has a unique RIC called RICFirst embedded into it, is stored in the USIM's flash memory in a field called ERANDUE before a subscriber procures it from the service provider. RICFirst is also stored at the HSS and an entry in the RIC-Index is made accordingly.

RICFirst is meant for one time usage during the initial connection.

**7.1 The Initial Connection**

For the initial connection, the UE transmits an attach request that contains a DMSI (instead of the IMSI, section 5.1) calculated according to the following steps.

- $RICr = fxKi(ERANDUE)$  (19)
- $ERICr = fnKi(RICr, ERANDUE)$  (20)
- $DMSIr = MCC||MNC||RICr||ERICr$  (21)

(1.1) The MME initiates the authentication procedure by sending a request for a fresh EPS-AV along with DMSIr to the HSS.

(1.2) On receiving the request, the HSS separates RICr from DMSIr and with the help of RIC-Index locates the corresponding IMSI and the secret key Ki of the UE in its database. It then calculates:

$RICd = fdKi(ERICr)$  (22)

and checks if  $RICd = RICr$ . If they do not match the request is rejected. If they match, it confirms that the request has been send by the concerned UE and not by a third party with malicious intentions; RICr is thus moved from its current position to RICInUse using fm, and a fresh EPS-AV (EPS-AVf ) is generated as explained in section 5.1.

HSS then computes

$RICFresh = fi(RIC-Index)$  (23)

RICFresh is then cryptographically embedded into the RAND (RANDf ) of EPS-AVf using fe.

$ERANDf = fe(RICFresh;RANDf)$  (24)

A copy of RICFresh is also stored using fs at the HSS's database. After embedding RICFresh into RANDf EPS-AVf looks like the following:

$EPS-AVf = (ERANDf ;XRESf ;CKf ;IKf ;AUTNf)$  (25)

From now on, ERANDf is used (instead of RANDf ) as the effective 128 bit random number for EPS-AKA related computations. Finally, HSS sends EPS-AVf along with DMSIr back to the MME.(1.3) On receipt, MME continues the AKA procedure by extracting ERANDf and AUTNf from EPS-AVf . ERANDf and AUTNf are then transmitted as a challenge towards the UE.(1.4) The UE and the MME completes the remaining part of the AKA procedure following the same steps as explained in section 5.1. If the mutual authentication process is successful:

—UE saves the recent ERANDf that it has received from the MME as ERANDUE.

—The MME stores DMSIr into the field meant for storing IMSI in its local database. Let us call this field as MSIMME.

MME continues to uniquely identify the UE with DMSIMME till it receives a new DMSI (during a successful AKA) from the UE.(1.5) At the end of the AKA procedure, a shared KASME is established between the UE and the MME . The MME then allocates a new GUTI to the UE by initiating a GUTI reallocation procedure through the NAS (as explained in section 5.1). MME stores this GUTI against DMSIMME in its local database. The GUTI is also stored in the UE's memory (say in a field called GUTIUE) for identity presentation during the next authentication.

**7.2 Subsequent Connections**

For all subsequent connections and the corresponding AKA procedure, the UE may present its identity in two different ways:

(i) By transmitting a GUTI received in the previous AKA: In this case, UE transmits the GUTI stored in GUTIUE. Out of the two options, this one is the preferred option since it reduces authentication latency (as the authentication procedure happens locally between the UE and the MME without involving the HE).

(ii) By transmitting a fresh DMSI: This option is less preferred and the UE may be forced to opt for this option when the UE roams into the area of a new MME or when the MME cannot identify the UE with its current GUTI.

The protocol flow for subsequent authentications through the transmission of a fresh DMSI is same as that of the initial connection (i.e., step 1.1 through 1.5). The protocol flow for subsequent connections through the transmission of GUTI is as follows:

(2.1) UE extracts GUTIUE from its memory and transmits it to the MME.

(2.2) through this GUTI, MME identifies the corresponding DMSI (ie. DMSIMME stored in its database). MME then sends a request for a fresh AV to the HSS along with DMSIMME.

(2.3) After receiving the request, HSS extracts the embedded RIC (say RICr) from DMSIMME. The IMSI-Pointer

against RICr leads to the record (in the HSS's database) that contain details related with the corresponding IMSI of the UE. The remaining portion of this step proceeds in the same manner as in step 1.2.(2.4) The remaining part of the protocol flow is same as steps 1.3through 1.5. Entire part is considered with reference [1].

### VIII. ACHIEVEMENTS OF THE EXTENSION

The key achievements of the proposed extension may be summarised as follows:

—End to end identity privacy: Knowledge of IMSI is confined only to the UE and the HSS; it is never transmitted at any stage of the network.

—Enhanced interoperability: MME to MME as well as HSS/UE to MME trust relationship requirement with respect to the permanent identity (i.e. IMSI) is relaxed; thereby, enhancing interoperability among cellular operators.

—No impact at the MME/SN: As no extra computation is introduced at the MME, the adoption of the extension in EPS-AKA will be easy. The extension can be adopted with minor modifications at the UE and the HSS (without requiring any modification at the intermediary network that may even belong to a third party).

—Reduced communication overhead: The extension reduces two protocol messages. Unlike EPS-AKA, during handover, the extension does not need the current MME to communicate with the previous MME to acquire the permanent identity of the UE. Instead, a DMSI is directly sent to the new MME. Entire part is considered with reference [1].

### IX. FORMAL ANALYSIS

In this section, we perform a formal analysis of the proposed security extension through an enhanced BAN logic [6] called AUT-LOG [12]. Through this analysis, the security goals described in the following subsection are proven to be achieved by the extension. Entire part is considered with reference [1].

#### 9.1 Security Goals

IMSI should be a shared secret between the UE and the HN/HSS; it should not be disclosed to any third party including the SN/MME:

—G1: UE believes UE    IMSI     $\xleftrightarrow{\text{HSS}}$

G2: UE believes     $\neg$  (MME sees IMSI)

GUTIs and DMSIs are transmitted in lieu of the IMSI of a UE. During every successful run of the protocol, if the UE receives a fresh GUTI and a fresh DMSI, it can easily protect its IMSI (section 7).

—G3: UE believes UE has GUTI

—G4: UE believes fresh(GUTI)

—G5: UE believes UE has DMSI

—G6: UE believes fresh(DMSI)

It should not be possible to link a GUTI with the corresponding DMSI and a DMSI with the corresponding IMSI.

—G7: UE believes  $\neg$  (GUTI =DMSI)

—G8: UE believes $\neg$  (DMSI =IMSI)

#### 9.2 Prerequisites & Proving the security goals

UE recognizes Ki and believes that it is a good key for communication

with HSS:

UE has Ki                    (26)

UE recognises Ki    (27)

U E believes f resh(SEQ) (29)

UE regards the following messages as atomic messages

(X ) U E = X X {ERAN D, GUT I} (30)

Similar to all above equations by reference paper [1] we can derive formulas no As proven in equation 33, 34, and 35, the UE receives a pair of fresh DMSI and GUTI during every successful run of the AKA protocol.

These new dynamic identities (as explained in section 7) may be used by the UE to identify itself (instead of the IMSI). Thus the following may be assumed about the UE:

UE believes UE controls  $\neg$  (MME sees IMSI)

Entire part is considered with reference [1].

### X. IMPLEMENTATION

For implementation purpose I have used

Simulation tool    : NS-2.3x

Languages us        : C++

Script Languages: AWK, TCL

Graph evaluation: Xgraph

In following module wise :

Module 1:

Apply LTE patch in ns2 and create a base LTE network with enodeB and users and transfer the data from sender node to receiver node.

Implementation: TCL, LTE Patch

Module 2:

Implement Existing Security architecture model (eNB is connected with one or more Mobility Management Entities (MME) through the S1-MME interface) and transfer data between users and eNodeB.

Implementation: TCL, C++

Module 3:

Measure Successful data delivery ratio and delay of Existing Security architecture model implemented LTE network and outputs are shown using graphs.

Implementation: TCL, AWK, Xgraph

Module 4:

Implement Proposed TRUST MODEL (The UE should trust only the HN with which it is registered And no one else) and transfer data between users and eNodeB.

Implementation: TCL, C++

Module 5:

Measure Successful data delivery ratio and delay of Proposed Secure TRUST MODEL implemented LTE network and outputs are shown using graphs.

Implementation: TCL, AWK, Xgraph

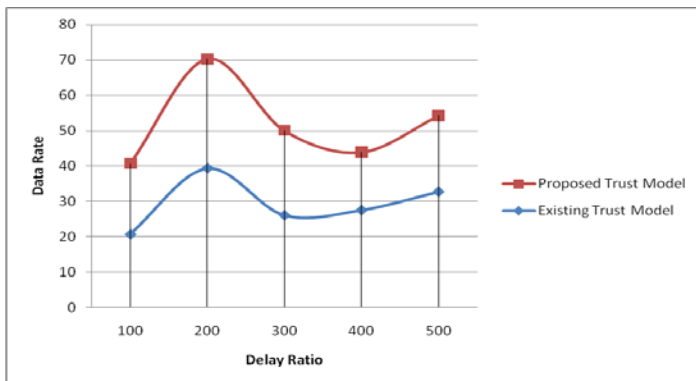
Module 6:

Compare Existing Security architecture model with proposed Secure TRUST MODEL using the measured Parameters (Successful data delivery ratio and delay) and outputs are shown using graphs.

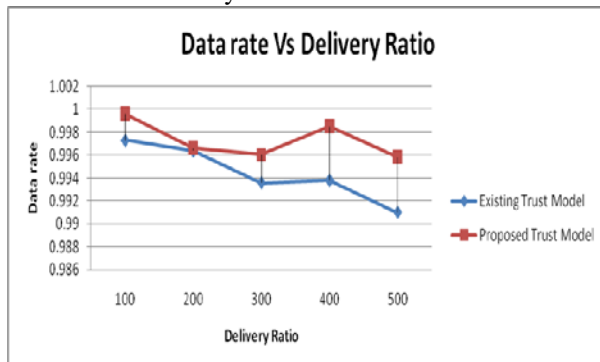
Implementation: Xgraph

## XI. RESULTS

### 11.1 Data Rate vs. Delay Ratio



### 11.2 Data rate vs Delivery Ratio



## XII. CONCLUSION

In conclusion, Compare Existing Security architecture model with proposed Secure TRUST MODEL using the measured Parameters (Successful data delivery ratio and delay) and outputs are shown using graphs. As part of conclusion the implementation contributed to understanding the importance and

the current status of subscriber's identity privacy in cellular network. With more and more operators taking a plunge into the competitive cellular market, interoperability is a key issue. A major factor that influence the ease at which interoperation may happen between cellular operators, depends on the flexibility of the trust model adopted by a cellular network. In this article, we implemented a trust model that may help in improving the status of identity privacy and as an additional benefit may make interoperability between cellular operators easier. Entire part is considered with reference [1].

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## AUTHORS

**First Author** – Mr.Somnath B.Thigale, B.E.CSE, MBA (HR), Pursuing M.E. CSE, from SVERI'S COE Pandharpur., Somnath.thigale@gmail.com

**Second Author** – Prof.Amit R.Sarkar, B.E.CSE, M.Tech CSE, Assist.Prof , at SVERI's COE Pandharpur., Amitsarkar.us@gmail.com

# Ethnobotanical analysis on the Campus of Govt. Degree College Rajouri (J&K), India.

Anwer Shah<sup>1</sup>, Shamim Ahmad Azad<sup>2</sup>, Ghulam Abbas<sup>2</sup>, M.A.Dar<sup>2</sup>, Mangat Ram, Sharma<sup>3</sup>, Aasia Rashid Bhat<sup>2</sup>, Umar Farooq<sup>2</sup>

<sup>1</sup> Department of Botany, Jammia Hamdard New Delhi- 110062

<sup>2</sup>Department of Botany, Government Degree College, Rajouri-185131

<sup>3</sup>Department of Zoology, Government Degree College, Rajouri-185131

**Abstract-** The present study documented the ethnobotanical information of 104 plant species from Rajouri College Campus belonging to 90 genera and 35 families. Of these about 51 species are used as medicines, 45 species as practical, 45 species as fodder, 44 species as soil conservation, 39 species as fencing, 39 species as construction, 39 species as fuel, 31 species as agricultural implements, 25 species as ornamental, 25 species as shade, 22 species as furniture wood, 19 species as fruits, 16 species as vegetables and 7 species are used as spices. Moreover almost all enlisted species to have use in more than one ethnobotanical use category. This study is first of its kind on the diverse and comprehensive use of the campus flora.

**Index Terms-** College campus, Ethnobotany, Rajouri

## I. INTRODUCTION

Rajouri is one of the hilliest districts of state Jammu and Kashmir [J&K] comprising of 2630 Km<sup>2</sup> area and is located between 70° and 74°4' east longitude and 32°58' and 33°35' north latitude. Rajouri, etymologically, is the land of Rajas (Kings). In the district, located along the Rajouri-Jammu national highway is a village known as Chingus. Historically this village is linked with the burial of Intestine of Jahangir (Mughal emperor) who died here during his return from Kashmir. Intensity of weather is noticeable from hot in plain and cool in Pir Panjal Mountains in the north. Temperature hardly exceeds 45°C according to the metrological records. The population of the district has been estimated by the Govt. of India as 642415 souls ([www.msmedijammu.gov.in](http://www.msmedijammu.gov.in)) and half of the population of the Rajouri district is owned by the tribal communities known as Gujjars, Bakerwals and Baniharas. Gojri, Pahari, Kashmiri and Dogri are common languages of the Rajouri. Ethnobotany of Rajouri district with special reference to its medicinal uses of

plants species has been previously published by (Sharma & Singh 1989; Nawchoo et al. 1994; Rashid and Anand (2007); Pant & Verma 2008; Rashid et al. 2008, 2013; Rashid 2012, 2013; Mahmood & Kadam 2012; Shah et al., 2012; Azad & Bhat 2013; Kumari et al. 2013; Shah et al.2015). There has been no ethnobotanical exploration on diverse uses of plant diversity growing within the campus of GDC Rajouri. Keeping this in mind we set out to investigate and capture the diverse ethnobotanical uses of plant diversity of this campus. Capturing the uses of plant species from a number of employees who belong to different ethnic groups is therefore a significant contribution to the documentation of indigenous knowledge on the diverse uses of plant resources in the Campus. Local inhabitants have high dependence on multipurpose floristic diversity of the campus not only for providing fuel wood, fodder, fruit and small timber but also for the treatment of many health related ailments.

## II. STUDY AREA

The College campus is located on a small plateau towards the north of the District Headquarter. The Campus is spread over an area of almost 100 *kanals* (Kanal = 20marlas and one Marla = 272.25 square feet). The snow covered Pir-Panjal Mountains and lush green meadows and lakes (*sars*) of the middle Himalayas add splendid look to its natural picturesque. The campus is surrounded from all side by scattered residential and commercial houses and shops. Because of its wide spread area, the college campus harbours different variety of in-situ and ex-situ plant species which are being used by the employees, students and other people who are associated with this College directly or indirectly for variety of purposes (Figure 1).

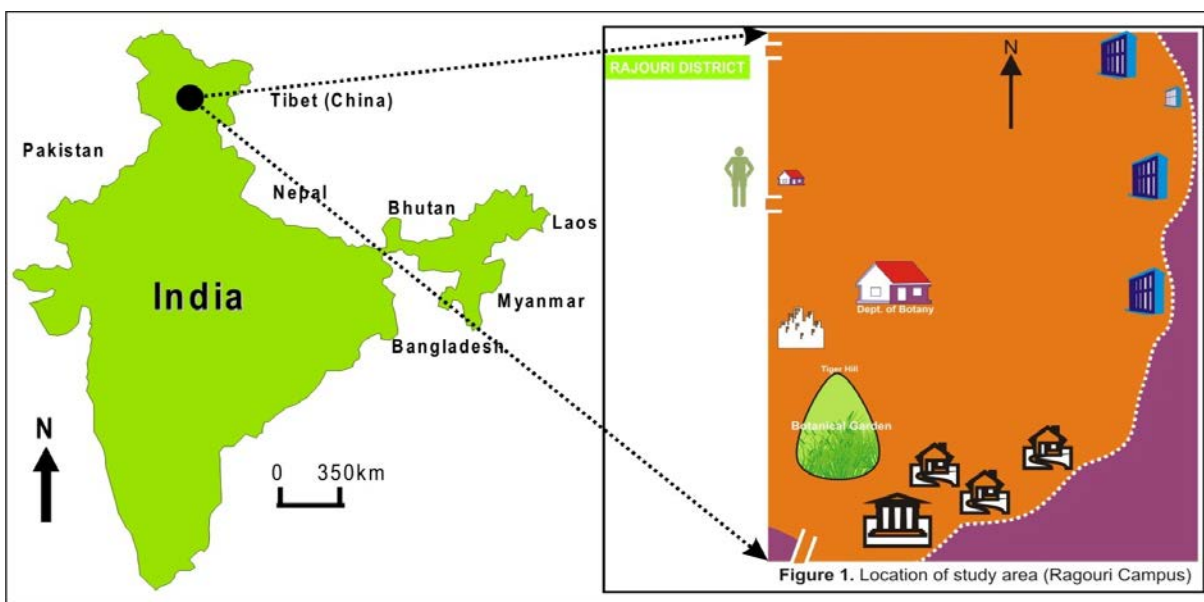


Figure 1: Map of Study area [Rajouri Campus, J&K, India]

### III. MATERIALS AND METHODS

Campus area was surveyed during May 2014-April 2015 to document ethnobotanical information on the uses of both wild and cultivated floristic diversity. A total of 70 informants were interviewed (49% of the total college's employees) but only 50 (35%) provided information on variety of uses of plants, included both male and female with age group from 22-52 year old (Table 1) and (Figure 2). The ethnobotanical information was collected through semi-structured interview and questionnaire. The plants specimens, collected from the campus were photographed, dried, preserved and identified with the available floristic literature Sharma & Kachroo, 1983; Swami & Gupta; Bhellum & Magotra, 2012; Malik et al., 2010; Dar et al., 2014..

### IV. RESULTS AND DISCUSSION

The ethnobotanical interviews resulted in the documentation of 104 plant species, distributed across 35 families and 90 genera, used under different ethnobotanical categories. Of these 102 plants were angiosperm and 1 belonged to each of Gymnosperm and Pteridophytes. The ethnobotanical use of plants along with family, growth form are given in Table 2 and Figure 3. The ethnobotanical informations showed that all the 104 species were locally used for various purposes. They include 51 species as medicines, 45 species as practical, 45 species as fodder, 44 species as soil conservation, 39 species as fencing, 39 species as construction, 39 species as fuel, 31 species as agricultural implements, 25 species as ornamental, 25 species as shade, 22 species as furniture wood, 19 species as fruits, 16 species as vegetables and 7 species as spices (Figure 4). The interaction between plant and humans is very strong and can never be disassociated as the dependence is indispensable. In the present study conducted in the college campus, it was observed through interviews that people in and around this campus use native plants for acquiring their basic household requirements such as medicine, fuel, fruit, fodder, forage, vegetable, furniture, roof

thatching and agriculture tools like Plough (*hal*), Yoke (*gunpla*), handle for shovel (*Belcha*), hoe (*Kaie*), sickle (*Drati*), axes (*kulahri*), saw (*aree*) and earth rake (*dandali*) etc.. Many medicinal plant species which have been cultivated under “ex-situ conservation drive” initiated by the Department of Botany in the campus were growing well under natural habitats at higher altitude and in the low land as well; these medicinally important species are *Acorus calamus*, *Ajuga bracteosa*, *Allium cepa*, *Cichorium intybus*, *Fumaria indica*, *Equisetum arvense*, *Phyllanthus emblica*, *Plantago major*, *Rubia cordifolia*, *Taraxacum officinale*, *Bergenia ciliate* and *Zanthoxylum armatum*. Overexploitation of these species by locals, hidden collectors and drug dealers has drastically decreased the species richness in their natural habitats. Ethnobotanical use categories revealed that a major proportion of plant species (51/104) were used for medicines such as *Achillea millefolium*, *Acorus calamus*, *Fumaria indica*, *Nerium oleander*, *Taraxacum officinale*, *Ocimum basilicum*, *Phyllanthus emblica*, *Plantago major*, *Viburnum grandiflorum* etc. The findings agree with (Rashid & Anand 2007; Rashid et al. 2008; Pant & Verma, 2008; Rashid 2012, 2013; Azad & Bhat 2013; Shah et al. 2015) in this respect. The next major used categories of plants were fodder and practical purposes (45 each). Our findings are similar to Rashid & Sharma, 2012 and Amajad et al., 2015. A large number of important medicinal plant species die every year before they attain their full life cycle during the period when heavy numbers of students from within the campus or outside, gather for fee deposit or filling up their examination or scholarship forms since they seek free entry into the protected area for ex-situ plant species. A few years back a heavy “Tree-Cut” operation was conducted in the campus on the behest of some College officials that has lead to the creation of barren areas. This operation has killed and cut more than 80 fully matured tree species like *Morus alba*, *Ficus palmata*, *Eucalyptus alba* and *Populus ciliata* and auctioned them for a meagre amount.





Figure 2: Photographs of plants [1-4] and some local fund employees [5] working in the Herbal Garden of the Campus

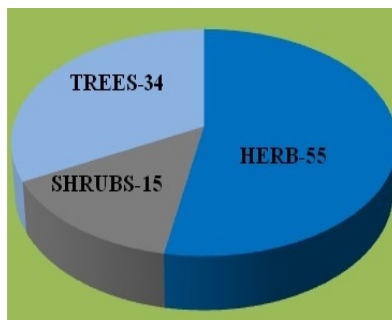


Figure 3: Classification of plants on the basis of their growth forms.

#### V. CONCLUSION

The heavy annual influx of the students in Sciences, Arts and in other outdoor courses causes drastic decrease of various

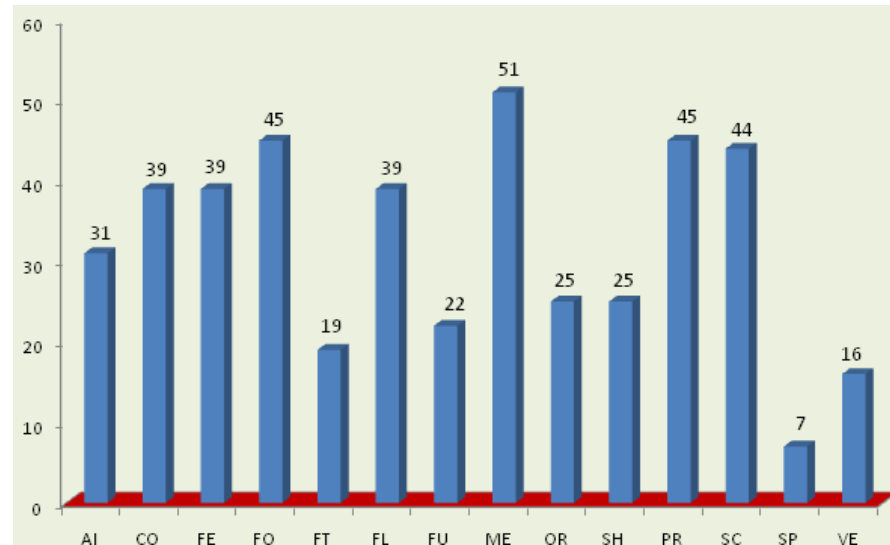
important campus floras due to the lack of scientific attitude of conservational strategies. It is an urgent need to create awareness through Class room lectures, Seminars, NSS and NCC cadets' awareness programmes about the usefulness of the floristic

diversity in and around the Campus. Cultivation of Threatened plants should be encouraged among medical students on marks-oriented basis. The Zoology department should be made a part of the College plantation derive so that the resources could be conserved and preserved as a future refuge for many animals, birds and reptiles needed for practical classes.

#### ACKNOWLEDGEMENTS

The authors wish to thank the informants especially the local fund employees who work in the Campus for their participation in documentation of this ethnobotanical information on the College Campus's floristic diversity. I (first author) also wish to acknowledge the kind hospitality and valuable contributions of the entire faculty in the Department of Botany, GDC Rajouri during this field studies.





**Figure 4: Ethnobotanical use of plants in different categories in Rajouri Campus [J&K], India**

**AI:** Agriculture Implement; **CO:** Construction; **FE:** Fencing; **FO:** Fodder; **FT:** Fruit; **FL:** Fuel; **FU:** Furniture; **ME:** Medicine; **OR:** Ornamental; **SH:** Shade; **PR:** Practical; **SC:** Soil Conservation; **SP:** Spices; **VE:** Vegetable

**Table 1: Socio-demographic characteristics of the informants**

Characteristic	Parameter		No. of informants (Employees)
Age	18-25		20
	26-30		10
	31-40		11
	41-50		6
	51-60		3
Gender	Male		44
	Female		6
Ethnicity	Muslim	Gujjar	22
		Kashmiri	20
	Sikh		2
	Hindu		6
Marital Status	Married		30
	Unmarried		19
	Widow		1
	Transgender		-
Education	None		3
	Primary		10
	Secondary		15
	Tertiary		20
	Ph.Ds		5
Employment	Professors		10
	Contr. Lecturers		15

	Technician	2
	Clerical	6
	Local fund	17
Monthly income	Rs.40000-80000	12
	Rs.8000-22000	10
	Rs.1000-4000	28

**Table 2: Ethnobotanical uses of Plant diversity growing in [in-situ and ex-situ] in the Rajouri Campus**

Botanical Name; [Family]	Family Name	Voucher Number	Growth Form	Growth Status	Ethnobotanical Uses														Part Used
					Ag. implement	construction	Fencing	Fodder, Forage	Fruit	Fuel / Coal	Furniture	Medicine	Ornament	Shade plant	Practical	S. conservation	Spices	Vegetable	
<i>Achillea millefolium</i> L.	Asteraceae	DCR2401	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp
<i>Achyranthes aspera</i> L.	Amaranthaceae	DCR2402	H	W	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp
<i>Acorus calamus</i> L.	Acoraceae	DCR2403	H	C	-	-	-	-	-	-	-	+	+	-	-	+	-	-	Rh
<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	DCR2506	H	W	-	-	-	+	-	-	-	+	-	-	+	+	-	-	Wp
<i>Ajuga bracteosa</i> Wall. ex Benth.	Lamiaceae	DCR2404	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp
<i>Ajuga parviflora</i> Benth.	Lamiaceae	DCR2405	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp
<i>Albizia lebeck</i> (L.) Benth.	Leguminosae	DCR2406	T	W	+	+	-	+	-	+	+	-	-	+	-	+	-	-	Wd;Lv
<i>Allium cepa</i> L.	Amaryllidaceae	DCR2407	H	C	-	-	-	-	-	-	-	+	-	-	+	-	+	+	Wp
<i>Allium sativum</i> L.	Amaryllidaceae	DCR2408	H	C	-	-	-	-	-	-	-	+	-	-	+	-	+	+	Wp
<i>Anagallis arvensis</i> L.	Primulaceae	DCR2409	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp
<i>Apium graveolens</i> L.	Apiaceae	DCR2411	H	C	-	-	-	-	-	-	-	+	-	-	-	-	+	+	Wp
<i>Araucaria heterophylla</i> (Salisb.) Franco	Araucariaceae	DCR2412	T	C	-	-	-	-	-	+	-	-	+	-	-	-	-	-	Wp
<i>Bambusa nutans</i> Wall. ex Munro	Poaceae	DCR2413	S	C	+	+	+	-	-	+	+	-	+	-	-	+	-	-	Wd

<i>Bauhinia variegata</i> L.	Fabaceae	DCR2414	T	N	+	+	+	+	-	+	+	+	-	-	-	+	-	+	Wd; Lv; Fl
<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	DCR2415	H	C	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Rt
<i>Bidens chinensis</i> (L.) Willd.	Asteraceae	DCR2416	H	W	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp
<i>Bougainvillea spectabilis</i> Willd.	Nyctaginaceae	DCR2417	S	C	+	+	+	-	-	+	-	-	+	-	+	-	-	-	Wp
<i>Brassica juncea</i> (L.) Czern.	Brassicaceae	DCR2418	H	C	-	-	-	+	-	-	-	-	-	-	+	-	-	+	Wp; Sd; Ol
<i>Brassica rapa</i> L.	Brassicaceae	DCR2419	H	C	-	-	-	+	-	-	-	-	-	-	+	-	-	+	Wp; Sd; Oil
<i>Buxus wallichiana</i> Baill.	Buxaceae	DCR2420	T	C	+	+	-	+	-	+	+	-	-	-	-	+	-	-	Wd;Lv
<i>Callistemon citrinus</i> (Curtis) Stapf	Myrtaceae	DCR2421	T	C	+	+	+	-	-	+	-	-	+	+	+	+	-	-	Wd;Fl
<i>Canna indica</i> L.	Cannaceae	DCR2422	H	C	-	-	-	-	-	-	-	-	+	-	+	+	-	-	Fl
<i>Cannabis sativa</i> L.	Cannabaceae	DCR2423	H	W	-	-	-	-	-	-	-	+	-	-	+	-	-	-	Wp; Sd;
<i>Capsella bursa-pastoris</i> (L.) Medik	Brassicaceae	DCR2424	H	W	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp
<i>Cassia occidentalis</i> L.	Caesalpinaceae	DCR2425	S	C	-	-	+	-	-	-	-	-	+	+	+	-	-	-	Wd; Lv; Fl.
<i>Celtis australis</i> L.	Ulmaceae	DCR2426	T	W	+	+	-	-	-	-	-	-	-	+	-	+	-	-	Wd;Lv
<i>Cestrum nocturnum</i> L.	Solanaceae	DCR2428	S	C	-	-	-	-	-	-	-	-	+	-	+	-	-	-	Fl
<i>Chenopodium album</i> L.	Chenopodiaceae	DCR2429	H	W	-	-	-	-	-	-	-	-	-	-	-	-	-	+	Wp;Lv
<i>Cichorium intybus</i> L.	Asteraceae	DCR2430	H	W	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Wp;Lv
<i>Cirsium arvense</i> (L.);	Asteraceae	DCR2431	H	W	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp
<i>Cirsium falconeri</i> (Hook. f.)	Asteraceae	DCR2432	H	W	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp
<i>Coriandrum sativum</i> L.	Apiaceae	DCR2433	H	C	-	-	-	-	-	-	-	+	-	-	+	-	+	+	Wp;Lv

<i>Coriandrum sativum</i> L.	Apiaceae	DCR2434	H	C	-	-	-	-	-	-	-	-	-	+	-	+	-	+	+	Wp; Lv; Ft
<i>Cupressus torulosa</i> D. Don	Cupressaceae	DCR2435	T	C	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	Wd
<i>Cycas circinalis</i> L.	Cycadaceae	DCR2436	T	C	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	Wp
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	DCR2507	H	W	-	-	-	+	-	-	-	+	-	-	+	+	-	-	-	Wp
<i>Dodonaea viscosa</i> (L.) Jacq.	Sapindaceae	DCR2437	S	C	-	+	+	+	-	+	-	-	-	-	-	-	+	-	-	Wp
<i>Duchesnia indica</i> (Andr.) Focke	Rosaceae	DCR2438	H	W	-	-	-	+	+	-	-	+	-	-	+	-	-	-	-	Wp;Lv
<i>Equisetum arvense</i> L.	Equisetaceae	DCR2439	H	W	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	Wp
<i>Eucalyptus alba</i> Reinw. ex Bl.	Myrtaceae	DCR2440	T	C	+	+	+	-	-	+	+	-	-	+	-	+	-	-	-	Wd
<i>Euphorbia elastica</i> Jum.	Euphorbiaceae	DCR2441	T	C	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Wp
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	DCR2442	H	W	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp; Fl
<i>Euphorbia hispida</i> Boiss.	Euphorbiaceae	DCR2443	H	W	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	Wp; Fl
<i>Euphorbia royleana</i> Boiss.	Euphorbiaceae	DCR2444	T	C	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	St
<i>Ficus palmata</i> Forssk.	Moraceae	DCR2445	T	W	-	+	+	+	+	+	-	+	-	+	+	+	-	-	-	Wd;Lv; Ft
<i>Ficus religiosa</i> L.	Moraceae	DCR2446	T	W	+	+	+	+	+	+	+	+	-	-	-	+	-	-	-	Wd; Lv; Ft
<i>Foeniculum vulgare</i> Mill.	Apiaceae	DCR2447	H	C	-	-	-	-	+	-	-	+	-	-	+	-	+	+	+	Wp ; Lv; Lt
<i>Fragaria chiloensis</i> (L.) Mill.	Rosaceae	DCR2448	H	C	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Ft
<i>Fumaria indica</i> (Haussk.) Pugsley	Fumariaceae	DCR2449	H	W	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Wp;Lv
<i>Galium aparine</i> L.	Rubiaceae	DCR2508	H	W	-	-	-	+	-	-	-	+	-	-	+	+	-	-	-	Wp
<i>Geranium rotundifolium</i> L.	Gentianaceae	DCR2450	H	W	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	Wp;Rt

<i>Grevillea robusta</i> A.Cunn. ex R.Br.	Proteaceae	DCR2451	T	C	+	+	+	-	-	+	+	-	+	+	-	+	-	-	Wd
<i>Grewia optiva</i> J.R.Drumm. ex Burret	Tiliaceae	DCR2452	T	W	+	+	+	+	-	+	-	-	-	+	-	+	-	-	Wd;Lv
<i>Helianthus annuus</i> L.	Asteraceae	DCR2453	H	C	-	-	-	+	-	-		+	+	-	+	-	-	Fl	
<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	DCR2454	S	C	-	-	-	-	-	-	-	-	+	-	+	-	-	Fl	
<i>Hippeastrum striatum</i> (Lam.) H.E.Moore	Amaryllidaceae		H	C	-	-	-	-	-	-	-	-	+	-	+	-	-	Fl	
<i>Indigofera heterantha</i> Wall. ex Brandis	Papilionaceae	DCR2455	S	W	-	+	+	+	-	+	-	-	-	-	-	+	-	Wd	
<i>Iris milesii</i> Baker ex Foster	Iridaceae	DCR2456	H	C	-	-	-	-	-	-	-	+	+	-	+	-	-	Rt; Fl	
<i>Justicia adhatoda</i> L.	Acanthaceae	DCR2457	S	W	-	+	+	-	-	+	-	+	+	-	+	+	-	Lv; Fl	
<i>Lamium amplexicaule</i> L.	Lamiaceae	DCR2458	H	W	-	-	-	+	-	-	-	-	-	-	-	-	+	Wp;Lv	
<i>Lathyrus aphaca</i> L.	Papilionaceae	DCR2459	H	W	-	-	-	-	-	-	-	-	-	-	+	-	+	Wp; Fl	
<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	DCR2460	H	W	-	-	-	-	-	-	-	-	-	-	+	-	-	Wp	
<i>Medicago polymorpha</i> L.	Papilionaceae	DCR2461	H	W	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp	
<i>Melia azadirachta</i> L.	Meliaceae	DCR2462	T	W	+	+	+	+		+	+		-	+	+	+	-	Wd;Lv Ft;WP	
<i>Mentha longifolia</i> (L.) L.	Lamiaceae	DCR2463	H	C	-	-	-	+	-	-	-	-	-	+	-	-	+	Lv	
<i>Morus alba</i> L.	Moraceae	DCR2464	T	W	+	+	+	+	+	+	+	+		+	+	+	-	Wd;Lv; Ft;	
<i>Morus nigra</i> L.	Moraceae	DCR2465	T	W	+	+	+	+	+	+	+	-	-	+	-	+	-	Wd; Lv; Ft;	
<i>Nerium oleander</i> L.	Apocynaceae	DCR2466	S	C	-	+	+	-	-	+	-	+	+	-	+	+	-	Tg	
<i>Ocimum basilicum</i> L.	Lamiaceae	DCR2467	H	C	-	-	-	-	+	-	-	+	-	-	+	-	+	Wp; Sd	
<i>Olea ferruginea</i> Royle	Oleaceae	DCR2468	T	C	+	+	+	+	-	+	+	+	-	+	-	+	-	Wd ;Ft	
<i>Papaver somniferum</i> L.	Papaveraceae	DCR2469	H	C	-	-	-	-	+	-	-	+	+	-	+	-	+	Wp ; Lv; Sd	

<i>Phyllanthus emblica</i> L.	Phyllanthaceae	DCR2470	T	C	+	+	+	-	+	+	+	+	+	+	+	+	-	-	Wd; Lv; Ft
<i>Pinus roxburghii</i> Sarg.	Pinaceae	DCR2471	T	W	+	+	+	-	-	+	+	+	+	+	+	+	-	-	Wd ; Lv; Rn
<i>Plantago lanceolata</i> L.	Plantaginaceae	DCR2472	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp;
<i>Plantago major</i> L.	Plantaginaceae	DCR2473	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp;Rt
<i>Platanus orientalis</i> L	Platanaceae	DCR2474	T	C	+	+	+	-	-	+	+	-	+	-	-	+	-	-	Wd;Lv
<i>Polygonum affine</i> D. Don	Polygonaceae	DCR2476	H	C	-	-	-	+	-	-	-	+	-	-	-	-	-	-	Wp; Rh
<i>Populus ciliata</i> Wall. ex Royle	Salicaceae	DCR2477	T	C	+	+	+	+	-	+	+	-	-	+	-	+	-	-	Wd;Lv
<i>Prunus armeniaca</i> L.	Rosaceae	DCR2478	T	C	+	+	+	+	+	+	+	-	-	+	+	+	-	-	Wd;Ft
<i>Pterospermum acerifolium</i> (L.) Winkl.	Malvaceae	DCR2480	T	C	+	+	+	-	-	+	+	-	-	+	-	+	-	-	Wd
<i>Pyrus communis</i> L.	Rosaceae	DCR2481	T	C	+	+	-	+	+	+	+	+	-	+	-	+	-	-	Wd;Ft; Lv
<i>Pyrus pashia</i> Buch.-Ham. ex D.Don	Rosaceae	DCR2482	T	W	+	+	+	+	+	+	+	+	-	+	-	+	-	-	Wd;Ft; Lv
<i>Quercus oblongata</i> D.Don	Fagaceae	DCR2483	T	C	+	+	+	+	-	+	-	+	-	+	-	+	-	-	Wd; Lv; Ft
<i>Ranunculus arvensis</i> L.	Ranunculaceae	DCR2484	H	W	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp
<i>Rosa indica</i> L.	Rosaceae	DCR2485	H	C	-	-	-	+	-	+	-	+	+	-	+	+	-	-	Fl
<i>Rubia cordifolia</i> L.	Rosaceae	DCR2486	H	W	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Wp
<i>Rubus ellipticus</i> Sm.	Rosaceae	DCR2487	S	W	-	-	+	+	+	+	-	-	-	-	-	+	-	-	Wp;Ft
<i>Rumex nepalensis</i> Spreng	Polygonaceae	DCR2488	H	W	-	-	-	+	-	-	-	+	-	-	-	-	-	+	Wp
<i>Salix tetrasperma</i> Roxb.	Salicaceae	DCR2489	T	W	+	+	+	+	+	+	-	-	-	+	-	+	-	-	Wd;Lv.
<i>Sarcococca saligna</i> Müll.Arg.	Buxaceae	DCR2490	S	C	-	+	-	-	-	-	-	-	+	-	-	+	-	-	Wp
<i>Saussurea heteromalla</i> (D. Don) Hand.-Mazz	Asteraceae	DCR2491	H	W	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Wp
<i>Skimmia laureola</i> Franch.	Rutaceae	DCR2492	S	C	-	-	-	-	-	-	-	+	-	-	-	-	-	-	Lv
<i>Sonchus arvensis</i> L.	Asteraceae	DCR2493	H	W	-	-	-	+	-	-	-	-	-	-	+	-	-	-	Wp
<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	DCR2494	H	W	-	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp



<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	DCR2495	T	W	+	+	+	-	+	-	-	+	-	+	-	-	-	-	Wd; Lv; Ft
<i>Taraxacum officinale</i> Weber	Asteraceae	DCR2496	H	W	-	-	-	+	-	-	+	-	-	+	-	-	+	Wp	
<i>Tectona grandis</i> L.f.	Lamiaceae	DCR2497	T	W	+	+	+	-	-	+	+	-	-	+	-	+	-	Wd;Lv	
<i>Toona ciliata</i> M.Roem.	Meliaceae	DCR2498	T	W	+	+	+	-	-	+	+	-	-	+	-	+	-	Wd;Lv	
<i>Toona sinensis</i> (Juss.) M.Roem.	Meliaceae	DCR2499	T	W	+	+	+	-	-	+	+	-	-	+	-	+	-	Wd;Lv	
<i>Trifolium fragiferum</i> L.	Papilionaceae	DCR2500	H	W	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp	
<i>Trifolium repens</i> L.	Papilionaceae	DCR2501	H	W	-	-	+	-	-	-	-	-	-	-	-	-	-	Wp	
<i>Viburnum grandiflorum</i> Wall. ex DC.	Capparaceae	DCR2502	S	C	+	+	+	+	+	+	-	+	-	-	-	+	-	Wd;Lv	
<i>Vitex negundo</i> L.	Lamiaceae	DCR2505	S	W	-	+	+	+	-	+	-	+	-	-	+	+	-	Wd;Lv	
<i>Zanthoxylum armatum</i> DC.	Rutaceae	DCR2503	S	C	+	+	+	-	+	+	-	+	-	-	-	+	+	Wd;Ft	
<i>Zizyphus mauritiana</i> Lam	Rhamnaceae	DCR2504	T	C	-	+	+	+	+	+	-	+	-	-	-	+	-	Bk; Ft	

**Abbreviation:** Bk; **Bark**, Ft; **Fruit**, Fl; **Flower**, Lv; **Leaves**, Rn; **Resin**, Rh; **Rhizome**, Rt; **Root**, Sd; **Seed**, St; **Stem**, Tg; **Twig**, Wd; **Wood**, Wp (**Whole plant**), W; **Wild**, C; **Cultivated**, H; **Herb**, S; **Shrub**, T; **Tree**, Ag. **Implement; Agriculture implement.**

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## AUTHORS

- First Author-** Anwer Shah, Assistant professor in Botany in Govt. Degree College Rajouri and presently pursuing Ph.D. at Jammia Hamdard University, New Delhi, India. e-mail address: [anwershah71@gmail.com](mailto:anwershah71@gmail.com)
- Second Author-** Dr. Shamim Ahmad Azad, Assoc. Professor in Botany in Govt. Degree College Rajouri. e-mail address : [Shamim.azad03@gmail.com](mailto:Shamim.azad03@gmail.com)
- Third Author-** Ghulam Abbas, Assistant professor in Botany in Govt. Degree College Rajouri. e-mail address: [abbas72mdr@gmail.com](mailto:abbas72mdr@gmail.com)
- Fourth Author-** M.A.Dar, Assistant professor in Botany Degree College Rajouri. e-mail address: [dmanzoor123@gmail.com](mailto:dmanzoor123@gmail.com)
- Fifth Author-** M.R. Sharma, Assistant professor in Zoology in Degree College Rajouri.
- Sixth Author-** Aasia Rashid Bhat, Assistant professor in Botany Degree College Rajouri. e-mail address: [aasiabhat@gmail.com](mailto:aasiabhat@gmail.com)
- Correspondence Author-** Dr. Umar Farooq, Assistant professor in Botany in Govt. Degree College Rajouri. e-mail address: [darumer786@gmail.com](mailto:darumer786@gmail.com)

# Influence of blend ratio in the properties of bamboo and silk woven fabrics

Dr. Smitarani Saikia,\* Dr. Binita Baishya kalita,\*\* Dr.Satvinder Kaur\*\*

\* Assistant professor, Deptt. Of Home Science, Moran Mahila Mahavidyalaya, sivasagar, Assam

\*\* Professor, Faculty of Home Science., A.A.U.Jorhat, Assam.,

\*\*Professor and Dean, Faculty of Home Science., A.A.U.Jorhat, Assam.

**Abstract-** Blending different types of fibres is a widely practiced means of enhancing the performance and the aesthetic qualities of a fabric. Blended yarns from natural and man-made fibres have the particular advantage of successfully combining the good properties of both fibre components, such as comfort of wear with easy care properties. These advantages also permit an increased variety of products to be made, and yield a stronger marketing advantage. Fiber blending can achieve quality products that cannot be realized using one fiber type alone, and it can also reduce the cost by substituting a less expensive fiber for a more costly one. So, the study was conducted to blend silk and regenerated bamboo to produce value added products with the objectives -To blend Bamboo fibre with silk, to construct fabric of plain weave using blended yarn and to produce value added products from the woven fabrics. The bamboo and silk fibre was blend in carding and drawing stage and yarn were produced in three different ratios 20:80, 50:50 and 80:20. These yarns were further weaved in plain weave and the functional properties of the fabrics produced were evaluated. It was found that the woven blended bamboo mulberry fabrics can successfully use for producing value added products.

**Index Terms-** Regenerated bamboo, Silk, Blending, Carding, Drawing.

## I. INTRODUCTION

Clothing is one among the most important three basic needs in every human life. It protects our body from various climates and gives us a good appearance. Clothing is an integral part of human life and has a number of functions: adornment, status, modesty and protection. Consumers are becoming increasingly very much conscious to environmental friendly consumer goods and much concerned about the green activities. This tendency for eco-friendly come into contact with the skin for a prolonged period of the time says Dharani *et al.* (2010). Fiber blending has been a common practice in the textile industry for a long time, stimulated to a great degree by the availability of an ever increasing number of manmade fibers. Fiber blending can

achieve quality products that cannot be realized using one fiber type alone, and it can also reduce the cost by substituting a less expensive fiber for a more costly one. (Das, *et al.*, 2009). The survival of textile industry depends primarily on the diversification of end products to meet the national as well as international demands. Diversification in the product can be brought about at various stages viz., yarn, fabric, design, fashion and style. Blended fabrics can be created with variegated novelty effect that caters to the fashion world today. Hence, the study was proposed with the following objectives:

- To blend regenerated bamboo fibre with silk, and
- To construct fabric of plain weave using blended yarn.

## II. MATERIALS AND METHODS

Bamboo fibre is regenerated cellulosic fibre produced from bamboo. The type of bamboo used for apparels is Moso bamboo (*Phyllostachys pubescens*). Mulberry silk is comes from the silkworm, *Bombyx mori L*, which solely feeds on the leaves of mulberry plant. Form of availability of raw material of bamboo and silk are differ, and also the basic fiber properties vary, hence they need to undergo different processes till they are suitable for good blending. The silk is always available in cocoon form. These cocoons contain sericin gum which is to be removed for further smooth processing. So the first process is degumming further followed by other processes. Both the fibres were blend in carding and drawing stage and Yarns of three different blends along with 100% bamboo and silk yarn were produced after proper blending. The blend proportion of prepared yarns samples were 20:80, 50:50 and 80:20 of bamboo/silk . The yarns produced were then wound to form cones. The controlled and blended fabrics were weaved in the Fabric plus industry Private Ltd. Guwahati, Assam. From the different blended yarn, fabrics were constructed using plain weave. Blended yarns of different ratios were used for making fabrics in both warp and weft. The nomenclature of the fabric sample was done according to the blend proportions.

**Table 1. Constructional details of regenerated bamboo and mulberry silk blended fabrics**

Sl. No	Sample	Weave	Types of loom	Yarn count	Composition Warp weft % %	Reed count	Loom pick	Cloth width
1	Bamboo 100%	Plain	Handloom Fly Shuttle Loom	1/60 s	Same in both way	48	54	36''
2	Mulberry 100 %	Plain		1/60 s	Same in both way	48	54	36''
3	Bamboo Mulberry 20:80	Plain		1/60 s	Same in both way	48	54	36''
4	Bamboo Mulberry 50:50	Plain		1/60 s	Same in both way	48	56	36''
5	Bamboo mulberry 80:20	Plain		1/60 s	Same in both way	48	54	36''

**Note:**

BP=Bamboo (control) plain weave  
 MP= Mulberry (control) plain weave  
 BMP 20:80= Bamboo x mulberry silk plain weave (20:80 ratio)  
 BMP 50:50= Bamboo x mulberry silk plain weave (50:50 ratio)  
 BMP 80:20= Bamboo x mulberry silk plain weave (80:20 ratio)

**III. RESEARCH FINDINGS**

The findings of the study are presented in the following head.

**Assessment of Functional properties of blended fabrics:**

The test fabrics were tested for their functional properties such as tensile strength, elongation, wicking height, abrasion resistance, absorbency etc. according to the IS and BS methods.

**Table 2. Tensile strength of plain weave blended fabric (kg f)**

Fabrics	Tensile strength (kg f)	
	Warp way	Weft way
BP	53.12	42.65
MP	53.49	44.43
BMP 20:80	58.07	53.54
BMP 50:50	62.00	47.80
BMP 80:20	54.67	55.67
<b>S.Ed(±)</b>	<b>0.34</b>	<b>0.20</b>
<b>CD</b>	<b>0.65</b>	<b>0.54</b>

The results are the arithmetic mean of five determination of each sample.

**Table 3. Elongation of plain weave blended fabric (%)**

Fabrics	Elongation (%)	
	Warp way	weft way
BP	20.09	19.65
MP	22.52	24.78
BMP 20:80	24.02	22.31
BMP 50:50	25.12	24.80
BMP 80:20	23.71	25.67
<b>S.Ed(±)</b>	<b>1.08</b>	<b>0.40</b>

<b>C.D</b>	<b>2.45</b>	<b>0.87</b>
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**Table 4. Drape co-efficient of plain weave blended fabric (%)**

<b>Fabrics</b>	<b>Drape co-efficient %</b>
BP	46.10
MP	48.39
BMP 20:80	43.12
BMP 50:50	45.34
BMP 80:20	41.56
<b>S.Ed(±)</b>	<b>0.75</b>
<b>CD(0.05%)</b>	<b>0.22</b>
<b>CV%</b>	<b>0.26</b>

**Table 5. Wicking height of plain weave blended fabric (cm)**

<b>Fabrics</b>	<b>Wicking height(cm)</b>	
	<b>Warp way(cm)</b>	<b>Weft way(cm)</b>
BP	6.04	6.80
MP	4.05	4.15
BMP 20:80	6.35	6.40
BMP 50:50	6.55	6.90
BMP 80:20	6.90	6.95

The results are the arithmetic mean of five determination of each sample.

**Table 6. Water Absorbency of the blended woven fabric(%)**

<b>Fabrics</b>	<b>Absorption (%)</b>
BP	55.52
MP	49.21
BMP 20:80	56.54
BMP 50:50	58.14
BMP 80:20	61.87
<b>S.Ed.(±)</b>	<b>0.28</b>
<b>CD</b>	<b>0.47</b>

The result of the tensile strength of plain weave blended fabric, the Table 2, illustrated that among the test samples highest tensile strength (62kg f) was shown by BMP 50:50 in warp direction, and the least was exhibited by BP (53.12kg f). While in weft direction, sample BMP 80:20 has a maximum strength (55.67kg f) and lowest tensile strength was found in BP (42.65kg f). The highest tensile strength was found in the blended samples, which may be due to the highest strength of the silk fibres. The table 3, showed the elongation of test samples. From the table it was observed that the elongation of all the samples in warp way have more or less difference with each other. In warp direction sample BMP 50:50 shows highest elongation (25.12%) followed by BMP 20:80 (24.02%). The lowest value was found in control bamboo plain weave fabrics (20.09 %). While in weft direction sample BMP 80:20 shows maximum elongation (25.67 %) while sample BP and BMUP 20:80 were at par (19.65%).

Table 4, Illustrated the drape coefficient of controlled and blended fabrics. It depicts that the highest drape coefficient (48.39%) was found in controlled fabric sample MP and least drape coefficient was found in fabric sample BMP 80:20 (41.56). Drapability of a fabric is combined effect of several factors such as stiffness, flexural rigidity, weight, thickness etc. Stiffness, an

attribute of fabric hand is one of the most important factors determining draping quality of fabric e.g. soft fabric drapes closer to the body forming ripples whereas stiff fabric drapes away from the body. (Pant, 2010) From table 5, it can be seen that the wicking height of plain weave test fabrics found to be maximum in control fabric of bamboo mulberry 80:20 (6.90 cm) and minimum value was found in MP control sample (4.05cm) in warp direction. While in case of weft ways, BMP 80:20 registered highest wicking height (6.95cm) and lowest was seen in MP (4.15cm). The sample BMP 80:20 showed maximum wicking height (table 5) in both warp and weft direction may be due to higher percentage of bamboo fibre in blended yarn. Since the bamboo fibre has good absorbency properties, so it may increase the wicking height of the tested samples. On the other hand MP showed a decreasing trend of wicking height in both the warp and weft direction, which may be due to higher percentage of sericin present in the fibre. In case of the water absorbency of the woven fabrics, the bamboo mulberry 80:20 blended test fabrics attained the highest absorbency (61.87%) while MP control sample recorded lowest absorption of water (49.21 %). It may be due to the amount of gum present in

mulberry fibre. But in case of other blended samples also absorbency increases with the increase in bamboo content.

#### IV. CONCLUSION

Both regenerated bamboo and silk fibre can be used to blend with different proportions. Considering all the physical tests, the 80:20 blend proportion shows better result than other blends, which is required for clothing materials. From the aforesaid, it can be inferred that all the three proportions can be used for producing the blended yarn. Blending of bamboo with silk fibres offers excellent scope for producing a variety of materials for different uses. Apart from these blend proportions, different blend proportions can be tried with silk & other fibers for different end uses.

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#### AUTHORS

**First Author-** Dr. Smitarani Saikia, Assistant professor, Deptt. Of Home Science, Moran Mahila Mahavidyalaya, Sivsagar, Assam., Email: [smitasaikia51@yahoo.com](mailto:smitasaikia51@yahoo.com)

**Second Author -** Dr. Binita Baishya kalita, Professor, Faculty of Home Science., A.A.U.Jorhat, Assam., Email: [baishyakalita@rediffmail.com](mailto:baishyakalita@rediffmail.com)

**Third Author –** Dr. Satvinder Kaur, Professor and Dean, Faculty of Home Science., A.A.U.Jorhat, Assam., Email: [skaur\\_123@yahoo.com](mailto:skaur_123@yahoo.com)

# Numerical Simulation of a Severe Thunderstorm over Delhi Using WRF Model

Jaya Singh<sup>1</sup>, Ajay Gairola<sup>1</sup>, Someshwar Das<sup>2</sup>

<sup>1</sup> CoEDMM, Center of Excellence in Disaster Mitigation and Management, IIT Roorkee, Roorkee-247667, INDIA

<sup>2</sup> India Meteorological Department, New Delhi, INDIA

**Abstract-** A severe thunderstorm affected Delhi and adjoining region between 1630 hrs IST and 1730 hrs IST of 30<sup>th</sup> May 2014. Weather Research and Forecasting (WRF) system version 3.6.1 has been used to simulate and investigate the severe thunderstorm. Sensitivity experiments are conducted to study the impact of using different grid resolution (9km and 3km) with terrain resolution 5 min (~10 km) and 1 min (~2 km) respectively and the same microphysics (MPs) and cumulus parameterization (CPs) schemes on the simulation of the system. The results demonstrate that the model simulates better structure and intensity of the thunderstorm at higher resolution domain.

**Index Terms-** Numerical simulation; Thunderstorm; Weather Research and Forecasting model; Sensitivity experiment.

## I. INTRODUCTION

Thunderstorms/dust storms develop due to intense convection and are generally associated with thunder, heavy rainfall, lightning, hail and squall line [1]. The lightning and thunder are produced by cumulonimbus clouds of convective origin having high vertical extent [2]. In India, when continental air and warm

moist oceanic air meets, the severity of thunderstorm increases, particularly in April - May (pre-monsoon season). In this period, the northern, northwestern and eastern part of India is influenced by thunderstorms. As these thunderstorms mostly move from north-west to south-east, they are also called Nor'westers [3]. On the basis of the development of thunderclouds, the life cycle of thunderstorms is divided in three phases [4] i.e. formative stage, mature stage and dissipative stage as shown in fig 1.1.

The characteristics of the three phases of thunderstorm are summarized below.

1. The updraft lasts throughout the cell.
2. Both updraft and downdraft are present in this stage. Since the upper level shear discriminate the updraft zone and downdraft zone, its presence adds severity to the storm. The duration of the life of cell is also extended by it.
3. The final stage is vanishing stage dominated by downdraft throughout the cell.

The focus of this paper is to use the Numerical Weather Prediction (NWP) system (WRF model) for simulation of the above severe weather phenomena and its structure of the event, at finer grid (domain) resolution to understand the atmospheric phenomena in the storm.

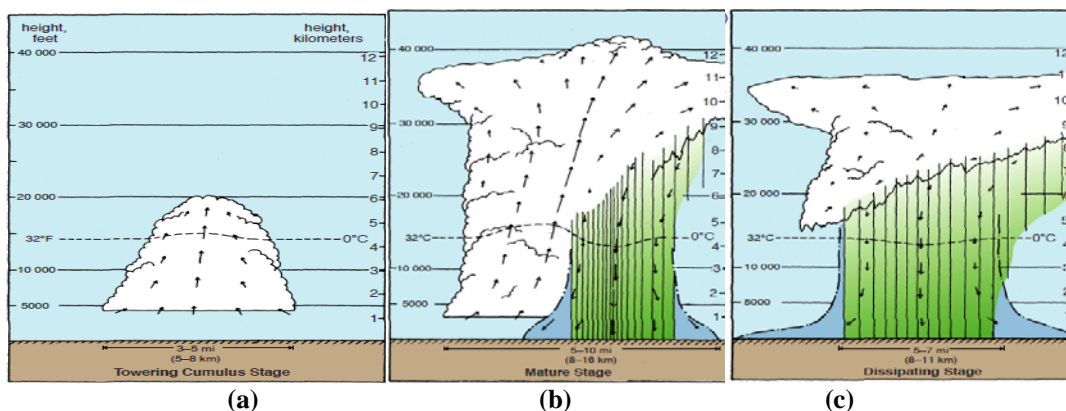
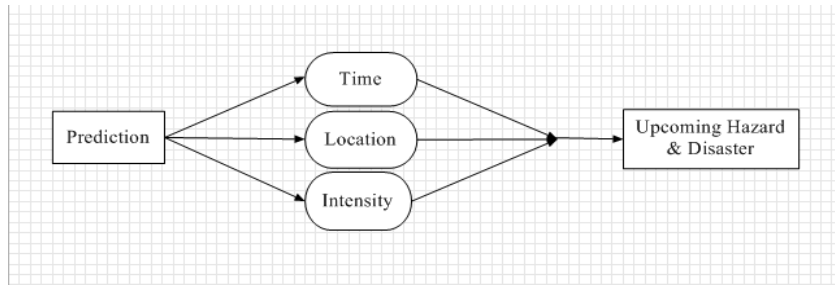


Figure 1.1: Life cycle of the single cell thunderstorm: (a) Towering Cumulus Stage (b) Mature Stage (c) Dissipating Stage, (Source: Markowski and Richardson, 2010).

## II. SCOPE OF THE STUDY

Over north India the terrain and the environment conditions are different at different places so the behavior and strength of the severe thunderstorms are different at different places. The scope of this study is to improve the prediction of this important

weather phenomenon. For this, numerical simulation of the severe weather event is important to predict the precise time, location and intensity of the upcoming hazard & disaster (fig 1.2) so that advance warning can be issued to the people and preventive measures can be taken.



**Figure (1.2): Scope of the study.**

**III. NUMERICAL MODEL AND CONFIGURATIONS**

**Model Description-** WRF model (Version 3.6.1) with the Advanced Research WRF (ARW) is used to simulate the severe norwester's. It is a multi-organization endeavor planned to make available a genX mesoscale predictable system. This is the system to serve both the interpretation and forecast of such mesoscale phenomenon and convey the advance research into operations.

**Model Initial and Boundary Conditions-** The United State Geographical Survey (USGS) 5min (~10 kilometer) and 1min

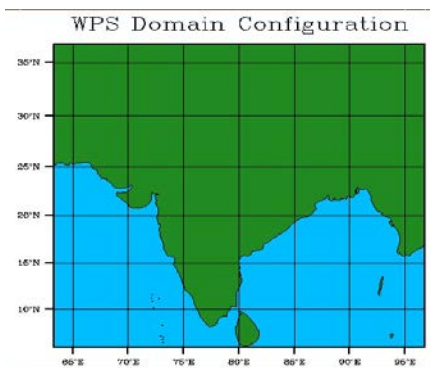
(~2 kilometer) resolution terrain topographical data have been used for two domains in the WRF pre-processing system (WPS). The 0.25° resolution outputs from the India Meteorological Department-Global Forecasting System (IMD-GFS) real time prediction has been used. The initial and boundary conditions are 29-05-2014 of 00 UTC and 31-05-2014 of 00 UTC. WRF model has been used to make 48 hours simulation of the event using different horizontal resolutions i.e. 9 and 3 km.

**Model Configuration-** Table - 1 provides the details of the two different experiments.

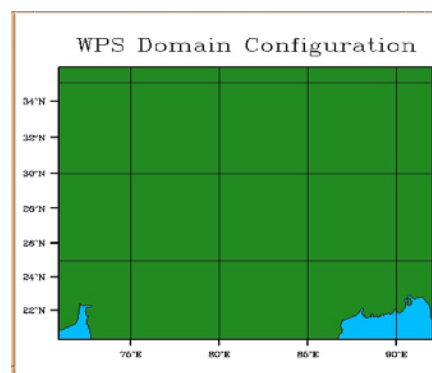
**Table 1: Description of the model**

Map projection	Mercator	Mercator
Reference latitude of the domain	22.00°N	28.30°N
Reference longitude of the domain	80.00°E	81.50°E
Number of domain	1	1
Number of vertical layers	27 sigma levels	27 sigma levels
Horizontal Resolution	9km	3km
Time step	30s	10s
Number of grid points e-we e-sn	360 360	680 570
Resolution of geographical data	5min(~10kilometer)	1min(~2kilometer)
Topography	USGS	USGS





Figure(1.3): Experimental Domain 9 km resolution.



Figure(1.4): Experimental Domain 3 km resolution.

#### IV. RESULTS AND DISCUSSIONS

##### Sensitivity Experiments

The WRF V-3.6.1 model has been run for 48 hours to simulate the severe thunderstorm. The output is post processed to obtain geopotential (850hPa), wind vector (850 hPa), wind speed (10m), convective available potential energy (CAPE), reflectivity and rainfall. The results were obtained at different grid resolution (9 and 3km) with the same MPs and CPs schemes. The USGS terrain/vegetation data was used at 5 min (~10 km) and 1 min (~2 km) corresponding to the grid resolution at 9 km and 3 km. These variables are plotted through Grid Analysis and Display System (GrADS) and discussed are as follows.

##### (i) Geopotential and Wind vector

Fig (1.5 & 1.6) illustrate the simulated wind vectors and geo-potential at 500 hPa, valid at 00 UTC of 30 May 2014 based on the initial condition of 00 UTC of 20 May 2014 at grid resolutions of 9 km and 3 km respectively. The diagrams indicate predominately north westerly winds over Delhi and neighborhood. The simulation at 3 km indicate a convergence line extending from north to south over east Rajasthan and West U.P illustrated by a thick line in the fig (1.6).

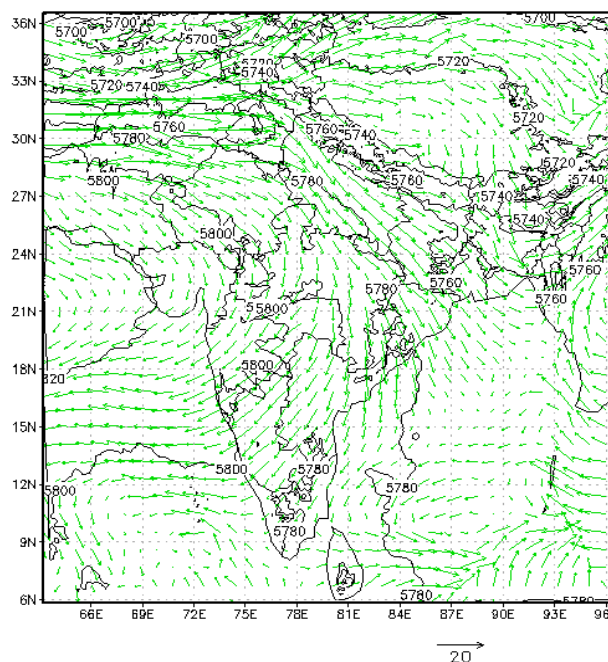
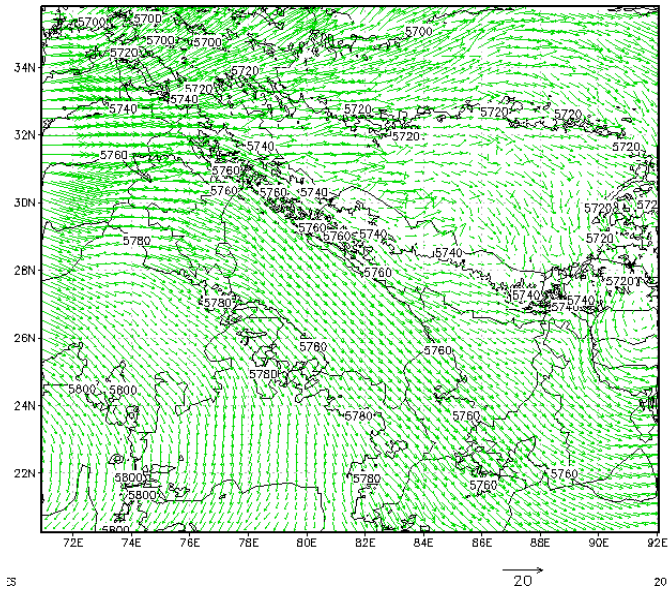


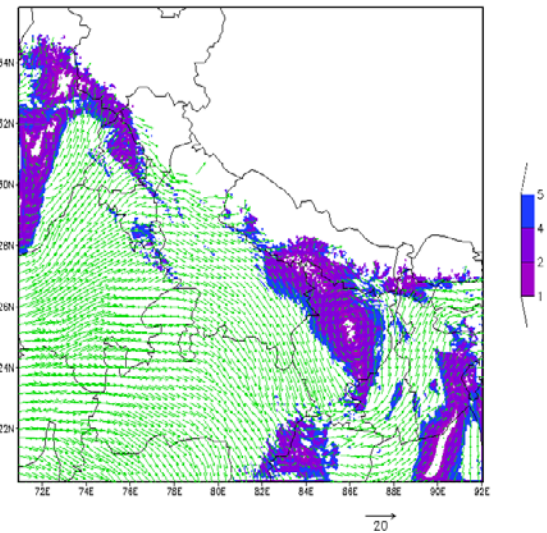
Figure (1.5): Simulated Geopotential and Wind vector at 500 hPa valid at 12 UTC, 30052014 based on the IC: 00 UTC, 29052014, using WRF model at 9 km resolution.



**Figure (1.6):** As in fig (1.5) but at 3 km resolution.

**(ii) Wind vector and Wind speed**

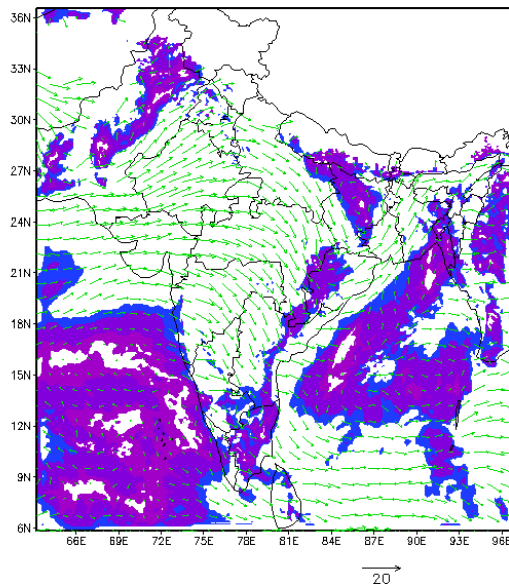
Fig (1.7 & 1.8) illustrate wind vector at 850 hPa and wind speed at 10 m valid at 00 UTC of 30 May 2014 based on the initial condition of 00 UTC of 29 May 2014, at grid resolution of 9 and 3 km respectively. The diagrams indicate pockets of high wind speed surrounding Delhi region in the 3 km simulation which is not seen in the 9 km resolution. Thus the simulation at higher resolution is closer to the reality.



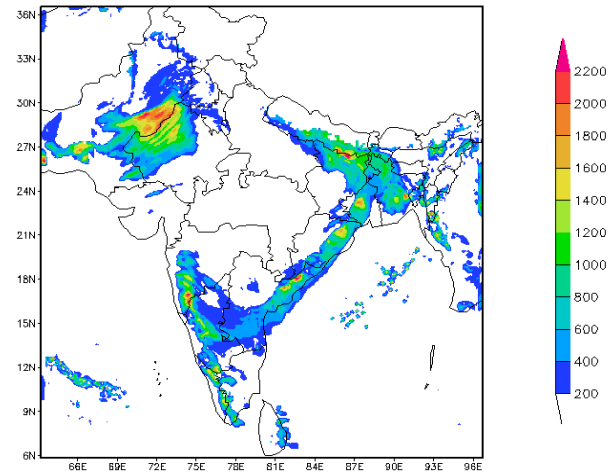
**Figure (1.8):** As in fig (1.7) but at 3 km resolution.

**(iii) Convective Available Potential Energy**

Fig (1.9 & 2.0) illustrate the simulated CAPE valid at 12 UTC of 30 May 2014 based on the initial condition of 00 UTC of 29 May 2014 at grid resolutions of 9 km and 3 km respectively. The diagrams indicate that the highest CAPE value is greater than 2000 (j/kg) over the northwest India in 9 km resolution while the highest CAPE value from 3 km resolution is 2400 (j/kg). The simulation from very high resolution WRF model (3 km) shows the higher value of CAPE as compare to the lower resolution (9 km).



**Figure (1.7):** Simulated Wind vector at 850 hPa and Wind speed at 10 m valid at 12 UTC, 30052014 based on the IC: 00 UTC, 29052014, using WRF model at 9 km resolution. The shaded values indicate iso-tech.



**Figure (1.9):** Simulated CAPE valid at 12 UTC, 30052014 based on the IC: 00 UTC, 29052014, using WRF model at 9 km resolution.

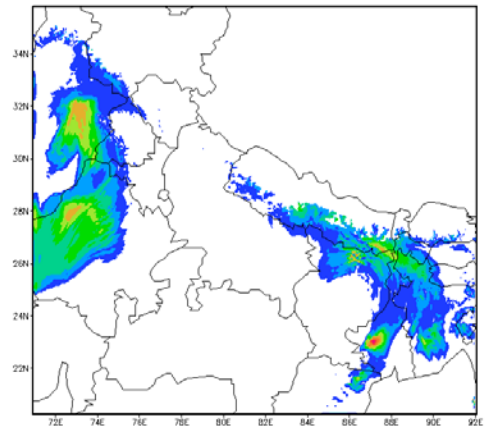


Figure (2.0): As in fig (1.9) but at 3 km resolution.

**(iv) Reflectivity and Rainfall**

The reflectivity values simulated by the model show some echoes south of the Delhi region by simulation in the 3 km resolution. Whereas the simulation at 9 km resolution does not show any echo surrounding Delhi fig (2.1 & 2.2). None of the simulations (at 9 and 3 km resolution) rainfall values around Delhi region. This may be because the observed rainfall was very less. A few pockets of rainfall are seen over Punjab and Haryana in the 9 km resolution which is not seen in the 3 km resolution. It may be noted that echoes may be obtained from rain bearing clouds, which may not rain in reality fig (2.3 & 2.4).

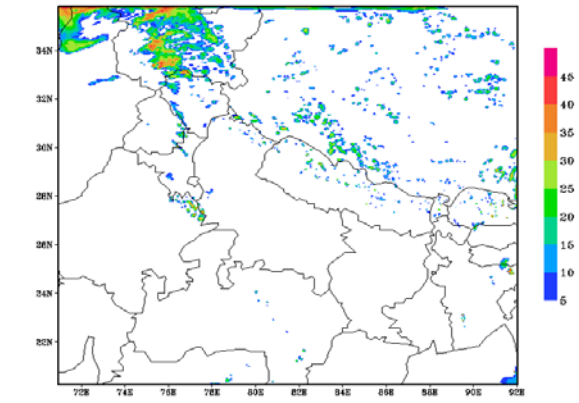


Figure (2.2): As in fig (2.1) but at 3 km resolution.

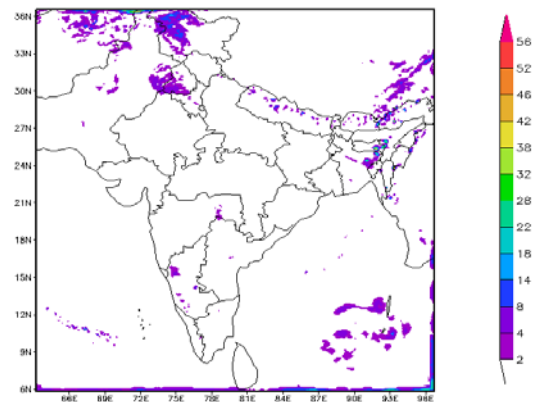


Figure (2.3): Simulated Rainfall valid at 12 UTC, 30052014 based on the IC: 00 UTC, 29052014, using WRF model at 9 km resolution.

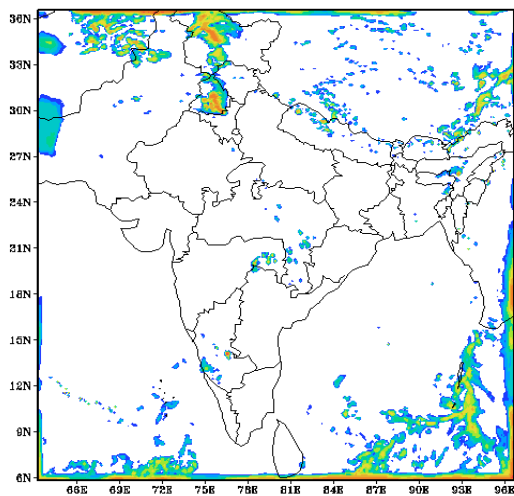


Figure (2.1): Simulated reflectivity valid at 12 UTC, 30052014 based on the IC: 00 UTC,29052014, using WRF model at 9 km resolution.

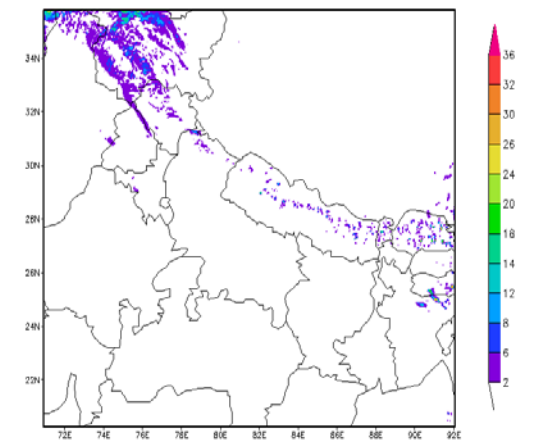


Figure (2.4): As in fig (2.3) but at 3 km resolution.

**V. CONCLUSION**

WRF V3.6.1 has been used to simulate and investigate the severe thunderstorm which affected Delhi and adjoining region between 1630 hours IST and 1730 hours IST of 30 May 2014. The system moved eastward and steered by a westerly trough. It

was accompanied by strong wind, lightning, thunder and squall causing destruction to the life and property.

Results demonstrate that the simulation at 3 km resolution provides better distributions of convergence zone in the wind fields at lower level then compare to simulation at 9 km resolution. The simulation at higher resolution also demonstrates better resolution. However there are many deficiencies in the simulated results in terms of maximum wind speed observed at the surface, precise time, location and intensity of the storm. Many experiments need to be conducted using nested domain, better physical parameterization schemes, data assimilation and ensemble forecasting.

#### ACKNOWLEDGEMENT

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#### AUTHORS

**First Author** (The corresponding author) - Jaya Singh, M.Tech Final Semester, IIT-Roorkee, jayasingh2525@gmail.com, jiya7pdt@iitr.ac.in, 09410280668, 08527461788.

**Second Author**- Ajay Gairola, PhD, IIT-Roorkee, garryfce@gmail.com, garryfce@iitr.ac.in

**Third Author**- Someshwar Das, PhD, IMD New Delhi, somesh03@gmail.com, somesh.moes@nic.in



# Design of Missile Models for Testing on Numerical Control Measurement Machines

Slobodan Jovanovic, Dusan Regodic

Singidunum University Belgrade, Serbia

**Abstract-** The most important fact for this paper is that, in addition to the common machine industry measuring devices, a manually operated coordinate measuring machine (DEA Beta) was used for the first time. Airfoil controls at the desired sections of the model for wind tunnel testing were performed manually by bringing the machine to the desired X, Y positions and by probe contact in the negative Z direction. The model design required a new generation of machine tools with 3-5 axis simultaneous control. The last missing piece was CMM DEA Epsilon 2304. Geometric similarity is the primary requirement defined in the project request for model production. Wind tunnel tests are laboratory tests, so the accuracy requirements of the model design are very high. The aim of the testing is to determine the character and values of the aerodynamic force and moment in the flow around the missile model type M.

**Index Terms-** numerically controlled measuring machines, measurement error

## I. INTRODUCTION

Wind tunnel testing model was designed on CAD / CAM SolidWorks computer aided design system, one of the most popular 3D software for computer-aided design (CAD) on the contemporary market. Since its introduction in 1995, SolidWorks has become a favorite design tool of many of today's engineers, mechanical and industrial designers. At its core, SolidWorks provides the capability of creating parametric 3D solid geometry, which is subsequently used to create drawings, draft instructions, manuals, produce animations, full-color rendering, as well as other types of documents.

First, a sketch is created and converted into a base of functions. The base is then further refined with functions added or removed by using materials from the base. Individual parts of the model can then be used to build forms of the final design. After creating a 3D model or assembly of the model, the drawings are made in the way that the document contains both the design and the production process.

The aim of the technological procedure optimization is to produce a model of the required quality and within the specified timeframe:

- manage the production without defect or rejection,
- reduce the number of machining operations,
- shorten the time of machining,
- shorten, or if possible, eliminate all non-production (manipulative) time,

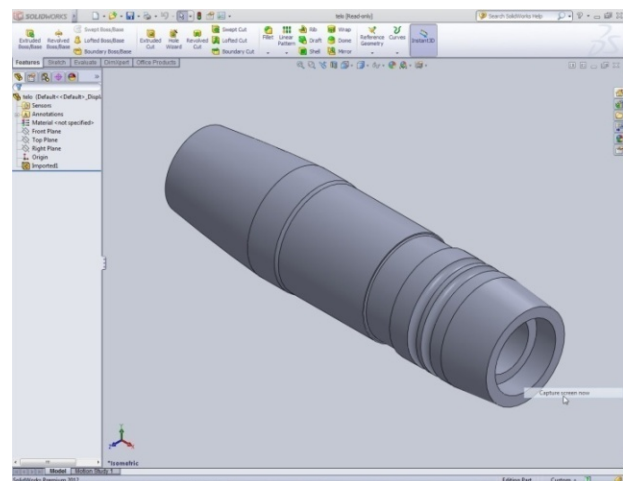
- minimize all preparatory-finishing periods in the technological process
- minimize the time of mid-phase measurements,
- speed up the decision-making process when creating machining operations.

## II. MODEL DESIGN IN CAD SOFTWARE

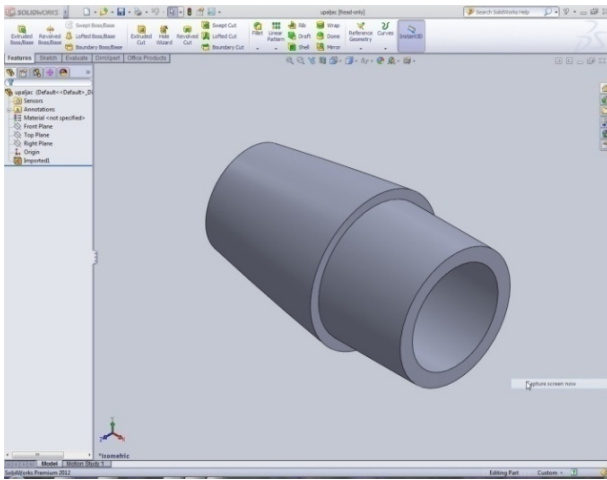
Following the production of the model, the measurement of real missile models will be performed on the coordinate measuring machine (CMM), with the following outputs:

- Geometry comparison between the real model and the model created in SolidWorks CAD software,
- Presentation of measurement and geometry readings of the measured model.

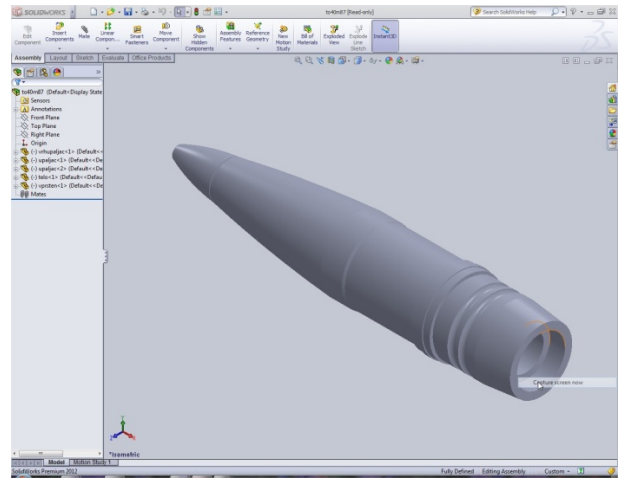
The following pictures show parts of the model measured on the coordinate measuring machine on Fig 1.



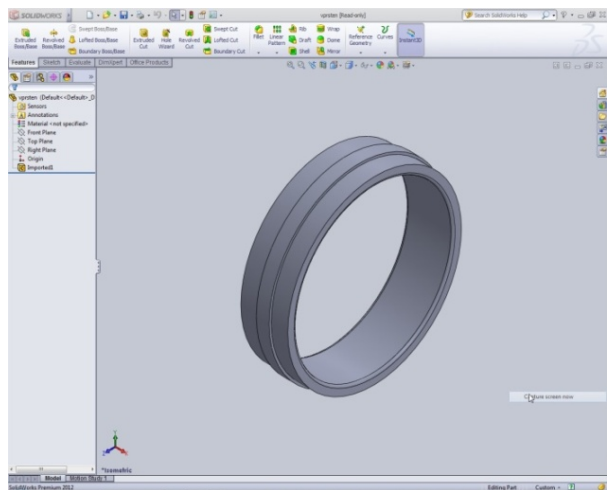
(a)



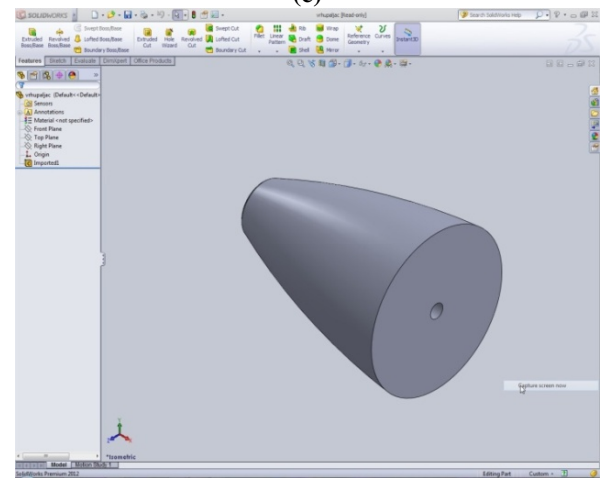
(b)



(e)



(c)

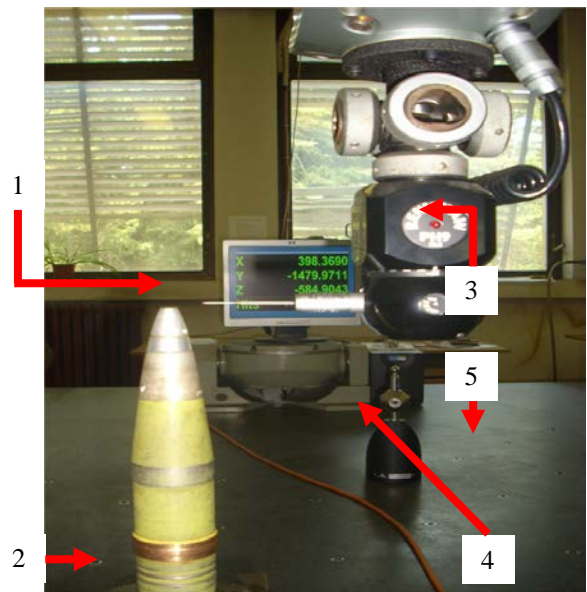


(d)

**Fig. 1. SolidWorks missile model in: (a) missile body model, (b) missile fuse model, (c) Missile driving band model, (d) missile fuse top model (e) missile model assembly**

Following the production of the model presented on Fig. 1, the CMM measuring starts on DEA Epsilon 2304, and the measurement procedure is performed in the following way:

- **STEP 1:** Set up the actual model on the mount located on the marble plate of the same CMM type DEA Epsilon 2304 (Fig. 2.);

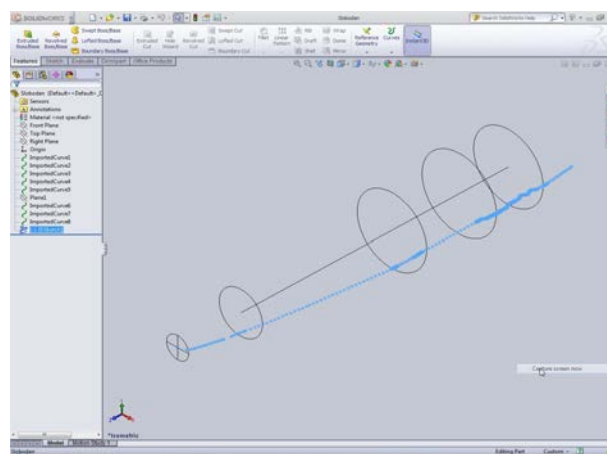


**Fig. 2. Start of measurements using the measuring probe and reading the data with Renishaw measuring sensor**

- Legend (Fig. 2.):
- 1 - Monitor tracking the probe head on X, Y, Z axes,
  - 2 - Measured object,
  - 3 - Measuring sensor Renishaw PH9,

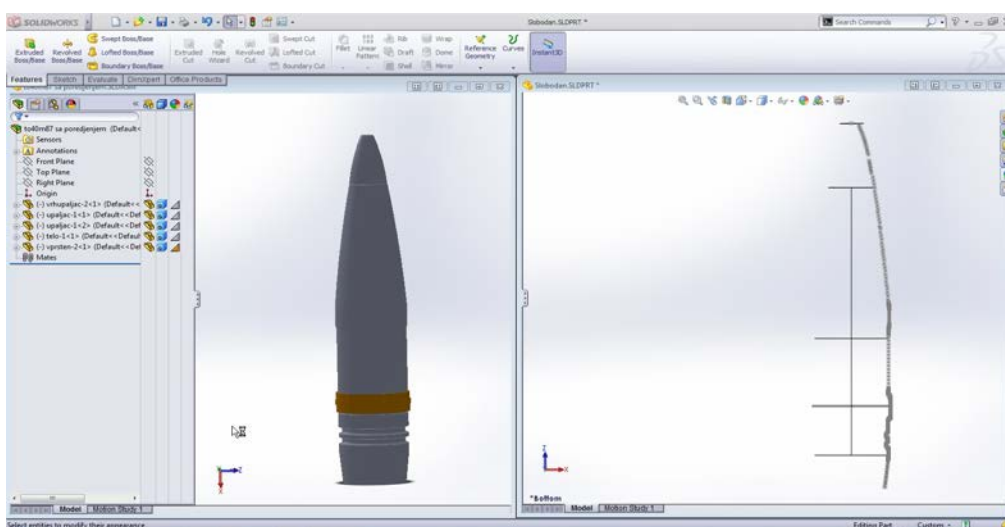
- 4 - Calibration sphere and
- 5 - Marble plate CMM.

- **STEP 2:** Place the appropriate measuring sensor for the tested model;
- **STEP 3:** Calibrate the measuring probe sensors;
- **STEP 4:** Start measuring the model geometry by the probe:
  - 1) top of the fuse;
  - 2) body of the fuse;
  - 3) driving band and;
  - 4) bottoms of the missile.
- **STEP 5:** The results are graphically rendered in STEP and IGES files and shown in tables containing data on geometry of the measured model in SolidWorks.



**Fig. 3. Graphical presentation of the measurement results in a STEP file (Isometric view)**

The results of the model M missile measurement on the coordinate measuring machine DEA Epsilon 2304 are shown in Table 1., and only for some typical sections where measurement was performed.



**Fig. 4. Comparative presentation of the constructed  $M_1$  missile model in CAD software and  $M_2$  missile model measured on CMM**

### III. EXPERIMENTAL DETERMINATION OF THE AERODYNAMIC COEFFICIENTS OF THE MISSILE MODEL

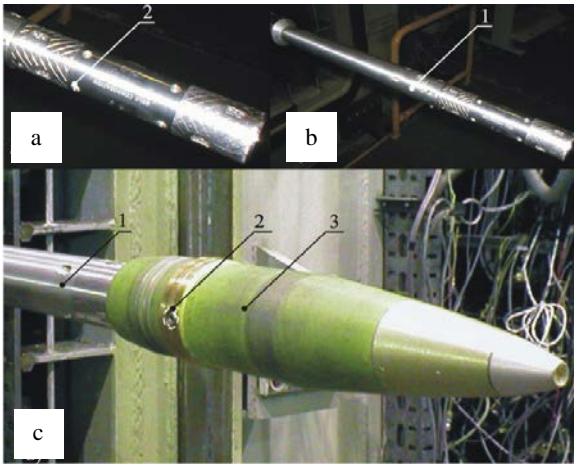
Determination of the aerodynamic coefficients of the forces and moments was performed in relation to the position of the missile body by changing the angle of attack. The value of the angle of attack at which the motion of this missile type is stable is approximately  $10^\circ$ . The range of the angles of attack applied in the experimentation was from  $-10^\circ$  to  $+10^\circ$ . Recording of the characteristics of the flow around the axisymmetrical body was performed on the basis of the image of the flow using the adequate optical method of flow visualization - Schlieren method.

Experimentally determined values of coefficients were compared with the values obtained through calculations of symmetric and axisymmetric flows around the missile and the table values of similar missiles (type M and  $M_1$ ).

#### 2.1 Measurement of Aerodynamic Forces and Moments

The strain gauge balance was selected on the basis of its measuring range in relation to the expected value of the strain on the model, that is, in accordance with the expected transitional strain occurring in the wind tunnels of this type.

To measure the forces and moments, the internal six-component balance ABL 1.0 MKXXXIII A was used, (Fig. 5a and 5b). The gauge balance was mounted on a sting - holder with 32 mm diameter. The accuracy of the balance is 0.3% of the full range.

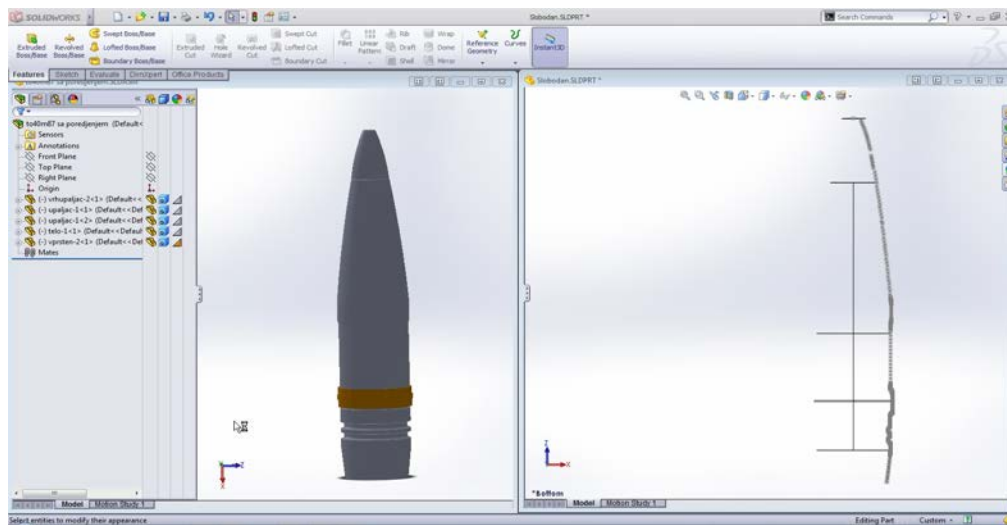


**Fig. 5. Six-component strain gauge balance with the type M missile model in the test section of the wind tunnel a) balance**

**ABLE 1.0 MKXXIII A; b) gauge balance with a mount; c) a model with a strain gauge balance on the moun 1 - mount with adapter, 2 - pin for connecting model and the balance, 3 - model (type M missile)**

The balance was calibrated on a small calibration frame in the calibration hall of the T-38 wind tunnel on Fig. 5. Weights of 1 kg, 4.5 kg, and 11.5 kg manufactured by ABLE, as well as 1 kg weights from the sets for calibration of FFA scales, and were used for calibration.

The calibration matrix for this balance was established on the basis of the data obtained from the calibration performed in the laboratory of the experimental aerodynamics of the Military Technical Institute (MTI). The balance was calibrated immediately prior to the test.



**Fig. 4. Comparative presentation of the constructed  $M_1$  missile model in CAD software and  $M_2$  missile model measured on CMM**

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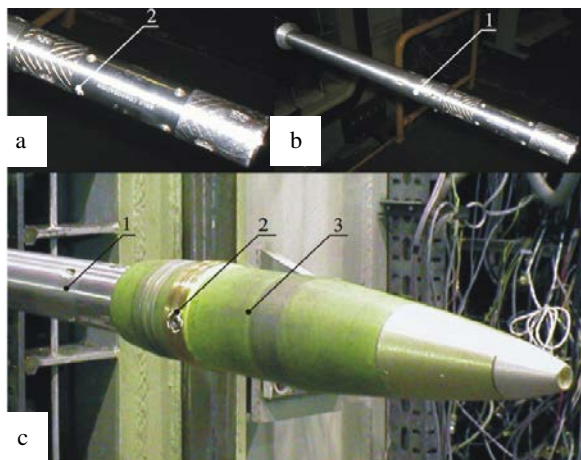
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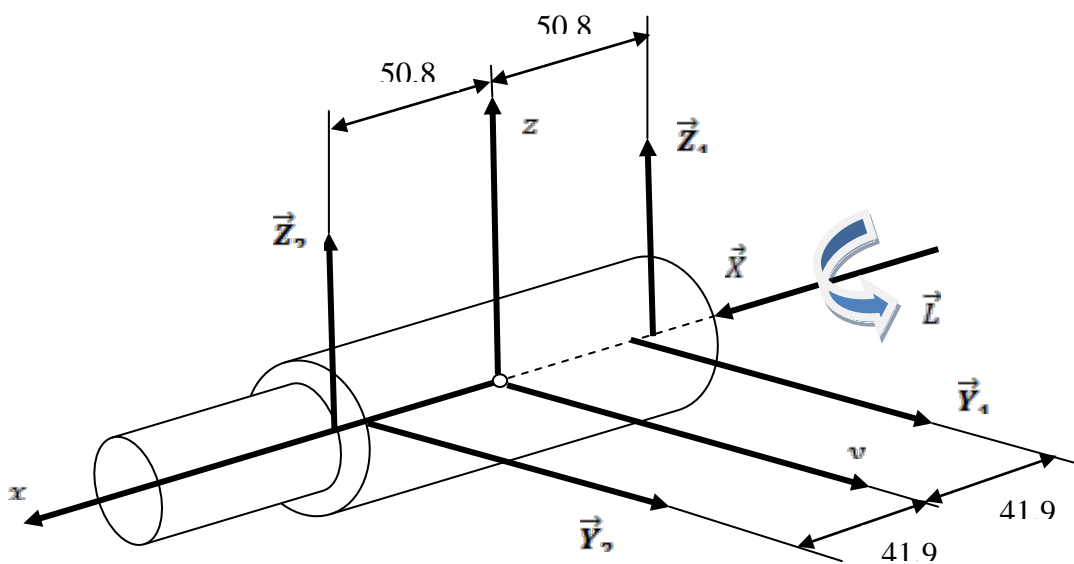


**Fig. 5.** Six-component strain gauge balance with the type M missile model in the test section of the wind tunnel a) balance ABL 1.0 MKXXIII A; b) gauge

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**Fig. 6.** Model of strain of the six-component gauge balance ABL 1.0 MKXXIII A

#### IV. ANALYSIS OF THE RESULTS OBTAINED FROM MEASURING AERODYNAMIC COEFFICIENTS OF AXISYMMETRIC FLOWS

The input geometric and dynamic data were defined for the given construction parameters of the type M missile model, and

the data were consolidated and presented in Table 2. In accordance with the given aerodynamic calculation ADK0, characteristic changes of the components of the drag force - axial force aerodynamic coefficient, were obtained in accordance with the **theoretical values calculation model**.

**Table 2. Input calculation database ADK0 for model M with theoretical values**

reference projectile diameter	projectile length	front part length	the ogive radius ratio	back cone length	base diameter	projectile top diameter	driving band diameter	position of mass center from the top
mm	caliber	caliber	-	caliber	caliber	caliber	caliber	caliber
1	2	3	4	5	6	7	8	9
39,9	5,203	2,589	0,57	0,461	0,882	0,180	1,053	3,333

Output data on the values of the aerodynamic coefficients of the axial resistance force with components as a function of Mach number are given in Table 3. for the **theoretical values model**.

Column 1 of Table 3. gives the range of Mach numbers with calculated components and the total coefficient of the aerodynamic force in the axisymmetrical flow, as follows:

- Column 2 - overall coefficient of the aerodynamic force  $C_{X0}$ ,
- Column 3 - coefficient of the front of the missile  $C_{X1}$ ,
- Column 4 - coefficient of friction of the missile  $C_{Xf}$ ,
- Column 5 - coefficient of the driving band  $C_{X4}$ ,
- Column 6 - coefficient of the back cone of the missile  $C_{X3}$ ,
- Column 7 - coefficient of the bottom of the missile  $C_{Xd}$ , and
- Column 8 - values of the relation between the subpressure behind the missile bottom and the free air stream pressure  $p_d/p_\infty$ .

Deviations of the calculated values of the aerodynamic axial coefficient from the presented types of missiles ( $M_2$  and  $M_1$ ) are less than 1%. This discrepancy confirms the compliance of the calculation with practical solutions.

The average deviation of the axial coefficient in the axisymmetrical flow around the missile model type M compared with the missile model type  $M_1$  is as follows (Table 4.):

- for the subsonic regime: lower by about 2%,
- for the transonic regime: lower by about 1% and
- for the supersonic regime: lower by about 0.2 %.

Compared to the missile type  $M_2$ , these deviations are reversed, so the coefficient is higher for each flow regime, as follows (Table 4.):

- for the subsonic regime: higher by about 4 %,
- for the transonic regime: higher by about 3 % and
- for the supersonic regime: higher by about 0.5 %.

**Table 3. Output calculation database ADK0 for model M with theoretical values**

$Ma$	$C_{X0}$	$C_{X1}$	$C_{XF}$	$C_{X4}$	$C_{X3}$	$C_{Xd}$	$P_d/p_\infty$
1	2	3	4	5	6	7	8
0.500	0.155	0.000	0.063	0.000	0.000	0.092	0.979
0.600	0.156	0.000	0.060	0.000	0.000	0.096	0.969
0.700	0.159	0.000	0.058	0.001	0.000	0.100	0.956

**Table 4. Comparative presentation of  $M, M_1$  i  $M_2$  models axial coefficients difference**

Mach number	Axial coefficient for type M by ADK0 calculation	Axial coefficient for type $M_1$	Axial coefficient difference between type M and type $M_1$ (%)	Axial coefficient for type $M_2$	Axial coefficient difference between type M and type $M_2$ (%)
$Ma$	$C_{X0}^M$	$C_{X0}^{M1}$		$C_{X0}^{M2}$	
1	2	3	4	5	6
0.500	0.155	0.156	-0.64	0.162	-4,51
0.600	0.156	0.157	-0.64	0.164	-5,12
0.700	0.159	0.160	-0.64	0.166	-4,40

subsonic regime deviation	-2,46	-4,03
transonic regime deviation	-0,61	-3,27
subsonic regime deviation	-0,18	-0,54
transonic regime deviation	-1,08	-2,61

### 3.1 Analysis of the Results From the Calculation of Missile Types M, M<sub>1</sub> i M<sub>2</sub> Motion and Stability

The calculation of the motion characteristics and motion stability parameters in accordance with the six degrees freedom of motion missile model, on the basis of the presented equations of motion and stability model was performed using the software solution SB6 according to [9]. The solution is based on the system of equations for the six degrees freedom of motion of the classic missile.

The original software solution was translated into the software package Matlab, and for the purposes of this paper, a modification of input routines was performed, and they are presented in the appendix of this dissertation.

Organization of the inputs for the missile types M, M<sub>1</sub> and M<sub>2</sub> was established in the database form, that is, input routines of the software solution, and they were classified as follows:

- the first set of data is about the starting and border conditions for the calculation of the missile flight: start time, the calculation step, the way of stopping the calculation - border data, range and the step of calculation of the stability parameters, wind components, the initial position of the missile, the initial velocity of the missile, the initial angular velocity of the missile and the angular initial position of the projectile (attitude),
- the second set of data is about the geometric and dynamic properties of the missile: the position of the center of mass, the principal moments of inertia, diameter and weight of the missile model,
- the third set of data is about the aerodynamic properties of the projectile: aerodynamic coefficients and derivatives of forces and moments in relation to the Mach number value.

For the purpose of comparison of the obtained values of the elements of the trajectory and the flight stability parameters of the missile model, the second set of data is not changed and they represent the constant properties of the missile model type M. The thirs set of data changes depending of the type of the obtained data on aerodynamic characteristics for missile models M<sub>1</sub> and M<sub>2</sub> - by calculation and testing.

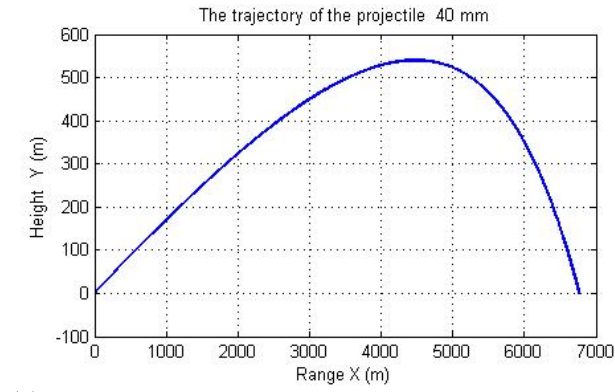
The result of the software solution calculation are three sets of data in funcional dependence on time as an independent variable:

- trajectory elements – motion characteristics:
  - 1) missile mass center coordinates ( $x, y, z$ ),
  - 2) time of flight – missile motion ( $t$ ),
  - 3) angular position of the missile in space ( $\chi, \gamma$ ),
  - 4) velocity components – missile motion ( $u, v, w$ ),
  - 5) components of the angular velocity of the missile motion ( $p, q, r$ ),
- stability parameters:
  - 1) damping coefficients - roots of the stability equation solutions ( $\lambda_1, \lambda_2$ ),
  - 2) gyroscopic stability factor in the form ( $1/Sg$ ),
  - 3) dynamic stability factor in the form ( $Sd(2 - Sd)$ ),
  - 4) angle of attack on the vertical plane and slip angle ( $\alpha, \beta$ ),

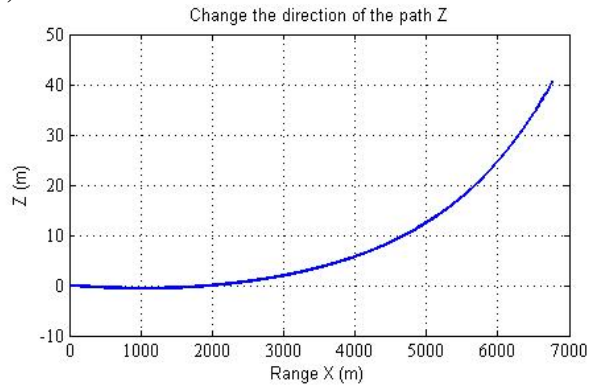
Dynamic properties of the missile model M were determined using the software package SolidWorks 2012. In addition to the position of the center of mass relative to the top of the projectile, the inertia moments along the main axes of the missile model were also determined:

- 1) position of the center of mass from the missile top,  $X_{CM} = 133\text{mm}$ ,
- 2) longitudinal moment of the the model inertia,  $I_{XX} = 263,6 \text{ kgmm}^2$ ,
- 3) transverse moments of the model inertia,  $I_{YY} = I_{ZZ} = 3,052 \cdot 10^3 \text{ kgmm}^2$ .

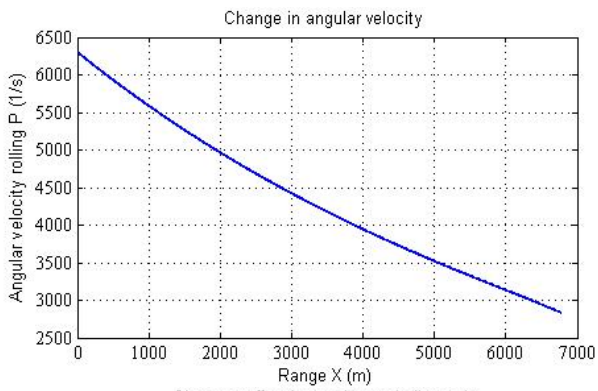
The summary of the used values and marks, that is, the initial and border values for the calculation of trajectory elements and stability parameters in Matlab programming solution is in the appendix of this doctorate, together with the results.



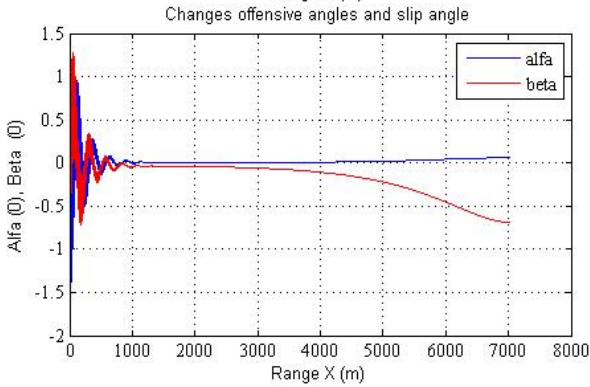
(a)



(b)

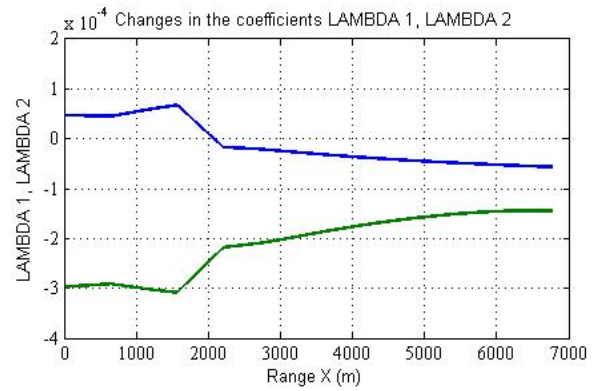


(c)

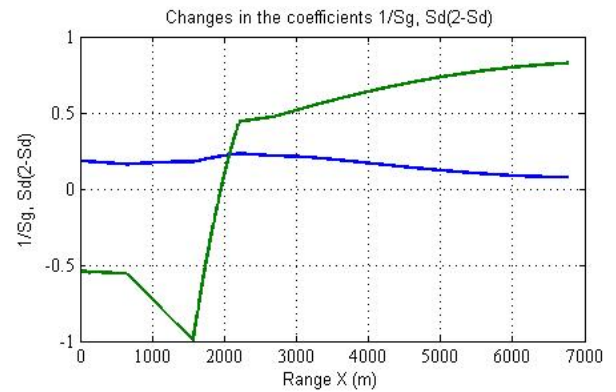


(d)

(c)



(d)



(e)

**Fig. 7. (a) Missile trajectory on the vertical plane; (b) Missile trajectory direction on Z trajectory;**

(c) Change of longitudinal angular velocity along the trajectory; (d) change of coefficients  $LAMBDA 1$  and  $LAMBDA 2$  on the trajectory (e) Change of coefficient of gyroscopic  $1/Sg$  and dynamic stability  $Sd(2-Sd)$  along the trajectory and (f) Change offensive angles and alip angle on the trajectory

The difference in the obtained flight time values to the vertex  $t_s$  ranges from 1.5% to 2.5%. The difference in the values of the horizontal distance to the vertex  $x_s$  ranges from 2.6% to 3.8%. The difference in the values of the vertical position of the vertex  $y_s$  ranges from 1.4% to 3.1%.

Larger deviations occur for the vertex position relative to the vertical plane  $z_s$ , for smaller starting angles, where the difference is over 20%. The difference of the absolute values of the derivative  $z_s$  is small (1 to 1.5 m). The relative difference between the value of the derivative on smaller starting angles is more pronounced because the integration step is higher than the calculation values.

The values of velocity in the vertex  $V_s$  vary from 0.1% to 3.8%. This range of deviation is partly affected by the size of the integrative step relative to the values of the velocity calculation. There is a high correlation between the values of the longitudinal angular velocity at the vertex  $p_s$ , and the average difference is about 1%.

The difference in the obtained values of the trajectory elements for the fall point can be considered to be more representative information, because the border conditions were exactly the same (position of the fall point in the horizontal plane), for which the trajectory elements were calculated for all three types of aerodynamic coefficients (calculation, experimental and values obtained with CMM). The deviation value of the total flight time  $t_c$  ranges from 1.5% to 2.4%, and of the final range  $x_c$  from 1% to 3%. All these deviations are very small and show a strong congruence of values of the aerodynamic coefficients obtained by calculation, experimentation and measurement by the CMM.

The values of the longitudinal angular velocity in the fall point  $p_c$  differ by 1.3% to 4.5%. By increasing the starting angle, that is, the range, the difference between these values is also increased. The values of the aerodynamic coefficients of the axial force in the subsonic velocity range, which occurs at the end of trajectory, affects such increase in differences of the values of the missile longitudinal angular velocity. On the other hand, very close values of the aerodynamic coefficient of the rolling moment prevent the difference from increasing.

## V. CONCLUSION

The presented solution of coordinate inspection of complex spatial shapes applied to the missile models for wind tunnel testing, represents a rounded functional whole. It is reflected in the developed and verified procedures applied during the implementation of the missile models projects. It is the primary characteristic of the described solution, because these requirements are frequent. The solution is rounded; however it is still open to further upgrade or improvement. The primary set objectives of optimization and production management with minimal defect and variations in the geometry, as well as the actual implementation of the system, have been achieved.

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## AUTHORS

**First Author** – Slobodan Jovanovic, Singidunum University  
Belgrade, Serbia, boban26582@gmail.com

**Second Author** – Dusan Regodic, Singidunum University  
Belgrade, Serbia, dregodic@singidunum.ac.rs

# Using a Simple Modeling and Simulation Scheme for Complicated Gasification System

Ye Min Htut\*, May Myat Khine\*\*, Myo Min Win\*\*\*

\*,\*\* Department of Chemical Engineering, Mandalay Technological University

\*\*\* Department of Chemical Engineering, Yangon Technological University

**Abstract-** Gasification processes are complicated with numerous parameters. It makes us difficult to understand the whole process nature. Therefore, a simplified approach based on modified stoichiometric equilibrium model for downdraft gasifier is designed in order to simulate the overall gasification process. The model uses the chemical reactions and species involved, while it starts by selecting all species containing C, H, O and N. Mass and energy balances of the gasifier -coupled with two equilibrium reactions are incorporated to create the model. This model can be solved with user friendly Microsoft Excel and nonlinear Matlab solver. To validate the model, a close agreement is shown between numerical and experimental results within the same configuration. It can predict the composition of producer gases and heating values with acceptable accuracy. After validation, it is simulated to study the effects of temperature, moisture content of biomass and air-fuel ratio (related to equivalence ratio) in the downdraft gasifier. And then, experiments are conducted using optimized simulation data obtained from the model and it was found that the output producer gases were a close agreement with model results in producer gas composition and heating value.

**Index Terms-** Biomass, thermodynamic equilibrium model, downdraft gasifier, producer gas, parametric study

## I. INTRODUCTION

Thermo chemical gasification is a process for converting solid fuels into gaseous form. The chemical energy of the solid fuel is converted into both the thermal and chemical energy of the gas. The chemical energy contained within the gases is a function of its chemical composition. Thus the composition of the product gas determines its quality as a fuel. High concentrations of combustible gases such as H<sub>2</sub>, CO and CH<sub>4</sub> increase the combustion energy of the product gas. During gasification, the organic material contained in the fuel is thermally released leading to the formation of porous char, which primarily consists of carbon and ash. The char particles undergo further reactions with several gases to yield the desired gaseous products. Thus thermo chemical characteristics of biomass play a major role in the selection of the gasification system design and performance.

Biomass gasification allows the conversion of different biomass feedstock to a more convenient gaseous fuel that can be used in conventional equipment (e.g., boilers, engines and turbines) or advance equipments (e.g., fuel cells) for the generation of heat and electricity. In addition to the production of heat and electricity, the product gas can be used to produce transport fuels such as synthetic diesel and hydrogen.

Thermodynamic equilibrium calculations are suitable for studying the influence of fuel and process parameters to predict the potential synthesis gas yield and its composition without providing to the designer the appropriate gasifier dimensions. The gas composition is calculated assuming a fixed reactor temperature and that gasifier reactions are in equilibrium.

Biomass is one of the most promising renewable energy sources. It is in various forms and abundance in Myanmar. Biomass gasification is one of the effective technologies for its thermochemical conversion. The conversion is achieved by reaction between the feedstock and insufficient feed gas (air). The primary goal of biomass gasification is maximum energy conversion of the solid biomass into a combustible gaseous products known as producer gas. The quality of producer gas can vary as a function of gasifying agents (air, steam, oxygen) and the process operating parameters (gasification temperature, types of biomass).

Biomass gasifiers are complex equipments that require a lot of time to be mounted and to be put in operation; make it difficult to explore various working conditions. As a result, some mathematical models were made to predict the performance of the gasifiers. Thermodynamic equilibrium calculations are widely used in order to predict the thermodynamic limits of chemical reactions describing the gasification process. Since this approach is independent of the gasifier design, it is commonly used in studying the influence of important process parameters.

Zainal et al. (2001)[1] had studied an equilibrium model based on equilibrium constants to simulate the gasification process in a downdraft gasifier.

In the article by Barman et al.(2012)[2], the study used the applicable gasification reactions and also considered possible deviations from equilibrium to further upgrade the equilibrium model to validate a range of reported experimental results.

Mendiburu AZ, et al (2013)[3] used different equilibrium models for biomass gasification and validated one model by mean of universal RMSE(Root Mean Square Error) analysis method to be the more accurate and versatile among the four equilibrium models.

In order to predict the operation of a gasifier, the availability of a fairly simplified method to do it is important, and at the same time, it should be reliable and accurate. The chemical equilibrium model meets these prerogatives because it involves only thermodynamic parameters [4].

In this work, the existing equilibrium model of gasification process is modified by correlations and validated with existing published experimental results and models. After model validation, the model is used

as a basis in order to predict the composition of the producer gas and its associated heating values by varying gasification temperature, moisture content of biomass and equivalence ratio.

## II. EQUILIBRIUM MODELING

A zero dimensional model (time independent)(steady state) presented in this paper takes the advantage of thermo chemical equilibrium approach which is based on equilibrium constants.

### A. Conforming a system of equation to model the downdraft gasification process

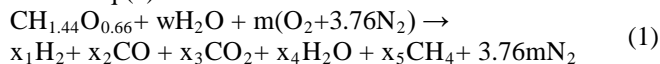
This model makes the following assumptions:

1. All reactions accounted are in thermodynamic equilibrium.
2. Species concentration and temperature are uniform throughout the chamber.
3. The gasifier chamber is perfectly insulated, with no heat transfer to the surroundings (Adiabatic).
4. Air entering the chamber is dry (relative humidity is zero), with 21% oxygen and 79% nitrogen by mass.
5. Steady state operation (time independent) is assumed.
6. The hard wood fuel may be represented by the chemical formula:  $CH_{1.44}O_{0.66}$  [1,6]
7. All the solid carbon is converted to syngas species and there is no solid carbon left after the gasification and the exit syngas is composed only of six gases in global model.
8. The gases estimated is free of any oxygen from the supplied air by partial oxidation and all oxygen is consumed during combustion reaction.

### B. The global gasification reaction

All the equations that model the gasification process are developed on the basis of a proposed global gasification reaction. From the study of the gasification literatures and experimental works on downdraft gasifiers[1-9], the main species on the producer gas are carbon monoxide (CO),hydrogen (H<sub>2</sub>), methane (CH<sub>4</sub>), carbon dioxide(CO<sub>2</sub>), water vapour(H<sub>2</sub>O), nitrogen (N<sub>2</sub>) and tars, while on the residues unconverted carbon (C) and ashes can be found.

On the side of the reactants, the feed biomass can be represented by a molecule comprising carbon (C), hydrogen (H), and oxygen (O) [1,6]. With the aforementioned consideration, the global gasification reaction considered in the present work is shown in Eq.(1)



Hard wood biomass (wet basis) represents  $CH_{1.44}O_{0.66} + wH_2O$  and air is  $O_2 + 3.76N_2$ .  $x_1$  to  $x_5$  are the coefficients (mole/mole biomass) of respective permanence gases. In the global gasification, biomass is separated into  $CH_{1.44}O_{0.66}$  formula and its moisture content fraction (w) in order to calculate effectively[1]. Because of the use of specified biomass formula, the model can be calculated on hard wood biomass only. The gasification agent can be air, oxygen and steam. In this system, air is primary interest.

### C. Mass and energy balance

Atomic species balance is used to express the constraints of the system described as below:

$$C: 1 = x_2 + x_3 + x_5 \quad (2)$$

$$H: 2w + 1.44 = 2x_1 + 2x_4 + 4x_5 \quad (3)$$

$$O: w + 0.66 + 2m = x_2 + 2x_3 + x_4 \quad (4)$$

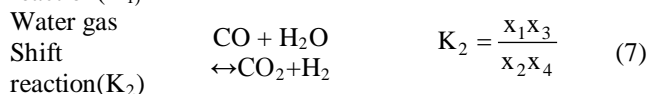
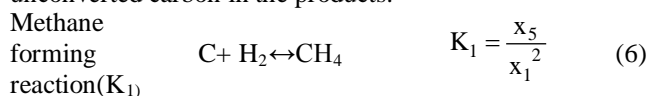
Energy balance is the importance boundary of this system and it is systematically reduced to:

$$H^{\circ}_{f,biomass} + w(H^{\circ}_{f,H_2O(l)} + H^{\circ}_{(vap)}) = x_2H^{\circ}_{f,CO} + x_4H^{\circ}_{f,H_2O(vap)} + x_5H^{\circ}_{f,CH_4} + \Delta T (x_1C_{p,H_2} + x_2C_{p,CO} + x_3C_{p,CO_2} + x_4C_{p,H_2O} + x_5C_{p,CH_4} + 3.76m \cdot C_{p,N_2}) \quad (5)$$

### D. Modification of chemical equilibrium reactions

There are two methods in equilibrium modeling, stoichiometric and Gibb free energy minimization. In the present work, stoichiometric model is used and modified with experimental correlations to develop equilibrium model. The stoichiometric thermodynamic equilibrium modelling requires the use of equilibrium constants of each reaction considered in the model. An introduction to the thermodynamic equilibrium concepts can be found in [12].

In order to model the gasification process, the selected chemical reaction must be independent. The concept of independence of reactions states that if for many particular group of reactions one of them could be written as a combination of at least two of the others, then this group is not independent and the model may be computing recurrent information [10]. Using this concept, the two reactions: methane forming and water gas shift reactions were used to model the case without presence of unconverted carbon in the products.



The equilibrium constant (K) is a function of temperature only for each reaction considered and  $-RT \ln K$  is equal to  $\Delta G^{\circ}$  where  $\Delta G^{\circ}$  is the standard Gibbs function of formation. From heat capacity, enthalpy and Gibbs free energy data from [11], equilibrium constants had calculated in the model. In pure equilibrium model, the equilibrium constants were far away from unity. Therefore responses were not suitable in practical case. So some experimental correlations were incorporated in this work.

The correlations -related to equilibrium condition used in the model are presented in equation (8) and (9) using from [1] and [2] respectively.

$$\ln K_1 = \frac{7082.848}{T} - 6.567 \ln T + \frac{7.466 \times 10^{-3}}{2} T - \frac{2.164 \times 10^{-6} T^2}{6} + \frac{0.701 \times 10^5}{2T^2} + 32.541 \quad (8)$$

$$K_2 = \exp((4276/T) - 3.961) \quad (9)$$



These two equilibrium correlations are the research works from the published papers.

### III. MODEL IMPLEMENTATION

#### A. Model input

The inputs required for the model are as follows:

1. Fuel composition (using ultimate analysis and heating value of hard wood biomass [1])
2. Initial temperature of wood fuel and air (Ambient Temperature)
3. Equilibrium reaction temperature range (600-1000°C)
4. Equilibrium constants from the correlations[1-3] for the gasification reactions (Water gas shift reaction and Methane forming reaction)

Thermodynamic data for the chemical species involved - including enthalpy of formation ( $H^{\circ}_{f0}$ ), and coefficients for specific heat ( $C_p$ ) [11].

#### B. Model output

The model outputs are producer gas compositions and heating values. Producer gas composition is the final gas composition that reflects thermodynamic equilibrium. Heating value can be calculated by using the combined heating values of carbon monoxide, hydrogen and methane composition.

#### C. Model implementation

The equations required for the numerical analysis are formulated using the C,H,O balance of the global equation followed by the rate constant equation for the two chemical reaction equations considered and finally carrying out the energy balance for the whole system.

The model is built within an Microsoft Excel work sheet. The MS Excel programming environment was chosen to make the model both user-friendly and portable. In the program, wood biomass is simplified to mole basis by using ultimate and proximate analysis of hard wood and heating values are calculated using correlations.

Using substitution and elimination, one linear and two nonlinear equations with three variables ( $x_1, x_2, x_3$ ) are obtained and the set of equations is solved using nonlinear solver in Matlab. The system of one linear and two non-linear equations are solved by using fsolve (verifying with symbolic Matlab toolbox) in Matlab program to find the composition of hydrogen, carbon monoxide and carbon dioxide. The remaining variables are simultaneously calculated using the modified equilibrium constant correlations (6,7). Lower heating values are calculated using the heating value of carbon monoxide, hydrogen and methane on the dry basis.

#### D. Validation of the Model

The model was validated by the comparison with different experimental data in ref [4,5,7-9] and models developed in ref [3] using the universal testing method of root mean square error (RMSE) which was calculated as follow.

$$RMSE = \sqrt{\frac{\sum_{i=1}^N (\text{experimental}_i - \text{Model}_i)^2}{N}} \quad (10)$$

#### E. Comparison with experiment results

Comparative study was performed with the various experimental results obtained from the literature. The Table.1 below shows the comparison with experimental data from various references [4,7,8,9] and the current model. It could be observed that the model had some acceptable error (0.52 to 4.14) compared to experimental works. The comparison illustrated closeness between 5 proved the quantitative and qualitative validity of the present model for the parameters of interest.

TABLE I  
COMPARISON OF THE MODEL WITH EXPERIMENTS DATA FROM REF[4,7,8,9]

	Exp[4]	Exp[7]	Exp[8]	Exp[9]	Model
H <sub>2</sub>	14.00	19.38	17.50	15.23	13.19
CO	20.14	20.59	21.30	23.04	19.34
CO <sub>2</sub>	12.06	11.67	13.30	16.42	15.46
CH <sub>4</sub>	2.31	4.47	3.10	1.58	1.52
N <sub>2</sub>	50.79	43.89	44.20	42.31	50.49
LHV	4.89	6.30	5.69	5.12	4.57
ER	0.30	0.27	0.30	0.30	0.30
RMSE	0.55	0.52	3.72	4.14	

#### F. Comparison with models

TABLE II  
COMPARISON OF THE MODEL WITH EXPERIMENT AND OTHER MODELS

	Exp[4]	M1	M2	M3	M4	Model
H <sub>2</sub>	14.00	23.35	17.37	23.39	23.56	13.19
CO	20.14	25.24	22.86	19.47	25.47	19.34
CO <sub>2</sub>	12.06	9.13	11.15	13.45	8.95	15.46
CH <sub>4</sub>	2.31	0.72	3.81	1.15	0.58	1.52
N <sub>2</sub>	50.79	41.56	44.80	41.53	41.45	50.49
LHV	4.89	5.97	6.13	5.76	5.97	4.57
ER	0.30	0.30	0.30	0.30	0.30	0.30
RMSE		6.48	3.40	5.96	6.63	1.65

where

- Exp[4] = Experimental results from ref.[4]
- M1 = Pure equilibrium model from ref.[3]
- M2 = Modification of equilibrium equations by multiplying with variables ( $\alpha, \beta$ ) from ref.[3]
- M3 = Modified by correlations from ref.[3]
- M4 = Modification of equilibrium equations from ref.[3]
- Model = Current model

From the above comparison with different equilibrium models (Table-2), it was observed that the results predicted by the present model generally agreed with the reference models. It was shown that the model proposed had smaller variation of RMSE (1.65) compared to the previous equilibrium models (3.4~6.63). Considering that previous modelling efforts presented had been validated with RMSE value of at least 3.4 to 6.63, this model had only 1.65. This proves the worthiness of the present model.

### IV. RESULTS AND DISCUSSION

#### A. Case study-1: Effect of gasification temperature on producer gas composition

After validating the model, it was used for the gasification of hard wood.



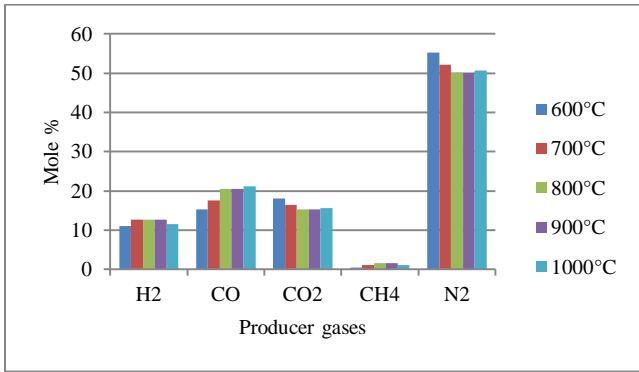


Fig.1.Effects of gasification zone temperature on producer gas concentration

The composition of producer gases from the model was calculated for a constant ER (0.3) and constant moisture content m (0.25) at  $CH_{1.44}O_{0.66}$  within the different gasification zone temperature range 600-1000°C.

The results showed that hydrogen and methane compositions did not change sharply within the study range. But carbon monoxide and carbon dioxide percent changed significantly. By increasing the zone temperature, the carbon monoxide rose upward and carbon dioxide and nitrogen fell downward. Carbon dioxide and inert nitrogen are undesirable in the gasification system. So reducing these undesirables means achieving more percentage of combustible gases.

From the simulation results in Fig.2, gasification temperature range (800-900°C) gave the maximum heating value and it could be concluded that within the previous mentioned range(800-900), the maximum composition of combustible gases ( $H_2$ , CO and  $CH_4$ ) could be achieved from the gasifier.

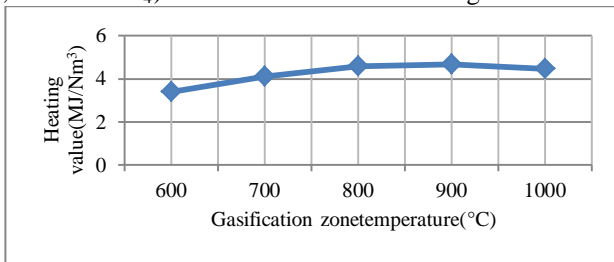


Fig.2. Effects of gasification zone temperature on heating value of producer gas at ER=0.3

Main target of the optimization process is the maximization of the heating value of the producer gas. However it is essential to define the final use of the producer gas in order to further clear out and specify the goal of the process. For instance, if the producer gas will be used in an internal combustion engine, the heating value should be greater than 4.2 MJ/Nm<sup>3</sup>. The simulation result clearly showed that the reduction zone temperature should be greater than 700°C.

**B. Case study-2: Effect of Moisture Content**

The equilibrium model described above was used for the analysis on the gasification of hard wood.

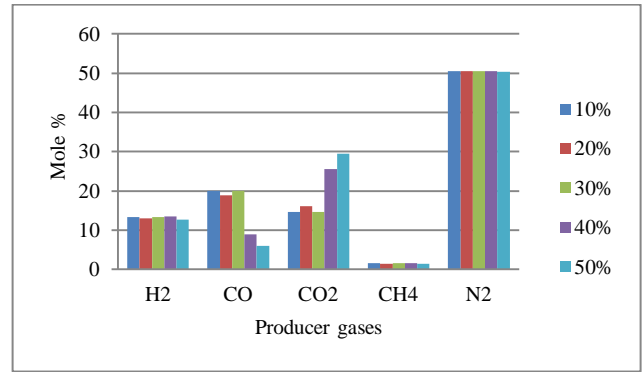


Fig.3. Effects of moisture content in wood on gas composition at T=800°C, ER=0.3

Fig.3 shows the effect of moisture content in the composition of producer gas when the gasifier is working at 800°C and ER(0.3). It was observed that the composition of nitrogen and hydrogen was almost constant within the study range. Meanwhile, increasing moisture content of biomass, the content of carbon monoxide decreases sharply. CO content was very low at the range 40-50% moisture content. Inversely, the rise in carbon dioxide was found. And then, heating value of producer gas decreased rapidly, shown in Fig.4. Therefore, the effect of moisture content is very important in gasification system to acquire sufficient heating value of producer gas.

In Fig.4, the heating values reduced significantly at moisture content >30%. So the simulation result also illustrates that maximum acceptable level of moisture content is 30% to be suitable in engine-generator set which has minimum limit of 4.2 MJ/Nm<sup>3</sup>.

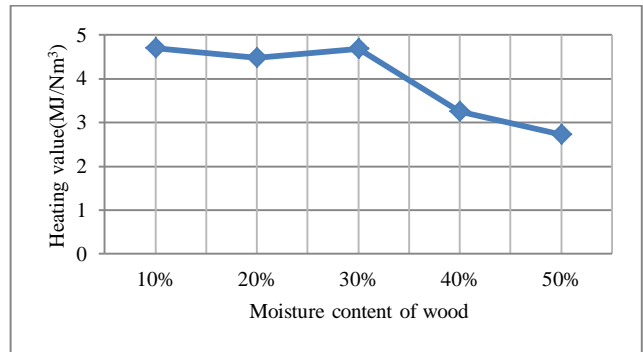


Fig.4. Effects of biomass moisture content on heating value of producer gas

**C. Case study-3: Effect of Equivalence Ratio at T=800°C and w=0.25**

Finally, effect of equivalence ratio on biomass gasification system had studied at T (800°C) and w (0.25) on hard wood biomass, shown in Fig-5 and 6. By increasing ER, the important combustible gases decreased considerably and, on the contrary, nitrogen composition increased dramatically. Accordingly, heating value changed in a downward trend.

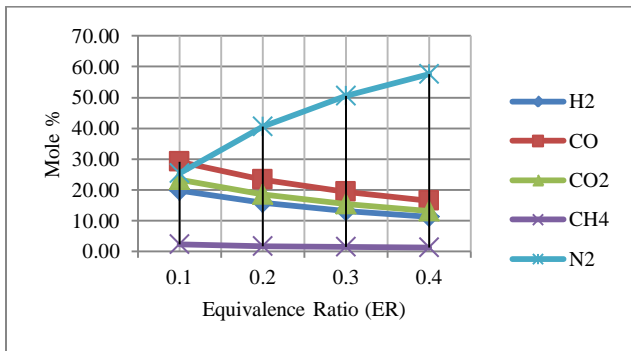


Fig.5. Effects of equivalence ratio in hard wood biomass on gas composition at  $T=800^{\circ}\text{C}$ ,  $w=0.25$

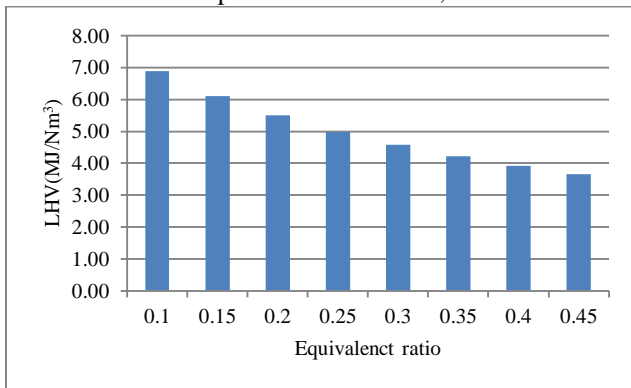


Fig.6. Effects of equivalence ratio in hard wood on gas composition at  $T=800^{\circ}\text{C}$ ,  $w=0.25$

The results pointed out the theory of gasification. At combustion (oxidation) zone, the air is required to promote combustion of fuel. But, at gasification zone, the air is unfavourable for gasification (reduction) reactions.

#### V. COMPARISON WITH CURRENT EXPERIMENTAL GASIFIER

Experiments are carried out by construction of the pilot scale gasifier at Chemical Engineering Department, Yangon Technological University (Fig.7). The objective of gasifier experiment is to achieve sufficient heating value producer gases by using briquette rice husks. It consists of reactor insulated with fire clay, cyclone, water scrubber, foam filter, dolomite filter and gas holder. Blower is to monitor air flow rate into the system. Water pump is to scrub the producer gas for tar and particulate removal and cool the output gas. Recycle system of water was conducted and briquette rice husks were used in all experiments. Measuring devices used are k type thermocouples for temperature, anemometer for gas flow, water flow meter and GC-TCD for gas compositions and heating value measurement.

In experiments, there are various parameters to be optimized for sufficient heating value producer gas. Some observations beyond the scope of modeling work were described as follows:

1. Reactor had a problem in ash removal (causing bridging, combustion zone shift). That is because of manual grade handled from the top of the reactor.
2. Water Scrubber was important to eliminate tar from the producer gas and to cool gases. Without using it, the outlet producer gases were hot and considerable amount of tar and moisture are included in the product gas. This caused the product gas incombustible.

3. Dolomite ring and foams used in the two filters could effectively absorb moisture and tar from the producer gases.
4. Combustible gases with sufficient heating value for engine quality had found. Sometime, the combustible gases were unstable.



Fig.7. Experimental Gasifier System

In comparison with model parameters, because of instability nature of operation conditions mentioned above, the results are described as follows:

**Temperature:** Although temperature is fixed in model, the real temperature distribution at pilot gasifier is changing time by time in the gasification zone within the range  $700\sim 1000^{\circ}\text{C}$ . This is due to the unstable nature of gasification zone. This problem can be minimized by the continuous ash removal system. At present, manual grate is used in all experiments. In addition, temperature distribution is directly proportional to the air flow rate. As excess air favors complete combustion instead of gasification, careful adjustment of air flow is required for producer gas.

**Moisture content:** In practical work, we used rice husk briquette which had moisture content  $<16\%$ , so any problem related with it was not found. It is recommended that in rainy season proper drying of raw materials is required in sunlight for about one day before using in the gasifier.

**Air-fuel ratio (ER):** It was controlled by the valves (before blower) in experiments, for ER calculation, it is still needed to install the flow measuring devices in 4 air nozzles.

So the current experimental works find difficulty to compare with the modeling scheme. But the modeling work shows that the objective of experimental work is combustible producer gas that is the driver of engine. The output producer gas components and their compositions in experiments are closely matched with the model outputs. Although the model cannot effectively compare the current experiments in the parameters, the objection function, producer gas quality and quantity, is comparable with the experiment work.

#### VI. CONCLUSION

An equilibrium model was developed and tested to study the influence of the three gasification process parameters, namely moisture content, equilibrium temperature and air fuel ratio. This model can be used in the downdraft gasification system with acceptable accuracy in producer gas composition and heating value.

So the designer of the gasifier can use this simulation data in the optimization of moisture content of biomass, equilibrium gasification zone temperature and air-fuel ratio to control producer gas composition and heating values in order to fulfil the specific requirement (e.g. boilers, engine-generator set, further synthesis of chemicals, fuel cells, etc). The model is very simple and clearly provides the operating range of equivalence ratio, moisture content for the woody biomass and optimum gasification zone temperature. Furthermore, this model facilitates the prediction of maximum temperature in the gasification zone which provides useful information for the designing of the gasifier and the selection of material for the construction.

The merits of the model lies in the fact that it is capable of handling predictions for all category of biomass materials with wide operating range of equivalence ratio and moisture content in the gasifier.

In the experimental work, all sample gases contain hydrogen, carbon monoxide, carbon dioxide, methane and nitrogen. It was not found significant composition of other impurities such as tars. The lower heating values of producer gas were in the range 4.5 to 7 MJ/Nm<sup>3</sup>. So the experiment results show a close agreement with model output.

The model cannot be regarded at the actual gasification system but it gives useful information for designing the system such as choice of materials and clay for insulation, design of throat for gasification zone, air inlet control. Therefore more research work is required to assess the effects of operation conditions and feed stock properties (type, morphology, size distribution, density) on these factors.

#### ACKNOWLEDGEMENT

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#### AUTHORS

**First Author** – Ye Min Htut, Ph.D(Thesis)(Chemical Engineering), Mandalay Technological University, [yminhtut@gmail.com](mailto:yminhtut@gmail.com)

**Second Author** – May Myat Khine, Ph.D (Chemical Engineering), Mandalay Technological University, [maymyatkhine81@gmail.com](mailto:maymyatkhine81@gmail.com)

**Third Author** – Myo Min Win, Ph.D (Chemical Engineering), Yangon Technological University, [myominwin21610@gmail.com](mailto:myominwin21610@gmail.com)

# The Serum Separating Capacity of *Ipomoea batatas* Starch in the Routine Glucose Determination

Larrizel Castro, Ana Isabella De Guzman, Rose Bernadette Padua, Eden Jean Supan, Chriesta Marielle Tan, Patricia Isabel Tayag, Arielle Katreena Tuason, Angelica Kristine Wong, Jocelyn Domingo, Julius Eliazar Jose, Xandro Alexi Nieto

University of Santo Tomas, Philippines

**Abstract-** Serum separator tube is composed of synthetic polymer gels designed to separate serum from the formed elements. In line with this, an alternative serum separator gel using 0.25 g/mL concentrated *Ipomoea batatas* starch extract was produced. Results show that all the samples in the alternative serum separator gel successfully separated the serum from the formed elements. However the serum blood glucose levels using the alternative serum separator gel showed no evidence of agreement [ $\rho_c = 0.133$ ,  $CI_{95\%}$ : -0.23 to 0.46] when compared with commercial serum separator tube.

**Index Terms-** *Ipomoea batatas*, Starch, Serum Separator Gel, Glucose Determination

## I. INTRODUCTION

The average human body is composed of 5 L of blood. The functions of the blood include: transportation of oxygen from lungs to tissues; transportation of glucose, proteins and fats; and movement of wastes to the liver and kidneys. Blood consists of formed elements, which is further subdivided into red blood cells (RBC), white blood cells (WBC) and platelets, and plasma, which provides coagulation enzymes that protect vessels from trauma and maintain the circulation (Rodak, Fritsma, & Keohane, 2012). Without an anticoagulant, the blood's clotting factors are activated to form a clot, which is encapsulated by the protein fibrinogen, and plasma is transformed into serum (Bishop, Fody, & Schoeff, 2013). Blood tests performed for clinical diagnostic and disease monitoring purposes commonly use serum or plasma. Electrolytes, enzymes, and hormones are important analytes of interest and assayed in serum and plasma. Thus, there is a need to separate serum or plasma from the formed elements and sustain a physical barrier between these blood components (Sun, Oh, Emerson, & Raghavan, 2011).

Serum separator tube (SST) is designed to separate serum from the formed elements. Typically, whole blood is drawn and transferred to SST that contains a separator gel. The separator gel is designed to have a density between that of the formed elements and serum. The tube is then centrifuged and the gel liquefies and settles in between the denser formed elements and the less dense serum by virtue of relative densities because of the thixotropic property of the gel. After centrifugation, the gel returns to its gel state, leaving a soft barrier (Sun *et al.*, 2011). Preferably, interaction with separator gels should not affect the laboratory results; however, effects on analyte concentrations were seen on several reports. Drug absorption to the gel may be

influenced by specimen volume, storage time, temperature, and gel type. Materials that interfere with analytical assays may also be released from the separator gels (Bowen, Hortin, Csako, Otañez, & Remaley, 2010).

Starch, an insoluble polymer of glucose residues produced by the majority of higher plant species, is a major storage product of seeds and storage organs produced agriculturally and used for human consumption (as cited in Chen *et al.*, 2015). Starch, as a polysaccharide, has applications which include use as thickeners, thixotropic agents, and flow and texture enhancers (Clasen & Kulicke, 2000).

*Ipomoea batatas*, typically known as sweet potato, is rich in carbohydrates, carotene, and polyphenolic antioxidants as well as a good source of vitamins A-C, calcium, iron, and phosphorus. In the Philippines, where it is commonly known as *kamote*, *Ipomoea batatas* is cultivated as a basic staple food. Promotion of *Ipomoea batatas* production and consumption is led by the Department of Agriculture, specifically the Bureau of Agricultural Research. Moreover, it is included as a priority among the root crops through the continued collaborative effort by the Philippine government. Although the use of *Ipomoea batatas* as ingredient in food products such as ketchup, jam, soy sauce, jellies, and other bakery and non-bakery products is increasing in popularity in the country, its industrial use is considerably superseded by China, Korea, and Vietnam, where it is being utilized for the production of chemical products, paper, paint, and ink, among others (Reynoso, 2011).

## II. OBJECTIVES

This study aims to propose an alternative serum separator gel through the use of *Ipomoea batatas* (sweet potato) starch extract. Specifically, the research aims to determine if the serum is separated from the formed elements using 0.25 g/mL *Ipomoea batatas* starch gel; and to determine if there is a significant agreement in the glucose determination of serum using serum separator tubes and 0.25 g/mL *Ipomoea batatas* starch gel.

## III. METHODS

### 3.1 Selection of subjects

For this study, the samples were obtained from five subjects through simple random sampling. Five different set-ups were used wherein each set-up consists of two tubes: control (commercial serum separator tube) and alternative *Ipomoea batatas* starch gel with 0.25 g/mL concentration. The serum,

which would be tested for glucose determination, would come from the venous blood extract using the syringe method of the abovementioned subjects.

### 3.2 Experiment procedure

The preparation of the separator gel was done by extracting the starch from *Ipomoea batatas* (sweet potato). First, the root crops were cut into cubes and placed inside the blender with distilled water. The resulting mixture was filtered using the cheesecloth. The solid residues were squeezed until dry and the filtrate was set aside in the plastic containers and refrigerated overnight to let the starch settle at the bottom. The liquid part of the filtrate was discarded to isolate the *Ipomoea batatas* starch.

Once the starch has been extracted, 7.5 g of the starch was weighed using the analytical balance. Afterwards, 30 mL of normal saline solution (NSS), which served as the solvent, was added to the weighed starch to obtain the concentration of 0.25 g/mL. NSS was used as the solvent since it does not lyse the red blood cells when the gel comes in contact with the cells during the blood extraction. The resulting mixture was heated at 300°C on a hot plate until a gel formed. The temperature of the gel was carefully monitored and maintained at 70 to 75°C. The prepared gel was approximated to the level of serum separator gel and incorporated in each of the plain red-top evacuated tubes. The tubes were centrifuged in order for the gel to settle at the bottom. The gel was allowed to cool down for at least one day before being used for serum separation.



**Figure 1. Separated Serum After Centrifugation (left), and Glucose Determination using Glucose Oxidase Method (middle and right)**

Syringe method was used as the blood collection method. Ten-milliliter syringes were used to avoid multiple punctures on the antecubital fossa of the subjects. The two tubes in each of the five set-ups were filled with 3 mL of blood from each subject: control (commercial serum separator tube) and alternative gel with 0.25 g/mL concentration. Since the serum was the sample examined for glucose determination, the collected blood was allowed to stand for 15 minutes in the control for it contains a clot activator and 30 minutes for the alternative gel for maximum clot formation. These tubes were centrifuged and the serum was separated.

The levels as to which the serum is separated in the 0.25 g/mL tubes were compared to that of the control qualitatively to determine the effectiveness of the alternative separator gels. The glucose concentrations of serum in each of the ten tubes were determined using the glucose oxidase method. From the twelve cuvettes, one was labeled properly with blank (blank reagent), one with standard (100 mg/dL glucose standard), five cuvettes

with control and the corresponding seat numbers of the subjects (serum from commercial serum separator tube), and the last five cuvettes with starch and the corresponding seat numbers (serum from 0.25 g/mL starch gel concentration). Using the mechanical pipet, 0.01 mL aliquots of each of the serums and the standard solution were aspirated and dispensed on their respective cuvettes. Then, 1.0 mL of the reagent was added to each of the cuvettes with serum. The cuvettes were covered with parafilm, mixed, and incubated for 10 minutes at 20 to 25°C. The absorbance and concentration of the standard and the samples were measured against the reagent blank within 60 minutes using the Primus Humalyzer Spectrophotometer. Only the glucose concentrations were used for the statistical analysis. See Figure 1.

### 3.3 Statistical Analysis

Pearson coefficient of concordance was used to determine if glucose determination of serum using serum separator tubes agree with 0.25 g/mL *Ipomoea batatas* starch. The statistical test used 5% level of significance with the aid of MedCalc version 14.10.2 (MedCalc Software, Ostend, Belgium).

## IV. RESULTS AND DISCUSSION

All the five samples of 0.25 g/mL concentration of alternative *Ipomoea batatas* starch gel have successfully separated the serum from the formed elements and formed a barrier between these components of blood, as well as all of the five samples of control (commercial serum separator tube).

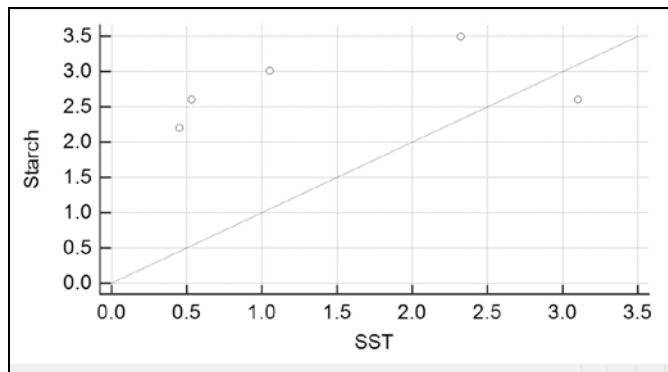
The serums obtained from the control and the alternative *Ipomoea batatas* starch gel were subjected to glucose oxidase method. The glucose concentrations of the serums were measured spectrophotometrically. See Table 1.

**Table 1. Glucose concentrations (in mg/dL) of SST (control) and Starch.**

Samples	SST (control)	<i>Ipomoea batatas</i> Starch gel
1	2.32	3.50
2	0.53	2.61
3	0.45	2.20
4	3.10	2.61
5	1.05	3.02

Concordance coefficient is found to be 0.13 [CI<sub>95%</sub>: -0.23 to 0.46], indicating that there is no evidence of agreement between the glucose levels of commercial serum separator tubes (SST) and *Ipomoea batatas* starch serum separator tubes. See Figure 2.





**Figure 2. Scatterplot of Glucose Concentrations (in mg/dL) of Serum Using Serum Separator Tubes and *Ipomoea batatas* Starch**

The results of this research were in contrast with the study conducted by Aldana *et al.* (2008) wherein it is stated that there is no significant difference in the mean glucose values of the serums collected from the different concentrations of *Solanum tuberosum* (potato) starch serum separator gels and the control. The results were also unparallel with the research conducted by Anico *et al.* (2014) wherein it is also stated that there is no significant difference in the glucose values of serums collected from the different concentrations of *Ipomoea batatas* starch serum separator gels and the commercial serum separator tube. It was also found that there is no significant difference in the mean potassium values of serums collected from the different concentrations of *Ipomoea batatas* starch serum separator gels, the positive control, and the negative control. However, 10 out of the 30 prepared *Ipomoea batatas* starch serum separator gels failed to separate the serum from the formed elements. Instead of direct heat, water bath was used as a source of heat. Homogenization of the starch mixture occurred inside the tubes instead of the beaker.

## V. CONCLUSION AND RECOMMENDATIONS

*Ipomoea batatas* starch gel was able to settle between the serum and the formed elements which makes it a potential alternative serum separator gel; however, there is no agreement between the blood glucose levels of the serum using the commercial serum separator tube and the alternative tube containing the 0.25 g/mL *Ipomoea batatas* starch gel.

For future researchers who would pursue this topic, the use of different concentrations other than 0.25 g/mL, to find the optimum concentration where the gel would settle between the serum and blood cell components is suggested. Furthermore, testing for the other serum routine tests, such as test for

creatinine, total cholesterol, triglyceride, high density lipoprotein (HDL) and low density lipoprotein (LDL) may also be done. The use of a method other than glucose oxidase test may be used to test blood glucose levels. Also, to prevent the growth of molds, the researchers suggest that the proper preservation and shelf life of the starch extract be noted.

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## AUTHORS

**Correspondence Author** – Xandro Alexi A. Nieto  
xandronieto@gmail.com, (+63)917-831-2776

# Factors That Influence Compliance with Tax Laws among Small and Medium Sized Enterprises in Kenya

Michael Ng'ang'a Thiga and Dr. Willy Muturi

School of business, Jomo Kenyatta University of Agriculture and Technology

**Abstract-** This study was meant to analyse the factors influencing tax compliance among the SMEs in Kenya. To achieve this aim, Kiambu County was taken as a case study. In various previous years revenue targets have been set by either the treasury or commissioner general but they are never met. Therefore the actual revenue collected has always been behind the targets. This is as a result of tax noncompliance. Tax non-compliance may be measured in terms of the tax gap. It is very clear that there have been tax gaps every fiscal year. Therefore the researcher opted to carry out this study with the aim of analyzing factors influencing tax compliance among the SMEs and recommend measures to be put in place by the government and KRA to enhance tax compliance in this sector.

The main objectives of the study was to assess tax understanding, tax rates, tax penalties and fines and tax compliance cost on tax compliance level. This have been considered by the researcher to be the most key factors that influences tax compliance level in Kenya.

This study was controlled by the theory of planned behavior. The study used questionnaires and oral interview method to collect data. The population of the study was a number of SMEs in Kenya and the sample size involved a number of SMEs in Kiambu County. A sample size of 400 was drawn from the target population of 2541 SMEs. Once the data was collected, it was coded and analysed with the help of the MS Excel. Mean, frequencies, and percentages were calculated. It was presented in tables, graphs and pie charts using simple percentages. Content analysis was done in order to make a through conclusion on factors influencing compliance with tax laws in Kenya.

As part of conclusion of the study it was very clear from the findings that tax rates and tax compliance cost are the greatest contributing factor in tax compliance. Therefore the results of this study contradict the study that was done by Osebe (Osebe 2012). His study concluded that the greatest contributors of tax compliance level are tax understanding and tax rates. In other words the studies are matching but partly (50%). According to these study findings there is enough proof to conclude that low tax rates and low tax compliance cost are associated with high levels of tax compliance. The study is not striking the other factors out but their impacts are not as for this two. Generally, tax understanding, tax rates, tax compliance cost and tax fines and penalties influences tax compliance level significantly. Finally, the study concludes that tax compliance cost have the most significant effect on tax compliance. In other words Kenyans are not ready to incur extra cost for them to pay tax.

From the study findings it was found that low tax compliance cost have a significant effect on tax compliance. Therefore proper restructuring should be done by KRA in order to address this issue. KRA should set up agents who should be

sited in different locations all over the country. Be it urban centers be it rural areas. Their main objective is to offer tax information advices for free. Some of the key services that they should be offering that are in great need are ; tax computation, filing of tax returns, which tax to be paid where, tax penalties and the due dates.

If this is not possible then they can implement tax information ATM. The purpose of the ATM is to address direct questions. KRA can negotiate with certain banks especially Equity so that they can be located next to their ATM. Am picking Equity because they have the biggest number of branches all over the country.

Also as a way of appreciating new technology which can fit persons KRA can also bring the services to the phones. In this case they can negotiate with service providers such as safaricom, Orange, YU and others who can help to address issues of the tax payers through SMS. Tax payers just need to send standard questions and they get an immediate answer. This will not only help tax payers but also tax practitioners.

KRA should also formally communicate tax information changes. Their system of communication is good but it is not sufficient because not all persons/tax payers get tax information. This brings a lot of confusion and it has reduced the level of tax compliance

However the study recommended that KRA should implement more tax incentives in order to encourage tax payers to continue to pay and also attract more investors hence improving the level of tax compliance. Tax penalties and fines should be harmonized and at least two ranges be created to ensure that those who do not feel the penalties they feel it. Finally there are many persons who are willing to comply with the tax laws but they are not aware. KRA should ensure that there is no tax payer who doesn't pay tax or file tax returns due to failure of tax understanding. This should be in Kenya history books but not a current matter. So to say tax awareness should be improved, tax rates made favorable, penalties increased and tax compliance cost reduced further by enhancing more training on how to use I-TAX SYSTEM. Generally this study shows that with the introduction of I- TAX SYSTEM compliance with tax laws in Kenya has greatly improved.

**Index Terms-** tax compliance, tax system, evasion, avoidance, penalties, fines

## I. INTRODUCTION

**T**ax compliance refers to fulfilling all tax obligations as required by the tax laws. There has been no charging of

taxes proportionately among small and medium enterprises (SMEs) internationally. High compliance costs, inadequate understanding, high tax rates and tax penalties are some of the variables that can lead to tax evasion and tax fraud. Their size, nature and operation make the issue of tax compliance critical among the SMEs. They are not well established in terms of resources and expertise. (Williams and Round, 2009)

Persons fail to comply with tax laws either willingly or unwillingly. They include [tax resisters](#) and [tax protesters](#). Tax protesters attempt to evade the payment of taxes using alternative interpretations of the tax law, while tax resisters refuse to pay a tax for conscientious reasons. SMEs are characterized by size, uncertainty, innovation and evolution. Proper understanding of SMEs would require a good understanding of its operations (Webley, 2004).

Students are the leaders of tomorrow and therefore it is also a fact that SMEs are the blue chips companies of tomorrow. Most well established companies started as small and medium enterprises. Therefore, the stepping stone of big companies is likely to be small and medium enterprise. Developing countries like Kenya should heavily encourage the SMEs and other private sectors in order to promote the business performance within and without Africa. Their problem was addressed to the letter in order to create a very conducive environment for them to operate. In other words they should be looked from the eye of success but not the eye of failure. A conducive environment for

the business is the best because economy wise the country tend to grow (Hijattulah and Pope, 2008).

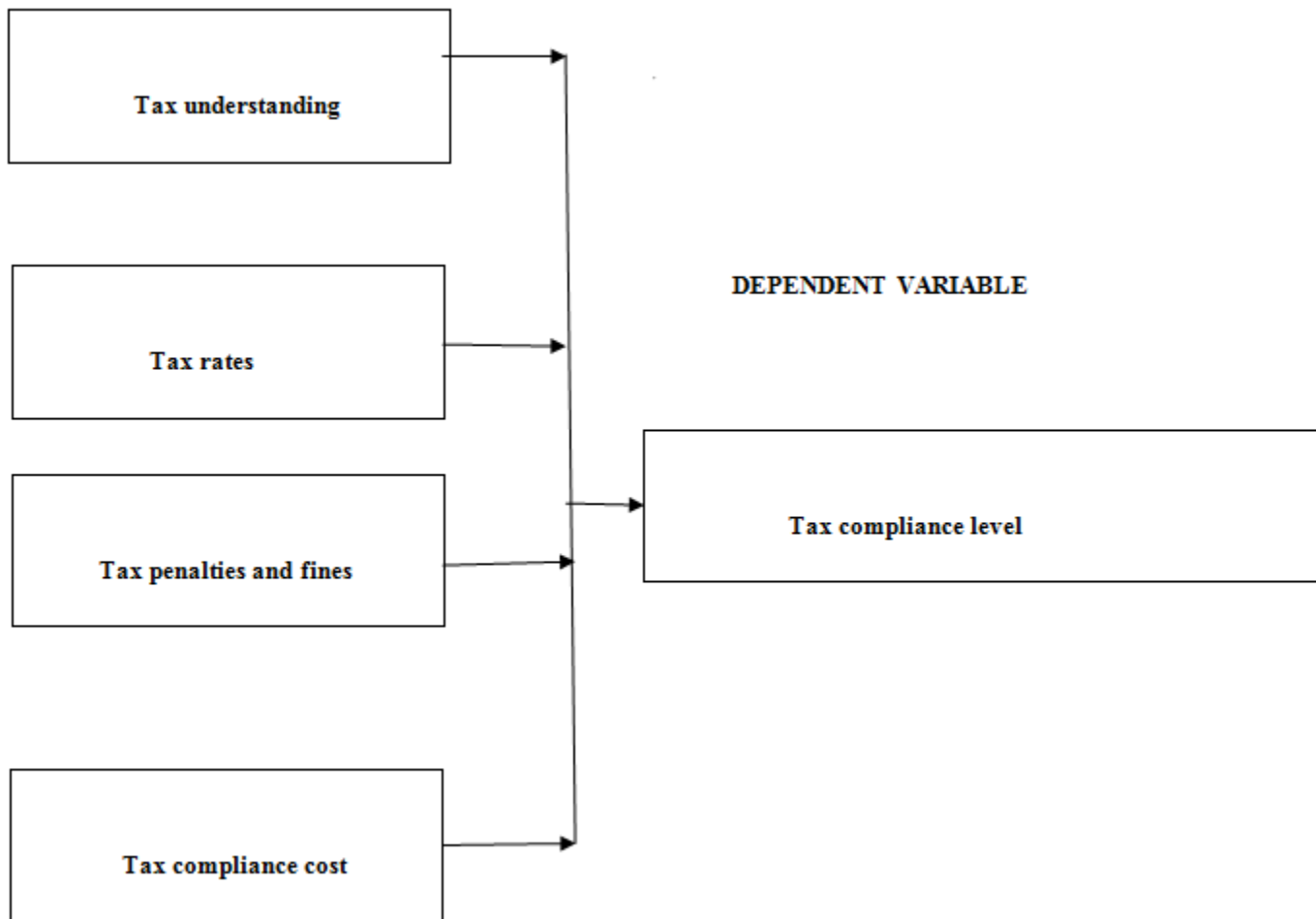
The fundamental purpose of taxation is to raise revenue. Inorder to achieve this tax system should be effective and efficient in to ensure that SMEs are not negatively affected. The society should also not complain. Many of the difficulties with the tax authorities are the consequence of poorly set tax systems and policies. Proper research should be done before employing any tax policy in order to have a properly working tax system. The objective of a tax policy should be to abide with tax laws. (James and Alley, 2004).

## II. RESEARCH ELABORATIONS

This study conceptualizes that the tax compliance could be affected by tax understanding, tax rates, fines and penalties and tax compliance cost. The main objective of this study was therefore to test the nature and the strength of these four relationships. This study tests the conceptual framework presented in Figure 2.1



## INDIPENDENT VARIABLES



**Figure 2.1: Conceptual Framework**

### 2.1 Tax understanding

The influence of tax understanding on compliance behaviors has been done by various researchers. Understanding as one of the factors in compliance is related to the taxpayers' ability to interpret taxation laws, and their willingness and ability to comply. The aspect of tax understanding that relates to compliance is the general understanding about taxation regulations and information pertaining to the opportunity to evade tax (Kasipillai, 2003).

Taxation understanding is necessary to increase public awareness especially in areas concerning taxation laws, the role of tax in national development, and especially to explain how and where the money collected is spent by the government (Mohd, 2010). Attitude towards tax compliance can be improved through the enhancement of taxation understanding. When a taxpayer has a positive attitude towards tax, this will motivate him to pay more and vice versa (Eriksen&Fallan, 1996).

Taxpayers who have attended a tax course would be expected to have better tax understanding and tax compliance attitude in comparison with taxpayers who have never attended a tax course (Mohd, 2010). According to Hite and Hasseldine (2001) tax authority need to emphasize teaching tax courses because of impact of understanding on compliance.

### 2.2 Tax rates

For the tax system to be efficient and efficient, the tax policy needs to be favoring the tax payers. It should be designed such that the tax rates are fairly rational. Tax policies can be designed in such a way that they do not only directly affect SMEs. They should also accelerate voluntary tax compliance. SMEs constitute untapped revenue potential and an uneven playing field in many countries. As such they need to be captured by the tax net. However, though legislations are necessary regulator for protection of the business environment and security of the economic agents, for establishment of the necessary social security regulations, they may also hamper compliance and the growth of business through additional expenditures and administrative obstacles. (Williams and Round, 2009).

### 2.3 Fines and Penalties

It is a fact that if many persons are given the chance they may not pay taxes unless there is a motivation to do so. Tax experts have a perception that the best way is to increase tax incentives while others believe the best way is to increase tax penalties. Stopping non compliance requires applying penalties effectively. The most appropriate strategy is to combine various

measures so as to maximize their effects on tax compliance as it were, in order to move the country from a low level of tax compliance to a higher level. (Gruber and Saez, 2002)

Higher tax fines can also lead to tax evasion. Various researchers have also suggested that an increase of penalties can have undesirable effect and result in more tax avoidance. (Kirchler et al., 2007). Tax penalties and Fines are many and they include:

Failure to register – fine not exceeding Kshs.20, 000 or imprisonment for a term not exceeding six months or both

Enforced registration – default penalty of Kshs. 100,000

Failure to submit a return on or before the due date or submitting a payment return without paying the tax due – default penalty of Kshs.10, 000 or five percent of the tax due whichever is the higher and additional interest of 2% per month compounded.

Failure to keep proper records – a default penalty of between Kshs.10, 000 to Kshs.200, 000

Fraudulent Accounting – a fine not exceeding Kshs.400, 000 or double the tax evaded whichever is greater or imprisonment for a term not exceeding three (3) years or both.

Failure to issue a Tax Invoice – an automatic penalty of not less than Kshs.10, 000 but not exceeding Kshs.100, 000/=.

Hindrance or obstruction of authorised officers

Uttering false statements

Charging tax when not registered – tax shown on such invoice is due to the Commissioner within seven (7) days.

Failure to display a certificate of registration – a default penalty of Kshs.20, 000 and a fine not exceeding Kshs.200, 000 or imprisonment for a term not exceeding two (2) years or both.

Failure to comply with VAT regulations

Failure to pay tax and late payment

Note: For offences, which no specific penalty is provided, a general penalty of a fine not is exceeding Kshs.500, 000 or imprisonment for a term not exceeding three (3) years or to both is applicable (KRA tax guide, 2013/2014).

**Table4.1 tax understanding on compliance**

The following table shows how tax understanding influences tax compliance level

INDIPENDENT VARIABLE	NO. OF RESPONDENTS	NO. OF COMPLIANT	COMPLIANCE LEVEL PERCENTAGE %
TAX UNDERSTANDING	YES 258	202	78.29
	No 142	02	1.41
TOTAL	400	204	79.70

According to the above analysis 258 of respondents understand the tax laws while 142 do not understand. This is out of 400 respondents who contributed to this study. This can be presented as follows:

**2.4 Tax Compliance Cost**

High tax rates and complex tax legislations can lead to various tax problems. This includes tax evasion, tax fraud. Earlier research (Franzoni, 1998) concluded that companies will create a kind of resentment against authorities who impose too high levies and too complex tax systems. This will accelerate tax avoiding systems (Franzoni, 1998). In addition, because of the complexity of the system, the companies often need to rely on external tax professionals who by means of sophisticated tax avoidance engineering will minimize tax payments (Franzoni, 1998).

Various components of costs of taxation include social costs, audit costs, travelling costs and others. Social costs are incurred by society in the process of transferring purchasing power from the taxpayers to the government. The other elements are administrative costs and deadweight efficiency loss from taxation. Administrative costs are the costs that exist besides the occurrence of compliance costs that are borne by the companies. These costs are cited as costs that the government must also take into account as a public cost to ensure that the tax legislation is obeyed. For example, it obtains the costs to collect taxes and to maintain the system to collect the taxes. These are to some extent substitutable, for example when a country transfers from a system where the tax office calculates the tax owed, to a self-assessment system (Slemrod and Yitzhaki, 1996)

**III. FINDINGS**

**CROSS TABULATION OF INDIPENDENT VARIABLES AND DEPENDENT VARIABLE**

The following is the analysis of how independent variables influence dependent variable.

**4.1 Tax understanding**

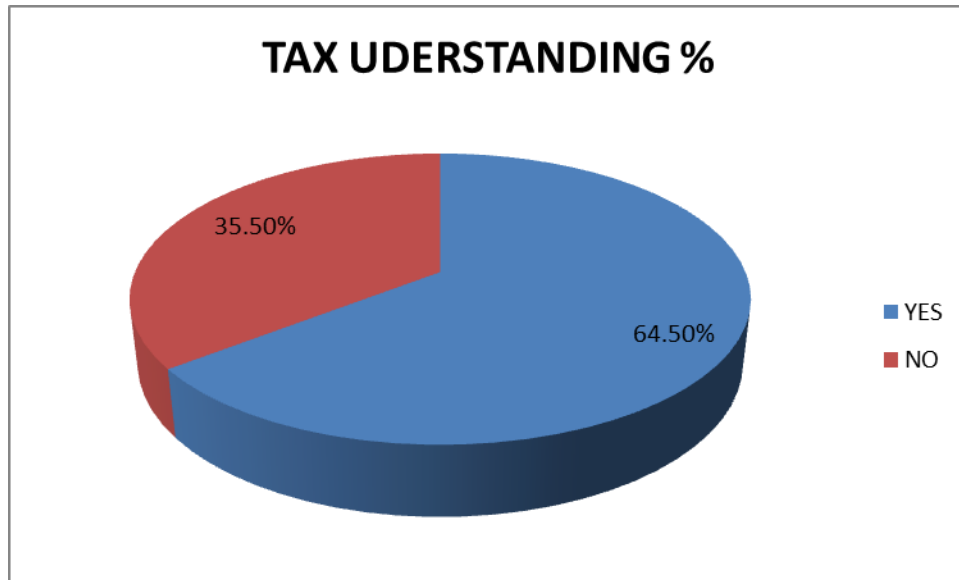


Figure 4.1: Tax understanding

It is clear that 258 of respondents understand the tax laws out of which 202 comply. Therefore 78.29% understand the tax laws and comply. This therefore means tax understanding influences the tax compliance level positively. It is also very clear that those respondents who do not understand the tax laws they do not comply. Out One hundred and forty two (142)

respondents who do not understand tax laws only two (02) comply. In other words only 1.41% of the respondents who do not understand tax laws comply. It is therefore very clear that lack/inadequate tax understanding reduces the level of tax compliance. This means lack of tax understanding or inadequate tax understanding influences tax compliance negatively.

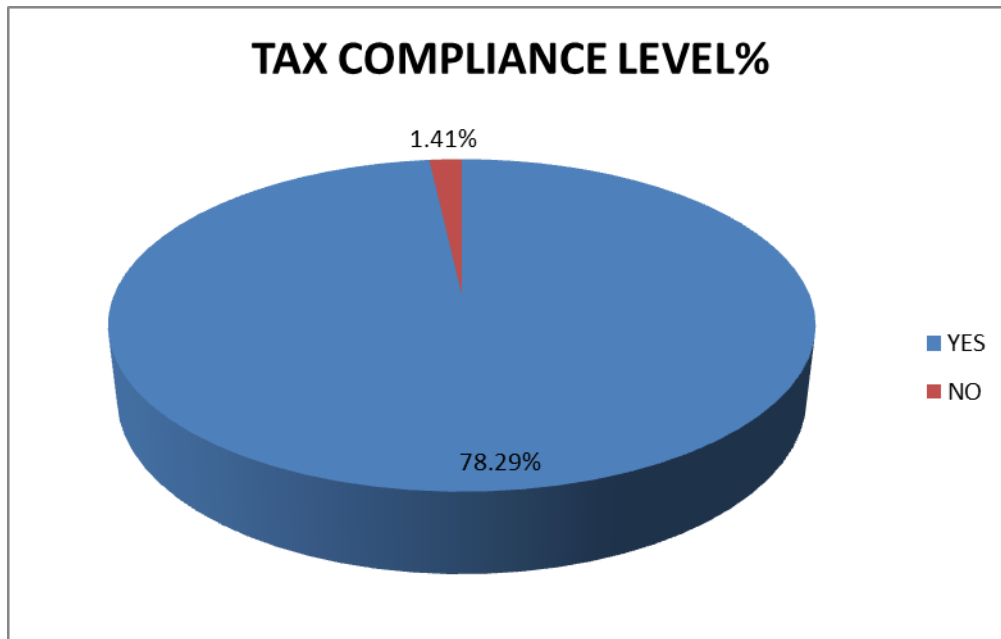


Figure 4.2: Tax understanding on tax compliance

**Key**  
78.29% indicates those respondents who understands and comply  
1.41% indicates those respondents who do not understand but they comply

In general many tax payers who understand the tax laws also comply and therefore tax understanding is a key factor that influences compliance with the tax laws. Furthermore the result of this study shows that with the introduction of the new I- tax

system has boosted the level of tax understanding among SMEs. In fact 83% of the respondents stated that their level of tax understanding was enhanced by the new I- tax system. Generally

in Kenya therefore tax understanding influences tax compliance level by seventy nine point seven percent (79.70%)

Previous researchers including (Mohd, 2010) have analysed tax understanding but in a shallow perspective. This study widened the scope by covering many areas of the tax laws. The influence of tax understanding on compliance behaviors has been

done by various researchers. Understanding as one of the factors in compliance is related to the taxpayers' ability to interpret taxation laws, and their willingness to comply. The aspect of tax understanding that relates to compliance is the general understanding about taxation regulations and information pertaining to the opportunity to evade tax.

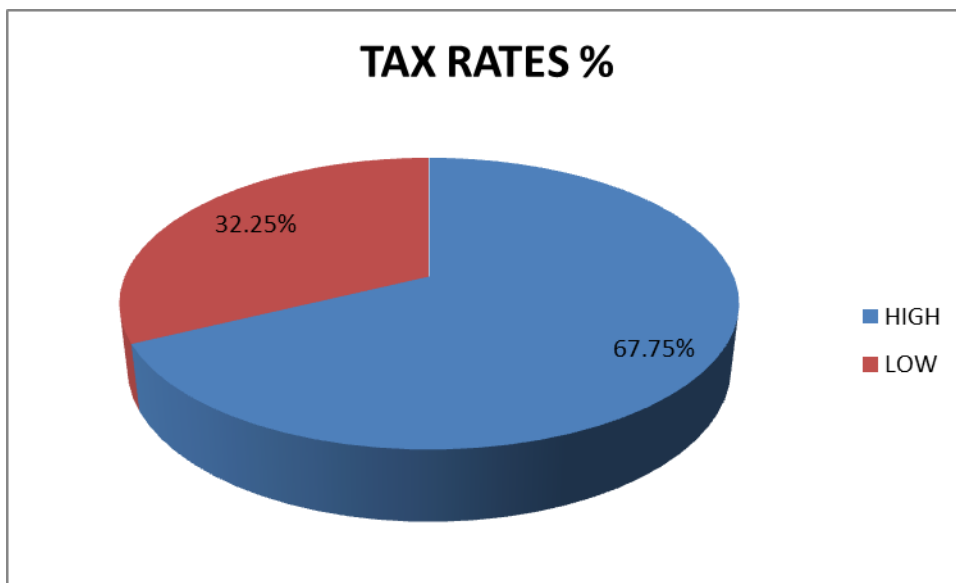
**Tax rates**

**Table 4.2 tax rate on tax compliance**

The following table shows how tax rates influences tax compliance level

INDIPENDENT VARIABLE	NO. OF RESPONDENTS	NO. OF COMPLIANT	COMPLIANCE LEVEL PERCENTAGE
TAX RATES	HIGH 271	15	5.54
	LOW 129	127	98.45
TOTAL	400	194	

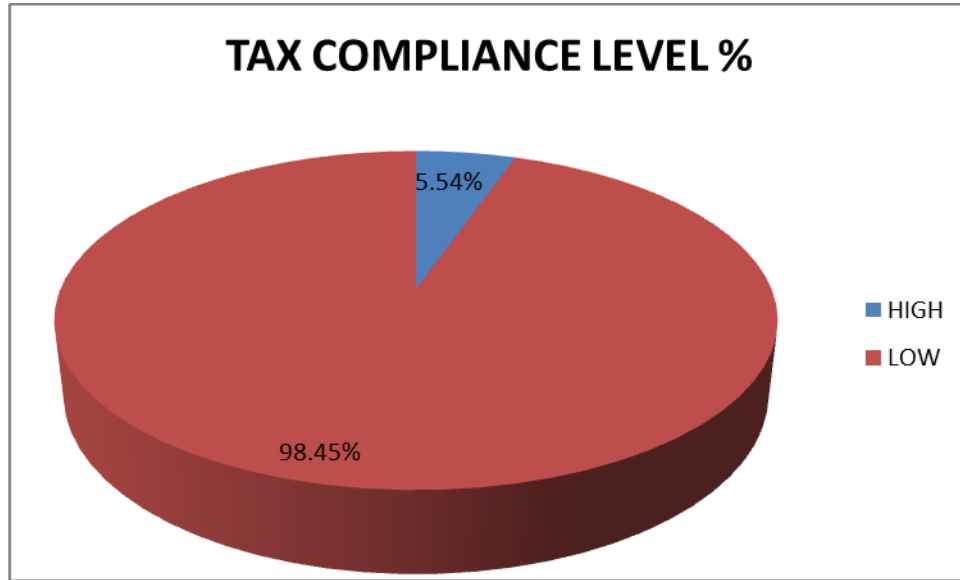
According to the above analysis 271 respondents said that tax rates are high 129 respondents said it is low. This is out of 400 respondents who contributed. This can be presented as follows.



**Figure 4.3: Tax rates**

Out of 271 respondents who said that tax rates are high only 15 comply. This influences tax compliance by 5.54% Of 129 respondents said that tax rates are low 127 comply with the tax laws. 98.45% of the respondents who said that the tax rates are low also comply with the tax laws. It is also very clear that those

respondents who said that tax rates are high rarely comply with the tax laws. Therefore as the tax rates keeps on increasing tax compliance level keeps on reducing. In other words high tax rates influences tax compliance negatively while low tax rates influences it positively.



**Figure 4.4: Tax rates on tax compliance level**

**Key**

98.45% represents respondents who said tax rates are low and they comply  
 5.54% represents respondents who said tax rates are high and they comply

This therefore indicates that the rate of tax influences tax compliance either positively or negatively. KRA should also visit them with an objective of ensuring that they satisfy as many tax payers as possible. Positive influence makes the government to enjoy more tax revenue.

**Fines and Penalties**

**Table 4. 3 tax penalties on tax compliance**

The following table shows how tax penalties and fines influences tax compliance level.

INDIPENDENT VARIABLE	NO. OF RESPONDENTS	NO. OF COMPLIANT	COMPLIANCE LEVEL %
<b>TAX PENALTIES AND FINES</b>			
	<b>HIGH 192</b>	<b>154</b>	<b>80.21</b>
	<b>LOW 208</b>	<b>26</b>	<b>12.5</b>
<b>TOTAL</b>	<b>400</b>	<b>346</b>	<b>92.71</b>

According to the above analysis 192 respondents stated that tax penalties and fines are high while 208 respondents said it was low. This has been analysed out of 400 respondents who participated in field work. Presentation can be done as follows

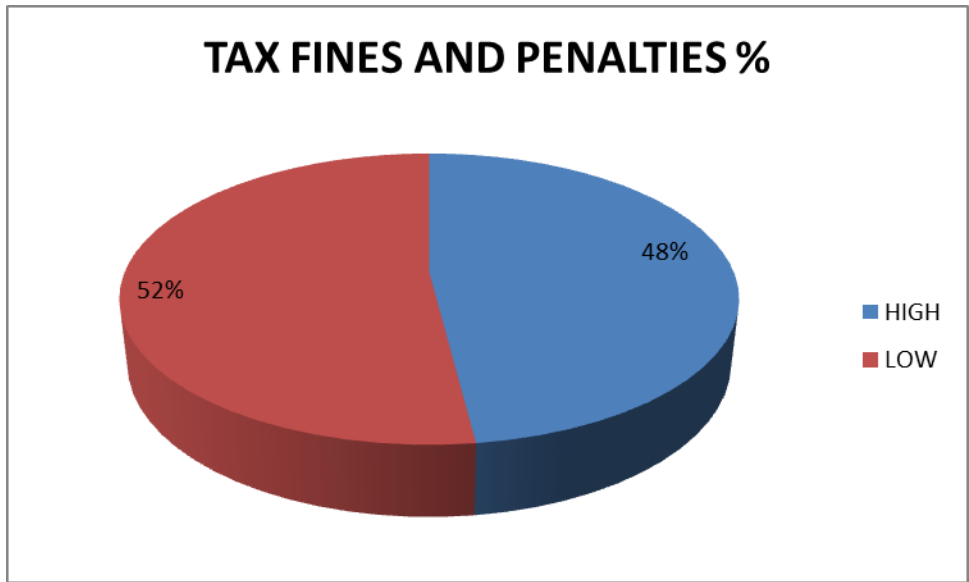


Figure 4.5: Tax penalties and fines

It is very clear that of the 192 respondents who said that tax penalties and fines are high 154 comply with tax laws. This constitutes 80.21% of the respondents who according to them tax penalties and fines are high but this makes them to comply with the tax laws. Also 26 respondents out of 208 suggested that tax penalties are low but despite this they also comply. Therefore even if the tax penalties and fines are high they are ready to comply further. This therefore indicates that fines and penalties

positively influence tax compliance but not to a very great extent. In other words they partly influence tax compliance. However in general high tax penalties and fines boost the level of tax compliance. The government should implement ranges of penalties. This is because those who view them as small or large can be taken in to consideration. The views might not be the same.

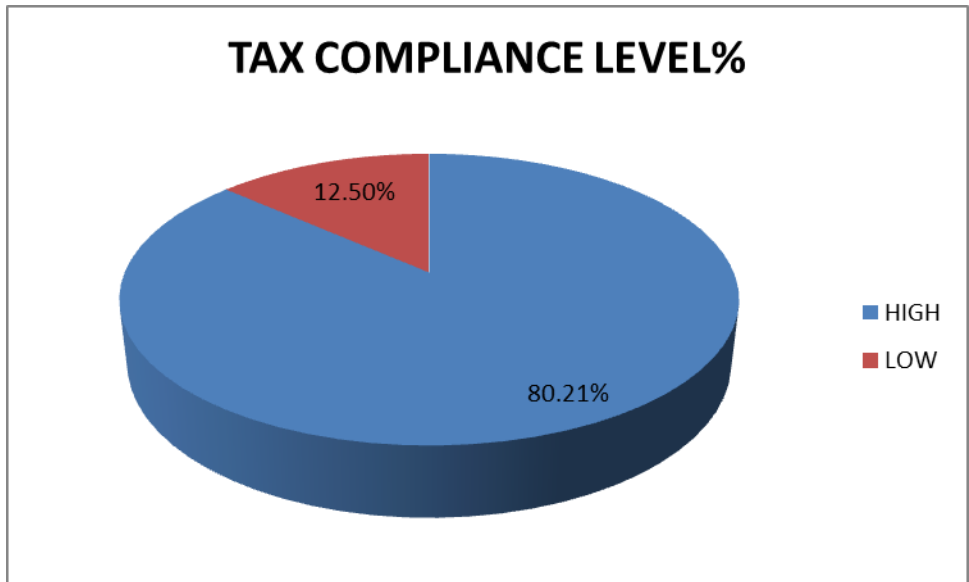


Figure 4.6: Tax penalties and fines on tax compliance level

Key  
80.21% represents respondents who said tax penalties are high and this makes them to comply  
12.5% represents respondents who said tax fines and penalties are low but they still comply

It is a fact that if many persons are given the chance they may not pay taxes unless there is a motivation to do so. Tax experts believe that the best way is to increase incentives while others believe the best way is to increase penalties. According to this research not all SMEs comply with the tax laws due to high tax penalties and fines. In fact 87.5% of respondents who said tax

penalties are low do not comply. This means they comply due to other factors other than tax penalties and fines. However generally in Kenya tax penalties and fines contribute 92.71% level of tax compliance.

**Tax Compliance Cost**

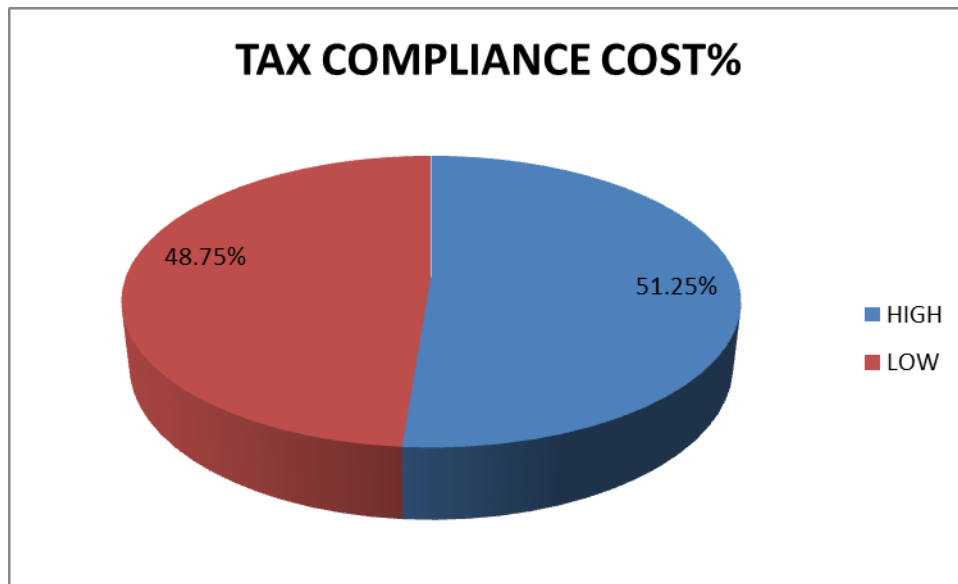
**Table 4.4 Tax compliance cost on tax compliance level**

The following table shows how tax compliance cost influences tax compliance level.

INDIPENDENT VARIABLE	NO. OF RESPONDENTS	NO. OF COMPLIANT	COMPLIANCE LEVEL PERCENTAGE %
TAX COMPLIANCE COST HIGH	205	95	46.34
LOW	195	194	99.49
<b>TOTAL</b>	<b>400</b>	<b>375</b>	

According to the above analysis 205 respondents claimed that tax compliance cost is high and 195 respondents said that it

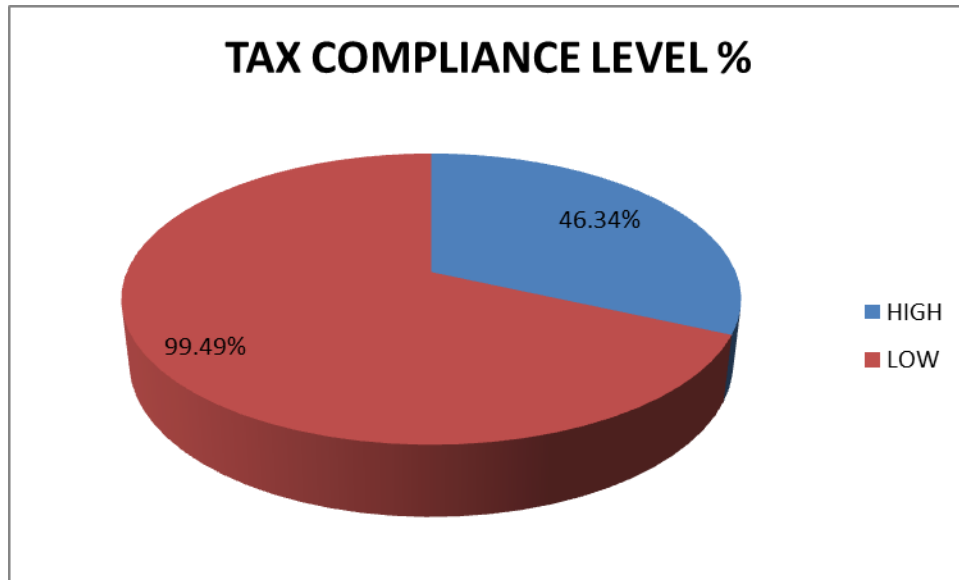
was low. The results are from 400 respondents who contributed in this study. This can be presented as follows



**Figure 4.7: Tax compliance cost**

Out of 205 respondents who said that tax compliance cost is high only 95 respondents comply with the tax laws. This constitutes 46.34% of the respondents who said that tax compliance cost is high but they also comply. The percentage of these respondents who comply is low. It is also very clear that high compliance cost influences tax compliance level negatively. Furthermore out of 195 respondents who suggested that tax compliance cost is low 194 respondents comply. Therefore

99.49% of the respondents said that compliance cost is low and they also comply. This is an indication that low compliance cost encourages tax payers to comply. It is therefore very clear that if the compliance cost is favorable among tax payers tax compliance level will increase and vice versa. In other words tax compliance cost negatively influence the compliance with the tax laws.



**Figure 4.8: Tax compliance cost on tax compliance**

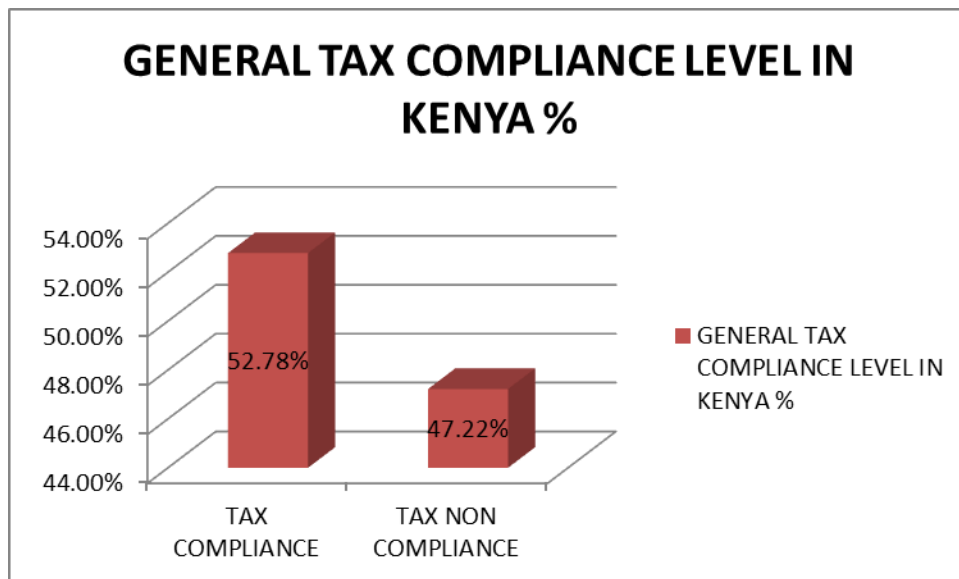
Key

46.36% respondents who said tax compliance cost is high but still comply

99.49% respondents who said tax compliance cost is low and they still comply

It should also be noted that as a result of the introduction of the new I- tax system the cost of tax compliance has reduced. The data collected and analysed from the respondents shows that 76.75% of the respondents unanimously agree that the tax

compliance cost reduced. The impacts of this can be felt in terms of the total revenue generated which has greatly improved since the implementation of I- tax system. In general tax compliance level in Kenya is fifty two point seven eight percent (52.78%).



**Figure 4.9: General tax compliance level in Kenya**

Findings on gender revealed that there are more male than females among the respondents indicating that more men than female are SMEs investors. It should also be noted that some of the respondents were not the owners but managers or accountants. Furthermore majority of the respondents were between the ages brackets of 25-40 years. Significant number of them were also educated and those with undergraduate

contributing the highest percentage followed by those with KCSE certificate reflecting that respondents were generally literate. Findings on information about the SME's affirmed that majority of the SMEs have been in operation for 6-10 years confirming the recent growth in these sector. Majority of the SMEs had a turnover below ksh: 500,000. Findings on tax characteristics acknowledge that most respondents have ever



heard of KRA although majority of them have never been audited.

The study also reveals that most SMEs investors are willing to grow to the level of the company. Therefore there is a need for the tax authority and the government to generate strategies meant to encourage SMEs investors to achieve their dream. This technique includes introducing tax incentives such as high capital allowances, tax holidays and tax exemption of some commodities in order to enhance tax compliance levels. On matters pertaining being penalized by KRA as a result of not filing tax returns, majority of the respondents have not been penalized. The study also found out that most of the respondents do not disclose all their incomes even if they know that the incomes are taxable. The study also examined the effect of tax understanding on tax compliance level. Seventy eight point two nine (78.29%) of those respondents who understands also comply. This means that tax understanding is positively related to tax compliance. Ninety eight point four five (98.45%) of the respondents who said tax rates are low also comply. This means that tax rates are negatively related to tax compliance.

Therefore the higher the tax rates the lower the level of tax compliance. Eighty point two one (80.21%) of the respondents said tax penalties are high and this makes them to comply. This means that tax fines and penalties are positively related to tax compliance. This implies that enforcement of fines and penalties on tax offenders will enhance levels of tax compliance. Ninety nine point four nine (99.49%) of the respondents who said tax compliance cost is low also comply. This means that tax compliance cost is negatively related to tax compliance. This means that high compliance costs reduces tax compliance level. The findings show that the level of tax compliance in Kenya in SMES is fifty two point seven eight (52.78%). This shows that there is a significant improvement since the last research was done. Previous research that was done reflected that tax compliance level was forty six percent (46%). (KRA tax guide 2012/2013).

#### IV. CONCLUSION

These study findings shows that tax rates and tax compliance cost are the greatest contributing factor in tax compliance. Therefore the results of this study contradict the study that was done by Osebe (Osebe 2012). His study concluded that the greatest contributors of tax compliance level are tax understanding and tax rates. In other words the studies are matching but partly (50%). According to these study findings there is enough proof to conclude that low tax rates and low tax compliance cost are associated with high levels of tax compliance. The study is not striking the other factors out but their impacts are not as for this two. Generally, tax understanding, tax rates, tax compliance cost and tax fines and penalties influences tax compliance level significantly.

Finally, the study concludes that tax compliance cost have the most significant effect on tax compliance. In other words Kenyans are not ready to incur extra cost for them to pay tax. This should be taken seriously by KRA because it seems that Kenyans are greatly feeling the pain of paying tax and this should be the final cost they should incur hence promoting the level of tax compliance. Also this study adds value to the

research that was done by Mohd and Mustapha (2011) which is one of the most recent researches the researchers also analysed the determinants of tax compliance in general. This study concurs with the views of these researchers however the factors have not been analysed specifically. The study also agree with Mohd(2010) that the higher the level of tax understanding the higher the level of tax compliance with tax laws.

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#### AUTHORS

**First Author** – Michael Nga'ng'a Thiga, School of business, Jomo Kenyatta University of Agriculture and Technology

**Second Author** – Dr. Willy Muturi, School of business, Jomo Kenyatta University of Agriculture and Technology

# State Space Modeling and Simulation and Analysis of Sensor-less BLDC motor Using MATLAB/SIMULINK

<sup>1</sup>Chitra Chhatre, <sup>2</sup>Dr. N. R. Kulkarni

<sup>1</sup> Department of electrical engineering, Modern College  
<sup>2</sup>Department of electrical engineering, Modern College

**Abstract-** This paper represents sensorless state space model of BLDC motor. The BLDC is modeled as sub-blocks and these blocks are either logical or S-function blocks. The BLDC main block is designed using state space model. The Zero cross detection control technique of back-emf is used for commutation of power switching device in 3 phase inverter. Modeling is done using MATLAB/SIMULINK and no built in Simpower system tool box is used. Motor's speed is controlled with PID controller and for current control, hysteresis current controller is used. By reading instantaneous position of the rotor as a one of the output of the state space model, different variables of the motor can be controlled without any external sensors hence motor is operating as sensorless.

**Index Terms-** BLDC, Sensorless, Back-emf, State Space Model, Zero Cross detection.

## I INTRODUCTION

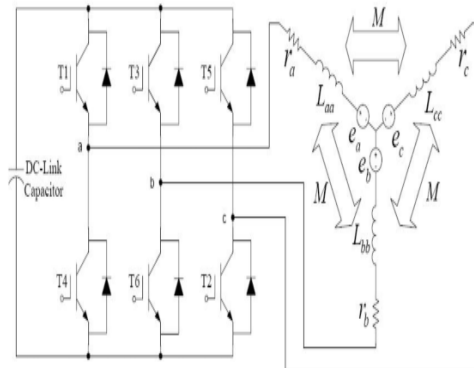
The PMLBDC motors are normally powered by conventional three phase inverter, controlled by the rotor position information obtained from hall sensors. But these position sensors have numerous drawbacks like increase in cost, complexity in control, temperatures sensitivity requiring special arrangements. These sensors reduce the system reliability and acceptability.

The sensorless technique used in this paper is based on sensing the back-emf. In PMLBDC motors, only two out of Three Phases are excited at any time leaving the third winding floating. The back-emf in the floating winding can be measured to determine the switching sequence for commutation of power switching device in the 3 phase inverter. The terminal voltage of the floating winding back-emf with respect to neutral point of the motor is needed to get the zero crossing time of the back-emf. The sensorless technique Based on zero cross detection of back emf has been widely used. In the ZCP method the back-emf cannot be obtained when the BLDC is operating nearly zero speed. Therefore special starting control is needed for smooth starting and reliable transfer to sensorless control. In this paper a MATLAB[1]/SIMULINK model of the PMLBDC motor suitable for sensor less operation is developed. Using this model the dynamic behavior of the motor with sensorless technique is studied.

## II MODELLING OF PMLBDC MOTOR

The modeling is based on the following assumptions:

- (1) The motor is not saturated.
- (2) Stator resistances of all windings are equal and self and mutual inductances are constant.
- (3) Power semiconductor devices in the inverter are ideal.
- (4) Iron Losses are negligible. The voltage equation of a BLDC motor can be expressed as:



**Figure 1: Basic PMLBDC Motor Drive Scheme**

The Voltage equation of a BLDC motor can be expressed as:

$$\begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = R \begin{bmatrix} I_a(t) \\ I_b(t) \\ I_c(t) \end{bmatrix} + L \frac{d}{dt} \begin{bmatrix} I_a(t) \\ I_b(t) \\ I_c(t) \end{bmatrix} + \begin{bmatrix} e_a(t) \\ e_b(t) \\ e_c(t) \end{bmatrix} \quad (1)$$

Where  $V_a, V_b, V_c$  are the stator phase voltages;  $R$  is the stator resistance per phase;  $I_a, I_b, I_c$  are the stator phase currents;  $e_a, e_b, e_c$  are the back electromotive forces. Back-emf equation of each phase is given below. Back-emf of the BLDC motor is trapezoidal in nature and is function of speed  $\omega$  and position  $\theta$  with a peak value of  $E_p$ . The instantaneous induced emfs can be expressed as,

$$e_a = f_a(\theta) \lambda \omega \quad (2)$$

$$e_b = f_b(\theta) \lambda \omega \quad (3)$$

$$e_c = f_c(\theta) \lambda \omega \quad (4)$$

The peak value,  $E_p$  is derived as,

$$E_p = (B l v) N = N (B l r \omega) = N \phi \omega = \lambda \omega \quad (5)$$

N is number of turns per phase, B is flux density of the field, l is gathered in above steps by adopting any of below suitable approaches: N is number of turns per phase is flux density of the field ,l is length of rotor,v is velocity,r is radius of rotor bore, ω is angular speed in rad/sec , φ is flux linkage=(Blr) , λ represent the total flux linkage as the product of number of turns and flux linkage/conductor.

Total Torque output can be represented as summation of each phase

$$T_e = \frac{e_a I_a + e_b I_b + e_c I_c}{\omega} \quad (6)$$

Where  $T_e$  is total torque output[Nm]  
 Also

$$T_e = J \frac{d\omega_m}{dt} + B \omega_m + T_L \quad (7)$$

Where  $T_L$ =load torque[Nm], J= inertia of rotor and coupled shaft[kgm<sup>2</sup>], B is Friction constant.

The rotor speed and its position are related as follows:

$$\frac{d\theta}{dt} = \frac{p}{2} \omega \quad (8)$$

where p is number of machine poles.

### III State Space Modeling

The general equations for state space modeling are:

$$\dot{X} = Ax + Bu \quad (9)$$

$$Y = Cx + Du \quad (10)$$

Where state vector  $x = [I_a \ I_b \ I_c \ \omega \ \theta]^T$   
 (11)

$$u = [V_{an} \ V_{bn} \ V_{cn} \ T_L]^T \quad (12)$$

The Matrix A,B are given as:

$$A = \begin{bmatrix} -\frac{R}{L} & 0 & 0 & \frac{f_a(\theta)\lambda}{L} & 0 \\ 0 & -\frac{R}{L} & 0 & \frac{f_b(\theta)\lambda}{L} & 0 \\ 0 & 0 & -\frac{R}{L} & \frac{f_c(\theta)\lambda}{L} & 0 \\ \frac{f_a(\theta)\lambda}{J} & \frac{f_b(\theta)\lambda}{J} & \frac{f_c(\theta)\lambda}{J} & -\frac{B}{J} & 0 \\ 0 & 0 & 0 & \frac{P}{2} & 0 \end{bmatrix} \quad (13)$$

$$B = \begin{bmatrix} \frac{1}{L} & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{L} & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{L} & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{J} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (14)$$

### IV Simulation blocks and operations:

The BLDC control system is divided into isolated function modules. In MATLAB/SIMULINK environment, these function modules are established respectively and then combined effectively to form the integrated simulation model for BLDCM. This Simulink model has several main blocks i.e. BLDC motor block, Reference current block, switching logic block ,Initial control block, Controller block, Inverter block etc.

The BLDC motor block contains state space sub block and S-function sub block.

The reference current controller block starts with calculating the error in speed and uses PID controller to estimate the torque and is calculated by

$$T_{req} = \left[ E \times \left( K_p + (K_i \times 0.5 \times t_s) + \frac{K_d}{t_s} \right) + \left[ E_{-1} \times (0.5 \times t_s \times K_i - \frac{K_d}{t_s}) \right] \right] \quad (15)$$

Where E is the angular speed error, E is the previous time step error in angular speed, t is the sampling time,  $K_p, K_i, K_d$  are proportional, integral and derivative constants. The total current command is evaluated from estimated torque. Then it is converted by means of an approximated Park's Transformation to three phase currents. The approximated park's transformation gives the corresponding phase current to every stator phase according to the rotor's position[6].

A Trigger block is used to hold on both the required and instantaneous current values in the open loop. Once the changer block closes the control loop, the Trigger block will give an access to the current values to pass to the present controller scheme. In this simulation, hysteresis controller function is chosen. In hysteresis type control[7]the controller is switched on and off according to whether the current generated is greater or less then reference current. Usually, the controller is used to fire the gates of six step inverter switches, as in [8].

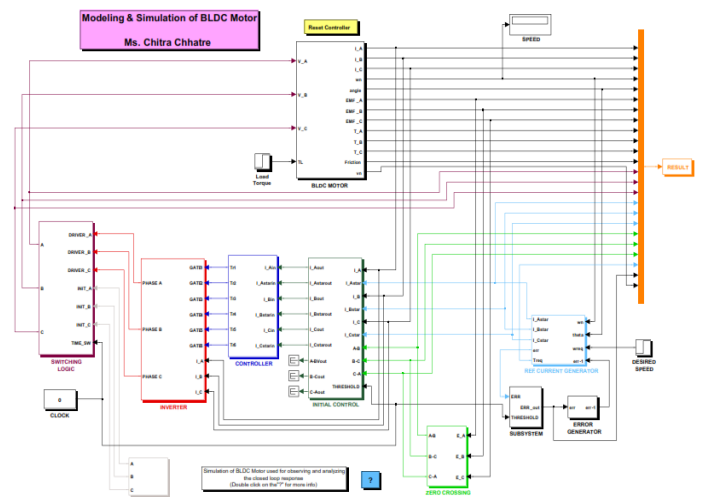
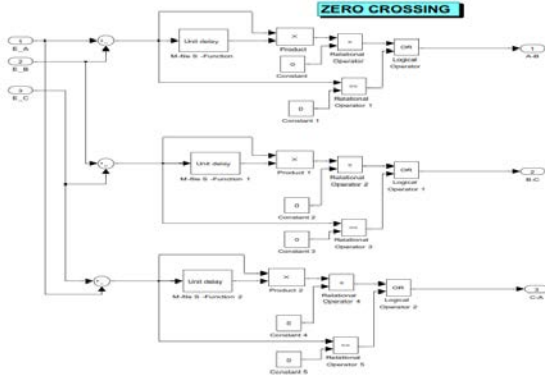


Figure 2:Simulation Model of BLDC motor

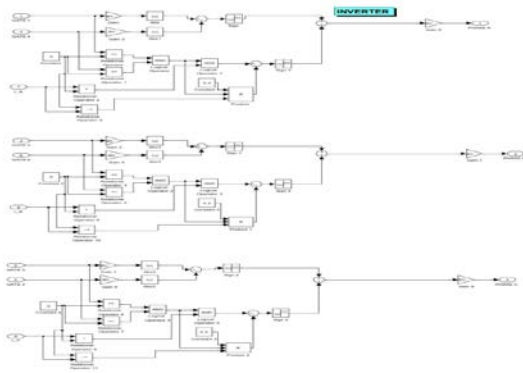
**Zero Crossing Block:**

This block evaluates the zero crossings of BEMF A - BEMF B (A-B), BEMF B - BEMF C (B-C) and BEMF C - BEMF A (C-A). These signals can be used to synchronize the controller or the inverter.



**Figure 3: Inside of Zero Crossing Block**

**Inverter Block:**



**Figure 4: Inside of the inverter Block**

This is a logical version of the power electronics 6 transistor inverter. As the core module BLDC MOTOR.mdl is written as a set of differential equations, the voltages that are impressed upon the module are signals derived from the general sources in SIMULINK. Hence, the inverter block is a completely logical unit.

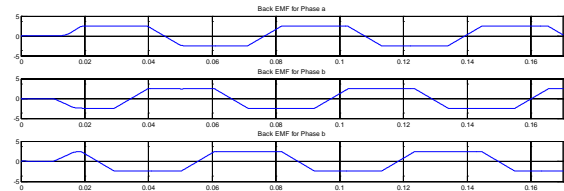
The logic used is straight forward, If the gate of transistor T4 is negative, the phase A is connected to the negative terminal of the voltage source. If however T1 is activated, the phase A is connected to the positive terminal of the voltage source. If however both the transistors are off, then depending upon the sign (i.e. direction) of the current  $I_A$ , the phase A may be connected to either side of the voltage source. This is to simulate freewheeling. If the switches are off and the current is +ve, then the phase A is connected to the -ve side of the voltage source and vice versa. Similar logic is followed for the other legs. THE INPUTS TO THE BLOCK ARE:

- GATE1, GATE2, . . . . . , GATE6 are the logical signals (zero/non-zero) that activate the transistors

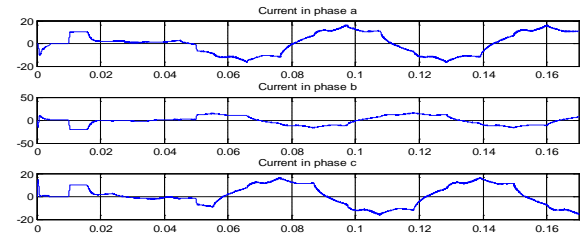
- $I_A$ ,  $I_B$  and  $I_C$  are the values of the phase currents that are required to decide the freewheeling logic. THE OUTPUTS OF THE BLOCK ARE:
- PHASE A, PHASE B and PHASE C are the signal voltages of the respective phases.

**V Simulation Results**

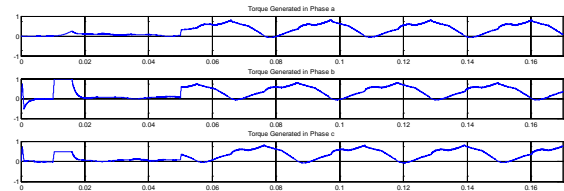
The motor specifications used in this simulation are shown in Table. 1. The simulation was run for 0.17 seconds (simulation time). When the reference speed equals 3600 rpm, the simulation curves of 3 $\Phi$  back emfs (Fig. 5), 3 $\Phi$  currents (Fig. 6), 3 $\Phi$  torques (Fig. 7) and rotor position are shown in, Fig. 9. Load torque is applied at 0.01 seconds. The motor speed stabilizes in 0.058 seconds with 0% overshoot. From Fig. 5 and Fig. 6, the back emf is almost trapezoidal with 120° phase difference.



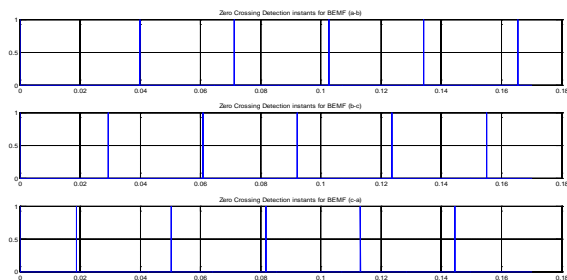
**Figure 5: Back-emf**



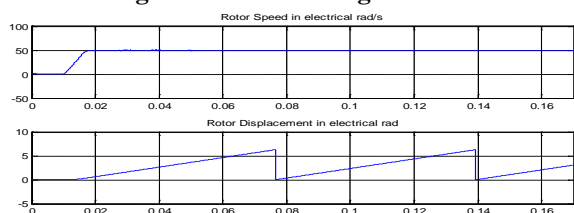
**Figure 6: Phase currents**



**Figure 7: Torque generated**



**Figure 8:Zero crossing instance**



**Figure 9:Rotor speed and Rotor Position**

<b>Current</b>	<b>20A</b>	<b>Rotor length</b>	<b>30cm</b>
<b>Torque</b>	<b>0.45N.m</b>	<b>Rotor radius</b>	<b>20cm</b>
<b>Self-inductance per winding</b>	<b>2.72mH</b>	<b>No.of turns per Phase</b>	<b>120</b>
<b>Mutual inductance</b>	<b>-1.5mH</b>	<b>Flux density</b>	<b>.8167wb</b>
<b>Motor inertia</b>	<b>.0002kg-m<sup>2</sup></b>	<b>Coulomb friction</b>	<b>.0178 N</b>
<b>Rated speed</b>	<b>3600 RPM</b>	<b>Static Friction</b>	<b>.089N</b>
<b>Number of poles</b>	<b>4</b>	<b>Viscous friction</b>	<b>.002N</b>
<b>Number of phases</b>	<b>3</b>	<b>Input dc voltage</b>	<b>160V</b>
<b>Winding resistance per phase</b>	<b>.29Ω</b>	<b>No of slots per pole per phase</b>	<b>120</b>

TABLE I: BLDC MOTOR SPECIFICATIONS

## VI CONCLUSION

In this study MATLAB/SIMULINK based modeling and simulation of the BLDCM is presented, for the specified motor. The simulation results satisfy the theoretical analysis. This model can provide a guide in the modelling of the PMLDC for investigators. State space model, the performance characteristics of the BLDC motor can be evaluated for different machine parameters which can be easily varied in the simulation study and useful information can be obtained. This model has a flexible structure and enables to users to change motor parameters easily.

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## AUTHORS

**First Author – Chitra Chhatre** is currently pursuing master’s degree program in control Systems in electrical engineering in Modern College, Pune University, India and completed degree at MPCT Gwalior ( M.P.)In 2000.  
Email address-chitra.chhatre@gmail.com

# Synthesis and I-V characterization of cuprous oxide nanocomposites

Monica Debbarma and Mitali Saha

Department of Chemistry, National Institute of Technology, Agartala -799046, Tripura, India

**Abstract-** The present research work is based on the studies of various nanocomposites and their I-V characterization for solar applications. Copper oxide ( $\text{Cu}_2\text{O}$ ) were synthesized and used, to prepare nanocomposites using titanium dioxide ( $\text{TiO}_2$ ) and GO. The composites have been synthesized in different ratios by applying simple mechanical stirring followed by ultra sonication. In this work,  $\text{Cu}_2\text{O}$  nanoparticles were prepared under microwave irradiation by our reported method which further used, to prepare copper oxide nanocomposite thin films. The prepared nanocomposites were further characterized using scanning electron microscopy and the current-voltage (I-V) characteristics of the thin films of  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposite were investigated. Various characteristics such as fill factor (FF), short circuit current ( $I_{sc}$ ), open-circuit photo-voltage ( $V_{oc}$ ), and efficiencies ( $\eta$ ) were measured for all the nanocomposites. The efficiencies of various ratios of  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  viz. 1:3, 1:1:1, 1:2:1 and 1:3:1 were found to be 1.98%, 1.16%, 1.45% and 1.55% respectively. During investigation it was found that  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposite with the ratio of 1:3 showed better efficiency ( $\eta$ ) as compared to other ratios.

**Index Terms-**  $\text{Cu}_2\text{O}$ ,  $\text{TiO}_2$ , GO, nanocomposites, current-voltage

## I. INTRODUCTION

The transition metal oxides are an important class of semiconductors having applications in magnetic storage media, solar energy transformation, electronics, catalysis etc [1, 10]. A rare earth oxide such as  $\text{TiO}_2$  has been applied widely in many fields. Titanium Oxide is also well known for its optical properties and is a semiconductor with a band gap of 3.95 eV [11-13]. Among various metal nanoparticles, oxides of copper have attracted many researchers and scientists, because of its importance in modern technologies, availability and also due to their optical, catalytic, mechanical and electrical properties [14-16]. The oxides are also of great interest due to their advantages such as non toxicity, abundance, high optical absorption coefficient and low band gap energies [17-19]. These characteristics make them prospective candidates for different applications such as catalysis, semiconductor equipment, solar/photovoltaic energy conversion, gas sensing, luminescence sources field, emission devices, lithium-ion electrode materials and dye-sensitized solar cells [20-23].

Cuprous oxide ( $\text{Cu}_2\text{O}$ ) is mostly p-type with band gap energy of  $\sim 2$  eV and have been used as one of the basic material in superconductors. Optical or magnetic characteristics can

change the particle sizes to very small dimensions, which are in general of major interest in the area of nanocomposite materials. Composites have excellent properties such as high hardness, high melting point, low density, low coefficient of thermal expansion, high thermal conductivity, good chemical stability and improved mechanical properties such as higher specific strength, better wear resistance and specific modulus and have good potential for various industrial fields [24-26].

Graphene is Carbon material with a one-atom thick and two-dimensional conjugated honeycomb lattice structure increasingly attracting scientists for its special characteristics [27-30]. Graphene oxide is a chemically modified graphene which is an atomically thin sheet of graphite that has traditionally served as a precursor for graphene [19]. Graphene, a single sheet composed of  $sp^2$  hybridized carbon, has drawn great attention owing to its outstanding electronic, optical, thermal and mechanical properties. Due to its unique and superior optical and electronic properties, much attention is focused on its application in the field of photovoltaic cells applications. Potential application of Graphene Oxide and its reduced forms have an extremely high surface area; because of this, these materials are under consideration for usage in photovoltaic cells [31].

In this paper, we have prepared nanocomposites of  $\text{Cu}_2\text{O}$  with  $\text{TiO}_2$  and GO, taking different ratios viz. 1:3, 1:1:1, 1:2:1 and 1:3:1, via mechanical stirring and ultra-sonication methods and studied their current-voltage performances.

## II. MATERIALS AND METHODS

### 2.1 Preparation of $\text{Cu}_2\text{O}/\text{TiO}_2$ nanocomposites

The prepared  $\text{Cu}_2\text{O}$  nanoparticles and  $\text{TiO}_2$  were taken in 1:3 ratio in water and was mixed with small amount of polystyrene in dichloroethane. The solution was then subjected to mechanical stirring for 3-4 hours, followed by sonication for 2 hours. Thin film of  $\text{Cu}_2\text{O}/\text{TiO}_2$  nanocomposite was prepared using reported doctor blade method and the thickness of the film was found to be of around  $1 \mu\text{m}$ .

### 2.2 Preparation of $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$ nanocomposites

The  $\text{Cu}_2\text{O}$  nanoparticles,  $\text{TiO}_2$  and GO were taken in different ratios of 1:1:1, 1:2:1 and 1:3:1, respectively, in water and mixed with small amount of polystyrene in dichloroethane. The solution was first mechanical stirred for 3-4 hours and then sonicated for 2 hours. The volume of the water was removed by evaporation and finally kept for drying in hot air oven for 24 hours. Thin films of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposite were then prepared using reported doctor blade method. The thickness of the films were found to be of around  $1 \mu\text{m}$ .

### III. CURRENT-VOLTAGE PERFORMANCES OF $\text{Cu}_2\text{O}/\text{TiO}_2$ AND $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$ NANOCOMPOSITES

The photovoltaic measurements of thin films of 1:3, 1:1:1, 1:2:1 and 1:3:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposites, respectively were carried out using a solar simulator with an irradiance of  $100 \text{ mWcm}^{-2}$ . The current-voltage characteristics of the cell was measured by applying external potential bias to the cell and measuring the generated photocurrent. The monochromator was incremented through the visible spectrum to generate the incident photon to current conversion efficiency (PCE). Parameters such as fill factor (FF), short circuit photocurrent ( $I_{\text{SC}}$ ), open-circuit photovoltage ( $V_{\text{OC}}$ ), and efficiency ( $\eta$ ) were measured for both  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposites.

### IV. RESULTS AND DISCUSSION

#### 4.1 Current-voltage (I-V) analysis

The I-V characteristics of the nanocomposites of 1:3, 1:1:1, 1:2:1 and 1:3:1 ratios of  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  were determined and the measured UV-illuminated I-V characteristics were shown in Figs. 1 a, b, c and d respectively. Thin film of  $\text{Cu}_2\text{O}/\text{TiO}_2$  of 1:3 ratio as shown in fig.1a gave the FF value of 0.535,  $I_{\text{sc}}$  of 7.5,  $V_{\text{oc}}$  value of 0.265 and  $\eta$  value of 1.98%. Fig. 1b shows the I-V curve of 1:1:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  and the value of FF,  $I_{\text{sc}}$  and  $V_{\text{oc}}$  were found to be 0.513, 5.08 and 0.230 respectively and the calculated efficiency increased upto 1.16%. Efficiencies of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  of 1:2:1 and 1:3:1 were also investigated. The values of FF was found to be 0.51 and 0.52, respectively.  $I_{\text{sc}}$  of 5.29 and 5.57,  $V_{\text{oc}}$  value of 0.275 and 0.280 and efficiencies ( $\eta$ ) of 1.45% and 1.55% respectively (fig.1 c and d). The increase and then decrease of the efficiency may due to presence of graphene oxide. Depending upon the conditions, the results may have varied. As the ratio of the titanium oxide increases the efficiencies also increases keeping the quantity of the GO same in all the mixtures. Since GO is insulator, it may have less effect in conductivity.

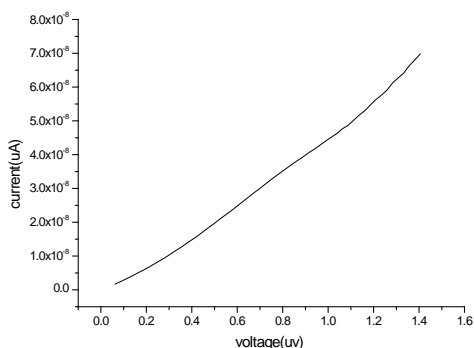


Figure 1a: I-V curve of 1:3 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2$

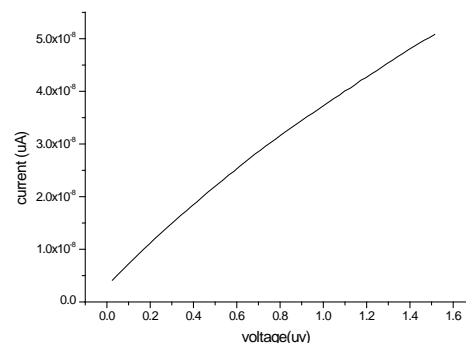


Figure 1b: I-V curve of 1:1:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$

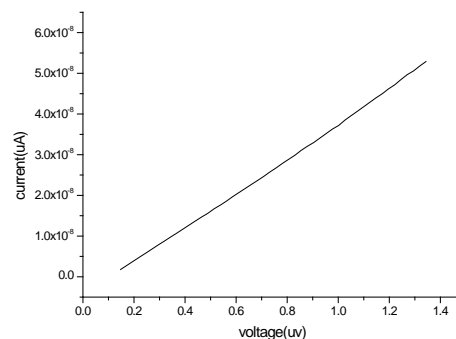


Figure 1c: I-V curve of 1:2:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$

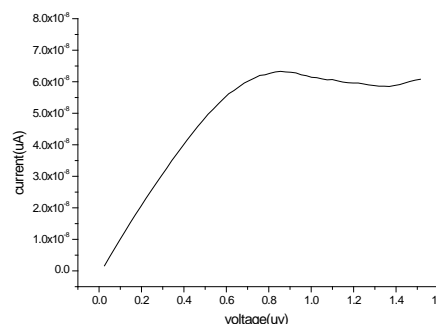
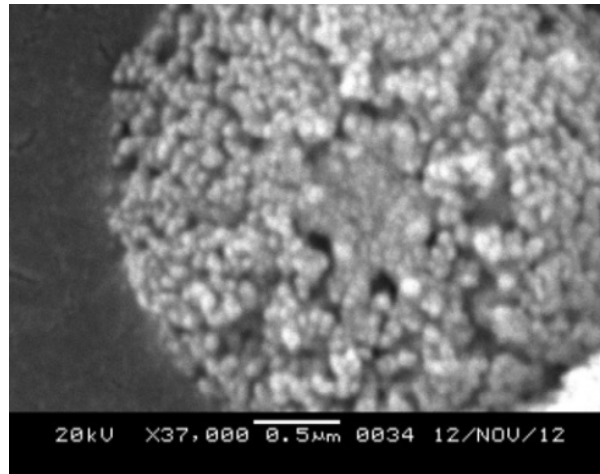


Fig 1d: I-V curve of 1:3:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$

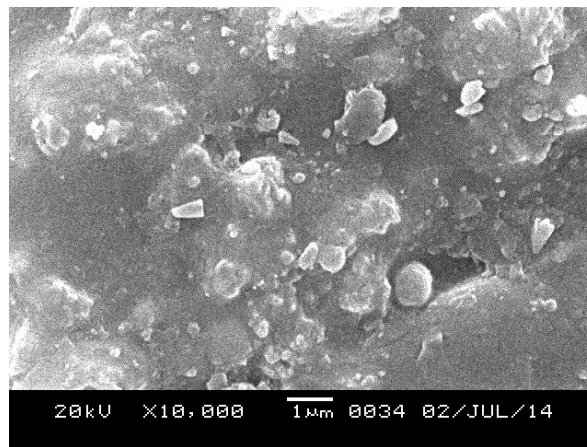
#### 4.2 SEM analysis

The SEM image of flower shaped aggregates of  $\text{Cu}_2\text{O}$  nanoparticles, where the size of the particles were found to be below 50 nm as shown in fig.2. Similarly 1:3 and 1:3:1 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2$  and  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  nanocomposites shown in Figs 3a and 3b indicated the presence of  $\text{Cu}_2\text{O}$  nanoparticles on the surface of thin films.

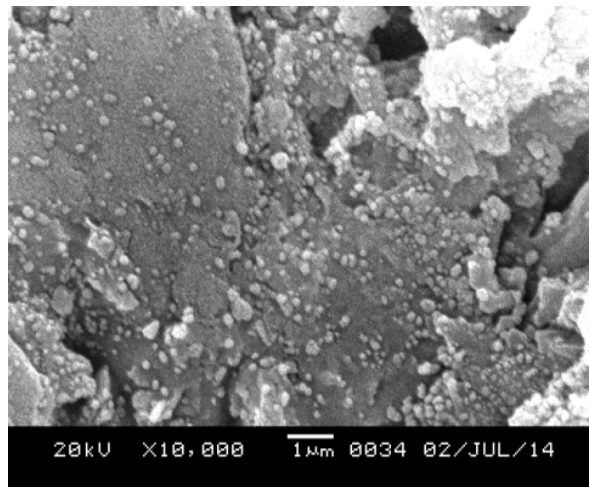




**Fig.2: SEM of Cu<sub>2</sub>O nanoparticles**



**Fig. 3a: SEM of 1:3:1 ratio of Cu<sub>2</sub>O/TiO<sub>2</sub>/GO nanocomposite**



**Fig. 3b: SEM of 1:3:1 ratio of Cu<sub>2</sub>O/TiO<sub>2</sub>/GO nanocomposite**

#### V. CONCLUSIONS

For the first time, nanocomposites of Cu<sub>2</sub>O with TiO<sub>2</sub> and GO have been synthesized in different ratios using simple method of mechanical stirring and ultra sonication. The structural

and electrical properties of thin films of Cu<sub>2</sub>O nanocomposites have been investigated and were found to be influenced by the ratios of the materials doped. The more titanium oxide is used ,the better the conductivity. Graphene oxide was used to see the variations and its effect in electrical conductivity ,although they are insulators. The 1:3 ratio of Cu<sub>2</sub>O with TiO<sub>2</sub> have efficiency

value of 1.98%. After doping of GO, the ratios of  $\text{Cu}_2\text{O}/\text{TiO}_2/\text{GO}$  exhibited efficiencies but low compared with 1:3 ratio of  $\text{Cu}_2\text{O}/\text{TiO}_2$ .

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#### AUTHORS

**First Author** – Monica Debbarma, Department of Chemistry, National Institute of Technology, Agartala -799046, Tripura, India, db.moni@gmail.com, Contact: +8794664263  
**Second Author** – Mitali Saha, Department of Chemistry, National Institute of Technology, Agartala -799046, Tripura, India

# Isolation and Characterization of a Novel Compound from Antibiotic and Antioxidant Fraction from Extract of Stem Bark of *Ventilago Maderaspatana* (Garten).

A.B. Kawade<sup>\*</sup>, R.G Weginwar<sup>\*\*</sup>, Dattatray M.Akkewar<sup>\*\*\*</sup>, V.Ramadevi<sup>\*\*\*</sup>, G.S. Gond<sup>\*\*</sup>, Y. Rajendra<sup>\*\*\*\*</sup>

<sup>\*</sup>Ramdeobaba College of Engineering and Management, Nagpur, Maharashtra, India.

<sup>\*\*</sup>Guru Nanak College Of Science, Ballarpur, Maharashtra, India.

<sup>\*\*\*</sup>Institute of Chemical Technology, Hyderabad – 500607, Andhra Pradesh, India.

<sup>\*\*\*\*</sup>Vaagdevi College of Pharmacy, Ramnagar, Warangal-506 001, Telangana, India

**Abstract-** *Ventilago maderaspatana* is a medicinal herb belonging to family Rhamnaceae. This herb is used in traditional medicine for Kapha, Dyspepsia, Colic disorder, Leprosy, Skin diseases and general disability. In our previous work we have noticed that methanolic extract of stem bark of *Ventilago maderaspatana* have exhibited strong antioxidant and significant antibiotic activity on gram negative bacteria and *Candida albicans* and the major phytochemicals phytosterols, flavonoids and alkaloids were noticed in bioactive extractive. During our present investigation on isolation of active constituents from bioactive fraction using chromatographic methods, we have isolated a pure compound designated as (E)-6-(3,4-dihydroxy-2-methyl-4-(2,6,6-trimethylcyclohex-2-enyl)but-1-enyl)-7-methoxy-2H-chromen-2-one, a novel coumarin derivative from analysis of UV, IR, proton NMR and Mass spectral data .We report this compound as a new natural product .

**Index Terms-** *Ventilago maderaspatana*, Phytochemical, UV, FTIR, <sup>1</sup>HNMR, <sup>13</sup>CNMR

## I. INTRODUCTION

The stem bark of *Ventilago maderaspatana* has been used for thousands of years for its medicinal properties such as appetite stimulant, treatment for gastro intestinal infection, to lower blood glucose in diabetes, for treatment of certain type of cancer and viral infections<sup>7</sup>. It is not understood yet which active ingredients are responsible for clinical usefulness .With this background ,we have examined the extracts of stem bark for the presence of various phytochemicals and found that it is rich in phytosterols , while other metabolites such as alkaloids ,flavonoids and phenolic compounds were also detected in moderate quantities .We have also noticed significant broad spectrum antimicrobial activity of methanolic extract of stem bark against several gram-positive and gram-negative bacteria including pathogenic fungus *Candida albicans* . In in-vitro antioxidant assay it showed 100% anti scavenging activity in our earlier studies<sup>10</sup>. Therefore the methanolic extract of stem bark of *Ventilago maderaspatana* with promising antimicrobial and strong antioxidant property is undertaken for further investigation to isolate and characterize active ingredients for therapeutic use during the present studies. It resulted into isolation of a new coumarin derivative .Its method of isolation

and various spectral data for structure elucidation is presented in this paper.

## II. METHODS

### Plant material

The stem bark of *Ventilago maderaspatana* was collected from forest of Chandrapur district, Maharashtra state, India and authenticated by PGTD, Dept of Botany RTMNU, Nagpur. It was washed, dried, powdered and stored for further studies.

### Extraction procedure

Air dried and coarsely powdered stem bark material was extracted with solvent methanol using Soxhlet extraction apparatus by percolation for 8 hours under reflux. 100grams bark material yielded 8 gm of extract.

### Solvent fractionation

1gm crude methanol extract was suspended in water: methanol (8:2) and partitioned successively with hexane and ethyl acetate solvents which upon concentration gave 0.104gm of hexane soluble fraction and 0.328gm ethyl acetate soluble fraction.

## III. RESULTS AND DISCUSSION

All the chemicals used were of AnalaR grade. The solvents were dried and distilled before use according to standard procedures. For column chromatography silica gel mesh 60-120 Merck grade was used. TLC was performed on silica gel glass plates containing 60 GF-254 and visualization was achieved by UV light and iodine chamber. HPLC profile of the compound was obtained by using Instrument Shimadzu, UVspectrophotometer. UV-VIS analysis was carried on Jasco V550 spectrophotometer: FTIR spectrum was recorded in KBr medium on a Perkin-Elmer 783 spectrophotometer. Proton NMR spectrum was recorded in CDCl<sub>3</sub> and run at 300MHz on a Bruker Avance 300 spectrometer and chemical shifts are reported in parts per million ( $\delta$ ) downfield from Tetramethylsilane as internal standard. <sup>13</sup>C NMR spectrum was recorded in CDCl<sub>3</sub> and run at 75MHz on a Bruker Avance 300 spectrometer. ESI mass spectra was recorded on Micromass, Quattro LC using ESI software with capillary voltage 3.98 KV and ESI mode positive ion trap detector.

### Column chromatography Isolation

After TLC analysis, the residue from ethyl acetate fraction (0.328g) was purified over a column of silica gel mesh 60-120, Merck grade using 4% ethyl acetate in n hexane. Homogeneous fractions were combined based on TLC and divided into two major fractions A1 and A2. Fraction A1 was further purified by silica gel column using solvent mixture 4% ethyl acetate in hexane. It yielded two compounds which were recrystallized with

hexane to get two pure compounds, Compound 1 (0.023g) and compound 2 (0.004g). Compound 1 was obtained as a red brown semisolid with a Rf value 2.4 by TLC monitor and m.p. was 120-122°C. Compound 1 was characterized using various spectral methods of analysis to arrive at the structure 1 assignable to it.

**Table I: Analytical data of ethyl acetate residue of *Ventilago maderaspatana* using column chromatography**

Elute from column Fraction no.	Mobile phase (ml)	TLC
1--5	hexane	Mixed spot
6--20	2% EA in hexane	Mixed spot
21-40	4% EA in hexane	Pure compound 1 (0.023g)
41-60	6% EA in hexane	Mixed spot
61-80	8% EA in hexane	Pure compound 2 (0.004g)
81-120	10% EA in hexane	Mixed spots

### HPLC and UV analysis:

Compound 1 has shown  $\lambda_{max}$  at 292 nm in its UV-Vis analysis besides absorption in the visible region at  $\lambda_{max}$  434.5

nm with shoulders was indicative of flavonoid or chromone compound with possible substitution or linkage with carotene like fragment.

**Table II . Analytical data of analysis Ethyl acetate soluble residue of *Ventilago maderaspatana* using U.V. analysis**

Sr. No.	$\lambda_{max}$ (MeOH)	Absorbance
1	292	1.27416
2	434.5	0.52208
3	661	0.04423

### FTIR spectrum of compound 1

In order to study the structure of compound 1, we have recorded the FTIR spectrum. It shows at high wave numbers the absorption band at 3311  $cm^{-1}$  assignable to CHOH (OH) stretch, 2920  $cm^{-1}$  assignable to CH stretch of CHOH, 2880  $cm^{-1}$  is attributed to  $OCH_3$ , 1705  $cm^{-1}$  is assignable to  $\alpha$ - $\beta$ unsaturated ketone. He absorption band at 1448  $cm^{-1}$  is attributed to

gemdimethyl CH rock. The absorption band 767-828  $cm^{-1}$  is assignable to methyl CH rocks.

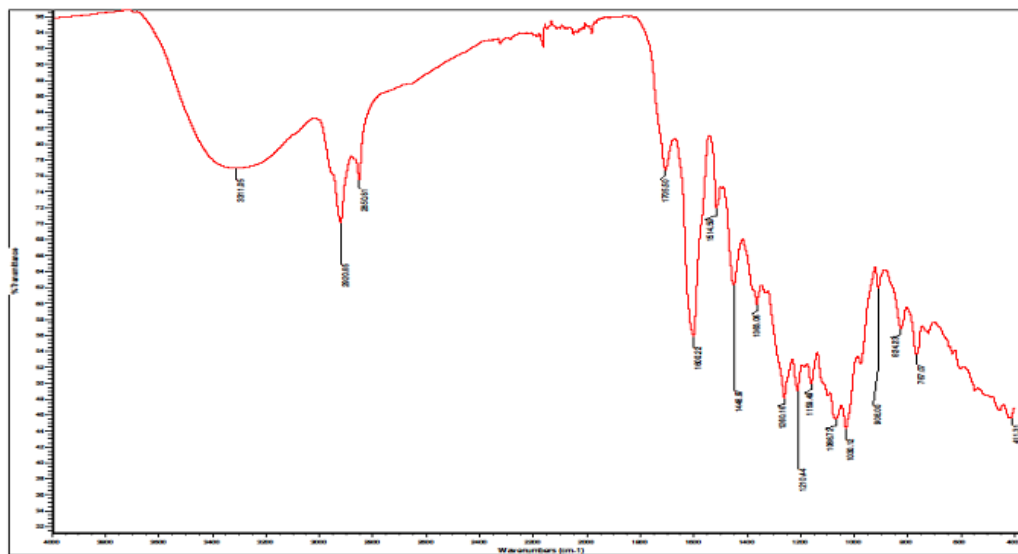


Figure 1: FTIR spectrum of compound 1

**Mass spectral analysis**

Its ESIMS mass spectrum shows fragment ions at m/e 382 and 368 for the fragments  $M^+ - OH + H$  and  $M^+ - OCH_3 + H$  respectively accounting for molecular ion  $M^+$  at m/e 398 corresponding to molecular formula  $C_{24}H_{30}O_5$  for compound

1. Fragment ion peaks noticed at m/e 382 and m/e 368 for the fragments  $M^+ - OH + H$  and  $M^+ - OCH_3 + H$  respectively accounting for the molecular ion  $M^+$  at m/e 398 noticed in ESIMS mass spectrum.  $M^+$  m/e 398 corresponds to molecular formula  $C_{24}H_{30}O_5$  for compound -1

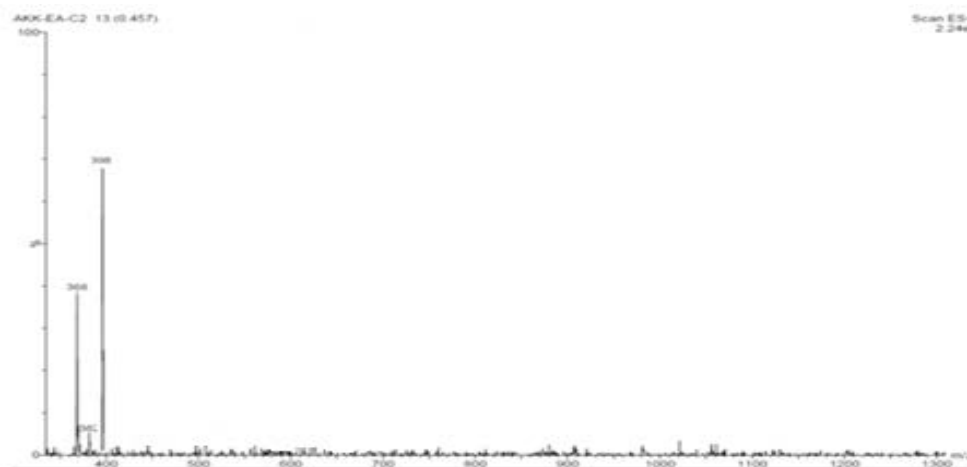


Figure 2: ESIMS mass spectrum of compound 1

**$^1H$ NMR spectrum of compound 1**

Its proton nmr displayed singnals at  $\delta$  6.58,7.08,7.53 and 7.76 assignable for aromatic protons H-3, H-4 H-5 H-8 respectively besides signal at  $\delta$  3.49 assignable to  $OCH_3$  protons probably at C-7 very commonly noticed in coumarin compounds and absence of aromatic proton signal at C-6 is suggestive of

substitution at C-6. Other proton chemical shifts pertaining to C-6 side chain include presence of 2 olefinic protons assignable at  $\delta$  7.34 and 5.39 , adjacent  $CHOH$  coupled protons appeared at  $\delta$  4.33 and 4.02 , 2 olefinic methyls at  $\delta$  2.04 and 1.61 and gem-dimethyl at  $\delta$  0.99 and 0.88 indicative of a geranyl butyl side chain accounting for  $C_{14}H_{23}O_2$  at C-6 of coumarin with  $C_{10}H_7O_3$  in agreement with molecular formula  $C_{24}H_{30}O_5$

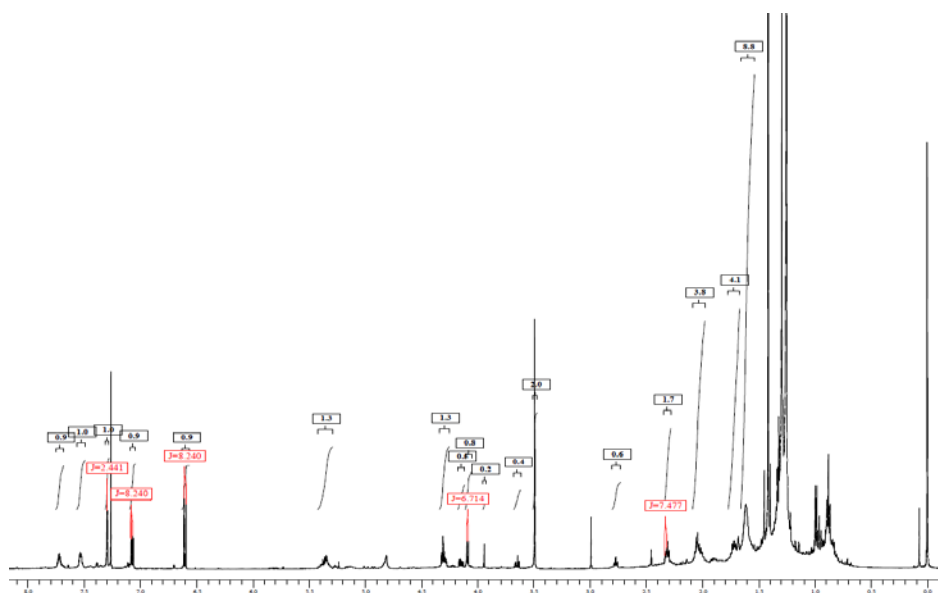


Figure 3. <sup>1</sup>H NMR spectrum of compound 1

Table III. Analytical data of <sup>1</sup>H NMR spectrum of compound 1

Proton	Chemical shift (δ ppm)	Coupling constant (J= Hz)
H-3	6.58	d, 8.24
H-4	7.08	d, 7.08
H-5	7.53	m
H-8	7.76	m
H-4	5.39	m
H-6	2.33	dd, 7.47, 10.05
H-8	4.02	d 6.71
H-7	4.33	dt 6.71, 10.22
H-10'	7.34	s, br
O-CH <sub>3</sub> -7	3.49	s
CH <sub>3</sub> -9'	2.04	s
CH <sub>3</sub> -5'	1.61	s, br
gem CH <sub>3</sub> -1'	0.88	m
gem CH <sub>3</sub> -1'	0.99	m

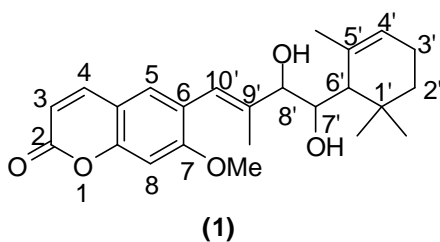
### <sup>13</sup>C NMR spectrum of compound 1

<sup>13</sup>C NMR spectrum of compound 1 was recorded by employing TMS as internal reference standard and CDCl<sub>3</sub> as solvent at ambient temperature.

Out of 24 Carbon signals, nine signals are corresponding to basic coumarin skeleton (δ 111.5, 111.9, 111.4, 120.8, 124.1, 144.1, 153.1, 161.2 and 161.6). The spectrum also showed two olefinic carbon signals at δ 22.5. Signal at δ 65 corresponds to methoxy C, two signals at δ 71, 74 assignable to secondary alcoholic C. Two signals at δ 20, 21 correspond to geminal dimethyl carbon. Two signals at δ 19.3 and 20.5 are assignable to two gemdimethyl groups. Signal at δ 25.4 corresponds to olefinic methyl group. Two signals at δ 120.86, 119.10 were assigned

olefinic carbon at position 10' and position 4'. Signals at δ 29.40 and δ 30.20 correspond to CH<sub>2</sub> carbon at position 2' and at position 3'.

By comparing the literature<sup>3</sup>, ESIMS mass spectrum, FTIR spectrum of compound 1, the proton and carbon data of compound 1, we propose that compound 1 has molecular formula C<sub>24</sub>H<sub>30</sub>O<sub>5</sub> supported by ESIMS mass spectral analysis. Structure of compound 1 is designated as (E)-6-(3,4-dihydroxy-2-methyl-4-(2,6,6-trimethylcyclohex-2-enyl)but-1-enyl)-7-methoxy-2H-chromen-2-one.



#### IV. CONCLUSION

In this paper we report isolation and characterization of a novel coumarin derivative from the stem bark of *Ventilago maderaspatna* with substitution at C6 reported for the first time.

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#### AUTHORS

**First Author-** A.B.Kawde, Ramdeobaba College of Engineering and Management, Nagpur, Maharashtra, India.

**Second Author-\*** R.G Weginwar PhD Principal, Guru Nanak College Of Science, Ballarpur, Maharashtra, India.  
[rajiv\\_weginwar@rediffmail.com](mailto:rajiv_weginwar@rediffmail.com)

**Third Author-** Dattatray M.Akkewar PhD Principal Scientist, Indian Institute of Chemical Technology, Hyderabad – 500607, Andhra Pradesh, India. [dattatray.akkewar@gmail.com](mailto:dattatray.akkewar@gmail.com)

**Fourth Author-** V.Ramadevi M.Pharm JRF, Indian Institute of Chemical Technology, Hyderabad – 500607, Andhra Pradesh, India. [ramadevi.velpula17@gmail.com](mailto:ramadevi.velpula17@gmail.com)

**Fifth Author-** G.S. Gond PhD Reader, Gurunanak College of Science, Ballarpur, Maharashtra, India. [gopalsgond@gmail.com](mailto:gopalsgond@gmail.com)

**Sixth Author-** Y. Rajendra M.Pharm Vaagdevi College of Pharmacy, Ramnagar, Warangal-506 001, Telangana, India [bhargavaaparna@gmail.com](mailto:bhargavaaparna@gmail.com)

**Correspondence Author:** A.B.Kawde ,  
[archana.nimkar@rediffmail.com](mailto:archana.nimkar@rediffmail.com). +919850011655

# Review on Heat Transfer in Spiral Heat Exchanger

R. W. Tapre\*, Dr. Jayant P. Kaware\*\*

\*Chemical Engineering Department, Datta Meghe College of Engineering, Airoli, Navi Mumbai

\*\* Bhonsala College of Engineering and Research, Akola, Maharashtra, India.

**Abstract-** Energy saving is major matter in our global world, and heat exchanger is very useful for energy saving. Of course heat exchanger is most significant component for chemical reaction, distillation, dissolution, crystallization, fermentation etc. So the correct selection of heat exchanger is important in these process industries. Spiral Heat Exchangers are known as excellent heat exchanger because of compact structure and high heat transfer efficiency. The flow of the two fluids is counter-current, which makes it possible to have a close temperature approach between the two medias being treated in the heat exchanger. A large variety of fluids can be suitable for a spiral heat exchanger solution e.g. fouling liquids containing solids and fibres, waste water, slurries, mixtures with inert gases, cooling and heat recovery, vapour/liquid condenser and vacuum condenser with inert gases.

**Index Terms-** Heat transfer coefficient, Fouling factor, Overall heat transfer coefficient, Reynold's Number, Prandtl Number

## I. INTRODUCTION

A heat exchanger is equipment built for efficient heat transfer from one medium to another. The media are separated by a solid wall to prevent mixing. They are widely used in chemical and petrochemical plants, refineries and sewage treatment. A basic heat exchanger involves a wall separating the flow paths of a hot fluid and a cold fluid. The amount of heat transferred depends upon various factors like type of fluid flow, area of heat transfer, thermal conductivity of the separating wall etc. There are three primary classifications of heat exchangers according to their flow arrangement. Co-current or parallel flow heat exchangers heat exchangers, the two fluids flow in the same direction. Counter-current or counter-flow heat exchangers the two fluids flow in oppositedirections. Cross-current or cross-flow heat exchangers such heat exchangers, the two fluids flow roughly perpendicular to one another.

## II. BASIC TYPES OF HEAT EXCHANGERS

Over the years, numerous models have been suggested for heat exchangers, with changes being made in the conventional designs to achieve higher heat transfer areas, higher heat transfer coefficients, and also to design economically viable models. Some of the conventional models are:

- i) Shell and Tube Heat Exchanger: This comprises of a shell that contains a number of tubes held together between two tube sheets at either end. It is mainly used for the cooling of hydraulic fluids, reboilers etc.
- ii) Plate Heat Exchanger: This consists of alternate square plates and frames which hold the plates together. There are holes at the

four corners which form four continuous channels for the fluids to flow. It is widely used in chemical, pharmaceutical and food industries.

iii) Double Pipe Heat Exchanger: It is a relatively primitive model consisting of two concentric pipes. One fluid flows through the inner pipe and the other flows through the annulus formed by the two pipes. It can be used instead of plate heat exchangers but is rarely an option as it occupies more space.

The type of Heat Exchanger that is to be used depends upon which type of fluid is to be handled, operating temperature range, floor spacing, and type of flow required. In general, Heat Exchangers are designed with the sole aim of achieving maximum heat transfer area and heat transfer coefficients within the specified temperature range. In order to increase the area of heat transfer, fins or corrugated plates may be used. To increase the heat transfer coefficient, baffles are placed to introduce turbulence. Ultimately, all these factors are taken into consideration for developing a Heat Exchanger required for particular operation. Spiral heat exchanger maintenance is easy. Each side of the closed spirals can be accessed by opening the side frame of the heat exchanger without any special tools. When opening the side frame there will be full access to the heat transmission area on one side, which can be cleaned without getting in contact with the other side of the heat exchanger. The side frame is designed with hinges which make lifting equipment unnecessary. The spiral heat exchanger is a compact solution. The design only requires a small space for installation compared to traditional heat exchanger solutions. This saves valuable production space and costs.

## III. LITERATURE SURVEY

The research was done by Kondhalkar and Kapatkat on performance analysis of spiral tube heat exchanger used in oil extraction system [1]. They discussed about the effective use of spiral tube heat exchanger in oil extraction process. They carried out research on the performance analysis of spiral tube heat exchanger over the shell and tube type heat exchanger. They studied the Performance of spiral tube heat exchanger and shell and tube heat exchanger for sugandh mantri oil emulsion. They found that the relation between mass flow rate and effectiveness and found out that for the same mass flow rate effectiveness increases for the spiral tube heat exchanger. Also it was observed that the heat transfer coefficient increased with increase in Reynolds number. Also they investigated the relation between Reynolds numbers and Nusselt number and concluded that Nusselt number increases with increase in Reynolds number. They finally compared the spiral heat exchanger with the shell



and tube heat exchanger and found out that effectiveness of shell and tube heat exchanger for lemon grass oil and sugandh mantra oil averages between 0.3 to 0.4 against for spiral 0.4 to 0.5 which shows increase in the effectiveness. They found out that heat transfer coefficient for shell and tube type heat exchanger was 350 – 600 W/m<sup>2</sup>K against for spiral tube heat exchanger is 450 to 650 W/m<sup>2</sup>K. It shows increase in the heat transfer rate with use of spiral tube heat exchanger. The research work was carried out by Thirumarimurugan et. al on experimental and simulation studies on spiral heat exchanger for miscible system using matlab[2]. They have done an experimental investigation on comparative heat transfer study on a solvent and solution using spiral heat exchanger. They used steam as the hot fluid and water and acetic acid -water miscible solution as cold fluid. They carried out series of runs between steam and water, steam and acetic acid solution. The flow rate of the cold fluid was varied from 120 to 720 lph and the volume fraction of Acetic acid was varied from 10-50%. Experimental results such as exchanger effectiveness, overall heat transfer coefficients were calculated. Generalized regression model was used for artificial neural network simulation using matlab and the data obtained was compared with experimental findings and found to be valid. The research was carried out by Naphon and Wongwises on study of the heat transfer characteristics of a compact spiral coil heat exchanger under wet-surface conditions [3]. The objective of their work was to find the heat transfer characteristics and the performance of a spiral coil heat exchanger under cooling and humidifying conditions. Air and water were used as working fluids. A mathematical model based on mass and energy conservation is developed and solved by using the Newton–Raphson iterative method to determine the heat transfer characteristics. They found that enthalpy, effectiveness and the humidity effectiveness decreased with increasing air mass flow rate for a given inlet-water temperature, inlet-air humidity ratio and water mass flow rate. The increase in the outlet enthalpy and outlet humidity ratio of air was larger than those of the enthalpy of saturated air and humidity ratio of saturated air. Therefore, the enthalpy effectiveness and humidity effectiveness tend to decrease with increasing air mass flow rate. They also observed that the effect of inlet-air temperature on the tube surface temperature. At a specific inlet-air temperature, the tube surface temperature generally increases with increasing air mass flow rate; however, the increase of the tube surface temperature at higher inlet-air temperatures was higher than at lower ones for the same range of air mass flow rates. They found that at a specific air mass flow rate, the tube surface temperature decreases as water mass flow increases. Finally the results obtained from the developed model are validated by comparing with the measured data. The research was carried out by Hossain et. al. on comprehensive study on heat transfer co-efficient and effectiveness for water using spiral coil heat exchanger [4]. They

have done experimental study to investigate the overall heat transfer co-efficient and effectiveness for water using spiral coil heat exchanger. They designed and fabricated a physical model of the spiral coil heat exchanger. They varied the mass flow rate of hot fluid from 0.049 kg/sec to 0.298 kg/sec and the mass flow rate of cold fluid from 0.029 kg/sec to 0.225 kg/sec. They found the effects of heat transfer rate on Reynolds number for three different cold water flow rate. They have observed that the heat transfer rate increases almost linearly with increasing Reynolds number, which is acceptable for the spiral coil heat exchanger. The heat transfer rate was maximum in case of medium cold water flow rate (0.129kg/sec). They have found that overall heat transfer co-efficient is maximum for the highest cold water flow rate (0.225kg/sec) and minimum for the lowest cold water flow rate (0.029kg/sec). They have also observed that Nusselt number increased linearly with increasing Reynolds Number for all three cold water flow rate. At 0.129kg/sec cold water flow rate Nu was maximum with respect to Reynolds Number. They have observed that effectiveness decreases with the increase of Reynolds Number and the value is maximum for the medium cold water flow. The research was carried out by Bhavsar et al. on design and experimental analysis of spiral tube heat exchanger [5]. Their objective was to develop new design methodology for flow of hot and cold fluids, where hot fluid flows in axial path while the cold fluid flows in a spiral path. They suitably designed and fabricated the spiral tube heat exchanger to measure the experimental tests. The objective of their work was to streamline design methodology of spiral tube heat exchanger. They have designed methodology for spiral tube heat exchanger and experiments performed on it to analyses pressure drop and temperature change in hot and cold fluid on shell side and tube side. The research was carried out by Baghel and Upadhyaya on effect of coil diameter on pressure drop in Archimedean spiral coils [6]. The main objective of this investigation was to study the effect of the coil diameter on the pressure drop in the Archimedean spiral tube coils. They developed a relation between the pressure drop and the feed flow rate for the steady state Newtonian fluid into the Archimedean spiral tubes. They constructed two spiral tubes with different inside tube diameter using the thick walled polyethylene tubing and the pressure drop versus flow rate data were taken for the both configuration for the wide range of maximum and minimum radius of the curvature, pitch and the inside diameter of the tube. They collected data for feed flow rate versus pressure drop data for the two configurations of the spiral tube coils using the carbon tetrachloride and mercury as the manometer fluid for the isothermal Newtonian fluid such as water. They studied various effects of feed flow rate and the coil diameter. They observed that the effect on the pressure drop was for the wide range of feed flow rate from 1 to 5 lpm for the 6 mm coil geometry. They concluded that on increasing the feed flow rate the pressure drop

increases and vice versa. Due to the presence of the secondary flow inside the coil and centrifugal flow due to curvature ratio increases the pressure drop inside the Archimedean spiral coils. They also concluded that on increasing the inside diameter of the coil, the pressure drop decreases while the feed flow rate was same for all the configurations because the velocity of the fluid into the spiral coil decreases due to increase of the diameter of the coil. The research was carried out by Rajavel and Saravanan on an experimental study of spiral plate heat exchanger for electrolytes [7]. The main objective of their study was to investigate convective heat transfer coefficient for electrolytes using spiral heat exchanger. They performed experiments by varying the mass flowrate, temperature and pressure of the cold fluid, keeping the mass flowrate of hot fluid constant. They investigated that heat transfer coefficient increases with increase in Reynolds number of electrolytes which increases the Nusselt number. They concluded that data obtained from the experimental study compared with the theoretical data. They have also developed a new correlation based on experimental data for practical application. The research was carried out by Ramachandran et al. on heat transfer studies in a spiral plate heat exchanger for water- palm oil two phase system [8]. They conducted experiment by using spiral plate heat exchanger with hot water as the service fluid and the two-phase system of water - palm oil in different mass fractions and flow rates as the cold process fluid. They investigated heat transfer coefficients. The research was carried out by Kaliannan Saravanan et al. on Spiral plate heat exchangers play a vital role in cooling high density and high viscous fluids [9]. They investigated convective heat transfer coefficient for electrolytes using spiral plate heat exchanger. Their methodology shows a test section consists of a Plate of width 0.3150 m, thickness 0.001 m and mean hydraulic diameter of 0.01 m. They have varied mass flow rate of hot fluid is varying from 0.4 to 0.8 kg/ sec and the mass flow rate of cold fluid varies from 0.3 to 0.8 kg/sec. They performed experiments by varying the mass flow rate, temperature and pressure of cold fluid, keeping the mass flow rate of hot fluid constant. They concluded that data obtained from the experimental study are compared with the theoretical data. They have proposed a new correlation for the Nusselt number that can be used for practical applications. The research was carried out by Shabiulla and Sivaprakasam on experimental investigation and neural modeling of water-butanol system in a spiral plate heat exchanger [10]. They have conducted experiments by varying the mass flow rate of cold fluid (Butanol) and inlet temperature of the hot fluid (Water), by keeping the mass flow rate of hot fluid constant. They studied the effects of relevant parameters on the performance of spiral plate heat exchanger. They have proposed Artificial Neural Network (ANN) models for the analysis of spiral heat exchanger. They investigated that prediction of the parameters can be obtained without using charts and complicated

equations. They compared the data obtained from ANN and polynomial models for overall heat transfer coefficient and Nusselt number with those of experimental data. They concluded that the accuracy between the NN's predictions, polynomial model's predictions and experimental values are achieved with minimum mean absolute relative error less than or equal to  $\pm 7\%$  for the training and testing data sets respectively. They suggested the reliability of the Neural Networks as a Modeling Tool for Engineers in preliminary design and analysis of Spiral plate Heat Exchangers. An analytic model for spiral coil type ground heat exchanger was developed by Jaywan Chung and others [11]. Here they used Green's function method to consider the 3 dimensional shape effects of a spiral coil heat exchanger. The spiral coil source model was transformed into the formula of error function to improve and simplify computation for the engineering application. To analyze the characteristics of the analytical model, the analytical model's prediction results were compared with test measurements by thermal response test conducted in a model chamber and the parametric study was performed. The spiral coil source model was transformed into the formula of error function to improve and simplify computation for the engineering application. To analyze the characteristics of the analytical model, the analytical model's prediction results were compared with test measurements by thermal response test conducted in a model chamber and the parametric study was performed. Rakesh and Sushant studied the effect of coil diameter on pressure drop in Archimedean Spiral Coils [12]. The aim of this investigation was to study the effect of the coil diameter on the pressure drop in the Archimedean spiral tube coils. The relation between the pressure drop and the feed flow rate has been obtained for the steady state Newtonian fluid into the Archimedean spiral tubes. The two spiral tubes were constructed with different inside tube diameter using the thick walled polyethylene tubing and the pressure drop versus flow rate data were taken for the both configuration for the wide range of maximum and minimum radius of the curvature, pitch and the inside diameter of the tube. The pressure drop in the spiral tube coils depend on the geometrical parameter of the different coils. The pressure drop in the spiral tube was represented by using the dimensionless Reynolds number and the Euler number. Ranganamy made an experimental and numerical study of a spiral plate heat exchanger [13]. The effects of geometrical aspects of the spiral plate heat exchanger and fluid properties on the heat transfer characteristics were also studied. Water was taken as test fluid. The effect of mass flow rate and Reynolds number on heat transfer coefficient has been studied. Correlation has been developed to predict Nusselt numbers. Numerical models have been simulated using CFD software package FLUENT 6.3.26. The numerical Nusselt number have been calculated and compared with that of experimental Nusselt number. Fouling of the heat transfer surfaces in a steam assisted

gravity drainage (SAGD) in SITU facility for the recovery of the oil sands bitumen as studied by Pugale and others [14]. Fouling of heat transfer surfaces presents an ongoing challenge to SAGD plants. SAGD produced water contains significant concentrations of dissolved solids as well as suspended clays, free oil, and dissolved organics. Under certain conditions of temperature, pressure and velocity, these components will cause fouling in heat exchanger and steam generator tubes. This led to the need for complex water treatment in conjunction with frequent down time for the cleaning and the maintenance. Hence fouling of these surfaces leads to additional operating cost and lost production for the SAGD sector. Yanuar and others conducted an experimental investigation of convective heat transfer coefficient for nanofluids using spiral pipe heat exchanger [15]. The aim of this study was to investigate experimentally flow and convective heat transfer characteristics of water-based nanofluids flowing through a spiral pipe. Analysis was carried out by Students of Shree Satya Saha Institute of Science and Technology in parallel and counter flow with inward and outward direction for achieving maximum possible heat transfer [16]. In this problem of heat transfer involved the condition where Reynolds number again and again varies as the fluid traverses inside the section of flow from inlet to exit, mass flow rate of working fluid is been modified with time. More and more analysis and experimentation and systematic data degradation led to the conclusion that the maximum heat transfer rates is obtained in case of the inward parallel flow configuration compared to all other counterparts, which observed to vary with small difference in each section. Furthermore, for the increase heat transfer rate in spiral plate heat exchanger was obtained by cascading system. Haque investigated the cause of calcium oxalate fouling in spiral heat exchangers. Calcium oxalate solubility decreased with lowering temperature [17]. The predicted precipitation rate due to temperature difference was consistent with the observed fouling rate. This observation suggested that the effluent supersaturates and forms precipitate (scale) upon contact with the cold heat exchanger surface. Suspended particles then accumulate and cause rapid fouling. He used physical separation methods and did a partial replacement of NaOH with Mg (OH)<sub>2</sub> during alkaline bleaching to reduce calcium oxalate content and minimize fouling.

#### IV. CONCLUSION

The research was carried out by various scientists on spiral plate heat exchangers and the results obtained were found valid and satisfactory. The research was carried out by Núñez resulted in maximizing pressure drop and so minimizing the size. The research done by Kondhalkar and Kapatkat concluded that heat transfer coefficient increases with increase in Reynolds number. It was observed that the heat transfer rate increases almost linearly with increasing Reynolds number. Study on the various effects of feed flow rate and the coil diameter was done and concluded that on increasing the feed flow rate the pressure drop

increases and vice versa. A relation between the pressure drop and the feed flow rate for the steady state Newtonian fluid into the Archimedean spiral tubes was developed.

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AUTHORS

First Author –

R. W. Tapre, M.E. in Chemical Engineering, Chemical Engineering Department, Datta Meghe College of Engineering, Airoli, Navi Mumbai, India.  
Email: ravitapre40@gmail.com

Second Author –

Dr. Jayant P. Kaware, Ph.D in Chemical Engineering, Bhonsala College of Engineering and Research, Akola, Maharashtra, India.  
Email: jayantkaware@gmail.com

Correspondence Author –

R. W. Tapre, ravitapre40@gmail.com  
Contact number: +919820540778

# Text Classification in Data Mining

Anuradha Purohit, Deepika Atre, Payal Jaswani, Priyanshi Asawara

Department of Computer Technology and Applications, Shri G.S. Institute of Technology and Science, Indore (M.P)

**Abstract-** Text classification is the process of classifying documents into predefined categories based on their content. Text classification is the primary requirement of text retrieval systems, which retrieve texts in response to a user query, and text understanding systems, which transform text in some way such as producing summaries, answering questions or extracting data. We have proposed a Text Classification system for classifying abstract of different research papers. In this System we have extracted keywords using Porter Stemmer and Tokenizer. The word set is formed from the derived keywords using Association Rule and Apriori algorithm. The Probability of the word set is calculated using naive bayes classifier and then the new abstract inserted by the user is classified as belonging to one of the various classes. The accuracy of the system is found satisfactory. It requires less training data as compared to other classification system.

**Index Terms-** Apriori algorithm, Association rule, confidence, support, Naïve Bayes classifier, Text classification.

## I. INTRODUCTION

Constructing fast and accurate classifiers for large data sets is an important task in data mining and knowledge discovery. There are numerous text documents available in electronic form. More and more are becoming available every day. Such documents represent a massive amount of information that is easily accessible. Seeking value in this huge collection requires organization; much of the work of organizing documents can be automated through data mining. The accuracy and our understanding of such systems greatly influence their usefulness. There is growing evidence that merging porter stemmer, naive bayes and association rule mining together can produce more efficient and accurate classification systems than traditional classification techniques [26]. Classification is one of the most important tasks in data mining. There are many classification approaches for extracting knowledge from data such as statistical [21], divide-and-conquer [15] and covering [6] approaches. Numerous algorithms have been derived from these approaches such as genetic algorithm. However, traditional classification techniques often produce a small subset of rules, and therefore usually miss detailed rules that might play an important role in some cases [29]. The task of data mining is to automatically classify documents into predefined classes based on their content. Many algorithms have been developed to deal with automatic text classification [4]. With the existing algorithms, a number of newly established processes are involving in the automation of text classification [20].

The most common techniques used for Text Classification include Association Rule Mining, Naïve Bayes Classifier,

Decision Tree and others. Association rule mining finds interesting association or correlation relationships among a large set of data items [1][4]. The discovery of these relationships among huge amounts of transaction records can help in many decision making process. On the other hand, the Naïve Bayes classifier uses the maximum a posteriori estimation for learning a classifier. It assumes that the occurrence of each word in a document is conditionally independent of all other words in that document given its class [3]. Each abstract is considered as a transaction in the text data. After pre-processing the text data association rule mining [1] is applied to the set of transaction data where each frequent word set from each abstract is considered as a single transaction.

This paper presents a new algorithm for text classification. Porter stemmer algorithm is used to remove unnecessary words from abstracts. The association rule is used to derive feature sets from pre-classified text documents. The concept of Naive Bayes Classifier is then used on derived features sets to calculate the probability of derived word sets.

The paper is structured as follows: Section 2 describes the previous work already done in the field of text classification, section 3 describes the concept of text classification, section 4 contains the proposed algorithm, and section 5 contains the experimental results defining the datasets used and various abstracts taken for classifying the text.

## II. PREVIOUS WORK

Classification is to put things according to their characteristics. Given a set of class, classifier determines which classes a given object belongs to. Documents may be classified according to their subjects or the other attributes such as document type, author, printing year etc. In Text Classification the most popularly used approaches are Porter Stemmer, Apriori algorithm, Naïve Bayes etc. Most of the researches in text categorization come from the machine learning and information retrieval communities such as decision trees, Naïve Bayes (NB) [9], Support Vector Machines (SVM) [11], k-Nearest Neighbor (kNN) [10], Neural Network (NNet) and etc. Among these methods, KNN is a simple statistic method and it also shows good performance. The automatic classification of documents into predefined categories can be classified by three ways: unsupervised, supervised, and semi-supervised methods [11]. From last few years, the task of automatic text classification has been extensively studied and rapid progress seems in this area, including the machine learning approaches.

Vandana Korde et al (2012) [21] observed that the text mining studies are gaining more importance recently because of the availability of the increasing number of the electronic documents from a variety of sources which include unstructured

and semi structured information. The main goal of text mining is to enable users to extract information from textual resources and deals with the operations like, retrieval, classification (supervised, unsupervised and semi supervised) and summarization, Natural Language Processing (NLP), Data Mining, and Machine Learning techniques work together to automatically classify and discover patterns from the different types of the documents.

Zakaria Elberrichi, et al (2008) [21] presents a new approach for text categorization based on incorporating background knowledge (WordNet) into text representation with using the multivariate, which consists of extracting the K better features characterizing best the category compared to the others. Newsgroups datasets show that incorporating background knowledge in order to capture relationships between words is especially effective in raising the macro-averaged F1 value.

William B. Cavnar et al (2010) [21] proposed a N-gram frequency method that provides an inexpensive and highly effective way of classifying documents. It does so by using samples of the desired categories rather than resorting to more complicated and costly methods such as natural language parsing or assembling detailed lexicons. Essentially this approach defines a "categorization by example" method. Collecting samples and building profiles can even be handled in a largely automatic way. Also, this system is resistant to various OCR problems, since it depends on the statistical properties of N-gram occurrences and not on any particular occurrence of a word.

Andrew McCallum [21], has compared the theory and practice of two different first-order probabilistic classifiers, both of which make the naive Bayes assumption." The multinomial model is found to be almost uniformly better than the multi variant Bernoulli model. In empirical results on five real-world corpora.

Author Mitchell [21], used training data for learning to classify text from all three categories, of which 47 are from Computer Science, 48 are from Electrical and Electronic Engineering and the rest 20 are from Mechanical Engineering papers. After preprocessing the text data association rule mining is applied to the set of transaction data where each frequent word set from each abstract is considered as a single transaction

### III. BACKGROUND STUDY

#### 3.1 Data Mining

Data mining [2] refers to extracting or "mining" knowledge from large amounts of data. It can also be named by "knowledge mining from data". Nevertheless, mining is a vivid term characterizing the process that finds a small set of precious nuggets from a great deal of raw material. There are many other terms carrying a similar or slightly different meaning to data mining, such as knowledge mining from databases, knowledge extraction, data/ pattern analysis, data archaeology, and data dredging [4]. Many people treat data mining as a synonym for another popularly used term, Knowledge Discovery in Databases, or KDD. Alternatively, data mining is also treated simply as an essential step in the process of knowledge discovery in databases.

Text databases are databases that contain word descriptions for objects. These word descriptions are usually not simple

keywords but rather long sentences or paragraphs, such as product specifications, error or bug reports, warning messages, summary reports, notes, or other documents. The widely used and well-known data mining functionalities are Characterization and Discrimination, content based analysis (Hayes, 1990), Association Analysis, Classification and Prediction (Han, 2001), Cluster Analysis (Lewis, 1990), Outlier Analysis, Evolution Analysis. For our text classification purpose we have used Porter Stemmer, Nave Bayes, Association Rule and Proposed Algorithm.

#### 3.2 Classification

Classification [2] means assigning a document or object to one or more classes. This may be done manually or algorithmically. The intellectual classification of documents is mostly used in information science and computer science. Classification is done mainly based on attributes, behavior or subjects. Classification techniques have been applied to spam filtering, email routing, language identification, etc. The Classification problem can be stated as a training data set consisting of records. Each record is identified by a unique record id, and consist of fields corresponding to the attributes. An attribute with a continuous domain is called a continuous attribute. An attribute with a finite domain of discrete values is called a categorical attribute. One of the categorical attribute is the classifying attribute or class and the value in its domain are called class labels. Classification is the process of discovering a model for the class in terms of the remaining attributes. The objective is to use the training data set to build a model of the class label based on the other attributes such that the model can be used to classify new data not from the training data set attributes. Two of the classification techniques that are used popularly are:

##### i) Parallel Formulation of Decision Tree based Classification

The goal of parallel formulation of decision tree based classification algorithms are scalability in both runtime and memory requirements. The parallel formulation overcome the memory limitation faced by the sequential algorithms, that is it should make it possible to handle larger data sets without requiring redundant disk I/O. Also parallel formulation offer good speedup over serial algorithm.

##### ii) Sequential Decision Tree based Classification

A decision tree model consists of internal node and leaves. Each of the internal node has a decision associated with it and each of the leaves has a class label attached to it. A decision tree based classification consists of two steps:

1. Tree induction – A tree is induced from the given training set.
2. Tree pruning – The induced tree is made more concise and robust by removing any statistical dependencies on the specific training data set.

Other type of classification techniques are also used which comes under supervised classification and unsupervised classification.

### 3.3 Porter Stemmer

To make the raw text valuable, that is to prepare the text, the keywords are considered. That is unnecessary words and symbols are removed. To make text data useful, unstructured text data is converted into structured data for further processing and then parsing of text is done. Parsing text involves identifying the spaces, punctuation, and other non alphanumeric characters found in text documents, and separating the words from these other characters. Most programming and statistical languages contain character procedures that can be used to parse the text data. There are several steps involved in the keyword extraction:

1. Extract the words from the data, typically discarding spaces and Punctuation.
2. Eliminate articles and other words that convey little or no information.
3. Replace words that are synonyms, and plural and other variants of words with a single term.
4. Create the structured data, a table where each term in the text data becomes a variable with a numeric value for each record.

### 3.4 Association Rule and Apriori Algorithm

Association rule mining is a data mining task that discovers relationships among items in a transactional database [12]. It is described as follows: Let  $I = \{i_1, i_2, \dots, i_m\}$ , be a set of items. Let  $D$ , the task relevant data, be a set of database transactions where each transaction  $T$  is a set of items such that  $T \subseteq I$ . Each transaction is associated with an identifier, called TID. Let  $A$  be a set of items. A transaction  $T$  is said to contain  $A$  if and only if  $A \subseteq T$ . An association rule is an implication of the form  $A \Rightarrow B$ , where  $A \cap B = \emptyset$ .

Following key parameters are used to generate valuable rules:

- Support (s): Support (s) of an association rule is the ratio (in percent) of the records that contain  $XY$  to the total number of records in the database:  $\text{Support}(X \Rightarrow Y) = \text{Prob}\{XY\}$ .
- Confidence(c): For a given number of records, confidence (c) is the ratio of the number of records that contain  $XUY$  to the number of records that contain  $X$ :  $\text{Confidence}(X \Rightarrow Y) = \text{Prob}\{Y|X\} = (\text{support}(XUY)) / (\text{support}(X))$ .
- Strong Association Rules: Rules that satisfy both a minimum support threshold ( $\text{min\_sup}$ ) and a minimum confidence threshold ( $\text{min\_conf}$ ) are called strong rules. Strong rules are what we are interested in. There are two main steps to process association rule mining: Step 1 is to use prior knowledge find all frequent item sets by Apriori algorithm. It uses iterative search and use k-item sets to find (k+1) item sets.[5] Every item set occurs at least more than the  $\text{min\_support}$  value. Step 2 is to generate strong association rules from frequent itemsets, which means these rules must satisfy both  $\text{min\_support}$  value and  $\text{min\_confidence}$  value.

### 3.5 Naive Bayes Classifier

Bayesian classification is based on Bayes theorem. A simple Bayesian classification namely the Naïve classifier is comparable in performance with decision tree and neural network classifiers. Bayesian classifiers have also exhibited high accuracy and speed when applied to large database. Naïve Bayes classifier assumes that the effect of an attribute value on a given class is

independent of the values of the other attributes. This assumption is called class conditional independence. It is made to simplify the computations involved and, in this sense, is considered “naïve”. While applying Naïve Bayes classifier to classify text, each word position in a document is defined as an attribute and the value of that attribute to be the word found in that position. Here Naïve Bayes classifications can be given by:

$$VNB = \text{argmax}_j P(V_j) \prod P(a_j | V_j)$$

Here VNB is the classification that maximizes the probability of observing the words that were actually found in the example documents, subject to the usual Naïve Bayes independence assumption. The first term can be estimated based on the fraction of each class in the training data.

## IV. PROPOSED WORK

In this work a text classification system is proposed. Our method to classify text is an implementation of Porter Stemmer with a combined use of Naïve Bayes Classifier and Association Rule. We have used the features of association rule to make association sets. On the other hand, to make a probability chart with prior probabilities we have used Naïve Bayes classifier’s probability measurements. And in the last retrieval phase of test data we have implemented the positive-negative matching calculation observed in different researches [2][6]. Here the associated word sets, which do not match our considered class is treated as negative sets and others are positive. Flowchart for the proposed method is given in Figure 4.1.

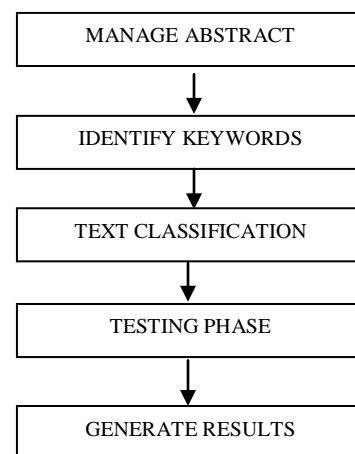


Figure 4.1: Proposed Method

### 4.1 The Algorithm for Text Classification

The proposed algorithm uses various steps for classifying text; these steps are described below in detail.

#### i) Porter Stemmer

To make the raw text valuable, that is to prepare the text, we have considered only the keywords. That is unnecessary words and symbols are removed. For this keyword extraction process we dropped the common unnecessary words like am, is, are, to, from...etc. and also dropped all kinds of punctuations and stop words. Singular and plural form of a word is considered same. Finally, the remaining frequent words are considered as keywords. The text data is cleaned by removing unnecessary

words i.e. text data is filtered and subject related words are collected.

**Input:** Database, D

Minimum support threshold, min\_sup.

**Output:** L, frequent itemsets in D.

### ii) The Apriori Algorithm

Keywords obtained from Porter Stemmer are joined together to form word sets. Each frequent word set from each abstract is considered as a single transaction. Using these transactions, we generated a list of maximum length sets applying the Apriori algorithm. The Apriori algorithm is given below:

**Input:** Database, D;

Minimum support threshold, min\_sup.

**Output:** L, frequent item sets in D.

### iii) Association Rule

For each frequent word set obtained from Apriori confidence and support is calculated in Association Rule Mining. Association rule mining finds interesting association or correlation relationships among a large set of data items. The discovery of these relationships among huge amounts of transaction records can help in many decision making process. In this project association rules from the significant words derived from keyword extraction apriori algorithm are used to derive feature set from pre-classified text documents.

### iv) Naive Bayes Classification

It calculates the probability of different class with the probability values of the matched set obtained from association rule mining while ignoring the unmatched sets. As a result set if test set matches with a rule set, which has weak probability to the actual class, may cause wrong classification. To make a probability chart with prior probabilities we have used Naïve Bayes classifier's probability measurements.

### The algorithm is as follows:

1. For each class  $i = 1$  to  $n$  do
2. Set  $pval = 0$ ,  $nval = 0$ ,  $p = 0$ ,  $n = 0$
3. For each set  $s = 1$  to  $m$  do
4. If the probability of the class ( $i$ ) for the set ( $s$ ) is maximum then
  - increment  $pval$
  - else
  - increment  $nval$
5. If 50% of the associated set  $s$  is matched with the keywords set do step 6 else do step7
6. If maximum probability matches the class  $i$  then
  - increment  $p$
7. If maximum probability does not match the class  $i$ 
  - increment  $n$
8. If ( $s \leq m$ )
  - go to step 3
9. Calculate the percentage of matching in positive sets for the class  $i$
10. Calculate the percentage of not matching in negative sets for the class  $i$
11. Calculate the total probability as the summation of the results obtained from

step 9 and 10 and also the prior probability of the class  $i$  in set  $s$

12. If ( $i \leq n$ )

go to step 1

13. Set the class having the maximum probability value as the result

Where,  $n$  = number of class,

$m$  = number of associated sets,

$pval$  = positive value

$nval$  = negative value

$s$  = set

$i$  = increment variable

The experimentation work done is described in next section.

## V. EXPERIMENTAL WORK

### 5.1 Dataset

Abstracts from different research papers have been used as data sets for training and testing of the proposed method. Four classes of papers from DBMS, Operating System, Java and Data Structure were considered for our experiment. Total 40 abstracts are used in our experiment (10 from DBMS, 10 from Java, 10 from Operating System and 10 from Data Structure). The result obtained for training and testing is discussed in subsequent section.

### 5.2 Experimental Results

We have divided the abstract into training set and testing set and then proposed algorithm is used to perform our experiments. We have repeated the experiments by changing the abstracts in testing set and keeping all other parameter constant in training set.

For Example abstract taken as input for Testing is:

“With respect to all algorithm perspective coding binary trees and an representation for well-formed parentheses strings. We present here the first Gray code and loop less generating algorithm for P-sequences, and extend them in a Gray code and a new loop less generating algorithm for well-formed parentheses strings. Given a connected graph  $G = (V, E)$  and a spanning tree  $T$  of  $G$ , a fundamental cycle is a cycle resulting by adding an edge  $e \in E - T$  to  $T$ . In this paper we establish that the average length of fundamental cycles in a complete graph increases with the number of vertices. Also, given a simple cycle in a complete graph, the paper describes a method of calculating the number of spanning trees, with respect to which the cycle is a fundamental cycle.”

Output generated is: respect, algorithm, tree, well, formed, parenthesis, string, gray, code, loop less, generating, graph, fundamental, cycle, paper, complete, number. The keyword extraction process is applied to all the abstracts and the value calculated according to algorithm is as follows:

$pval=10$ ,  $nval=30$ ,  $p=2$ ,  $n=30$ .

Now the probability of DBMS =  $((p*100)/pval) + ((n*100)/nval)$   
+ prior probability of DBMS

$$= ((2*100)/10) + ((30*100)/30) +$$

0.26

$$= 120.26$$

For this set of keywords,

Calculated Probability for class DBMS

$$=120.26$$



Calculated Probability for class Data Structure =106.09  
 Calculated Probability for class Java = 118.08  
 Calculated Probability for class Operating System =121.13  
 The results obtained by Proposed Method with Text Classifier for different abstracts are as shown in Table I.

**Table I**

Technique	(%) Training Data	(%)Data Accuracy
Association Rule Based Decision Tree	76	87
Naïve Bayes Classifier	69	68
Proposed Algorithm	50	75

Table I show results that are found using the same data sets for both Association Rule with Naive Bayes Classifier and proposed method. In text categorization using association rule based decision tree [16] 76 % data set of the total 40 data set was used to train and 87% accuracy was observed. On the other hand using 50% data as training data the proposed algorithm can able to classify text with 75% accuracy rate.

**VI. CONCLUSION**

In this paper a Text Classification System for classifying abstracts of the research paper in four categories (Java, Operating System, DBMS, Data Structure) have been proposed. To improve the performance of classification, Association rule and Naïve bayes classifiers are used. To demonstrate and validate our approach we have presented the result on forty real datasets. To describe the usefulness of our approach we have compared the probability of various abstract papers and obtained the satisfactory results in term of accuracies. We have achieved 75% accuracy of classification.

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**AUTHORS**

**First Author** – Anuradha Purohit, Department of Computer Technology and Applications, Shri G.S. Institute of Technology and Science, Indore (M.P)  
**Second Author** – Deepika Atre, Department of Computer Technology and Applications, Shri G.S. Institute of Technology and Science, Indore (M.P)  
**Third Author** – Payal Jaswani, Department of Computer Technology and Applications, Shri G.S. Institute of Technology and Science, Indore (M.P)  
**Fourth Author** – Priyanshi Asawara, Department of Computer Technology and Applications, Shri G.S. Institute of Technology and Science, Indore (M.P)



# A preliminary study on the diversity of odonata in Bodoland University and its vicinity, Assam, India

Paris Basumatary, Debajit Adhikary, Manita Daimary, Noymi Basumatary, Abhijita Daimary

Department of Zoology, Bodoland University, Kokrajhar, Assam, India

**Abstract-** A total of 34 species of odonates, including 26 species of dragonflies (sub-order *Anisoptera*) belonging to 3 families and 8 species of damselflies (sub-order *Zygoptera*) belonging to 3 families were recorded from the Bodoland University between May 2013 to November 2014. From the sub-order Anisoptera, the Libellulidae was the richest family with 20 species and from the sub-order Zygoptera, the Coenagrionidae was the richest family with 6 species. A detailed list of odonates recorded from Bodoland University is presented.

**Index Terms-** Bodoland University, dragonflies, damselflies, diversity, Kokrajhar, Assam, India

## I. INTRODUCTION

Dragonflies and damselflies collectively called odonates are one of the most common insects flying over forest, fields, meadows, ponds and rivers. Odonata are one of the ancient orders of insects. They have been around from the carboniferous era [1]. These flying machines can fly backward, move vertically like a helicopter or stop in turn in the mist of the most rapid progression as if they have been remained into [2]. Odonates, being predators both at larval and adult stages, play a significant role in the wetland ecosystem [3]. Even though most species of odonates are highly specific to a habitat, some have adapted to urban areas and exploit man-made water bodies [4]. Odonates taxa are ideal models for the investigation of the impact of environmental warming and climate change due to their tropical evolutionary history and adaptations to temperate climates [5]. Odonates play crucial role in ecosystem functioning and serve to keep other insects including those harmful to humans (like mosquitoes, blood sucking flies, etc) under control [6]. Eight super families, 29 families and some 58 subfamilies of dragonflies covering approximately 600 genera and 6000 named species have so far been described all over the world [7]. Dragonflies and damselflies of the Indian sub-region (India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and Myanmar are well documented with over 600 species [6]. The study of odonates fauna in Assam has not been comprehensively carried out. Thus

it will provide relevant information about odonates, which would come out helpful for further studies

## II. MATERIALS AND METHODS

Kokrajhar town is the gateway to the beautiful North Eastern region of India. Kokrajhar town lies at a latitude of 26° 24'N and a longitude of 90° 16'N. Bodoland University is located in Debargaon area, which is about 9 km away from Kokrajhar town, Assam, India. The area is surrounded by small villages, green paddy fields and the Gaurang river. Visual Surveys of odonates was carried out from the month of May 2013 to November 2014 randomly in between 9 am to 11 am in sunny days. Survey was carried out on paddy fields, open fields, ponds, streams and water canal. Specimens were photographed with Sony digital still camera and in case of difficulties the specimen was captured using net, photographed and released. The odonates were identified upto the species level. All the specimens were identified with the help of following literatures Subramanian (2005) and Kalita, et al., (2014).

## RESULTS AND DISCUSSION

A total of 34 species of odonata representing 27 genera from 6 families was recorded from the Bodoland University and its vicinity. From the sub order Anisoptera, family Libellulidae is the dominant by 20 species followed by Aeshnidae with 4 species and Gomphidae with 2 species. While from the sub order Zygoptera, family Coenagrionidae is the dominant by 6 species followed by Chlorocyphidae with 1 species and Platycenemididae with 1 species. Libellulidae was found to be the most abundant family. The highest percentage of diversity of dragonflies (Anisoptera) was recorded from the family Libellulidae (77%), followed by Aeshnidae (15 %) and Gomphidae (8%) (Fig: 1). Among the damselflies (Zygoptera), the highest percentage of diversity was that of the family Coenagrionidae (75%) followed by Chlorocyphidae (12.5%) and Platycenemididae (12.5%) (Fig: 2).

**Table: 1, Checklist of dragonflies (sub order- Anisoptera) of Bodoland University, Assam, India**

Sl. No.	Family	Common name	Scientific name	Status
1	<i>Aeshnidae</i>	Rusty darner	Anaciaeschna jaspidea	Rare
		Blue tailed green darner	Anax guttatus	Rare
		Blue draner	Anax immaculifrons	Rare
		Brown darner	Gynacantha dravida	Rare
2	<i>Gomphidae</i>	Common club tails	Ictinogomphus rapax	Common

		Common hooktail	Paragomphus lineatus	Common
3	<i>Libellulidae</i>	Trumpet tail	Acisoma panorpoides	Rare
		Scarlet marsh hawk	Aethriamanta brevipennis	Rare
		Ditch jewel	Brachythemis contaminata	Common
		Granite ghost	Bradinyopyga geminata	Common
		Ruddy marsh skimmer	Crocothemis servilia	Common
		Blacktipped ground skimmer	Diplacodes nebulosa	Very common
		Ground skimmer	Diplacodes trivialis	Very common
		Amberwinged marsh glider	Hydrobasileus croceus	Common
		Asiatic blood tail	Lathrecista asiatica	Rare
		Fulvous forest skimmer	Neurothemis fulvia	Very common
		Pied paddy skimmer	Neurothemis tullia	Common
		Blue marsh hawk	Orthetrum glaucum	Rare
		Crimson tailed marsh hawk	Orthetrum pruinosum	Common
		Green marsh hawk	Orthetrum Sabina	Very common
		Wandering glider	Pantala flavescens	Very common
		Common picture wing	Rhyothemis variegata	Common
		Coral tailed cloud wing	Tholymis tillarga	Rare
		Red marsh trotter	Tramea basilaris	Rare
		Crimson marsh glider	Trithemis aurora	Rare
		Greater crimson glider	Urothemis signata	Common

**Table: 2, Checklist of damselfies (sub order- Zygoptera) of Bodoland University, Assam, India**

Sl. no.	Family	Common name	Scientific name	Status
1.	<i>Chlorocyphidae</i>	River heliodor	Libellago lineate	Very rare
2.	<i>Coenagrionidae</i>	Pigmy darlet	Agriocnemis pygmaea	Rare
		Orange tailed marsh dart	Ceriagrion cerinorubellum	Common
		Coromandel marsh dart	Ceriagrion coromandelianum	Common
		Black tailed marsh dart	Ceriagrion fallax	Rare
		Golden darlet	Ischnura aurora	Common
		Saffron faced blue dart	Pseudagrion rubriceps	Very rare
3.	<i>Platycenemididae</i>	Yellow bush dart	Copera marginipes	Common

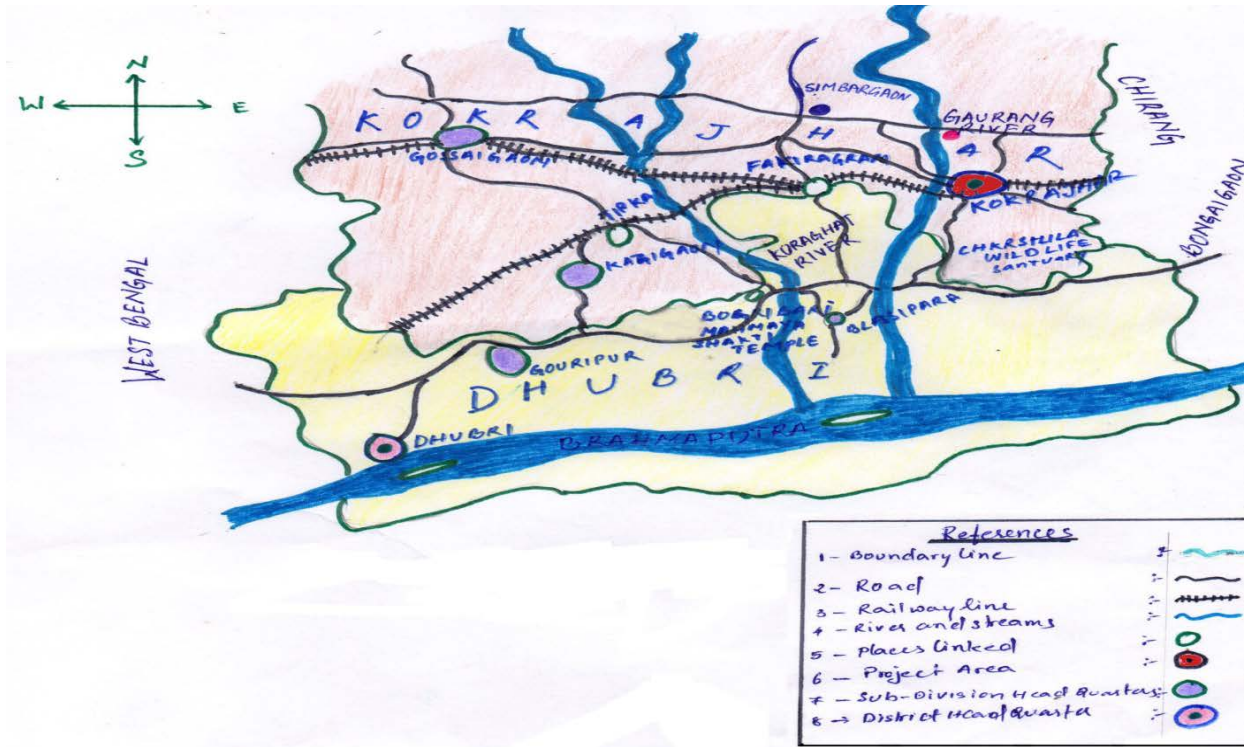


Fig: 1, Map showing the study area of the project.

### Dragonfly (Anisoptera)

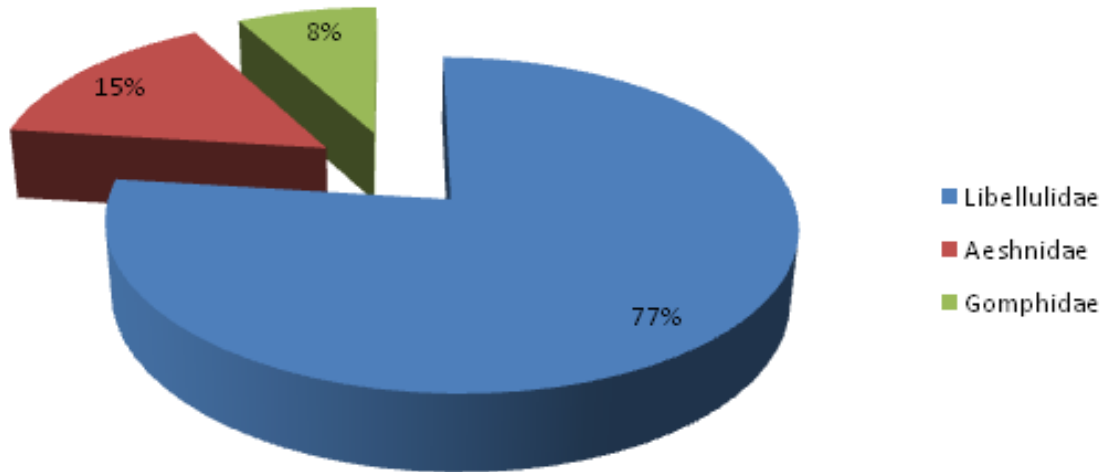
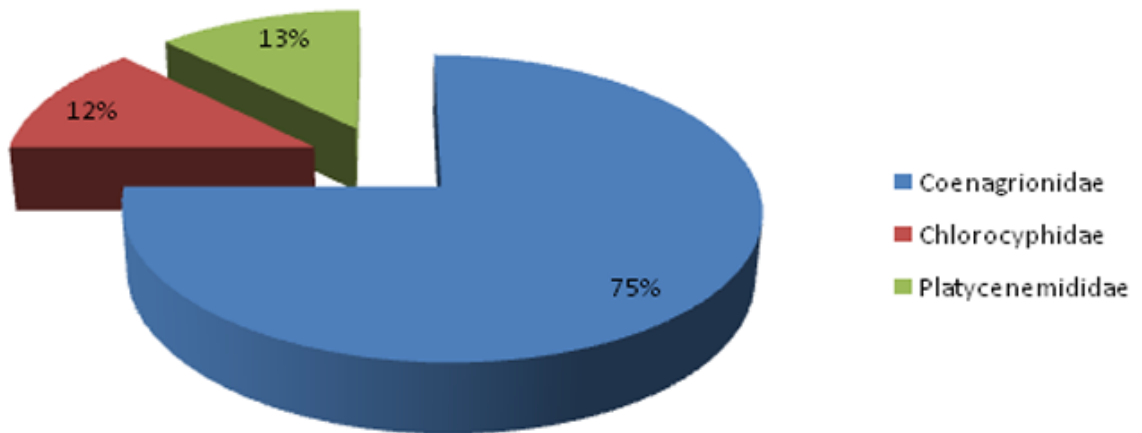


Fig: 2, Percentage of occurrences of dragonfly (Anisoptera) from Bodoland University and its vicinity, Assam, India.

## Damselflies (Zygoptera)



**Fig: 3, Percentage of occurrences of damselfly (Zygoptera) from Bodoland University and its vicinity, Assam, India.**





**Orthetrum sabina**



**Rhyothemis variegata**



**Brachythemis contaminata**



**Orthetrum pruinatum**



**Ictinogomphus rapax**



**Tholymis tillarga**





Photo: Paris Basumatary

**Neurothemis tullia**



Photo: Paris Basumatary

**Neurothemis fulvia**



Photo: Paris Basumatary

**Bradinopyga geminata**



Photo: Paris Basumatary

**Orthetrum glaucum**



Photo: Paris Basumatary

**Diplacodes trivalis**



Photo: Paris Basumatary

**Trithemis aurora**





**Ceriagrion cerinorubellum**



**Pseudodagrion rubriceps**



**Ischnura aurora**



**Agriocnemis pygmaea**



**Ceriagrion coromandelianum**



**Libellago lineata**

### III. CONCLUSION

Odonates are predatory in nature, but also a good source of energy to different animals, especially for birds and other insects such as spiders<sup>[8]</sup>. Odonates are the important link between aquatic and terrestrial ecosystem changes in aquatic communities such as mowing of shoreline vegetation or introduction of aquatic exotic species reduce the quality of odonates habitat<sup>[9]</sup>. Odonates are important indicators of water quality and pollution levels<sup>[8]</sup>. They inhabit diversified habitats near water bodies ranging from stagnant pond water to flowing streams<sup>[8]</sup>. Although, Bodoland University has a huge diversity of odonates, gradual increase in human pressure in and around open fields and water bodies is affecting the sustainability of this insects. Therefore, protection measures are necessary for these creatures. Much more elaborate study is required to access the biodiversity of these unique creatures.

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### AUTHORS

**First Author-** Paris Basumatary, Department of Zoology, Bodoland University, Kokrajhar, Kokrajhar-783370, BTC, Assam, India.

**Second Author-** Debajit Adhikary, Department of Zoology, Bodoland University, Kokrajhar, Kokrajhar-783370, BTC, Assam, India.

**Third Author-** Manita Daimary, Department of Zoology, Bodoland University, Kokrajhar, Kokrajhar-783370, BTC, Assam, India.

**Fourth Author-** Noymi Basumatary, Department of Zoology, Bodoland University, Kokrajhar, Kokrajhar-783370, BTC, Assam, India.

**Fifth Author-** Abhijita Daimary, Department of Zoology, Bodoland University, Kokrajhar, Kokrajhar-783370, BTC, Assam, India.

**Correspondence Author-** Paris Basumatary, [parishbasumatary@gmail.com](mailto:parishbasumatary@gmail.com), Mob. no- 09678982895

# Application of SCADA system in Steel Industries

**Deepak Kumar Agrawal**

Department of Mechanical Engineering  
Takshshila Institute of Engineering & Technology, Jabalpur (M.P.)  
RGPV University Jabalpur (M.P.)

**Abstract-** SCADA system is envisaged for the steel plants Electrical and Instrumentation automation network world wide now a day. SCADA system is Supervisory Control and Data Acquisition system, SCADA system is based on PLC system, The SCADA system uses PLC to collect the data from field instruments and equipments used in Industrial Process system. The SCADA system has been developed by companies who are members of Standardization committees e.g. OPC, OLE for the process control and include trends of IT technologies.

The major application of SCADA system in steel plants is to supervision, online control of field instruments and equipments which are spread throughout the plant area and these instruments and equipments play the main role to obtain desired quality output of the plant. This paper describes SCADA system in terms of their Application, Architecture, and their interface to the process Instruments and Equipments hardware and Software process control, the function and application of SCADA system development they provide to steel plants. Due to Industrial standards and their characteristics which very important for plant operation point of view, the SCADA system has accepted by major of the plants.

## 1.1 INTRODUCTION

SCADA is the acronym for Supervisory Control and Data Acquisition. SCADA is the software package for monitoring online process parameters and function of plant operational equipments in technological manner. In plant SCADA system generally installed in control room.

SCADA system having three types of working station in control room, First working station is Operating station; in operator station the users can only do real time process parameter monitoring function. The second type is called Engineering Station in such type of work station users can able to do process parameter monitoring function as well as modification if process needs modification and only authorized users can modify the control sequence, control logics, instruments or equipment parameters etc. as per process requirement if required. Then the third type of work station is called server station. In this station users not monitoring or engineering any process parameters but all the SCADA system software have stored in server as backup data when in any main stations e.g. Engineering and Operating station any control block is malfunctioning then from server data uninstall the corrupted program and install it.

In SCADA system all these work station connected through a centralized controller system normally we called it Programmable Logic Controller (PLC) or Distributed control System (DCS) through Ethernet cables via Ethernet switch. SCADA system software and application software processed by the PLC / DCS / RTU system and display on SCADA system for process parameter monitoring.

All the Field instruments such as Pressure Transmitters, Flow Transmitters, Level Transmitters, Temperature Transmitters, Limit Switches, Position switches are connected to SCADA system via Screened pair cables from field up to input output cards of PLC panel. The input output signals in plant generally analog and digital type so that the input output cards are installed in Programmable logic controller panel. These Input output cards are communicated with processor (CPU) via. Fiber optic cables, the quantity of input output cards depend upon the no. of signals in the plant operation. These signals through PLC and in different work station we monitor online process parameters. Now a day SCADA system has come with unlimited tag nos. so that we can monitor unlimited tags in the SCADA system. The SCADA software used to run on DOS, VMS and UNIX, recently SCADA vendors go to NT. SCADA can also run on LINUX.

In Fig-1 below shows the diagram of typical SCADA system, which contains 1 no. PLC System, 4 nos. Remote Terminal Units, 3 nos. of operator station, Radio modems and other field level operational process Instruments and Equipments.

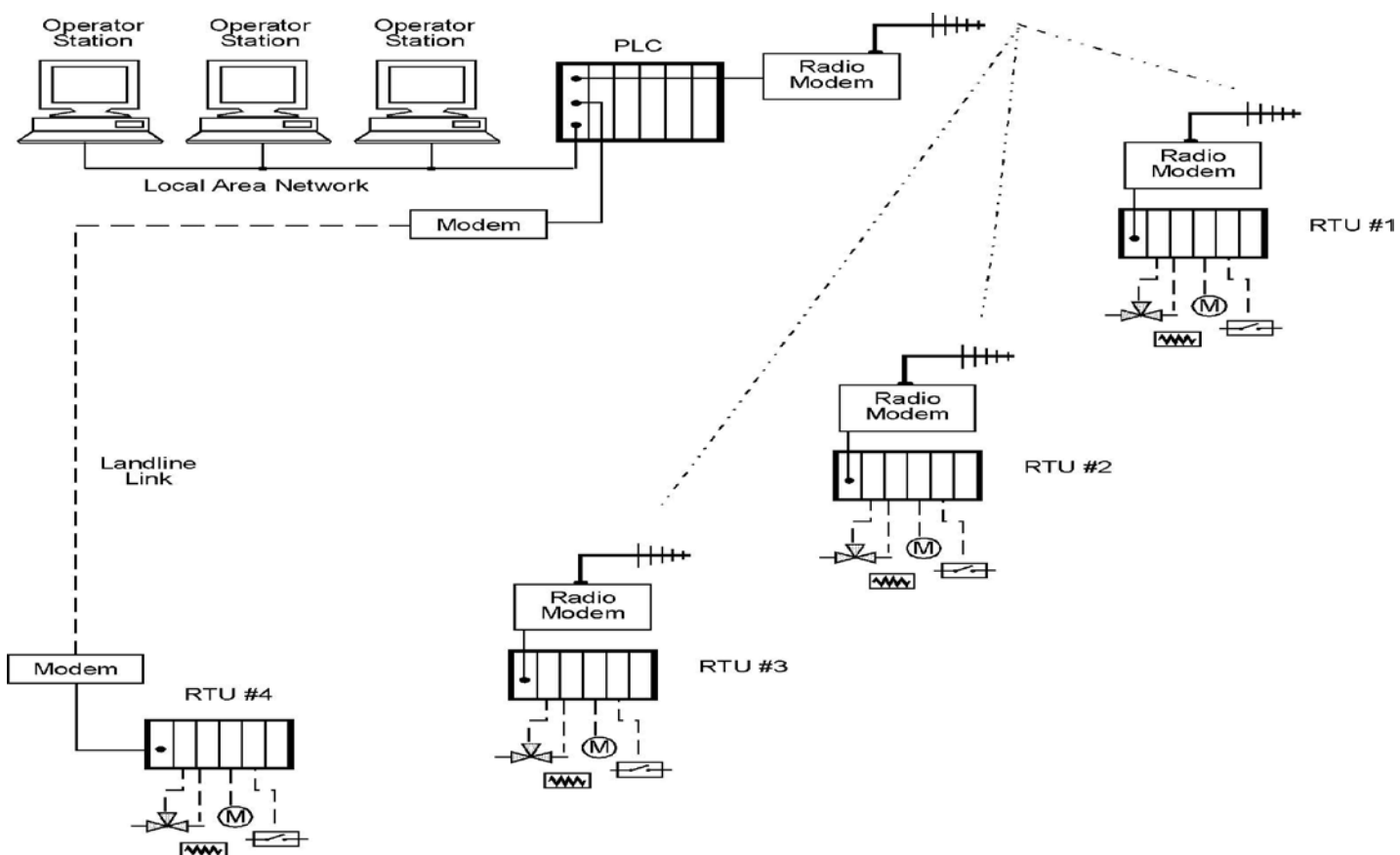


Fig 1:- Diagram of Typical SCADA system

## 1.2 Why SCADA system

In Integrated steel plant for process monitoring and control function SCADA is best system, some features are as follows which makes SCADA system best in industry:-

1. SCADA is fully software package computer based system which control primary equipments, records and store very large amount of process data.
2. SCADA system allows to plant engineer to interact real time process data form level 0 equipments, field sensors etc.
3. The operator assist computer based SCADA system for monitoring process data that recommended action keep system safety.
4. Remote terminal unit is the main source of process data this create online image of the system.

## 1.3 Benefits of SCADA system:-

1. Good functionality, Easy under stood by plant operator, and exhaustive development facility.
2. The amount of specific development that needs to be performed by the end users is limited, especially with suitable engineering.
3. SCADA is reliable and robust system that's why it is used in critical industrial process environments where reliability and performance is priority. In well established framework specific development is performed by SCADA system that enhance reliability and robustness of the system.

## 1.4 Hidden or confidential –

SCADA system doesn't have any such type of features which provided confidentiality of communication. If the lower level protocols do not provide confidentiality than that intercepted communications may be easily read.

## 1.5 Authentication

SCADA system has security features, protected by passwords that restrict the persons who are not authorized for access the system.

## 1.6 CONCLUSION

This project we learn about Application of industrial SCADA system, configuration of industrial SCADA system, equipments involved for completion of industrial SCADA system, software needed for industrial SCADA system, working of industrial SCADA system, basic process parameters indication and control process parameters by industrial SCADA system.

By adaptation of SCADA system in industry the major advantage for plant engineers that is very fast troubleshooting , Fast maintenance of plant, Save raw material of plant, increase quality of the output or final product and save time and money of organization.

## 1.7 ACKNOWLEDGEMENT

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# Hybrid Ant Colony Optimization and Cuckoo Search Algorithm for Travelling Salesman Problem

Sandeep Kumar\*, Jitendra Kurmi\*\*, Sudhanshu P. Tiwari\*\*\*

\*M.Tech. Scholar, Lovely Professional University, Jalandhar(Punjab), India

\*\*M.Tech. Scholar, Lovely Professional University, Jalandhar(Punjab), India

\*\*\*Assistant Professor, Lovely Professional University, Jalandhar(Punjab), India

**Abstract-** Travelling salesman problem (TSP) is one of the most popular real world combinatorial optimization problem in which we have to find a shortest possible tour that visits each city exactly once and come back to starting city. It ranges among NP hard problem so it is often used as a benchmark for optimization techniques. In this paper a hybrid of Ant Colony Optimization (ACO) and Cuckoo Search (CS) algorithm is proposed for travelling salesman problem. ACO is good metaheuristic algorithm but drawback of this algorithm is that, the ant will walk through the path where the chemical substances called pheromone density is high. It makes the whole process slow hence CS is employed to carry out the problem of local search of ACO. Cuckoo search uses single parameter apart from the population size because of this reason it works efficiently and performs local search more efficiently. The performance of new hybrid algorithm is compared with ACO. The result shows that new hybrid algorithm is better and efficient than simple ACO algorithm.

**Index Terms-** Travelling Salesman Problem, Ant Colony Optimization, Cuckoo Search, Mantegna Search, Egg Laying Region, Probability Parameter, Pheromone Evaporation Coefficient, Pheromone Deposit Factor

## I. INTRODUCTION

Travelling Salesman Problem (TSP) [1] is widely studied problem in Computer Science in which task is to find a hamiltonian path with minimum cost. The TSP is known to be NP-hard. It means that no known algorithm is guaranteed to solve all TSP instances optimality within reasonable execution time. So in addition to find exact solution approaches, various heuristics and metaheuristics algorithms have been developed to solve problems approximately. They are used to find good quality solutions within reasonable execution times. Metaheuristics are normally improvement algorithms, *i.e.*, they start with one or more feasible solutions to the problem at hand and suggest methods for improving such solutions.

ACO [2],[3],[4],[5] is the population based optimization technique which was first introduced by Marco Dorigo, as Ant System in 1996. It was refined as Ant Colony Optimization in 1999 and used to solve the travelling salesman problem. It is inspired by behavior of ants in finding shortest paths from the colony to its food source. Cuckoo search [6],[7],[9] is one of the evolutionary technique which was introduced in 2009 by Yang and Deb . This algorithm is inspired by the egg laying behavior

of the cuckoo bird. Cuckoo search is simple and takes less no. of parameters as compared to other metaheuristic algorithms. The major disadvantage of ACO is that the local search it performs is not much faster, so cuckoo search is employed to perform the local search of ACO. In this paper a hybrid of ACO and CS are formulated to solve the travelling salesman problem.

## II. CUCKOO SEARCH

Cuckoo search [6],[7],[9] is a new metaheuristic optimization algorithm. Cuckoo bird does not make nests for laying its egg, it uses other bird's nest for laying eggs. This optimization algorithm is inspired by this behaviour of cuckoo bird. If host bird recognizes the eggs of cuckoo bird, host bird will either destroy the eggs or leave the nest. Each cuckoo can lay its egg in the nest of host bird within a specific region; this region is called Egg Laying Region (ELR) [7]. The working concept of Cuckoo search is this behaviour of cuckoo bird and it is used to solve different optimization problems. The main advantage of cuckoo search is that it uses very less number of parameters which makes it better than other metaheuristic algorithms. Each egg in a nest shows a solution, and a cuckoo egg shows a new solution. Our goal is to find new solution (cuckoos) among all the existing solutions present in the nest. CS works on following three rules:

1. Each cuckoo can lay one egg at a time, and can dump its egg in any random selected nest.
2. The nest which would have high quality of eggs will called best nest and it will go to the next generation;
3. The number of available host nests is fixed and the egg laid by a cuckoo is discovered by the host bird with a probability  $p_a \in (0,1)$ .

In Cuckoo Search, leaving the population size  $n$ , there is only one parameter  $p_a$  and the convergence rate is not related to the parameter  $p_a$ . It means we do not need to change these parameters for a specific problem. The major advantage of CS is that it is more robust and generic. For number of optimization problems, when it is compared with other metaheuristic algorithms; it performs better.

In cuckoo search main component is Mantegna algorithm which is used to find the best random points in the space. It is used to generate random numbers on the basis of symmetric levy stable distribution. The value of the distribution's parameter  $\alpha$  lies from 0.3 to 1.99. The Mantegna algorithm has following phases:



First is to calculate

$$v = \frac{x}{|y|^{1/\alpha}} \quad (1)$$

Here  $x$  and  $y$  are normally distributed variables with standard deviations, respectively. The value of variable  $x$  and  $y$  is calculated with the help of following formula:

$$\sigma_x = \left[ \frac{\Gamma(1+\alpha) \cdot \sin(\pi\alpha/2)}{\Gamma(\frac{1+\alpha}{2}) \cdot \alpha \cdot 2^{(\alpha-1)/2}} \right]^{1/\alpha} \quad (2)$$

$$\sigma_{y=1} \quad (3)$$

In this way with the help of Mantegna algorithm best points in the space is found.

### III. ANT COLONY OPTIMIZATION

Ant Colony Optimization (ACO) [11],[12] algorithm is a metaheuristic optimization technique that is used to minimize the cost and maximize the efficiency of an optimization problem. ACO is a natural computational technique for which main basis is behaviour of ants. Ant colony optimization is inspired by the foraging or food searching behaviour of real ant colonies. Ants are naturally blind, deaf & dumb so when they move, leave pheromone (chemical material) [8],[10],[13],[14] in its path. On the basis of this pheromone density other ants follow the path. This simulated pheromones attract ants to best trail in the graph because ants choose the path based on the pheromone density. This natural behaviour of artificial ant colonies does not search the exact solutions but provides approximate solutions to continuous and discrete optimization problems, like travelling salesman problem, vehicle routing problem, job scheduling problem etc. ACO uses four main parameters [11] that are influence of pheromone on direction ( $\alpha$ )[15],[16], influence of adjacent node distance ( $\beta$ ), pheromone evaporation coefficient ( $\rho$ ) and pheromone depositing factor ( $Q$ )[17],[18],[19]. This algorithm updates the trail on the basis of current pheromone density.

Initially, each ant is randomly put on a city. During the construction of a feasible solution, ants select the following city to be visited through a probabilistic decision rule. When an ant  $k$  states on city  $i$  and constructs the partial solution, the probability moving to the next city  $j$  neighbouring on city  $i$  is given by

$$p_{ij}^k(t) = \begin{cases} \frac{[\tau_{ij}(t)]^\alpha \cdot [\eta_{ij}]^\beta}{\sum_{k \in allowed_k} [\tau_{ij}(t)]^\alpha \cdot [\eta_{ij}]^\beta} & \text{if } k \in allowed_k \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

where  $\tau_{ij}$  is the intensity of trails between edge  $(i,j)$  and  $\eta_{ij}$  is the heuristic visibility of edge  $(i, j)$ , and  $\eta_{ij} = 1/d_{ij}$ .  $\alpha$  is pheromone influence factor,  $\beta$  is local node influence, and  $J_k(i)$  is a set of cities which remain to be visited when the ant is at city  $i$ . After each ant completes its tour, the pheromone amount on each path will be adjusted with following equation.

$$\tau_{ij}(t+1) = (1-\rho)\tau_{ij}(t) + \Delta\tau_{ij}(t) \quad (5)$$

where  $\rho$  is pheromone evaporation coefficient and

$$\Delta\tau_{ij}(t) = \sum_{k=1}^m \Delta\tau_{ij}^k(t)$$

$$\Delta\tau_{ij}^k(t) = \begin{cases} \frac{Q}{L_k} & \text{if } (i, j) \in \text{tour done by ant } k \\ 0 & \text{otherwise} \end{cases} \quad (6)$$

$(1-\rho)$  is the pheromone decay parameter ( $0 < \rho < 1$ ) [19] where it represents the trail evaporation when the ant chooses a city and decide to move.  $L_k$  is the length of the tour performed by ant  $k$  and  $m$  is the number of ants.

### IV. TRAVELLING SALESMAN PROBLEM

Given a set of cities and the cost between each pair of them, the travelling salesman problem, is to find the cheapest way of visiting all of the cities and return to starting point. In the standard version we study, the travel costs are symmetric in the sense that travelling from city  $X$  to city  $Y$  costs just as much as traveling from  $Y$  to  $X$ .

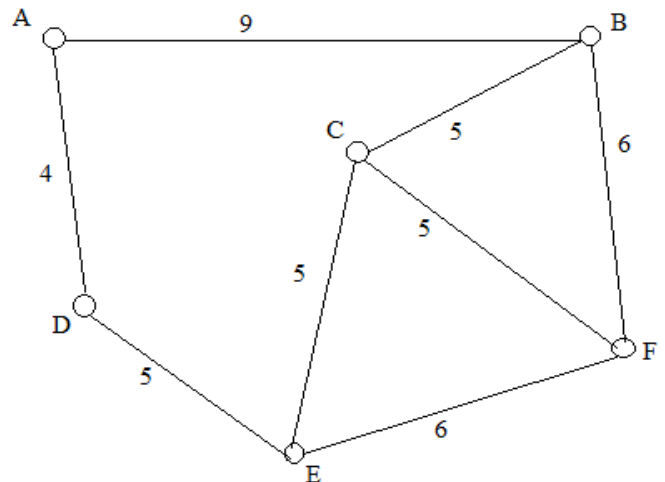


Fig.1: Graphical Representation of TSP

In figure 1 each node in graph represents a city and each weighted edges in graph represents path from one city to other city. Weight is the cost to travel to reach city. Fitness function of the TSP will be

$$T_c = \sum_{k=1}^d C_{ij} \quad (7)$$

where  $C_{ij}$  is cost associated of path  $i$  to  $j$  and  $k$  is for the number of city or dimension.

Assumptions for the Travelling Salesman Problem are:

1. There should be finite no. of cities.
2. Each city should connect to next city.

Constraints for the Travelling Salesman Problem are:

1. Each city should traverse exactly once.

2. Salesman should reach at starting city after traversing all the cities.

V. PROPOSED METHODOLOGY

In this paper we have proposed a solution for Travelling Salesman Problem using ant colony optimization algorithm with cuckoo search. For solving any optimization problem we have to first formulate the problem according to optimization problem. In

this case first we formulate the Traveling salesman problem according to our proposed ACO with CS. Our proposed algorithm combines the advantages of Ant Colony Optimization and Cuckoo search. The major drawback in the ACO is that while trying to solve the combinatorial optimization problems the search has to perform much faster, but in ACO ant walk through the path where the chemical substance called pheromone density is high. In order to overcome this drawback, Cuckoo search is used.

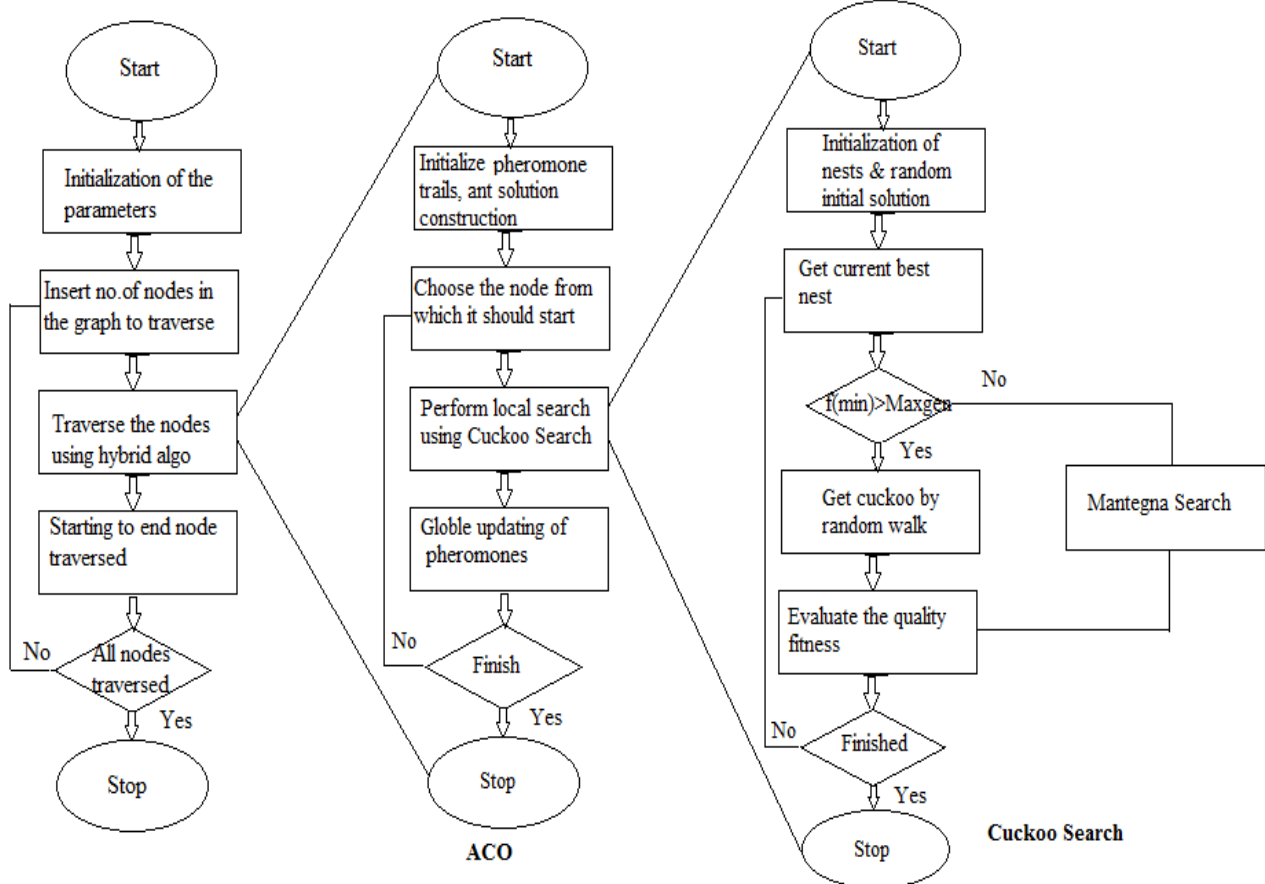


Fig. 2: Flow Chart of Hybrid Algorithm to solve TSP

Figure shows the flow chart of the Hybrid algorithm. Firstly initialization of the parameters need to be performed. Then the number of nodes that has to be traverse is initializing. Traversing of nodes are carried out with the help of Hybrid algorithm which uses ACO and Cuckoo search.

*ACO flow chart description:* Initialization of the pheromone trails, and ant solution construction is performed. Each ant is assign to an individual node, assigning of the resource to the task is performed by Cuckoo search. Global updating is performed using the pheromone global update. Termination of task is carried out till the traversal of all the nodes is completed.

*Cuckoo search flow chart description:* Initialization of the nests and the random initial solution is performed. The current best nest is chosen by the random walk and then the evaluation of the quality is fitness is performed. Else apply Mantegna search

for the evaluation. Execution is carried out till all the solution is constructed.

The steps of complete proposed hybrid algorithm for TSP is given as:

Hybrid ACO and Cuckoo Search Algorithm to solve TSP

1. Initialization.
2. Insert no. of nodes in the graph to traverse.
3. Traverse each node using hybrid algorithm (ACO and Cuckoo Search).
4. Assign each ant to different node /\*ACO algorithm starts\*/
5. Perform local search using cuckoo search
6. Initialize nest /\*Cuckoo Search algorithm starts\*/
7. Get the current best nest
8. **While** ( $F_{min} > \text{max generation}$ )



9. Get the cuckoo by random walk, if not replace it by Mantegna search
  10. **End while**
  11. Evaluate the quality fitness, randomly choose nests among n (call as j)
  12. If ( $F_i < F_j$ ) then replace j value by new solution.
- Else Retain the best solution and nest.
13. Choose next city according to fitness value of cuckoo search /\*Cuckoo Search algorithm ends\*/
  14. For each ant update the value of pheromone and calculate fitness function.
  15. If total iteration < maximum iteration then go to step 3
- Else terminate /\*ACO algorithm ends\*/
16. Traverse each node exactly once and return back to starting node.
  17. If all nodes traversed then terminate
- Else repeat step 3 to 16.
18. Stop

## VI. EXPERIMENTAL SETUP AND RESULTS

### A. Experimental Setup

For every algorithm there are some control parameters which are used for its efficient working. Hence, there are some control parameters for ant colony optimization algorithm with cuckoo search. We did an extensive literature survey to determining the values of these control parameters. From this we found that the values which we have taken in this experiment are standard values and they are also suitable for this experiment. The control parameters of ACO are  $\alpha$  (influence of pheromone on direction),  $\beta$  (influence of adjacent node distance),  $\rho$  (pheromone evaporation coefficient) and Q (pheromone depositing factor) and values is taken as 1, 2, 0.5 and 2.0 respectively. In cuckoo search value of  $p_a$  is taken from 0 to 1. For mantegna search the value of alpha is taken from 0.3 to 1.99. The next parameter in our experiment is maximum number of population and we have taken its value to be 5 to 30. No. of ants is taken according to no. of cities, it is same as no. of cities. All results is taken on Windows platform with framework Matlab R2013a.

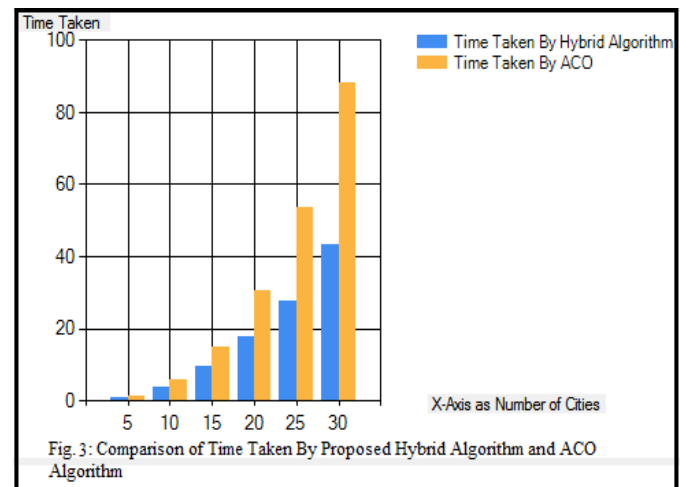
### B. Experimental Result

In this section we analyse the result obtained by our proposed hybrid algorithm. To test the efficiency of our algorithm; results of our hybrid ACO and CS is compared with real simple ACO algorithm results. In TSP we already have the information about the number of cities. We have analysed time taken by proposed hybrid algorithm and simple ACO algorithm to traverse each city exactly once and back to source city. We conducted the experiment by changing the number of cities and then compared our results with simple ACO algorithm. The time is measured in seconds and for graph we have taken symmetric distance in which the distance between two cities is taken from 0 to 19. Results are shown in table 1.

**TABLE I TIME TAKEN BY ACO AND PROPOSED HYBRID ALGORITHM TO SOLVE TSP FOR DIFFERENT NUMBER OF CITIES**

No. of cities	Time taken by ACO	Time taken by hybrid ACO and CS
5	1.1572	0.9499
10	5.7805	3.9142
15	14.9135	9.5106
20	30.4802	17.9556
25	53.6349	27.7136
30	88.2881	43.1170

The above comparison of results of proposed hybrid algorithm and ACO algorithm is shown in following bar chart:



## VII. CONCLUSION

It can be concluded from the results TABLE I that the performance of proposed hybrid algorithm is better than ACO algorithm in most cases because proposed hybrid algorithm performs local search faster than simple ACO algorithm. The main advantage of Cuckoo search is that it takes only one parameter  $p_a$  (probability function) with population size. Very less number of parameters makes Cuckoo Search algorithm so efficient and simple than other metaheuristic algorithm. By merging ACO with Cuckoo Search it does not depend on pheromone density to choose the next city which will make the process faster. As future work we have the intention to apply other types of nature inspired algorithms to the Travelling salesman problem.

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## AUTHORS

**First Author** – Sandeep Kumar, M.Tech, Lovely Professional University, sandeep.cs12@gmail.com.  
**Second Author** – Jitendra Kurmi, M.Tech, Lovely Professional University, jitendrakurmi458@gmail.com.  
**Third Author** – Sudhanshu P. Tiwari, Assistant professor, Lovely Professional University, sudhanshu.iitg@gmail.com

# Inventory Models with Weibull Deterioration and Time-Varying Holding Cost

Ritu Raj\*, Naresh Kumar Kaliraman\*, Dr Shalini Chandra\*\*, Dr Harish Chaudhary\*\*\*

\* Research Scholar, Centre for Mathematical Sciences, Banasthali University, P.O. Banasthali Vidyapith, Banasthali – 304022, Rajasthan, India

\*\* Associate Professor, Centre for Mathematical Sciences, Banasthali University, P.O. Banasthali Vidyapith, Banasthali – 304022, Rajasthan, India

\*\*\* Assistant Professor, Department of Management Studies, Indian Institute of Technology, Delhi, New Delhi-110016, India

**Abstract-** This paper develops inventory models for deteriorating item; the rate of deterioration is Weibull distribution deterioration with two parameters. It considers ramp-type demand. Shortage is allowed and it is completely backlogged. In these models, we consider time dependent holding cost. These models are developed under two different replenishment policies; (i) without shortage (ii) with shortage. The aim of these models is to find the optimal solution for minimizing the total inventory costs for both the above mentioned policies. To optimize the models numerical illustrations have been carried out and sensitivity analysis occurred to evaluate the result of parameters on assessment variables and the entire cost of these models.

**Index Terms-** Holding Cost, Ramp-Type Demand, Shortage, Weibull Deterioration.

## I. INTRODUCTION

Inventory is a fundamental part of manufacturing, distribution, retail infrastructure and demand plays an important role in choosing the beneficial inventory strategy. Researchers were developed the inventory models assuming the demand of the objects to be constant, stock dependent, linearly increasing, linearly decreasing, exponentially increasing and exponentially decreasing with time etc. after that, it has been noticed that the above mentioned demand policies do not accurately describe the demand of assured objects such as newly launched cosmetics, garments, fashion items, electronics etc., for which the demand increases with time as they are launched into the market and after some time it becomes stable. Ramp-type demand pattern is introduced to consider the demand of such types of materials. Mostly the ramp-type demand rate is increasing for some time when new variety of consumer goods comes to the marketplace. In case of ramp-type demand pattern, the demand increases linearly at the beginning and when the market comes into a steady state, the demand becomes stable until the end of the inventory cycle. For example, the demand of festival greetings likes sweets, gods and goddess's pictures, phatakhes, paintings etc., follows ramp-type demand rate. At the beginning demands of these items increases linearly from starting of October to the end of November month, after that demands of these items becomes constant.

The inventory of deteriorating items is a big problem for any organization in the supply chain system. The finished goods are deteriorating with time in inventory. Some items used in daily life like fruits, vegetables, milk products, meat etc., are

deteriorating at higher rate instead of other items. It is necessary that consume these items within time limit to avoid deterioration. The inventory model with ramp-type demand rate was projected by Mandal and Pal [9]. Wu and Ouyang [2] developed a replenishment inventory model for deteriorating items with ramp-type demand rate. Wu [3] developed an economic order quantity inventory model for deteriorating items. He considered weibull distribution deterioration, partial backlogging and ramp-type demand. The inventory model with Weibull deterioration and related issues have been studied by many researchers. Silver [6] presented a heuristic for deteriorating items inventory model with time dependent linear demand. Goyal and Giri [5] extended review on deterioration inventory model. Covert and Philip [1] presented an inventory model where the time to deterioration is described with two parameters Weibull distribution deterioration. Ghosh and Chaudhuri [7] developed an inventory model for deteriorating items with two parameters Weibull distribution deterioration, shortages and quadratic demand rate. Sanni [8] developed an inventory model for three parameters Weibull deteriorating items, quadratic demand rate and shortages are allowed. Shortages are permitted and customers will wait till the next order arrives i.e. called a backorder model. All demands are fulfilled instantly. Ghare and Schrader [4] developed an exponentially deteriorating inventory model. In this paper, they considered stable rate of deterioration with no shortage. There after a lot of research work has been done. Holding cost is considered as known and constant in most of the models. Now, holding cost may not be considered as constant, it is varying with regular change in time value of money and change in price index. There is lot of competitions in globalization, so holding cost may not remain constant over time. Naddor[10], Van Deer Veen [13], Weiss [14] assumed holding cost as a non-linear function over time for which the items are held in inventory and the amount of the on-hand inventory. Roy [11] proposed an EOQ model for deteriorating items in which deterioration rate and holding cost are considered as linearly increasing function of time, selling price is dependent on demand rate and shortage is allowed and completely backlogged. Tripathi [12] presented an inventory model for non-deteriorating items under permissible delay in payments where holding cost is a function of time.

The aim of this paper is developing inventory models where rate of deterioration is two parameters weibull distribution deterioration. Holding cost as a linearly increasing function of time. These models have been studied under two different inventory policies such as without shortage and with shortage. The main purpose of this paper is to show that there exist a unique optimal cycle time to minimize the total inventory cost

per unit time. To optimize these models numerical illustrations the result of parameters on assessment variables and the entire have been carried out and sensitivity analysis occurred to study cost of these models.

## II. ASSUMPTIONS

We consider the following assumptions for developing mathematical model:

1. The inventory system consider single item.
2. T is the fixed unit of time for each ordering cycle.
3. The replenishment rate is infinite.
4. The demand rate  $F(t)$  is a ramp type function:

$$F(t) = \begin{cases} Dt, & t < \mu, \\ D\mu, & t \geq \mu, \end{cases}$$

$Dt$  is positive and continuous for  $t \in [0, T]$ .

5. The lead time is zero.
6. Shortage is allowed and completely backlogged.
7. Holding cost  $H_c$  per unit is time dependent:  
 $H_c(t) = a + bt$ , where  $a > 0$  and  $b > 0$ .
8. The rate of deterioration is two parameters weibull deterioration denoted by  
 $\theta = \alpha\beta t^{\beta-1}$ , where  $\alpha > 0$ ,  $\beta > 0$  and  $0 \leq t \leq t_1$ .
9.  $Q$  is the ordering quantity.

## III. NOTATIONS

We consider the following notations for developing mathematical model:

1.  $D^c$  is the deterioration cost per unit per item.
2.  $\mu$  is the parameter of the ramp type demand function.
3.  $t_1$  is the time when inventory level reaches zero.
4.  $t_1^*$  is the optimal point for the replenishment policy.
5.  $S_c$  is the shortage cost per unit per item.
6.  $I(t)$  is the on hand inventory level at time t over the ordering cycle  $[0, T]$ .
7. T is considered annually.

## IV. MATHEMATICAL MODEL

These models are developed for the following two different replenishment policies:

- (i) Without Shortage.
- (ii) With Shortage.

## V. MODELS WITHOUT SHORTAGE

The inventory model is starting with no shortage. At this stage, the inventory level reaches its maximum level and then production is stopped. The inventory depletes to zero due to demand and deterioration during the time interval  $[0, t_1]$  and falls zero at  $t = t_1$ . Thus,

shortage occurs during  $[t_1, T]$ , which is completely backlogged. Therefore, the inventory is described by the system of differential equations:

$$\frac{dI_a(t)}{dt} = -\theta I_a(t) - F(t), 0 \leq t \leq t_1 \quad \text{with boundary condition } I_a(t_1) = 0 \quad \dots(1)$$

$$\frac{dI_b(t)}{dt} = -F(t), t_1 \leq t \leq T \quad \text{with boundary condition } I_b(t_1) = 0 \quad \dots(2)$$

We considered two cases, (i)  $t < \mu$  and (ii)  $t \geq \mu$  for solving these differential equations:

**5.1 Case (i):  $t < \mu$**

From equation (1), we get

$$I_a(t) = De^{-\alpha t^\beta} \left[ \frac{1}{2}(t_1^2 - t^2) + \frac{\alpha}{\beta + 2}(t_1^{\beta+2} - t^{\beta+2}) \right] \quad \dots(3)$$

Equation (2), solve by the following two ways:

$$\frac{dI_b(t)}{dt} = -Dt, \quad t_1 \leq t \leq \mu \quad \dots(i)$$

$$\frac{dI_b(t)}{dt} = -D\mu, \quad \mu \leq t \leq T, I(\mu_-) = I(\mu_+) \quad \dots(ii)$$

We have

$$I_b(t) = -\frac{D}{2}(t^2 - t_1^2) \quad \dots(4)$$

and 
$$I_b(t) = \frac{D\mu^2}{2} - D\mu t + \frac{D}{2}t^2 \quad \dots(5)$$

Total deterioration amount during  $[0, t_1]$

$$D_c = \int_0^{t_1} Dte^{\alpha t^\beta} dt - \int_0^{t_1} Dtdt = \frac{\alpha D}{\beta + 2} t_1^{\beta+2} \quad \dots(6)$$

Total holding cost during  $[0, t_1]$  is

$$HC = \int_0^{t_1} H_c(t)I_a(t) dt = \int_0^{t_1} (a + bt)De^{-\alpha t^\beta} \left[ \frac{1}{2}(t_1^2 - t^2) + \frac{\alpha}{\beta + 2}(t_1^{\beta+2} - t^{\beta+2}) \right] dt$$

$$HC = D \left[ Pt_1^{2\beta+4} + Qt_1^{2\beta+3} + Rt_1^{\beta+4} + St_1^{\beta+3} + \frac{b}{8}t_1^4 + \frac{t_1^3}{3} \right] \quad \dots(7)$$

See Appendix-A

Lost sale amount during  $[t_1, T]$  is

$$S_c = \int_{t_1}^T -I_b(t) dt = \int_{t_1}^{\mu} -I_b(t) dt + \int_{\mu}^T -I_b(t) dt = \int_{t_1}^{\mu} \frac{D}{2}(t^2 - t_1^2) dt + \int_{\mu}^T \left( D\mu t - \frac{D\mu^2}{2} - \frac{D}{2}t_1^2 \right) dt$$

$$S_c = \frac{D}{6}(A_1 - 3Tt_1^2 + 2t_1^3) \quad \dots(8)$$

See Appendix-A

Order quantity is

$$OQ = -\int_0^{t_1} e^{\alpha t} D t dt - D \int_{t_1}^{\mu} t dt - \int_{\mu}^T D \mu dt = D \int_0^{t_1} (1 + \alpha t^{\beta}) t dt + D \int_{t_1}^{\mu} t dt + \int_{\mu}^T D \mu dt$$

$$OQ = D \left( \frac{t_1^2}{2} + \frac{\alpha}{\beta+2} t_1^{\beta+2} - \frac{1}{2} t_1^2 \right) + A_2 \quad \dots(9)$$

See Appendix-A

Total cost during  $[0, T]$  = holding cost + lost sale amount + deterioration cost  $TC_1(t_1) = HC + S_c + D_c$

$$TC_1(t_1) = D \left[ P t_1^{2\beta+4} + Q t_1^{2\beta+3} + R t_1^{\beta+4} + S t_1^{\beta+3} + \frac{\alpha}{\beta+2} t_1^{\beta+2} + \frac{b}{8} t_1^4 + \frac{2}{3} t_1^3 - \frac{T}{2} t_1^2 + \frac{A_1}{6} \right] \dots(10)$$

**5.1.1 Solution:**

$$\frac{\partial TC_1}{\partial t_1} = D \left[ \begin{aligned} &P(2\beta+4)t_1^{2\beta+3} + Q(2\beta+3)t_1^{2\beta+2} + R(\beta+4)t_1^{\beta+3} + S(\beta+3)t_1^{\beta+2} \\ &+ \alpha t_1^{\beta+1} + \frac{b}{2} t_1^3 + 2t_1^2 - T t_1 \end{aligned} \right] \quad \dots(11)$$

$$\frac{\partial^2 TC_1}{\partial t_1^2} = D \left[ \begin{aligned} &P(2\beta+4)(2\beta+3)t_1^{2\beta+2} + Q(2\beta+3)(2\beta+2)t_1^{2\beta+1} + R(\beta+4) \\ &(\beta+3)t_1^{\beta+2} + S(\beta+3)(\beta+2)t_1^{\beta+1} + \alpha(\beta+1)t_1^{\beta} + \frac{3b}{2} t_1^2 + 4t_1 - T \end{aligned} \right] \quad \dots(12)$$

Main objective to minimize the total relevant cost for the model starting without shortage, the necessary condition to minimize the total relevant cost is

$$\frac{\partial TC_1}{\partial t_1} = 0$$

, We get

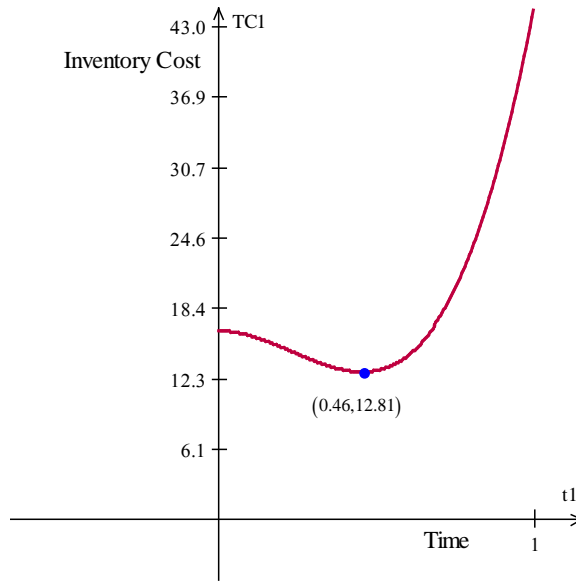
$$DP(2\beta+4)t_1^{2\beta+3} + DQ(2\beta+3)t_1^{2\beta+2} + DR(\beta+4)t_1^{\beta+3} + DS(\beta+3)t_1^{\beta+2}$$

$$+ D\alpha t_1^{\beta+1} + \frac{Db}{2} t_1^3 + 2Dt_1^2 - DTt_1 = 0 \quad \dots(13)$$

Using the software Mathematica, we can calculate the optimal value of  $t_1$  by equation (13) and the optimal value  $TC_1(t_1)$  of the total relevant cost is determined by equation (10). The optimal value of  $t_1$  satisfy the sufficient condition for minimizing total relevant

$$\text{cost } TC_1(t_1) \text{ is } \frac{\partial^2 TC_1}{\partial t_1^2} > 0 \quad \dots(14)$$

The sufficient condition is satisfied.



**Figure 1: Graphical representation of total relevant cost without shortage.**

**5.1.2 Numerical Example:**

Let us consider

$$a = \$1 / \text{unit}, b = \$0.5 / \text{unit}, S_c = \$1 / \text{unit} / \text{year}, d_c = \$5 / \text{unit}, \alpha = 0.02, \beta = 2, T = 1 \text{ year},$$

$$D = 100, \mu = 0.8 \text{ year}.$$

$$P = -0.00000625, Q = -0.00002, R = 0.0004, S = 0.003, A_1 = 0.99, A_2 = 16$$

Thus, the optimal value of  $t_1$  is  $t_1^* \rightarrow 0.46 < \mu$ . The optimal ordering quantity is  $OQ = 16.02$ . The minimum relevant cost is  $TC_1 = 12.81$

**5.1.3 Sensitivity Analysis:**

To know, how the optimal solution is affected by the values of parameters, we derive the sensitivity analysis for some parameters. The particular values of some parameters are increased or decreased by +25%, -25% and +50%, -50%. After that, we derive the value of  $t_1$  and  $TC_1$  with the help of increased or decreased values of  $S_c$  and  $d_c$ . The result of the minimum relevant cost is existing in the following table 1.

**Table: 1**

Parameters	Actual Values	50% Increased	50% Decreased	25% Increased	25% Decreased
$S_c$	1	1.5	0.5	1.25	0.75
$d_c$	5	7.5	2.5	6.25	3.75

$t_1^*$	0.46	0.55	0.31	0.51	0.4
$TC_1$	12.81	13.28	7.4	14.96	10.32
$OQ$	16.02	16.045	16.005	16.034	16.013

From the result of above table, we observe that total relevant cost and ordering quantity is much affected by deterioration cost and shortage cost, other parameters are less sensitive.

**5.2 Case II:  $t \geq \mu$**

Equation (1), solve by the following two ways:

$$\frac{dI_a(t)}{dt} + \theta I_a(t) = -Dt, \quad 0 \leq t \leq \mu, \quad I(\mu_-) = I(\mu_+) \quad \dots(i)$$

$$\frac{dI_a(t)}{dt} + \theta I_a(t) = -D\mu, \quad \mu \leq t \leq t_1, \quad I(t_1) = 0 \quad \dots(ii)$$

We have

$$\frac{dI_a(t)}{dt} + \alpha\beta t^{\beta-1} I_a(t) = -Dt, \quad 0 \leq t \leq \mu, \quad I(\mu_-) = I(\mu_+)$$

$$I_a(t) = De^{-\alpha t^\beta} \left\{ \frac{1}{2}(\mu^2 - t^2) + \frac{\alpha}{\beta+2}(\mu^{\beta+2} - t^{\beta+2}) + \mu \left( (t_1 - \mu) + \frac{\alpha}{\beta+1}(t_1^{\beta+1} - \mu^{\beta+1}) \right) \right\} \dots(15)$$

and

$$I_a(t) = e^{-\alpha t^\beta} D\mu \left[ (t_1 - t) + \frac{\alpha}{\beta+1}(t_1^{\beta+1} - t^{\beta+1}) \right], \quad \mu \leq t \leq t_1 \quad \dots(16)$$

From equation (2), we get

$$\frac{dI_b(t)}{dt} = -D\mu, \quad t_1 \leq t \leq T, \quad I_b(t_1) = 0 \quad I_b(t) = -D\mu(t - t_1)$$

Total deterioration amount during  $[0, t_1]$

$$D_c = D \int_0^\mu t e^{\alpha t^\beta} dt + D\mu \int_\mu^{t_1} e^{\alpha t^\beta} dt - D\mu \int_\mu^{t_1} dt = D \left[ S + \mu \frac{\alpha}{\beta+1} t_1^{\beta+1} \right] \quad \dots(18)$$

See Appendix-B

Total holding cost during  $[0, t_1]$  is

$$HC = \int_0^{t_1} H_1(t) I_a(t) dt = \int_0^\mu (a + bt) I_a(t) dt + \int_\mu^{t_1} (a + bt) I_a(t) dt$$

$$HC = aD \left[ \delta_1 + \gamma \left\{ (t_1 - \mu) + \frac{\alpha}{\beta+1}(t_1^{\beta+1} - \mu^{\beta+1}) \right\} + \left\{ \varepsilon + \frac{1}{2}\mu t_1^2 - t_1 \gamma + t_1^{\beta+2} \psi + t_1^{\beta+1} \eta + t_1^{2\beta+2} \kappa \right\} \right]$$

$$+ bD \left[ \pi + \rho \left( t_1 + \frac{\alpha}{\beta+1} t_1^{\beta+1} \right) + \left\{ \frac{\mu}{6} t_1^3 - \rho t_1 + \xi + t_1^{\beta+3} \tau + t_1^{\beta+1} \vartheta + t_1^{2\beta+3} \Omega \right\} \right]$$

See Appendix-B



$$\begin{aligned}
 HC &= aD \left[ \left( \delta_1 - \gamma\mu - \frac{\alpha\mu^{\beta+1}\gamma}{\beta+1} + \varepsilon \right) + \frac{1}{2} \mu t_1^2 + t_1^{\beta+1} \left( \frac{\alpha\gamma}{\beta+1} + \eta \right) + t_1^{\beta+2} \psi + t_1^{2\beta+2} \kappa \right] + \\
 &\quad bD \left[ \pi + \xi + t_1^{\beta+3} \tau + t_1^{\beta+1} \left( \frac{\alpha\rho}{\beta+1} + \vartheta \right) + t_1^{2\beta+3} \Omega + \frac{\mu}{6} t_1^3 \right] \\
 HC &= aD \left[ \frac{1}{2} \mu t_1^2 + t_1^{2\beta+2} \kappa + t_1^{\beta+2} \psi + t_1^{\beta+1} \Pi + \mathfrak{R} \right] + bD \left[ \frac{\mu}{6} t_1^3 + t_1^{2\beta+3} \Omega + t_1^{\beta+3} \tau + t_1^{\beta+1} \Upsilon + \Psi \right] \dots(19)
 \end{aligned}$$

See Appendix-B

Lost sale amount during  $[t_1, T]$  is

$$S_c = - \int_{t_1}^T I_b(t) dt = D\mu \int_{t_1}^T (t - t_1) dt = D\mu \left[ \frac{1}{2} (T^2 - t_1^2) - t_1 (T - t_1) \right] = D\mu \left( \frac{T^2}{2} + \frac{t_1^2}{2} - t_1 T \right) \dots(20)$$

Order quantity is

$$OQ = \int_0^{\mu} Dte^{\alpha t} dt + D\mu \int_{\mu}^{t_1} dt + D\mu \int_{t_1}^T (t - t_1) dt = D \left( \frac{1}{2} \mu t_1^2 + \mu t_1 - \mu t_1 T + Z_{12} \right) \dots(21)$$

Total cost during  $[0, T]$  = holding cost + lost sale amount + deterioration cost

$$\begin{aligned}
 TC_2(t_1) &= D \left[ a \left( \frac{1}{2} \mu t_1^2 + t_1^{2\beta+2} \kappa + t_1^{\beta+2} \psi + t_1^{\beta+1} \Pi + \mathfrak{R} \right) + \mu \left( \frac{T^2}{2} + \frac{t_1^2}{2} - t_1 T \right) \right] \\
 TC_2(t_1) &= HC + S_c + D_c \left[ + b \left( \frac{\mu}{6} t_1^3 + t_1^{2\beta+3} \Omega + t_1^{\beta+3} \tau + t_1^{\beta+1} \Upsilon + \Psi \right) + S + \frac{\alpha\mu}{\beta+1} t_1^{\beta+1} \right] \dots(22)
 \end{aligned}$$

**5.2.1 Solution:**

$$\frac{\partial TC_2}{\partial t_1} = D \left[ \begin{aligned} &a\mu t_1 + a(\beta+1)t_1^{\beta} \Pi + a(\beta+2)t_1^{\beta+1} \psi + a(2\beta+2)t_1^{2\beta+1} \kappa \\ &+ b(\beta+3)t_1^{\beta+2} \tau + b(\beta+1)t_1^{\beta} \Upsilon + b(2\beta+3)t_1^{2\beta+2} \Omega + \frac{b\mu}{2} t_1^2 \\ &+ \alpha\mu t_1^{\beta} + \mu(t_1 - T) \end{aligned} \right] \dots(23)$$

$$\frac{\partial^2 TC_2}{\partial t_1^2} = D \left[ \begin{aligned} &a\mu + a(\beta+1)\beta t_1^{\beta-1} \Pi + a(\beta+2)(\beta+2)t_1^{\beta} \psi + a(2\beta+2)(2\beta+1)t_1^{2\beta} \kappa \\ &+ b(\beta+3)(\beta+2)t_1^{\beta+1} \tau + b(\beta+1)\beta t_1^{\beta} \Upsilon + b(2\beta+3)(2\beta+2)t_1^{2\beta+1} \Omega + b\mu t_1 + \\ &+ \alpha\mu\beta t_1^{\beta-1} + \mu \end{aligned} \right] \dots(24)$$

Main objective to minimize the total relevant cost for the model starting without shortage, the necessary condition to minimize the total relevant cost is

$$\frac{\partial TC_2}{\partial t_1} = 0$$

, we get

$$\begin{aligned}
 &bD\Omega(2\beta+3)t_1^{2\beta+2} + aD\kappa(2\beta+2)t_1^{2\beta+1} + bD\tau(\beta+3)t_1^{\beta+2} + \frac{bD\mu}{2} t_1^2 \\
 &+ aD\psi(\beta+2)t_1^{\beta+1} + D((a\Pi + b\Upsilon)(\beta+1) + \alpha\mu)t_1^{\beta} + D\mu(a+1)t_1 - D\mu T = 0 \dots(25)
 \end{aligned}$$

Using the software Mathematica, we can calculate the optimal value of  $t_1$  by equation (25) and the optimal value  $TC_2(t_1)$  of the total relevant cost is determined by equation (22). The optimal value of  $t_1$  satisfy the sufficient condition for minimizing total relevant

$$\text{cost } TC_2(t_1) \text{ is } \frac{\partial^2 TC_2}{\partial t_1^2} > 0 \quad \dots(26)$$

The sufficient condition is satisfied.

**5.2.2 Numerical Example:**

Let us consider

$$a = \$1 / \text{unit}, b = \$0.5 / \text{unit}, S_c = \$1 / \text{unit} / \text{year}, d_c = \$5 / \text{unit}, \alpha = 0.02, \beta = 2, T = 1 \text{ year},$$

$$D = 100, \mu = 0.8 \text{ year}.$$

$$\delta_1 = 0.17, \gamma = \phi = 0.637, \varepsilon = 0.25, \psi = 0.0013, \eta = -0.0042, \kappa = -0.000018, \pi = -0.153,$$

$$\xi = 0.136, \rho = 0.25, \tau = 0.0016, \vartheta = -0.0034, \Omega = -0.000011, \Re = -0.092,$$

$$\Pi = 0.000047, \Upsilon = -0.0017, \Psi = -0.017, S = 0.32, Z_{12} = 0.082, S = 0.32$$

Thus, the optimal value of  $t_1$  is  $t_1^* \rightarrow 0.92 > \mu$ . The optimal ordering quantity is  $OQ = 42.06$ . The minimum relevant cost is  $TC_2 = 191.92$

VI. MODELS WITH SHORTAGE

Now, inventory model starting with shortage during the period  $[0, t_1]$  and is completely backlogged. Replenishment brings the inventory level up to  $Q$  after time  $t_1$ . The inventory level depletes and falls to zero at  $t = T$  because of demand and deterioration during  $[t_1, T]$ . Two cases occur

- (i)  $t_1 < \mu$
- (ii)  $t_1 \geq \mu$

**6.1 Case (i)  $t_1 < \mu$**

Therefore, the inventory  $I(t)$  is described by the system of differential equations during  $[0, T]$ :

$$\frac{dq_1(t)}{dt} = -D(t), \quad 0 \leq t \leq t_1, \quad q(0) = 0 \quad \dots(27)$$

$$\frac{dq_2(t)}{dt} + \theta q_2(t) = -Dt \quad t_1 \leq t \leq \mu, \quad q(\mu_-) = q(\mu_+) \quad \dots(28)$$

$$\frac{dq_3(t)}{dt} + \theta q_3(t) = -D\mu \quad \mu \leq t \leq T, \quad q(T) = 0 \quad \dots(29)$$

From equation (27), we have

$$q_1(t) = -D \int_0^t t dt = -\frac{D}{2} t^2, \quad 0 \leq t \leq t_1 \quad \dots(30)$$

From equation (28), we have

$$q_2(t) = e^{-\alpha t^\beta} D \left\{ \int_t^\mu t e^{\alpha t^\beta} dt + \mu \int_\mu^T e^{\alpha t^\beta} dt \right\} = e^{-\alpha t^\beta} D \left( Z_{13} - \frac{1}{2} t^2 - \frac{\alpha}{\beta+2} t^{\beta+2} \right), t_1 \leq t \leq \mu \dots (31)$$

See Appendix-C

From equation (29), we have

$$q_3(t) = e^{-\alpha t^\beta} D \mu \int_t^T e^{\alpha t^\beta} dt = e^{-\alpha t^\beta} D \mu \left\{ Z_{14} - t - \frac{\alpha}{\beta+1} t^{\beta+1} \right\}, \mu \leq t \leq T \dots (32)$$

See Appendix-C

Total deterioration amount during  $[t_1, T]$

$$D_c = e^{-\alpha t_1^\beta} \left\{ \int_{t_1}^\mu D t e^{\alpha t^\beta} dt + D \mu \int_\mu^T e^{\alpha t^\beta} dt \right\} = D \left[ (1 - \alpha t_1^\beta) \left\{ \frac{t_1^2}{2} + \frac{\alpha}{\beta+2} t_1^{\beta+2} + C_2 \right\} \right] \dots (33)$$

See Appendix-C

Total holding cost during  $[t_1, T]$  is

$$HC = \int_{t_1}^T (a + bt) q(t) dt = D \left[ \begin{aligned} & N_1 + \mu N_2 - a Z_{13} t_1 - \frac{1}{2} b Z_{13} t_1^2 + \frac{a}{6} t_1^3 + \frac{b}{8} t_1^4 + \left( \frac{\alpha b}{(\beta+2)(\beta+4)} - \frac{\alpha b}{2(\beta+4)} \right) t_1^{\beta+4} \\ & + \left( \frac{a\alpha}{(\beta+2)(\beta+3)} - \frac{a\alpha}{2(\beta+3)} \right) t_1^{\beta+3} + \frac{\alpha b Z_{13}}{(\beta+2)} t_1^{\beta+2} + \frac{a\alpha Z_{13}}{\beta+1} t_1^{\beta+1} \\ & - \frac{b\alpha^2}{(\beta+2)(2\beta+4)} t_1^{2\beta+4} - \frac{a\alpha^2}{(\beta+2)(2\beta+3)} t_1^{2\beta+3} \end{aligned} \right]$$

See Appendix-C

$$HC = D \left[ \begin{aligned} & N_1 + \mu N_2 - a Z_{13} t_1 - \frac{1}{2} b Z_{13} t_1^2 + \frac{a}{6} t_1^3 + \frac{b}{8} t_1^4 + N_3 t_1^{\beta+4} + N_4 t_1^{\beta+3} \\ & + \frac{\alpha b Z_{13}}{(\beta+2)} t_1^{\beta+2} + \frac{a\alpha Z_{13}}{\beta+1} t_1^{\beta+1} - N_5 t_1^{2\beta+4} - N_6 t_1^{2\beta+3} \end{aligned} \right] \dots (34)$$

Lost sale amount during  $[0, t_1]$  is

$$S_c = D \int_0^{t_1} (t_1 - t) t dt = D \left\{ \frac{1}{2} t_1^3 - \frac{1}{3} t_1^3 \right\} = \frac{D}{6} t_1^3 \dots (35)$$

Order quantity is

$$OQ = D \int_0^{t_1} t dt + e^{-\alpha t^\beta} \left\{ \int_{t_1}^\mu D t (1 + \alpha t^\beta) dt + D \mu \int_\mu^T (1 + \alpha t^\beta) dt \right\}$$

$$OQ = D \left[ \begin{aligned} & \frac{1}{2} t_1^2 + (1 - \alpha t^\beta) \left( \frac{1}{2} (\mu^2 - t_1^2) + \frac{\alpha}{\beta+2} (\mu^{\beta+2} - t_1^{\beta+2}) \right) \\ & + \mu (T - \mu) + \frac{\alpha \mu}{\beta+1} (T^{\beta+1} - \mu^{\beta+1}) \end{aligned} \right] \dots (36)$$

Total cost during  $[0, T]$  = holding cost + lost sales amount + deterioration cost

$$TC_1'(t_1) = HC + S_c + D_c \left[ \begin{aligned} & N_1 + \mu N_2 - aZ_{13}t_1 - \frac{1}{2}bZ_{13}t_1^2 + \frac{a}{6}t_1^3 + \frac{b}{8}t_1^4 + N_3t_1^{\beta+4} + N_4t_1^{\beta+3} + \frac{\alpha bZ_{13}}{(\beta+2)}t_1^{\beta+2} \\ & + \frac{\alpha aZ_{13}}{\beta+1}t_1^{\beta+1} - N_5t_1^{2\beta+4} - N_6t_1^{2\beta+3} + \frac{1}{6}t_1^3 + e^{-\alpha t_1^\beta} \left( \frac{t_1^2}{2} + \frac{\alpha}{\beta+2}t_1^{\beta+2} + C_2 \right) \end{aligned} \right] \dots(37)$$

**6.1.1 Solution:**

$$\frac{\partial TC_1'}{\partial t_1} = D \left[ \begin{aligned} & -aZ_{13} - bZ_{13}t_1 + \frac{a}{2}t_1^2 + \frac{b}{4}t_1^3 + N_3(\beta+4)t_1^{\beta+3} + N_4(\beta+3)t_1^{\beta+2} \\ & + \alpha bZ_{13}t_1^{\beta+1} + \alpha aZ_{13}t_1^\beta - N_5(2\beta+4)t_1^{2\beta+3} - N_6(2\beta+3)t_1^{2\beta+2} \\ & + \frac{1}{2}t_1^2 + (1-\alpha t_1^\beta)(t_1 + \alpha t_1^{\beta+1}) - \alpha \beta t_1^{\beta-1} \left( \frac{t_1^2}{2} + \frac{\alpha}{\beta+2}t_1^{\beta+2} + C_2 \right) \end{aligned} \right] \dots(38)$$

$$\frac{\partial^2 TC_1'}{\partial t_1^2} = D \left[ \begin{aligned} & \frac{3b}{4}t_1^2 + N_3(\beta+4)(\beta+3)t_1^{\beta+2} + N_4(\beta+3)(\beta+2)t_1^{\beta+1} \\ & + \alpha bZ_{13}(\beta+1)t_1^\beta + \alpha aZ_{13}\beta t_1^{\beta-1} - N_5(2\beta+4)(2\beta+3)t_1^{2\beta+2} \\ & - N_6(2\beta+3)(2\beta+2)t_1^{2\beta+1} + (1-\alpha t_1^\beta)(1+\alpha(\beta+1)t_1^\beta) \\ & - \alpha \beta t_1^{\beta-1}(t_1 + \alpha t_1^{\beta+1}) - \alpha \beta t_1^{\beta-1}(t_1 + \alpha t_1^{\beta+1}) - bZ_{13} + at_1 \\ & - \alpha \beta (\beta-1)t_1^\beta \left( \frac{t_1^2}{2} + \frac{\alpha}{\beta+2}t_1^{\beta+2} + C_2 \right) + t_1 \end{aligned} \right] \dots(39)$$

Main objective to minimize the total relevant cost for the model starting with shortage, the necessary condition to minimize the total relevant cost is

$$\frac{\partial TC_1'}{\partial t_1} = 0$$

, we get

$$D \left[ \begin{aligned} & -aZ_{13} - bZ_{13}t_1 + \frac{a}{2}t_1^2 + \frac{b}{4}t_1^3 + N_3(\beta+4)t_1^{\beta+3} + N_4(\beta+3)t_1^{\beta+2} \\ & + \alpha bZ_{13}t_1^{\beta+1} + \alpha aZ_{13}t_1^\beta - N_5(2\beta+4)t_1^{2\beta+3} - N_6(2\beta+3)t_1^{2\beta+2} \\ & + \frac{1}{2}t_1^2 + (1-\alpha t_1^\beta)(t_1 + \alpha t_1^{\beta+1}) - \alpha \beta t_1^{\beta-1} \left( \frac{t_1^2}{2} + \frac{\alpha}{\beta+2}t_1^{\beta+2} + C_2 \right) \end{aligned} \right] = 0 \dots(40)$$

Using the software Mathematica, we can calculate the optimal value of  $t_1$  by equation (40) and the optimal value  $TC_1'(t_1)$  of the total relevant cost is determined by equation (37). The optimal value of  $t_1$  satisfy the sufficient condition for minimizing total relevant

$$\text{cost } TC_1'(t_1) \text{ is } \frac{\partial^2 TC_1'}{\partial t_1^2} > 0 \dots(41)$$

The sufficient condition is satisfied.

**6.1.2 Numerical Example:**

Let us consider

$$a = \$1 / \text{unit}, b = \$0.5 / \text{unit}, S_c = \$1 / \text{unit}, d_c = \$5 / \text{unit}, \alpha = 0.02 \beta = 2,$$

$$T = 1 \text{ year}, D = 100, \delta = 1, \mu = 0.8 \text{ year}.$$

$$Z_{13} = 0.48, Z_{14} = 1.006, C_2 = 0.162, N_1 = 0.35, N_2 = 0.083, N_3 = -0.00042, N_4 = -0.001,$$

$$N_5 = 0.00000625, N_6 = 0.000014$$

Thus, the optimal value of  $t_1$  is  $t_1^* \rightarrow 0.099 < \mu$ . The optimal ordering quantity is  $OQ = 48.5$ . The minimum relevant cost is  $TC_1^* = 118.4$

**6.2 Case (ii)  $t_1 \geq \mu$**

Therefore, the inventory  $I(t)$  is described by the system of differential equations during  $[0, T]$ :

$$\frac{dq_1(t)}{dt} = -D(t), \quad 0 \leq t \leq \mu, \quad q(0) = 0 \quad \dots(42)$$

$$\frac{dq_2(t)}{dt} = -D(\mu), \quad \mu \leq t \leq t_1, \quad q(\mu_-) = q(\mu_+) \quad \dots(43)$$

$$\frac{dq_3(t)}{dt} + \theta q(t) = -D\mu, \quad t_1 \leq t \leq T, \quad q(T) = 0 \quad \dots(44)$$

From equation (42), we have

$$q_1(t) = -D \int_0^t t dt = -\frac{D}{2} t^2, \quad 0 \leq t \leq \mu \quad \dots(45)$$

From equation (43), we have

$$q_2(t) = -D \int_0^\mu t dt - D\mu \int_\mu^t dt = -D \left( \mu t - \frac{1}{2} \mu^2 \right), \quad \mu \leq t \leq t_1 \quad \dots(46)$$

From equation (44), we have

$$q_3(t) = e^{-\alpha t} D\mu \int_t^T e^{\alpha t} dt = e^{-\alpha t} D\mu \left\{ M_1 - t - \frac{\alpha}{\beta + 1} t^{\beta + 1} \right\}, \quad t_1 \leq t \leq T \quad \dots(47)$$

*See Appendix-D*

Total deterioration amount during  $[t_1, T]$

$$D_c = e^{-\alpha t_1} D\mu \int_{t_1}^T e^{\alpha t} dt - (T - t_1) dt = D\mu \left\{ (1 - \alpha t_1^\beta) \left( M_1 - t_1 - \frac{\alpha}{\beta + 1} t_1^{\beta + 1} \right) - (T - t_1) \right\} \dots(48)$$

Total holding cost during  $[t_1, T]$  is

$$HC = \int_{t_1}^T (a + bt) q_3(t) dt = a \left[ \int_{t_1}^T q_3(t) dt \right] + b \left[ \int_{t_1}^T t q_3(t) dt \right]$$

$$HC = D\mu \left[ \begin{aligned} & D_1 + a \left( -M_1 t_1 + \frac{1}{2} t_1^2 + D_2 t_1^{\beta + 2} + \frac{\alpha M_1}{(\beta + 1)} t_1^{\beta + 1} - D_3 t_1^{2\beta + 2} \right) \\ & + b \left( -\frac{M_1}{2} t_1^2 + \frac{1}{3} t_1^3 + D_4 t_1^{\beta + 3} + \frac{\alpha M_1}{(\beta + 2)} t_1^{\beta + 2} - D_5 t_1^{2\beta + 3} \right) \end{aligned} \right] \quad \dots(49)$$

Lost sale amount during  $[0, t_1]$  is

$$S_c = \int_0^\mu q_1(t) dt + \int_\mu^{t_1} q_2(t) dt = D \left[ \frac{1}{6} \mu^3 + \frac{1}{2} \mu t_1^2 - \frac{1}{2} \mu^2 t_1 \right] \quad \dots(50)$$

Ordered quantity is

$$OQ = D \int_0^\mu t dt + D \mu \int_\mu^{t_1} dt + e^{-\alpha t_1^\beta} D \mu \int_{t_1}^T e^{\alpha t^\beta} dt$$

$$OQ = D \left[ -\frac{1}{2} \mu^2 + \mu t_1 + e^{-\alpha t_1^\beta} \mu \left( (T - t_1) + \frac{\alpha}{\beta + 1} (T^{\beta+1} - t_1^{\beta+1}) \right) \right] \quad \dots(51)$$

Total cost during  $[0, T]$  = holding cost + lost sale amount + deterioration cost

$$TC_2'(t_1) = D \left[ \begin{aligned} & \frac{b\mu}{3} t_1^3 - b\mu D_5 t_1^{2\beta+3} + b\mu D_4 t_1^{\beta+3} - a\mu D_3 t_1^{2\beta+2} + \frac{\alpha^2 \mu}{\beta+1} t_1^{2\beta+1} \\ & + \mu \left( aD_2 + \frac{\alpha b M_1}{(\beta+2)} \right) t_1^{\beta+2} + \alpha \mu \left( \frac{aM_1}{(\beta+1)} - \frac{1}{\beta+1} + 1 \right) t_1^{\beta+1} \\ & - \alpha \mu M_1 t_1^\beta + \frac{\mu}{2} (1+a-bM_1) t_1^2 - \mu \left( aM_1 + \frac{\mu}{2} \right) t_1 \\ & + \mu \left( \frac{1}{6} \mu^2 - T + D_1 + M_1 \right) \end{aligned} \right] \quad \dots(52)$$

$$TC_2'(t_1) = HC + S_c + D_c$$

**6.2.1 Solution:**

$$\frac{\partial TC_2'}{\partial t_1} = D \left[ \begin{aligned} & b\mu t_1^2 - b\mu D_5 (2\beta+3) t_1^{2\beta+2} + b\mu D_4 (\beta+3) t_1^{\beta+2} - a\mu D_3 (2\beta+2) t_1^{2\beta+1} \\ & + \frac{\alpha^2 \mu (2\beta+1)}{\beta+1} t_1^{2\beta} + \mu (\beta+2) \left( aD_2 + \frac{\alpha b M_1}{(\beta+2)} \right) t_1^{\beta+1} + \alpha \mu (\beta+1) \left( \frac{aM_1}{(\beta+1)} - \frac{1}{\beta+1} + 1 \right) t_1^\beta \\ & - \alpha \mu \beta M_1 t_1^{\beta-1} + \mu (1+a-bM_1) t_1^1 - \mu \left( aM_1 + \frac{\mu}{2} \right) \end{aligned} \right] \quad \dots(53)$$

$$\frac{\partial^2 TC_2'}{\partial t_1^2} = D \left[ \begin{aligned} & 2b\mu t_1 - b\mu D_5 (2\beta+2)(2\beta+3) t_1^{2\beta+1} + b\mu D_4 (\beta+2)(\beta+3) t_1^{\beta+1} \\ & - a\mu D_3 (2\beta+1)(2\beta+2) t_1^{2\beta} + \frac{2\alpha^2 \mu \beta (2\beta+1)}{\beta+1} t_1^{2\beta-1} + \mu (\beta+1)(\beta+2) \left( aD_2 + \frac{\alpha b M_1}{(\beta+2)} \right) t_1^\beta \\ & + \alpha \mu \beta (\beta+1) \left( \frac{aM_1}{(\beta+1)} - \frac{1}{\beta+1} + 1 \right) t_1^{\beta-1} - \alpha \mu \beta \beta - 1 M_1 t_1^{\beta-2} + \mu (1+a-bM_1) \end{aligned} \right] \quad \dots(54)$$

Main objective to minimize the total relevant cost for the model starting with shortage, the necessary condition to minimize the total relevant cost is

$$\frac{\partial TC_2'}{\partial t_1} = 0$$

, we get

$$D \left[ \begin{array}{l} b\mu t_1^2 - b\mu D_5(2\beta + 3)t_1^{2\beta+2} + b\mu D_4(\beta + 3)t_1^{\beta+2} - a\mu D_3(2\beta + 2)t_1^{2\beta+1} \\ + \frac{\alpha^2 \mu(2\beta + 1)}{\beta + 1} t_1^{2\beta} + \mu(\beta + 2) \left( aD_2 + \frac{\alpha b M_1}{(\beta + 2)} \right) t_1^{\beta+1} \\ + \alpha\mu(\beta + 1) \left( \frac{aM_1}{(\beta + 1)} - \frac{1}{\beta + 1} + 1 \right) t_1^\beta - \alpha\mu\beta M_1 t_1^{\beta-1} + \mu(1 + a - bM_1)t_1^1 \\ - \mu \left( aM_1 + \frac{\mu}{2} \right) \end{array} \right] = 0 \quad \dots(55)$$

Using the software Mathematica, we can calculate the optimal value of  $t_1$  by equation (55) and the optimal value  $TC_2'(t_1)$  of the total relevant cost is determined by equation (52). The optimal value of  $t_1$  satisfy the sufficient condition for minimizing total relevant

$$\text{cost } TC_2'(t_1)_{is} \frac{\partial^2 TC_2'}{\partial t_1^2} > 0 \quad \dots(56)$$

The sufficient condition is satisfied.

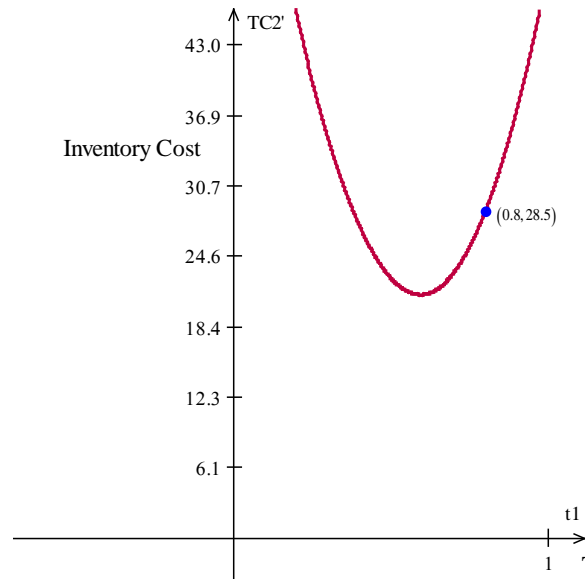


Figure 2: Graphical representation of total relevant cost with shortage.

### 6.2.2 Numerical Example:

Let us consider

$$a = \$1 / \text{unit}, b = \$0.5 / \text{unit}, S_c = \$1 / \text{unit}, d_c = \$5 / \text{unit}, \alpha = 0.02 \beta = 2$$

$$T = 1 \text{ year}, D = 100, \delta = 1, \mu = 0.8 \text{ year.}$$

$$M_1 = 1.007, D_1 = 0.587, D_2 = -0.003, D_3 = 0.00002, D_4 = -0.0026, D_5 = 0.000019$$

We find  $t_1 \rightarrow 0.62$ , which does not satisfy  $t_1 \geq \mu$ , so the maximum point is  $\max\{t_1, \mu\} = \mu$ . Thus, the optimal value of  $t_1$  is  $t_1^* \rightarrow 0.8 = \mu$ . The optimal ordering quantity is  $OQ^* = 48.05$ . The minimum relevant cost is  $TC_2^* = 28.5$ .

**6.2.3 Sensitivity Analysis:**

To know, how the optimal solution is affected by the values of parameters, we derive the sensitivity analysis for some parameters. The particular values of some parameters are increased or decreased by +25%, -25% and +50%, -50%. After that, we derive the value of  $t_1$  and  $TC_1$  with the help of increased or decreased values of  $S_c$  and  $d_c$ . The result of the minimum relevant cost is existing in the following table 2.

**Table: 2**

Parameters	Actual Values	+50% Increased	-50% Decreased	+25% Increased	-25% Decreased
$S_c$	1	1.5	0.5	1.25	0.75
$d_c$	5	7.5	2.5	6.25	3.75
$t_1^*$	0.8	0.8	0.8	0.8	0.8
$TC_1^*$	28.5	41.5	15.5	35.0	22.0
$OQ^*$	48.05	48.05	48.05	48.05	48.05

From the result of above table, we observe that total relevant cost and ordering quantity is much affected by deterioration cost and shortage cost, other parameters are less sensitive.

**VII. CONCLUSION**

We developed order level inventory models with time varying holding cost for weibull deteriorating items. We considered ramp-type demand rate and holding cost is not constant varying over time. The deteriorating item is deteriorated with two parameters weibull distribution deterioration. The models are developed under two different policies (i) without shortage and (ii) with shortage, which is completely backlogged. The total relevant cost with constant holding cost is less than the total relevant cost with time varying holding cost. The total inventory cost with constant holding cost is more realistic than the total inventory cost with time varying holding cost. Advance research in this way can be carried out such as stochastic demand and finite replenishment rate, quantity discounts and permissible delay in payments.

**Appendix-A:**

$$P = -\frac{\alpha^2 b}{2(\beta + 2)^2}, R = \frac{\alpha b}{2(\beta + 2)} - \frac{b\alpha}{(\beta + 2)(\beta + 4)} - \frac{\alpha b}{2(\beta + 2)} + \frac{\alpha b}{2(\beta + 4)}$$

Where,

$$Q = \frac{\alpha\alpha^2}{(\beta + 2)(2\beta + 3)} - \frac{\alpha\alpha^2}{(\beta + 1)(\beta + 2)}, S = \frac{\alpha\alpha}{\beta + 2} - \frac{\alpha\alpha}{(\beta + 2)(\beta + 3)} - \frac{\alpha\alpha}{2(\beta + 1)} + \frac{\alpha\alpha}{2(\beta + 3)}$$

$$A_1 = \mu(3T^2 - 3T\mu + \mu^2), A_2 = \frac{D}{2}\mu^2 + D\mu(T - \mu)$$

**Appendix-B:**

Where,

$$S = \frac{\mu^2}{2} + \frac{\alpha}{\beta + 2}\mu^{\beta + 2} - \frac{\alpha\mu^{\beta + 2}}{\beta + 1}$$



$$\delta_1 = \frac{\mu^3}{3} + \frac{\alpha(\beta+2)\mu^{\beta+3}}{(\beta+1)(\beta+3)} - \frac{(\beta+2)\alpha^2\mu^{2\beta+3}}{(\beta+1)(2\beta+3)}, \gamma = \mu^2 - \frac{\alpha\mu^{\beta+2}}{(\beta+1)}, \varepsilon = \frac{\mu^3}{2} - \frac{\alpha\mu^2}{\beta+1}$$

$$+ \frac{\alpha\mu^{\beta+3}}{(\beta+1)(\beta+2)}, \psi = \frac{2\alpha\mu}{\beta+2} - \frac{\alpha\mu}{(\beta+1)(\beta+2)} - \frac{\alpha\mu}{\beta+1}, \eta = \frac{\alpha^2\mu^{\beta+2}}{(\beta+1)^2} - \frac{\alpha\mu^2}{\beta+1},$$

$$\kappa = \frac{\alpha^2\mu}{(\beta+1)(2\beta+2)} - \frac{\alpha^2\mu}{(\beta+1)^2}, \pi = \frac{\mu^4}{8} + \frac{\alpha\beta\mu^{\beta+4}}{2(\beta+2)(\beta+4)} - \frac{\alpha^2\mu^{2\beta+4}}{2(\beta+2)^2} - \left( \frac{\mu^3}{2} - \frac{\alpha\mu^{\beta+3}}{(\beta+2)} \right)$$

$$\left( \mu + \frac{\alpha\mu^{\beta+1}}{\beta+1} \right), \vartheta = \frac{\alpha^2\mu^{\beta+3}}{(\beta+1)(\beta+2)} - \frac{\alpha\mu^3}{(\beta+1)}, \rho = \frac{\mu^3}{2} - \frac{\alpha\mu^{\beta+3}}{(\beta+2)}, \xi = \frac{\mu^4}{3} + \frac{\alpha\mu^{\beta+4}}{(\beta+1)(\beta+3)}$$

$$- \frac{\alpha\mu^{\beta+4}}{\beta+3} - \frac{\alpha^2\mu^{2\beta+4}}{(\beta+1)(2\beta+3)}, \tau = \frac{\alpha\mu}{(\beta+1)} \left( \frac{1}{2} - \frac{\alpha}{\beta+2} + \frac{\alpha-1}{\beta+3} \right),$$

$$\Omega = \frac{\alpha^2\mu}{(\beta+1)(2\beta+3)} - \frac{\alpha^2\mu}{(\beta+1)(\beta+2)}$$

$$\Re = \delta_1 - \gamma\mu - \frac{\alpha\mu^{\beta+1}\gamma}{\beta+1} + \varepsilon, \Pi = \frac{\alpha\gamma}{\beta+1} + \eta, \Upsilon = \frac{\alpha\rho}{\beta+1} + \vartheta, \Psi = \pi + \xi$$

$$Z_{12} = \frac{\mu T^2}{2} - \frac{\mu^2}{2} + \frac{\alpha\mu^{\beta+2}}{\beta+2}$$

**Appendix-C:**

Where

$$Z_{13} = \frac{1}{2}\mu^2 + \frac{\alpha}{\beta+2}\mu^{\beta+2} + \mu \left\{ (T-\mu) + \frac{\alpha}{\beta+1}(T^{\beta+1} - \mu^{\beta+1}) \right\}$$

$$Z_{14} = T + \frac{\alpha}{\beta+1}T^{\beta+1}, \quad C_2 = \mu \left( T - \mu + \frac{\alpha}{\beta+1}(T^{\beta+1} - \mu^{\beta+1}) \right)$$

$$N_1 = \left[ \begin{aligned} & aZ_{13}\mu - \frac{a\mu^3}{6} - \frac{a\alpha\mu^{\beta+3}}{(\beta+2)(\beta+3)} - \frac{a\alpha Z_{13}\mu^{\beta+1}}{\beta+1} + \frac{a\alpha\mu^{\beta+3}}{2(\beta+3)} + \frac{a\alpha^2\mu^{2\beta+3}}{(\beta+2)(2\beta+3)} \\ & + \frac{bZ_{13}\mu^2}{2} - \frac{b\mu^4}{8} - \frac{ab\mu^{\beta+4}}{(\beta+2)(\beta+4)} - \frac{abZ_{13}\mu^{\beta+2}}{(\beta+2)} + \frac{ab\mu^{\beta+4}}{2(\beta+4)} + \frac{b\alpha^2\mu^{2\beta+4}}{(\beta+2)(2\beta+4)} \end{aligned} \right]$$

$$N_2 = \left[ \begin{aligned} & aZ_{14}(T-\mu) - \frac{a\alpha(T^{\beta+2} - \mu^{\beta+2})}{(\beta+1)(\beta+2)} - \frac{a\alpha Z_{14}(T^{\beta+1} - \mu^{\beta+1})}{(\beta+1)} + \frac{a\alpha(T^{\beta+2} - \mu^{\beta+2})}{(\beta+2)} \\ & + \frac{a\alpha^2(T^{2\beta+2} - \mu^{2\beta+2})}{(\beta+1)(2\beta+2)} + \frac{bZ_{14}(T^2 - \mu^2)}{2} - \frac{b(T^3 - \mu^3)}{3} - \frac{b\alpha(T^{\beta+3} - \mu^{\beta+3})}{(\beta+1)(\beta+3)} \\ & - \frac{abZ_{14}(T^{\beta+2} - \mu^{\beta+2})}{\beta+2} + \frac{ab(T^{\beta+3} - \mu^{\beta+3})}{(\beta+3)} + \frac{b\alpha^2(T^{2\beta+3} - \mu^{2\beta+3})}{(\beta+1)(2\beta+3)} - \frac{a(T^2 - \mu^2)}{2} \end{aligned} \right]$$

$$N_3 = \frac{ab}{(\beta+2)(\beta+4)} - \frac{ab}{2(\beta+4)}, N_4 = \frac{a\alpha}{(\beta+2)(\beta+3)} - \frac{a\alpha}{2(\beta+3)}, N_5 = \frac{b\alpha^2}{(\beta+2)(2\beta+4)}, N_6 = \frac{a\alpha^2}{(\beta+2)(2\beta+3)}$$

**See Appendix-D:**

$$M_1 = T + \frac{\alpha}{\beta + 1} T^{\beta + 1}$$

Where,

$$D_1 = a \left\{ M_1 T - \frac{1}{2} T^2 - \frac{\alpha}{(\beta + 1)(\beta + 2)} T^{\beta + 2} - \frac{\alpha M_1}{(\beta + 1)} T^{\beta + 1} + \frac{\alpha}{(\beta + 2)} T^{\beta + 2} + \frac{\alpha^2}{(\beta + 1)(2\beta + 2)} T^{2\beta + 2} \right\} +$$

$$b \left\{ \frac{M_1}{2} T^2 - \frac{1}{3} T^3 - \frac{\alpha}{(\beta + 1)(\beta + 3)} T^{\beta + 3} - \frac{\alpha M_1}{(\beta + 2)} T^{\beta + 2} + \frac{\alpha}{(\beta + 3)} T^{\beta + 3} + \frac{\alpha^2}{(\beta + 1)(2\beta + 3)} T^{2\beta + 3} \right\}$$

$$D_2 = \frac{\alpha}{(\beta + 1)(\beta + 2)} - \frac{\alpha}{(\beta + 2)}, D_3 = \frac{\alpha^2}{(\beta + 1)(2\beta + 2)}, D_4 = \frac{\alpha}{(\beta + 1)(\beta + 3)} - \frac{\alpha}{(\beta + 3)},$$

$$D_5 = \frac{\alpha^2}{(\beta + 1)(2\beta + 3)}$$

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**AUTHORS**

**First Author** – Ritu Raj, Research Scholar, Centre for Mathematical Sciences, Banasthali University, P.O. Banasthali Vidyapith, Banasthali – 304022, Rajasthan, India, e-mail: rrituiit@gmail.com, Mob:09711717006.

**Second Author** – Naresh Kumar Kaliraman, Research Scholar, Centre for Mathematical Sciences, Banasthali University, P.O. Banasthali Vidyapith, Banasthali – 304022, Rajasthan, India, e-mail: dr.nareshkumar123@gmail.com, Mob:09891008069.

**Third Author** – Dr Shalini Chandra, Associate Professor, Centre for Mathematical Sciences, Banasthali University, P.O. Banasthali Vidyapith, Banasthali – 304022, Rajasthan, India, e-mail: chandrshalini@gmail.com, Mob: 07891434849.

**Fourth Author** – Dr Harish Chaudhary, Assistant Professor, Department of Management Studies, Indian Institute of Technology, Delhi, New Delhi-110016, India, e-mail: hciitd@gmail.com, Mob: 09911555875.



# A Study to assess the effectiveness of foot care instruction on the knowledge among diabetic patients in a selected community

V Anilvince \* Pallela Narayana Someshwara Rao\*\* N Meenakshi Sundaram \*\*\*

\* MSc Nursing, R.V.S. College of Nursing, R.V.S Educational Trust, Sulur, Coimbatore, Tamilnadu, India.

\*\* Assistant Professor, Department of Surgery, Sri Muthukumar Medical College, Chikarapuram, Mangadu, Chennai, Tamilnadu, India.

\*\*\* Professor, R.V.S. College of Nursing, R.V.S Educational Trust, Sulur, Coimbatore, Tamilnadu, India.

**Abstract-** Global burden of diabetes mellitus is increasing every day.

In India diabetes mellitus has become an epidemic with more than 67 million diabetic individuals currently diagnosed with the disease. Patients are losing their savings because of the complications of diabetes like ischemic heart disease, myocardial infarction, chronic kidney disease, diabetic retinopathy and diabetic foot ulcer. Among these, foot ulcer being a complication is also a social stigma. At any given moment, between 4-10% of diabetics have a foot ulcer. In 3-5% of cases, ulcer leads to amputation. Hence resulting in lifelong disability and dependency.

This study was done to emphasize the importance of education in preventing foot ulcer among the diabetic patients. A sensitized patient towards the complications will have less chances of landing up in amputation. Hence, video demonstration was used as a medium of instruction and pre-test and post test were conducted on the study population with control sample. The difference in gain of knowledge was proven by the improved scores in post-test in the experiment group.

**AIM:** To assess the effectiveness of foot care instruction on knowledge among the patients with diabetes mellitus in a selected community at kanyakumari district.

**RESULTS:** In the experimental group significant mean score difference was seen between pre-intervention and post-intervention knowledge status. Significant difference is seen in all the areas of knowledge like basic diabetic knowledge ( $t=15^{\text{th}}$  day- 8.76,  $30^{\text{th}}$  day- 10.44  $df=58$   $P < 0.05$ ), diabetic management ( $t=15^{\text{th}}$  day- 9.55,  $30^{\text{th}}$  day- 11.77  $df=58$   $P < 0.05$ ), foot care ( $t=15^{\text{th}}$  day- 10.68,  $30^{\text{th}}$  day- 10.99  $df=58$   $P < 0.05$ ), and foot risk assessment ( $t=15^{\text{th}}$  day- 12.24,  $30^{\text{th}}$  day- 13.99  $df=58$   $P < 0.05$ ).

**CONCLUSION:** The study concluded that teaching with video demonstration had an effect on diabetic patients. It improved their knowledge regarding diabetic foot care and ensuring the safety of the patients and minimizing the risk of diabetic foot ulcer and amputation.

**Index Terms-** diabetes, diabetic foot care, education, knowledge, prevention.

## I. INTRODUCTION

In 2011 diabetes resulted in 1.4 million deaths worldwide, making it the 8th leading cause of death. The number of people with diabetes is expected to rise to 592 million by 2035. Untreated, diabetes can cause many complications. Serious long-term complications include heart disease, kidney failure, and damage to the eyes and diabetic foot ulcer. The term "Diabetic Foot" is used to refer to a variety of pathologic conditions that may affect the feet of people with diabetes. All Diabetes mellitus patients require effective education regarding prevention of foot injuries, foot care because diabetes initially causes poor circulation and nerve damage and leads to injury. Nerve damage caused by the high levels of glucose in blood can lead to loss of circulation, pain, tingling and burning sensation in the feet. Diabetes patient feet become cold due to less blood circulation. In diabetic patients, foot ulcer occurs because of default treatment and not giving proper attention and care of feet. Diabetic patients may not feel pebbles, nails, small stones inside the shoes which may lead to small injuries. A sore or even blister may form with wearing of new shoes. Such injuries can cause ulcers, which do not properly heal and may get infected; therefore a little care everyday can prevent such foot problems.

Patients who have had a previous foot ulcer are more likely to have future foot complications. Nerve damage, poor circulation, and chronically high blood sugar levels also increase the likelihood of foot complications. It is important to wear shoes that fit well. Shoes that are too tight can cause pressure ulcers. Going barefoot, even in the home, should be avoided as this increases the risk of injury to the foot.

Diabetes can lead to many different types of foot complications, including athlete's foot (a fungal infection), calluses, bunions and other foot deformities, or ulcers that can range from a surface wound to a deep infection. Poor circulation — longstanding high blood sugar can damage blood vessels, decreasing blood flow to

the foot. This poor circulation can weaken the skin, contribute to the formation of ulcers, and impair wound healing. Some bacteria and fungi thrive on high levels of sugar in the bloodstream, and bacterial and fungal infections can break down the skin and complicate ulcers.

More serious complications include deep skin and bone infections. Gangrene (death and decay of tissue) is a very serious complication that may include infection; widespread gangrene may require foot amputation. Approximately 5 percent of men and women with diabetes eventually require amputation of a toe or foot. This tragic consequence can be prevented in most patients by managing blood sugar levels and daily foot care.

Nerve damage (neuropathy) — Elevated blood glucose levels over time can damage the nerves of the foot, decreasing a person's ability to notice pain and pressure. Without these sensations, it is easy to develop callused pressure spots and accidentally injure the skin, soft tissue, bones, and joints. Over time, bone and joint damage can dramatically alter the shape of the foot. Nerve damage, also called neuropathy, can also weaken certain foot muscles, further contributing to foot deformities.

In order to prevent these complications of diabetic foot, we devised a strategy of video demonstration to improve their knowledge regarding foot care.

## II. OBJECTIVES

- a) To describe the background of the diabetic patients who will be interviewed.
- b) To determine whether the foot care instruction makes any difference in the knowledge among diabetic patients

## III. MATERIALS AND METHODOLOGY

Study population: The population included all the adults with Type 2 Diabetes Mellitus residing in the selected community at Kanyakumari.

Study period: December 2013-2015.

Sample size: 60

Sample selection : Systematic random sampling method was used.

### INCLUSION CRITERIA

- Both males & females.
- Age above 35.
- Known case of diabetes above 2 years.
- Adults with Type 2 Diabetes Mellitus and those who are willing to participate in the study.
- Those who understood Tamil.

### EXCLUSION CRITERIA

- Those who had training about diabetic foot care.
- Those who were critically ill.
- Those who are bedridden.
- Those with the history of diabetic foot ulcers.
- Those with the history of peripheral vascular disorders or any other co morbid conditions.
- Hearing problem
- Visual problem

### PROCEDURE

Study was begun after approval from the institutional ethical board. A prior permission was obtained from the Municipal Council, primary health center, village health nurse, church committee, priest, clients and their family members.

The conceptual frame work used in this study was based on modified Orem's self care model (2004). A true experimental pre and post test control group design was used to determine the effect of individualized instruction on knowledge of diabetic foot ulcer among the adults with type 2 diabetes mellitus. The sample of 60 patients was selected who were on treatment for diabetes. Selection was done by systemic random sampling method. Samples were randomly assigned to control and the experimental group 30 in each. The data from the samples were collected by using a structured interview schedule and observational checklist. The data was analyzed using descriptive and inferential statistics. A pretest was given to both experimental and the control group. An individualized teaching with video demonstration on diabetic foot care was given to the experimental group after the pre-test. Post-test was conducted on 15<sup>th</sup> and 30<sup>th</sup> day. The knowledge was assessed in different areas like basic knowledge, management, foot care and foot risk assessment awareness for both the experimental and the study group.

Statistical analysis: By descriptive and inferential statistics.

Frequency and percentage distribution were used to analyze demographic variables and to assess the level of knowledge regarding diabetic foot care.

Mean and mean score percentages were used to determine the difference in the level of knowledge regarding diabetic foot care.

Unpaired 't' test was used to determine the significant difference in the level of knowledge in different areas on diabetic foot in experimental and the control group.

'Chi square test' was used to assess the association of selected demographic variables with the level of knowledge.

IV. RESULTS

A. Demographic characteristics of the sample

TABLE 1  
FREQUENCY AND PERCENTAGE DISTRIBUTION OF  
EXPERIMENTAL AND CONTROL GROUP ACCORDING TO  
PERSONAL CHARACTERISTICS  
N=60

S. No.	Demographic Characteristics	Experimental group (N=30)		Control group (N=30)	
		Frequency	Percentage	Frequency	Percentage
1.	Age				
	a) 36-45 Years	2	6.7	2	6.7
	b) 46-55 Years	9	30.0	7	23.3
	c) 56-65 Years	12	40.0	13	43.3
d) >65 Years	7	23.3	8	26.7	
2.	Sex				
	a) Male b) Female	13 17	43.3 56.7	15 15	50.0 50.0
3.	Education				
	a) Illiterate	5	16.7	2	6.7
	b) Primary	10	33.3	7	23.3
	c) Secondary	8	26.7	9	30.0
d) Collegiate	7	23.3	12	40.0	
4.	Marital status				
	a) Married	25	83.3	17	56.67
	b) Unmarried	2	6.7	4	13.33
	c) Widow	3	10.0	5	16.67
d) Separated	-	-	4	13.33	
5.	Occupation				
	a) Farmer	1	3.3	-	-
	b) Laborer	6	20.0	13	43.3
	c) Private employee	4	13.3	4	13.3
	d) Government employee	3	10.0	3	10.0
e) Unemployed	16	53.3	10	33.3	
6.	Religion				
	a) Hindu	2	6.7	1	3.3
	b) Christian c) Muslim	28 -	93.3 -	29 -	96.7 -

Table-1 Presents frequency and percentage distribution of experimental and control group samples according to personal characteristics

TABLE - 2  
FREQUENCY AND PERCENTAGE DISTRIBUTION OF  
EXPERIMENTAL AND CONTROL GROUP ACCORDING  
TO DISEASE CHARACTERISTICS  
N=30

SL No	Disease characteristics	Experimental group (N=30)		Control group (N=30)	
		Frequency	Percentage	Frequency	Percentage
1	History of Diabetes Mellitus	10	33.3	12	40.0
	a. 2-4Year	8	26.7	5	16.7
	b. 5-7 Years	4	13.3	8	26.7
	c. 8-10years d. >10years	8	26.7	5	16.7
2	Treatment measures followed	22	73.3	23	76.7
	a. Oral hypoglycemic Agents b. Insulin	4 4	13.3 13.3	1 6	3.3 20.0
3	Presence of comorbid illness	17	56.7	14	46.7
	a. No b. Yes	13	43.3	16	53.3
4	Smoking habit				
	a. No b. Yes	28 2	3.3 6.7	26 4	86.7 13.3
5	Blood sugar				
	a. 100-150mgs/dl	10	33.3	15	50.0
	b. 151-200 mgs/dl	8	26.7	7	23.3
	c. 201-250 mgs/dl	6	20.0	3	10.0
	d. 251-300 mgs/dl e. >301 mgs/dl	4 2	13.3 6.7	3 2	10.0 6.7
6	Results of latest urine test?				
	a. Not Done b. Done	30 -	100.0 -	30 -	100.0 -
7	Results of latest HbA1C?				
	a. Not Done b. Done	30 -	100.0 -	30 -	100.0 -

Table-2 shows the frequency and percentage distribution of experimental and control group according to disease condition and treatment information.

B. Comparison of the knowledge regarding Diabetic foot care in experimental and control group before and after intervention

TABLE – 3

FREQUENCY AND PERCENTAGE DISTRIBUTION OF EXPERIMENTAL AND CONTROL GROUP ACCORDING TO LEVEL OF OVERALL KNOWLEDGE BEFORE AND AFTER INTERVENTION

N = 60

Level of Knowledge	Experimental Group N=30						Control Group N=30					
	Before		After Intervention				Base Line		Subsequent			
	Interve		15 <sup>th</sup> day		30 <sup>th</sup> day		Line		15 <sup>th</sup> day		30 <sup>th</sup> day	
	F	%	F	%	F	%	F	%	F	%	F	%
Good	1	3.3	29	96.7	29	96.7	-	-	-	-	1	3.3
Fair	15	50.0	1	3.3	1	3.3	23	76.7	20	66.7	16	53.3
Poor	14	46.7	-	-	-	-	7	23.3	10	33.3	13	43.3

Graph 1

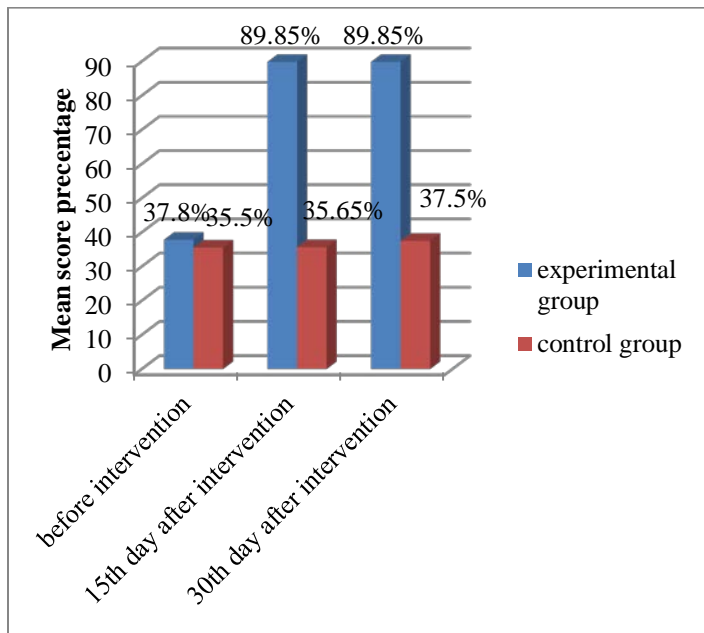


Figure 4.1 Overall mean knowledge score of experimental and control group regarding Diabetic foot care before and after intervention in percentage.

TABLE-4

MEAN KNOWLEDGE SCORE AND STANDARD DEVIATION OF EXPERIMENTAL AND CONTROL GROUP IN DIFFERENT ASPECTS OF DIABETIC FOOT CARE ON THE 30TH DAY AFTER INTERVENTION AND LEVEL OF SIGNIFICANCE

Aspects of Knowledge	Max Score	Experimental Group N = 30			Control Group N = 30			Un paired 't' value P<0.05 df=58	
		Mean score	Mean score %	SD	Mean score	Mean score %	SD		
Diabetes knowledge	4	3.77	94.15	0.51	1.87	46.65	0.86	1.90	10.44*
Diabetic management	5	3.90	78	0.55	1.50	30.00	0.97	2.40	11.77*
Foot care	6	5.53	92.22	0.73	2.17	36.10	1.51	3.37	10.99*
Foot risk assessment	5	4.77	95.32	0.43	1.60	32.00	1.16	1.17	13.99*

\*- Significant, NS- Not Significant.

Table 4 shows mean knowledge score and standard deviation of experimental and control group in different aspects of diabetic foot care on 30<sup>th</sup> day after intervention and level of significance.

TABLE-5

ASSOCIATION OF SELECTED DEMOGRAPHIC VARIABLES WITH OVERALL LEVEL OF KNOWLEDGE ON DIABETIC FOOT CARE BEFORE THE INTERVENTION

N=59

Sl. No	Characteristics	Level of Knowledge				χ <sup>2</sup> value	χ <sup>2</sup> table value p < 0.05
		Average		Poor			
		F	%	F	%		
1.	Age in years > 55	12	20.38	7	11.86	0.07 NS	Df=1 3.84
		26	44.08	14	23.72		
2.	Gender Male	18	30.51	10	16.94	0.01 NS	Df=1 3.84
		20	33.90	11	18.64		
3.	Educational Status Primary	9	15.25	14	23.72	3.21 NS	Df=1 3.84
		9	15.25	08	13.56		
		12	20.38	07	11.86		
4.	Occupation Employed	25	42.37	9	15.25	1.11 NS	Df=2 5.0
		13	22.03	12	20.38		

5.	Duration of Diabetes Mellitus				28.81	2.17	Df=1
	<7years	18	30.51	17	22.03	NS	3.84
	>7 years	12	20.34	13			
6.	Co morbid illness					0.81 NS	Df=1
	No	22	37.29	8	13.56		3.84
	Yes	16	27.12	13	22.03		

\*-Significant. NS- Not Significant

Table 5 shows the association between the demographic variables and knowledge of diabetic foot care before intervention.

The table shows that there was no significant association between the age, gender, educational status, occupation, duration of diabetes, co morbid illness and the knowledge before intervention.

### DISCUSSION

Nearly half i.e. 14(46.7%) of the samples in the experimental group had a poor level of knowledge and the remaining 15(50%) had fair knowledge, only one had good knowledge before intervention. After intervention on the 15<sup>th</sup> day and 30<sup>th</sup> day some improvement in the level of knowledge, with good level for 29 samples(96.7%) and to fair level for 1 sample(3.3%) fair level for 1 sample (3.3%).

In the control group, 23 samples (76.7%) had an average level of knowledge and the rest had a poor level of knowledge in the baseline observation.

On the 15<sup>th</sup> day in the control group, 20 samples (66.7%) had fair knowledge and the rest 10(33.3%) had poor level of knowledge in the subsequent observation.

On the 30<sup>th</sup> day, in the control group, 16 samples(53.3%) had a fair level of knowledge and the rest 13(43.3%) had poor level of knowledge, only one(3.3%) had good level of knowledge.

On the 30<sup>th</sup> day after intervention, the percentage mean knowledge score on various aspects of knowledge showed a variation from 78% to 95.32% in the experimental group, the highest score was observed in the aspect of foot risk assessment 95.32%, the second score in the aspect of diabetes knowledge 94.15%, the third score in the aspect of foot care 92.22% and the least score was in the aspect of diabetic management.

On the 30<sup>th</sup> day in the control group, all the four aspects of mean knowledge score ranged from 30 to 46.65 percentage, the highest score was observed in the aspect of diabetic knowledge 46.65%, the second score in the aspect of foot care 36.1%, third score in the aspect of foot risk assessment 32%, and the least score was in the aspect of diabetic management 30%.

Statistically, there was a significant difference in the mean knowledge score between the experimental and the control group in the aspect of diabetic knowledge [‘t’ value of 10.44(p<0.05, df=58)], in the aspect of diabetic management [‘t’ value of 11.77(p<0.05, df=58)], in the aspect of foot care [‘t’ value of 10.99(p<0.05, df=58)] and in the aspect of diabetic management [‘t’ value of 13.99(p<0.05, df=58)]. The experiment group had a

higher mean knowledge score with regard to control group on 30<sup>th</sup> day after intervention.

There was a significant difference in the aspects of diabetes knowledge, diabetes management, foot care and foot risk assessment between experimental and control group.

### CONCLUSION

In conclusion, since diabetic foot ulcers leading to foot amputation and below knee amputation have become a burden on health care system, we must act to increase the knowledge of foot care among diabetic patients.

If interventions like video display regarding foot care can cause a significant difference in knowledge (which in turn can decrease the incidence of foot ulcers and resulting amputations) among the diabetic patients as shown in this study, then we should adopt a nationwide policy on the same so that even the poorest of the patients is benefitted.

India’s economy will improve with less expenditure on these preventable complications.

This again emphasizes the fact that prevention is better than cure.

### Appendix

#### A. Scoring and interpretation of scoring

Structured interview question schedule on knowledge was designed and minimum obtainable score was 0 and maximum 20.

Score	Grading
14 to 20	Good
7 to 13	Average
0 to 6	Poor

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#### AUTHORS

**First Author** – Mr.V.Anilvince,Msc(N), Pothian vilai; Alanchy PO, Kanyakumari dist, [anilvince@gmail.com](mailto:anilvince@gmail.com).

**Second Author** – Pallela Narayana Someshwara Rao, MBBS,MS, Sri Muthukumaran Medical College, [pn\\_somesh@rediffmail.com](mailto:pn_somesh@rediffmail.com).

**Third Author** – ,Mr.N.Meenakshi sundaram, MSc (N), MBA.,R.V.S College of Nursing, R.V.S Institute of Health Sciences, Sulur, Coimbatore,

**Correspondence Author** – Pallela Narayana Someshwara Rao, MBBS,MS, Sri Muthukumaran Medical College, [pn\\_somesh@rediffmail.com](mailto:pn_somesh@rediffmail.com), 09884355367.

# An Efficient Packet Delivery Mechanism Using Secured Geo-cast Routing Approach for a VANET Network

Mrs. Deepika N Murthy<sup>1</sup>, Ms. E. Elavarasi<sup>2</sup>

\* M-tech Student, Dept. of ECE, AMC Engineering College Bangalore, India.

\*\* Asst. Professor, Dept. of ECE, AMC Engineering College Bangalore, India.

**Abstract-** In recent years, the innovation of Vehicular Ad-hoc Networks (VANET's) communication has become more prominent and provides a wide variety of services for effective communication, permitting individuals to impart the road information with one another. Vehicular Ad-hoc Networks are exceptional sort of Mobile Ad-hoc Networks (MANET's) in which nodes are profoundly motile, so the network topology changes very rapidly. Furthermore there is no limitation on the network size. All of these attributes have made VANET environment a challenge for developing routing protocols. For the better execution in networks, VANET requires a special support, which makes the network quick, secure and proficient. In order to frame the communication there are several routing protocols that provides optimal path for delivery of packets. In this paper, the Geo-cast routing protocols (GPRs) are applied on highways in view of on traffic environment. The two routing protocols i.e. Information Propagation Speed Analysis (IPSA) in Highway vehicular networks and Mobicast Routing (MR) for Highway Traffic Environment are examined. The path developments from the source node (vehicle) to the destination node based on different criteria are considered. The outcomes are dissected utilizing MATLAB simulation.

**Index Terms-** Vehicular Ad-hoc networks, CAGR, IPSA and MR.

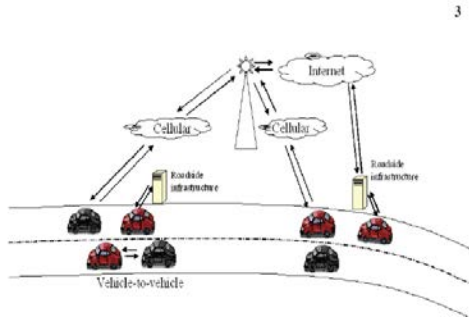
## I. INTRODUCTION

Vehicular ad hoc networks (VANETs) can provide adaptable and cost-effective solutions for applications such as traffic safety, dynamic route planning, and context-aware advertisement using short-extend wireless communication. To function appropriately, these applications require proficient routing protocols. On the other hand, existing mobile ad hoc network routing and forwarding approaches have constrained execution in VANETs. This exposition demonstrates that routing protocols which represents VANET particular attributes in their plans, such as high density and compelled portability, can provide great execution to a huge spectrum of applications. This work proposes a novel class of routing protocols as well as two forwarding optimizations for VANETs. Wireless ad hoc networks (i.e., decentralized networks created on the fly by hosts located in proximity of one another) are no more only an exploration concept. Due to their aptitude to require minimal effort to setup, ad hoc networks are suitable for a wide range of applications,

including battlefields communication and disaster recovery operations. In August of 2008, researchers at the National Institute of Standards and Technology (NIST) exhibited an ad hoc network prototype for people on call in building fires and mines collapse [2] Unmanned vehicles (aerial, terrestrial, and aquatic) with autonomic operation of a couple of hours, as of now can be sent to districts where human vicinity is deemed hazardous [3, 4], and they can frame networks on the fly to report perceptions to command and control centers.

## II. VEHICULAR NETWORKS

In recent years, most new vehicles come officially outfitted with GPS receivers and navigation systems. Car manufacturers for example, Ford, GM, and BMW have already announced efforts to include significant computing power inside their cars [5, 6] and Chrysler became the first car manufacturer to incorporate Internet access in a couple of its 2009 line of vehicles [7]. This trend is relied upon to continue and in the near future, the number of vehicles equipped with processing advancements and remote network interfaces will increase dramatically. These vehicles will have the capacity to run network protocols that will exchange messages for safer, entertainment and more fluid traffic on the roads. Institutionalization is as of now in progress for correspondence to and from vehicles. The Federal Communication Commission (FCC) in the United States has allocated a bandwidth of 75MHz around the 5.9GHz band for vehicle to vehicles and vehicles to road side infrastructure communications through the Dedicated Short Range Communications (DSRC) [8] services. The emergence of vehicular networks would empower a few valuable applications, both wellbeing and non-safety related, such as automatic road traffic alerts dissemination, dynamic route planning, service queries (e.g., parking availability), audio and video file sharing between moving vehicles, and context-aware advertisement (e.g., [9, 10, 11]). To deploy these services, three sorts of communications involving moving vehicles are considered, including cellular network, vehicle to roadside infrastructure and ad hoc vehicle communications. Brief descriptions of each of these sorts of communication are given beneath. Note that hybrids means of communication involving combinations of the methods described here can likewise be utilized [12, 13].



**Figure1: Vehicular networks can be formed in three ways: using cellular network, roadside infrastructure/ vehicle-to-vehicle communications.**

**2.1 Communications through Cellular Network**

The first method connects vehicles to the Internet through cellular data networks using any of the accompanying technologies: EV-DO, 3G, GPRS, and so on [14, 15]. This service is now accessible from car manufacturers [7] and from other outsiders [16]. In most commercially available solutions, the vehicle is transformed into a IEEE 802.11 (WIFI) hotspot and the Internet association can be shared by many PCs in the car. For the most part, a limit is set on the measure of information exchange (e.g., 1GB or 5GB greatest every month). The main advantage of this method of connection is that the vehicle will have Internet access wherever the cellular coverage is available. The main drawbacks are the reliance on the cellular operator coverage network and the restricted accessible data rates (rates may vary around 500Kbps-800Kpbs) [17].

**2.2 Vehicle to Roadside Infrastructure Communications**

The second technique utilizes roadside infrastructure. Here, vehicles interface with different vehicles or to the Internet through roadside access focused positioned along the roads. Two principle variants can be found in the literature: the access focuses could be introduced specifically for the purpose of providing Internet access to vehicles or the latter could make use of open 802.11 (Wi-Fi) access focuses encountered opportunistically along city streets [18]. The benefit of this technique for association is that vehicles will have the capacity to connect to the Internet using much higher data rates (e.g., 11Mbps) than through the cellular network. The drawbacks incorporate the cost expense related to introducing access indicates along the roads to obtain reasonable coverage. Additionally, for the case where open access focuses are used, the access point’s owners’ consent would legitimately be needed before such a service is deployed [18].

**2.3 Vehicle-to-vehicle (ad-hoc) Communications**

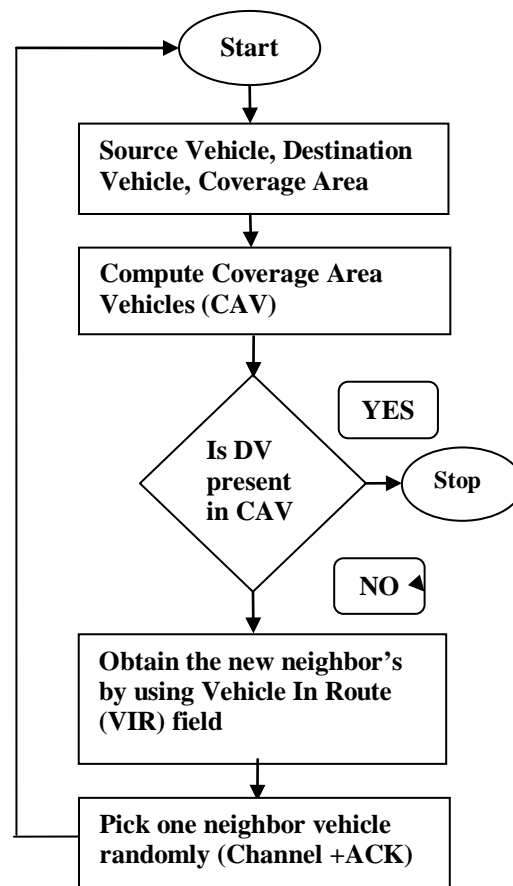
Utilizing Internet-based correspondences to and from vehicles will likely remain the method of choice for interchanges the length of the proportion of Wi-Fi empowered vehicles stays low. However, the predominance of Wi-Fi-prepared vehicles will open the route for ad hoc networks of moving vehicles [11, 19]. The point of interest here is the addition of a distinct, high data transmission network to the existing framework network. The fundamental drawback is that these networks could oblige new arrangement of protocols as the practicality of vehicular

networks applications depicted above is molded by regardless of whether VANET routing protocols have the capacity to fulfill the throughput and delay requirements of these application.

**III. EXISTING METHOD**

In the existing method Coverage-aware Geo cast Routing (CAGR) is utilized as a part of Urban Vehicular Networks. Which first discovers a set of vehicles within the range and then along with the set of Coverage Area Vehicles (CAV). One among the CAV is chosen arbitrarily in order to move forward and the new vehicle turns into the originator and afterward CAV is computed for the new source vehicle. Now the Vehicle In Route (VIR) is figured and after that is compared with CAV and comparative vehicles between the two entities are evacuated and then one among new CAV is picked. The procedure is repeated until the Destination Vehicle is reached.

A. The CAGR algorithm can be described by the following flowchart



**Figure 2: The CAGR Flow Chart**

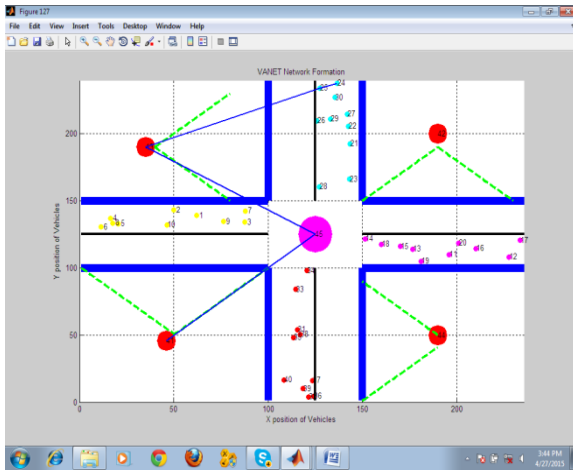


Figure 3: The CAGR Algorithm Simulation Result

The Source Vehicle, Destination Vehicle and Coverage Area acts like an input. First the CAV is computed for the Source Vehicle. If the Destination Vehicle is present in CAV then stop the process. If not then we need to pick up the new neighbors. The VIR lists are already traversed vehicle and then new vehicles are generated. Now one the vehicle is picked randomly from new neighbours and that vehicle acts like a new Source Node. The above steps are repeated until destination vehicle is reached.

The existing method CAGR has following drawbacks

- The CAGR algorithm needs computation of GPS based Vehicular Routing Tables (VRT) but the vehicles will contain vehicles ID which are in scope of both frauhoffer and Fresnel regions. Thus processing expense is high.
- The CAGR algorithm will have expensive overhead due to maintenance of vehicular routing tables for each of the node. Hence Overhead is more.
- The CAGR algorithm will take more time for conveying the packets. Source Vehicle to Destination Vehicle and back.
- The CAGR algorithm is not suitable for Highway Traffic conditions.
- CAGR requires retransmission of packets.

IV. PROPOSED METHOD

In the proposed strategy two algorithms are proposed specifically “Information Propagation Speed Analysis (IPSA)” and “Mobicast Routing (MR) Protocol for Highway Traffic Environment” are proposed.

4.1 Information Propagation Speed Analysis (IPSA)

IPSA algorithm does not require any vehicle routine table to identify the vehicle. IPSA algorithm mainly based on the density of the vehicles. The next forward vehicle will be chosen based on which neighbour vehicle has the maximum density. If multiple

vehicles has the same maximum density then the vehicle is chosen which has low vehicle ID. This process is repeated until the destination vehicle is reached.

B. IPSA algorithm can be described by the following flowchart

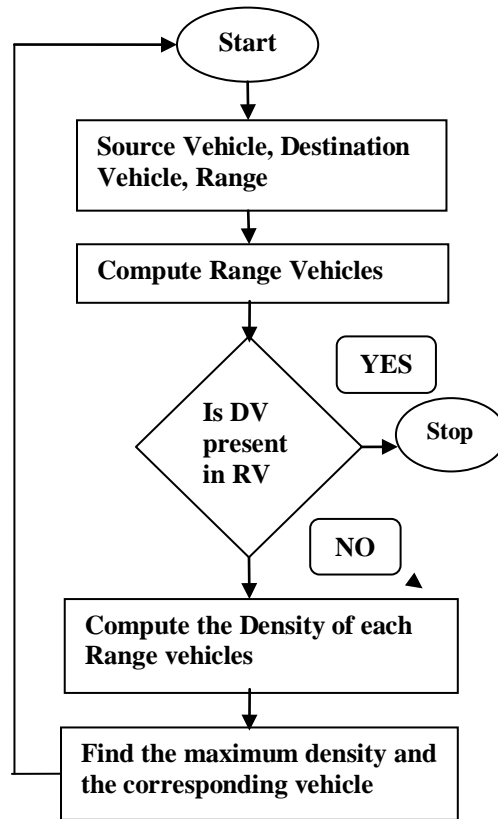


Figure 4: The IPSA Flow Chart

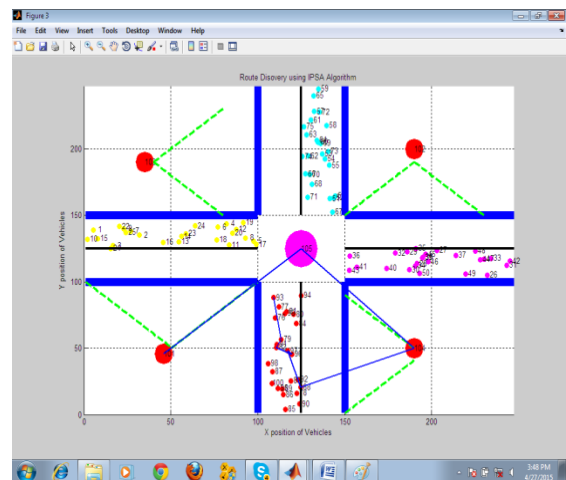


Figure 5: The IPSA Algorithm Simulation Result

4.2 Mobicast Routing (MR) Protocol for Highway Traffic Environment

Mobicast Routing is an algorithm which is in view of separating the area surrounding to every vehicle based on GPS Range and afterward the source Vehicle will discover the list of Neighbor vehicles which are within the GPS range. For every

direction vehicle is picked i.e. EAST, WEST, NORTH & SOUTH and after that the data packet are forwarded in every direction of vehicle and pick a node which is closeness to destination vehicle. This procedure is repeated until the Destination Vehicle is reached.

C. The Mobicast can be described by the following flowchart

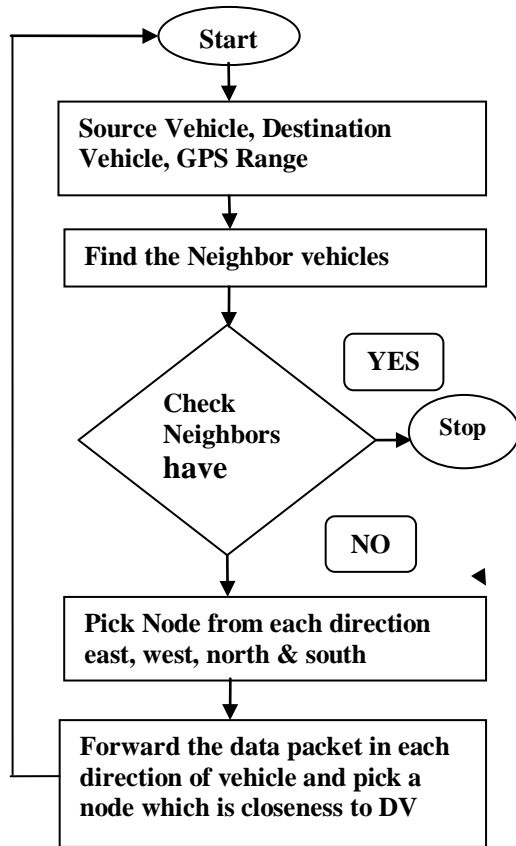


Figure 6: The MR Flow Chart

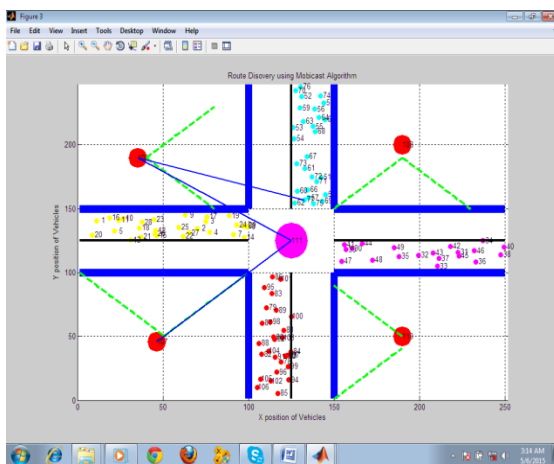


Figure 7: The MR Algorithm Simulation Result

## V. RESULTS

Vehicular Ad hoc Networks (VANETs) have become more popular in Intelligent Transportation Systems, they have been intended to provide road security and services for passengers comfort, given their significations related to the safety of human’s lives. In this paper, diverse Geo-cast routing protocols in VANETs based on traffic environments are displayed. The execution result demonstrates the messages been sent over the network. The messages can be sent within lane and also between lanes utilizing distinctive routing protocols. The CAGR is for urban while IPSA and MR are for highway traffic environment.

## VI. CONCLUSION AND FUTURE SCOPE

In this project 3 mechanisms or algorithms have been proposed for VANET network for different densities of vehicles and every algorithm has its own particular manner of setting up the path and sending the packets .CAGR finds the GPS vehicles, pick the vehicle ID which sends the reply first and has the most lowest channel noise and repeats until the destination is reached. In IPSA algorithm the forward node is chosen based on the density of the neighbor vehicles, the vehicle which has the highest density is chosen to move forward. In Mobicast routing a dedicated sensor is utilized which moves back and forth and delivers the packets to all other vehicles. The Algorithms can make utilization of Centralized Server and Security mechanisms to reduce the overhead and to keep away from the security attacks.

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AUTHORS

**First Author** – Mrs. Deepika N Murthy, 1M-tech Student, Dept. of ECE, AMC Engineering College Bangalore, India.,  
deeps.dee143@gmail.com

**Second Author** – Ms. E. Elavarasi, Asst. Professor, Dept. of ECE, AMC Engineering College Bangalore, India.,  
elu-ye@yahoo.in

# Chaotic Differential Evolution Algorithm based PID Controller for Automatic Voltage Regulator system

S.Vivekanandan\*, G.Saravanan\*, P.Kamalakaran\*, S.Krishnaprabhu\*

\* Department of Electrical and Electronics Engineering  
KPR Institute of Engineering and Technology, Coimbatore-641 407, Tamil Nadu.

**Abstract-** This paper presents a genetic based method to design a PID controller for Automatic Voltage Regulator system. Many practical problems have objective functions that are non-differentiable, non-continuous, non-linear, noisy, flat, and multi-dimensional or have many local minima, constraints or stochasticity. The proposed algorithm is applied to those fields and the design of PID controller. The result from the algorithm shows the proposed method will able to give better performance and higher speed of convergence. Performance of our proposed algorithm is compared with other famous algorithms and the simulation results clearly indicate that our proposed approach is more efficient and improving the performance of an AVR system.

**Index Terms-** AVR System, Chaotic DEA, PID Controller, TL Method, ZN Method.

## I. INTRODUCTION

Automatic voltage regulator plays a vital role in power system in order to regulate the output voltage at a nominal constant voltage level. The main functions of AVR are to detect terminal voltage, compare with the voltage setter and regulate field current via the exciter. The stability of the AVR system is of great concern because it can seriously affect the security of the power system. The excitation system must contribute for the effective voltage control and enhancement of the system stability. It must be able to respond quickly to a disturbance enhancing the transient stability and the small signal stability [1]. The excitation system controls the generated EMF of the generator and therefore controls not only the output voltage but the power factor and current magnitude also. In many of the exciter system is a dc generator supplied to the exciter and the increasing use of solid state devices such as thyristor based excitation systems are also used to give a controlled output voltage to the exciter. The proportional-integral-derivative (PID) controller is the most popular controller, which has been widely used in the industry because of its simple structure, easy implementation and robust performance in a wide range of operating conditions. However, proper tuning of the parameters of PID controllers has been quite difficult because many industrial plants are often hampered with problems such as high order, time delays, and nonlinearities [2]-[4]. The first method used the classical tuning rules proposed by Ziegler and Nichols. But in reality, it is often hard to optimize PID parameters with Ziegler-Nichols method in many industrial plants. So in order to increase the performance of controller several soft computing techniques such as fuzzy logic, neural network, evolutionary computing were used. Fast and accurate controlling is obtained by incorporating soft computing algorithms. Differential Evolution (DE) is a vector population based stochastic optimization method which has been introduced in 1995 by Storn and Price. Like genetic algorithm (GA), this method is able to optimize objective functions which are function of discrete variables. Differential Evolution (DE) algorithm [5] belongs to Evolutionary Algorithms (EAs) and now-a-days it is considered one of the most powerful tools in EAs. One of the advantages of DE algorithm compared to GA is that this method does not require the transformation of the variables into binary strings. Since 1996 differential evolution has been used in a wide spectrum of scientific problems such as physics [6], computer science, shape optimization, signal processing, control science, traffic control, manufacturing, management and even economics. Fig.1 shows the general diagram of AVR system. In includes Amplifier, exciter, Governor and Sensor.

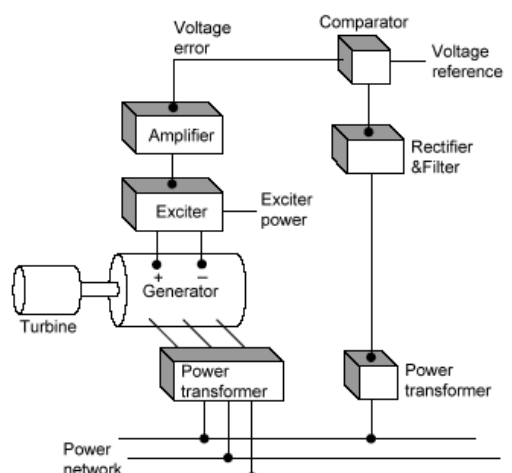


Fig.1 Model of AVR System

## II. DESCRIPTION OF THE AVR SYSTEM

The AVR model consists of the amplifier model, exciter model, generator model and the sensor model. An AVR is used to hold the terminal voltage magnitude of a synchronous generator at a specified level. The block diagram of the whole system is given in Figure2. A sensor senses the voltage magnitude and this voltage is compared with a dc set point signal to generate the error signal. A PID controller is used to decrease the error and to get better the dynamic response.

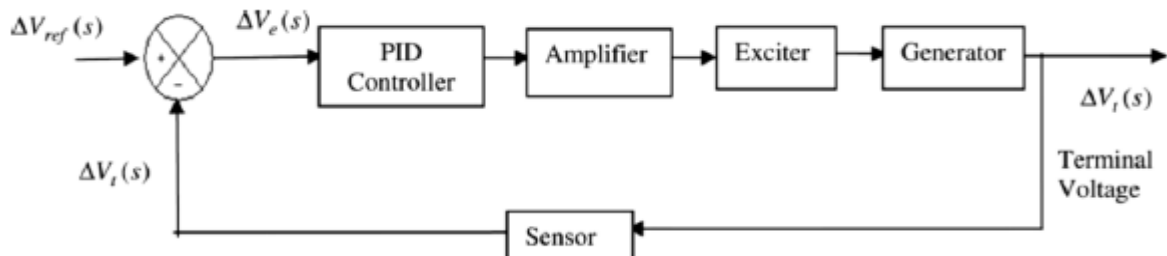


Fig.2 Block diagram of AVR system with PID controller

The PID controller improves the dynamic response of the system and also reduces the steady state error by rearranging the poles and zeros of the closed loop transfer function. The derivative controller adds a finite zero to the open-loop plant transfer function and improves the transient response. The integral controller adds a pole at the origin, thus increasing system type by one and reducing the steady-state error due to a step function to zero. For mathematical modeling and determining transfer functions of the four components, these components must be linearized, which takes into account the major time constant and ignores the saturation or other nonlinearities. The transfer function of AVR is given by the equation

$$TF = \frac{(K_D s^2 + K_P s + K_I)(1 + sT_s)(K_a K_e K_g)}{s(1 + sT_a)(1 + sT_e)(1 + sT_g) + (K_D s^2 + K_P s + K_I)(K_a K_e K_g K_s)}$$

Where

$K_P$  -Proportional gain of PID controller,  $K_I$  -Integral gain of PID controller,  $K_D$  -Derivative gain of PID controller  $K_a$  -Amplifier gain,  $K_e$ -Exciter gain,  $K_g$ -Generator gain,  $K_s$  -Sensor gain,  $T_a$  -Amplifier time constant,  $T_e$  -Exciter time constant,  $T_g$  -Generator time constant,  $T_s$  -Sensor time constant.

The following table represents the approximate transfer function and parameter limits of amplifier, exciter, generator and sensor. [7]

Model	Transfer Function	Parameter limits	Used parameter value
PID controller	$K_P + \frac{K_I}{s} + K_D s$	$0 \leq K_P \leq 1$ $0 \leq K_I \leq 1$ $0 \leq K_D \leq 1$	$K_P, K_I, K_D = \text{optimum values}$
Amplifier	$\frac{K_a}{1 + sT_a}$	$10 \leq K_a \leq 400$ $0.02 \leq T_a \leq 0.1$	$K_a = 10$ $T_a = 0.1$
Exciter	$\frac{K_e}{1 + sT_e}$	$1 \leq K_e \leq 200$ $0.4 \leq T_e \leq 1$	$K_e = 1$ $T_e = 0.4$
Generator	$\frac{K_g}{1 + sT_g}$	$0.7 \leq K_g \leq 1$ $1 \leq T_g \leq 2$	$K_g = 1$ $T_g = 1$
Sensor	$\frac{K_s}{1 + sT_s}$	$K_s = 1$ $0.01 \leq T_s \leq 0.06$	$K_s = 1$ $T_s = .01$

Table 1: T/F and parameter limits of AVR system

## III. PROPOSED ALGORITHM

Differential Evolution (DE) algorithm is one of the population-based stochastic optimization algorithm. Advantages of DE are: simplicity, efficiency & real coding, easy use, local searching property and speediness. DE works with two populations; old generation and new generation of the same population. The size of the population is adjusted by the parameter  $NP$ . The optimization process is conducted by means of three main operations: mutation, crossover and selection. In each generation, individuals of the current population become target vectors. For each target vector, the mutation operation produces a mutant vector, by adding the weighted difference between two randomly chosen vectors to a third vector. The crossover operation generates a new vector, called trial vector, by mixing the parameters of the mutant vector with those of the target vector. If the trial vector obtains a better fitness value than the target vector, then the trial vector replaces the target vector in the next generation.



A) Objective function:

The problem of PID controller parameter selection is formulated as an optimization problem, the objective function of which is given by

$$\text{MinF}(K_p, K_I, K_D) = (1 - e^{-\beta})(M_p + E_{ss}) + e^{-\beta}(t_s - t_r)$$

The above optimization problem is subjected to the following constraints

$$K_p^{\min} \leq K_p \leq K_p^{\max}$$

$$K_I^{\min} \leq K_I \leq K_I^{\max}$$

$$K_D^{\min} \leq K_D \leq K_D^{\max}$$

B) Bound value of PID controller:

The individuals initialized by randomly choosing values from a uniform distribution having lower bound and upper bound of the values of the parameters. The range of the parameter values is given below.

Controller Parameters	Min.Value	Max.Value
$K_p$	0	1.5
$K_I$	0	1
$K_D$	0	1

Table 2: Bound Value

C) Parameters of DE, JDE and CDE:

The following table gives the various parameter values of algorithms.

DE	JDE	CDE
$G_{\max} = 100$ NP = 20 F = 0.6 CR = 0.9	$G_{\max} = 100$ NP = 20 $F_L = 0.1$ $F_U = 0.2$ $T_1 = 0.1$ $T_2 = 0.1$ CR = 0.7867 F = 0.6242	$G_{\max} = 100$ NP = 20 $\mu = 4$ CR = 0.9703 F = 0.7935

Table 3: Parameters of Algorithm

D)  $K_p, K_I, K_D$  of PID controller:

The tuning of a PID controller is mainly based on the proper selection of Proportional, Integral and derivative gain values. The following table shows these values.

Parameters	$K_p$	$K_I$	$K_D$
Methods			
Without controller	0	0	0
ZN	0.4673	0.8801	0.0620
MZN (No OS)	0.1589	0.2992	0.0843
MZN(OS)	0.2621	0.4938	0.0928
TL	0.3575	0.1530	0.0602
DE	0.3807	0.2779	0.1220
JDE	0.5813	0.3788	0.1846
CDE	0.5716	0.4748	0.2028

Table 4: Values of  $K_p, K_I, K_D$

#### IV. SIMULATION RESULTS

The simulation of AVR with PID controller was done by MATLAB R2012a. It is a powerful tool to analyze the model of various parts of the plant.

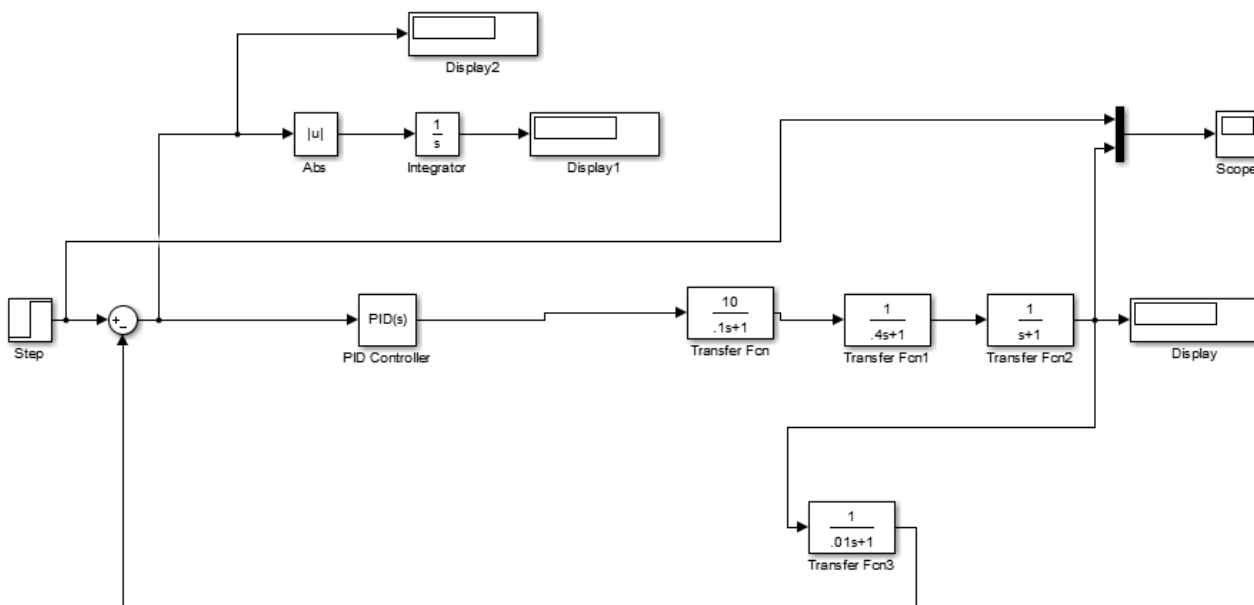


Fig.3 Simulink model of AVR with PID controller

The results obtained from the simulation shown in Fig.4 and Fig.5. It is observed that the response of AVR system is better by introducing CDE optimization technique. Fig.6 clearly shows the plant steady state response with CDE algorithm.

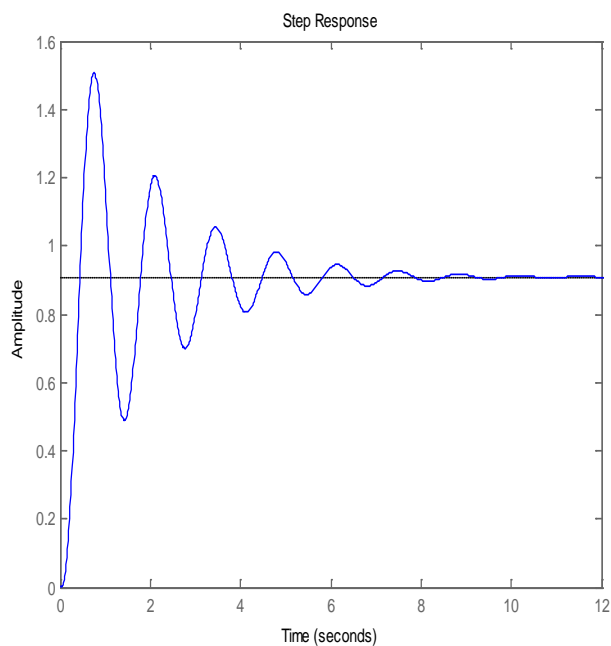


Fig.4 Plant response without controller

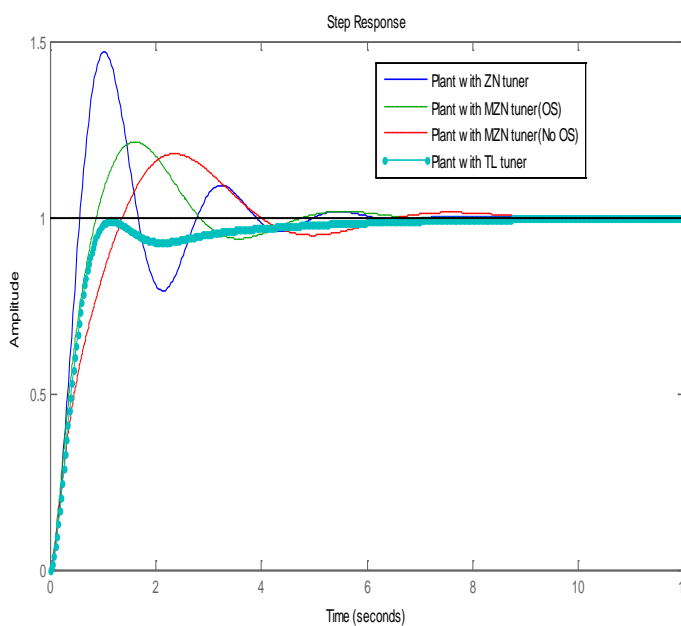


Fig.5 Plant response with conventional tuning

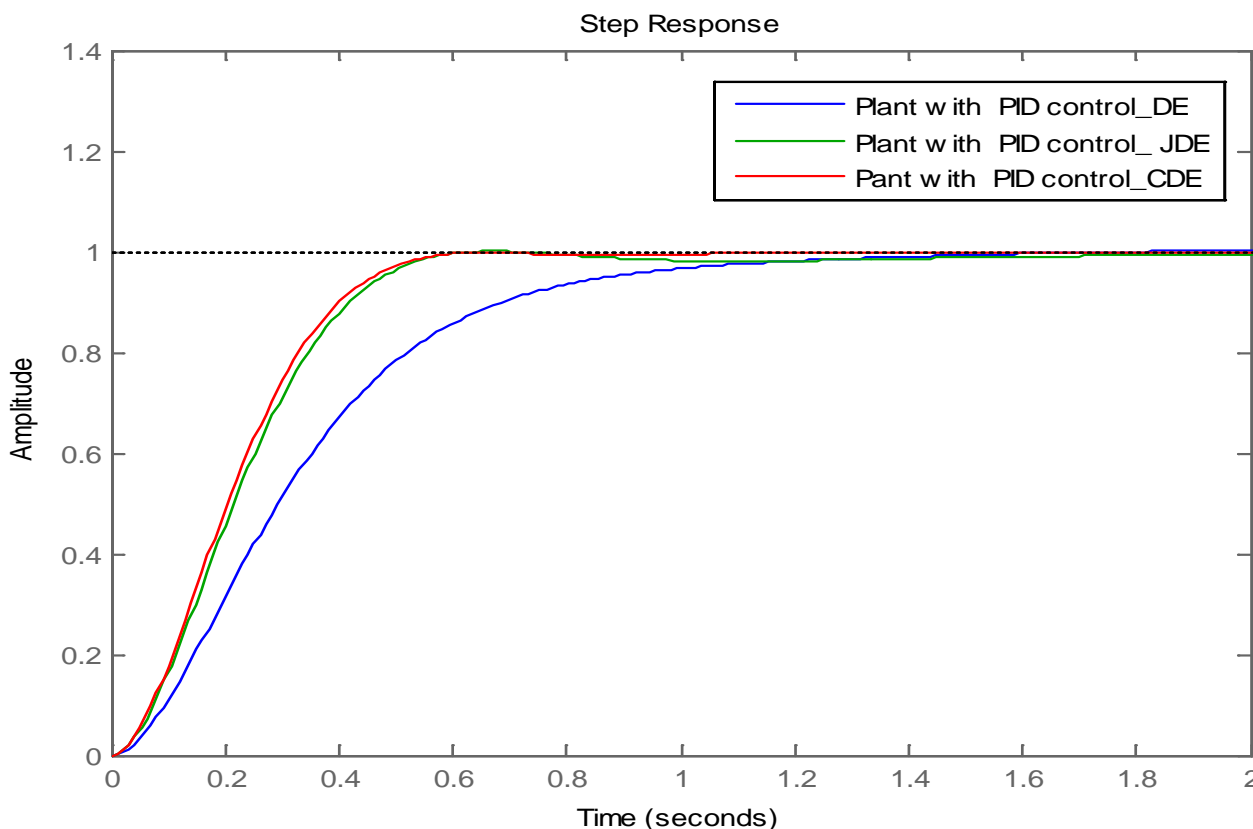


Fig.6 Plant response using optimization algorithm

The values of rise time, settling time and maximum peak overshoot are tabulated. From the table 5 it is understood that with CDE algorithm the maximum peak overshoot is reduced to zero.

Measured value Methods	$t_r$ (s)	$t_s$ (s)	$M_p$ (%)	Peak value
Without controller	0.2608	6.9865	65.7149	1.5065
ZN	0.3890	4.7526	46.9002	1.4690
MZN (No OS)	1.0116	6.0492	18.0335	1.1803
MZN(OS)	0.6215	4.4462	21.4856	1.2149
TL	0.6477	5.0695	0	0.9997
DE	0.5917	1.1766	0.1943	1.0019
JDE	0.3437	0.5345	0.0431	1.0004
<b>CDE</b>	<b>0.3291</b>	<b>0.5200</b>	<b>0</b>	<b>0.9977</b>

Table 5: Rise time, Settling time and Peak overshoot

### V. CONCLUSION

This article represents an efficient algorithm used to determine the parameters of PID controller for AVR system. The aim was to improve the control performance using a genetic algorithm for PID controller tuning. The tuning new controller parameters using genetic algorithm was succeeding very good results. The performance of the algorithm in obtaining the optimal values of PID controller parameters under various operating conditions has been analyzed through computer simulation. The result obtained from the simulation shows the proposed algorithm gives better performance than the conventional tuning methods.

### APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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#### AUTHORS

**First Author** – S.Vivekanandan M.E., Assistant Professor (Sr.G), KPR Institute of Engineering and Technology Coimbatore.  
E-mail: s.vivekanandan@kpriet.ac.in

**Second Author** – G.Saravanan M.E., Assistant Professor (Sr.G), KPR Institute of Engineering and Technology Coimbatore.  
E-mail: g.saravanan@kpriet.ac.in

**Third Author** – P.Kamalakaran M.E., Assistant Professor, KPR Institute of Engineering and Technology Coimbatore.  
E-mail: p.kamalakaran@kpriet.ac.in

**Fourth Author** – S.Krishnaprabhu M.E., Assistant Professor, KPR Institute of Engineering and Technology Coimbatore.  
E-mail: krishnaprabhu.s@kpriet.ac.in

**Correspondence Author** – S.Vivekanandan M.E., Assistant Professor (Sr.G), KPR Institute of Engineering and Technology Coimbatore. E-mail: s.vivekanandan@kpriet.ac.in

# Factors Influencing the Choice of Huduma Centers' Services

## (A Case Study of Mombasa Huduma Centre)

Sarah Wanjiru Ng'aru<sup>\*</sup>, Moses Kimani Wafula<sup>\*\*</sup>

<sup>\*</sup> Deputy Center Manager Huduma Center Mombasa

<sup>\*\*</sup> Senior Assistant Librarian Jomo Kenyatta University of Agriculture and Technology Mombasa CBD

**Abstract-** In October 2013 the Jubilee Government embarked on the implementation of the Huduma Kenya Program as a flagship project in its Manifesto to address the requirements of the Kenyan Constitution on quality and access to Public Services. Ultimately, the Government aimed at transforming the Public Service into a Professional and Customer-Centered Public Service. The initiation of Huduma Centers has ensured that considerable levels of compliance have been realized. Significant progress has been made on the requirement on governance, transparency and accountability. Strategic leadership, strategic decision making and change management in the public sector on service delivery have restored the citizenry confidence in the public service and created a new government brand that customers associate with newness, freshness and high standards in delivery of public services. Overall, the accountability framework has moved the public service to significant levels of efficiency. This paper aims at bringing out explicitly these results and also focuses on areas of improvement. Its main research methodology is predominantly reliance on secondary data. A desk research was adopted and it was found that: Since the initiation of Huduma Centers, considerable levels of compliance have been realized. Significant progress has been made on the requirement on governance, transparency and accountability, and that citizens are able to access quality services.

**Index Terms-** customer care, Strategic leadership, strategic decision making, Huduma Centers, public service, Huduma Kenya.

### I. INTRODUCTION

#### **B**ackground of the Study

In October 2013 the Jubilee Government embarked on the implementation of the Huduma Kenya Program as a flagship project in its Manifesto to address the requirements of the Kenyan Constitution on quality and access to public services. Ultimately, the government aimed at transforming the public service into a professional and customer-centered public service. (Psck, 2014).

Huduma Kenya is a program by the Government of Kenya that aims to transform Public Service Delivery by providing citizens' access to various Public Services and information from One Stop Shop citizen service centers called Huduma Centres and through integrated technology platforms. Huduma Kenya

provides Efficient Government Services at the Convenience of the citizen. This is according to (Oyugi, 2015), Huduma Kenya is a 'one stop shop' approach in reforming service delivery in the public sector Kenya. Huduma Kenya involves bring services closer to the people whereby services are offered under one roof, effectively making it possible for service seekers to access it conveniently without moving from one building to another. This means that you will be able to get birth certificates, national identity cards, passports, registration of business names, and applications for marriage certificates, drivers' licenses, police abstracts and many other services in one place. (Oyugi, 2015)

Among the changes to be introduced in the public service include introduction of one stop Huduma Service Centres to provide customer services to citizens from a single location, online e-Huduma web portal to provide integrated services offered by various government ministries, departments and agencies (MDAs) and a unified and integrated channel Huduma payment gateway to facilitate ease of payment for government services, through postapay. Thirteen Huduma centers are already operational in Kenya, they include, Nairobi – GPO, City Square- Haile Sellasie Avenue, Makadara, Machakos – GPO Machakos, Nakuru – GPO Nakuru, Eldoret – GPO Eldoret, Kakamega – GPO Kakamega, Kisumu – Former PC office, Nyeri – Provincial Headquarters, Embu – GPO Embu and Mombasa – GPO Mombasa. Oyugi, (2015),

According to Bass (1997), definition of leadership is related to the purpose associated with the attempt to define it, and so presents a wide range of possibilities. Leadership can be seen as a group process, an attribute of personality, the art of inducing complaisance, an exercise of influence, a particular type of action or behaviour, a form of persuasion, a power relationship, an instrument to achieve goals, the result of an interaction, a differentiated role or initiation of a structure (Burnes, 2000). The concept of leadership is defined, according to Hersey and Blanchard (1979), as the process of influencing the activities of an individual or a group in efforts toward goal accomplishment. Organizational change is a process in which an organization optimizes performance as it works toward its ideal state. Organizational change occurs as a reaction to an ever-changing environment, a response to a current crisis situation, or is triggered by a leader. Successful organizational change is not merely a process of adjustment, but also requires sufficient managing capabilities. However, there are many topics to be

considered to achieve successful change. It is a process in which an organization optimizes performance as it works toward becoming its ideal state. (Jones, 2004). Organizational change occurs as a reaction to an ever-changing environment or as a response to a current crisis situation. On the other hand, a more proactive viewpoint is that it is triggered by a progressive manager. Furthermore, organizational change is especially evident when the organization has just undergone a transfer of executive power (Haveman, et al. 2001).

### **Huduma Center Structure**

The Huduma Kenya Program is an Integrated Service Delivery (ISD) strategy that aims at the delivery of Public Services through a "One Stop Shop" Model with a great emphasis in Customer Service Excellence. This "One Stop Shop" approach enables citizens and customers to access various public services and information from a single location and through integrated service platforms. In this regard, the Presidency has been steering the Program through the Ministry of Devolution and Planning under the Huduma Kenya Secretariat. The Huduma Kenya Secretariat was instituted through the Presidential Gazette Notice No. 2177 of 31st March 2014 establishing the Governance Structure of the Huduma Kenya Program. The Huduma Kenya Secretariat is the third tier Management Structure of the Huduma Kenya Program below the Summit and Technical Committee as provided for in the Gazette. This structure was established in order to anchor this extensive and transformational Programme. (Marwa, 2013).

### **Statement of the Problem**

Corruption manifests itself through various forms, including petty and grand corruption, embezzlement of public funds, and a system of political patronage well entrenched within the fabrics of society. Although some progress has been made by the government in the past to attract foreign investments, inefficient and complex government regulations continue to provide both incentives and opportunities for corruption. According to the World Bank and IFC enterprise survey 2007, close to 80 % of the firms' surveyed reported being expected to make informal payment to get things done and circumvent burdensome bureaucratic requirements, making it almost impossible for businesses to operate without facilitation payments. The Global Corruption Barometer 2011 as well as the Eastern Africa Bribery Index 2012 also confirms that citizens have to pay bribes for simple bureaucratic tasks and accessing basic public services. (Ndegwa, 2004).

It is common knowledge that corruption appears domesticated and entrenched in the fabric of our nation. It is acknowledged that corruption is an undeclared national disaster, requiring a concerted effort to eradicate it. There is also an acknowledgement that the consequences of corruption run wide and deep, finding expression in economic and human rights perspectives. Corruption in Kenya has been a challenge since colonial times. Official attempts to fight corruption can be traced back to 1956 when the Prevention of Corruption Act was enacted, although there was little compliance with this law in the post-colonial period. The Act was amended in 1991 to enhance the penalties against offenders. However, no prosecution under the Act followed the amendments. According to the report, for

Kenya to be at par with other developing nations, corruption prevalence needs to be at the minimal. It's against this backdrop that the Jubilee government came up with the Huduma Kenya project to mitigate corruption in the public sector. Since the success of this project is more verbalized than quantified, the purpose of this paper will be to bring out the role of Huduma Centres on service delivery in the public service. (KACC, 2009)

### **General Objective**

Factors influencing the choice of Huduma center's services in Mombasa County.

### **Specific Objectives**

- i. To determine the role of strategic leadership in service delivery at Huduma Centers
- ii. To determine the effects of strategic decision making on service delivery at Huduma Centers.
- iii. To examine the effects of change management on service delivery at Huduma Centers.

## **II. RELATED LITERATURE**

Citizens who have been served at the centers have lauded the quality of service provision at the centres as superior; they indicated that they felt valued and were treated with utmost respect something they never experienced in a Government Service Point before. This is a result of the high Customer Service Standards in the Centers and the modern Government service delivery model anchored on 21st century technology that includes the use of Knowledge Management Portal, Virtual Desktop Infrastructure, Ticketing & Queue Management System and Electronic and Instant Feedback Devices. (Ministry of Planning, 2010)

The Huduma Kenya Programme is a huge leap in the transformation of the Public Service and this has resulted in a number of delegations visiting the Huduma Centers from across Africa to study the Programme. Delegates have been received from South Africa, Tanzania, Nigeria, Mali, Swaziland, Uganda, Gambia, Rwanda, Togo, Mozambique, Botswana, Lesotho, Malawi, Papua New Guinea. Our counterparts have applauded the impacts of the Programme that has restored the Citizenry Confidence in the Public Service and created a new Government Brand that customers associate with newness, freshness and high standards in delivery of Public services. With this kind of reactions African Cofrom our African Colleagues we are looking forward to sharing our experiences and lessons learnt with fellow members of the Commonwealth especially in sub-Saharan Africa and other Emerging Economies. As members of the Commonwealth Community we are committed to its Vision of improving the lives of our Citizenry and we will take part in initiatives aimed at replicating the Huduma Kenya Concept across the Commonwealth as a means to achieve an effective and responsive Public Service that meets Global Standards and Best Practices. (Ongwae, 2013)

### **Theoretical Framework**

#### **Gestalt- Field Behavioral Theory**

Pavlov, (1928) started from the idea that there are some things that a dog does not need to learn. For example, dogs don't

learn to salivate whenever they see food. This reflex is 'hard wired' into the dog. In [behaviorist terms](#), it is an unconditioned response (i.e. a stimulus-response connection that required no learning). Pavlov showed the existence of the unconditioned response by presenting a dog with a bowl of food and the measuring its salivary secretions. In his experiment, Pavlov used a bell as his neutral stimulus. Whenever he gave food to his dogs, he also rang a bell. After a number of repeats of this procedure, he tried the bell on its own. As you might expect, the bell on its own now caused an increase in salivation. So the dog had learned an association between the bell and the food and a new behavior had been learnt. Because this response was learned (or conditioned), it is called a conditioned response. The neutral stimulus has become a conditioned stimulus.

In Behaviourist theory, all behaviour is learned; the individual is the passive recipient of external and objective data. Among the earliest to work in the field of conditioning of behaviour was Pavlov, (1928). Pavlov found that for associations to be made, the two stimuli had to be presented close together in time. He called this the law of temporal contiguity. If the time between the conditioned stimulus (bell) and unconditioned stimulus (food) is too great, then learning will not occur. He discovered that a dog could be 'taught' to salivate at the ringing of a bell, by conditioning the dog to associate the sound of the bell with food. Arising from this, one of the basic principles of the Behaviourists is that human actions are conditioned by their expected consequences. Behaviour that is rewarded tends to be repeated, and behavior that is ignored tends not to be. Therefore, in order to change behaviour, it is necessary to change the conditions that cause it. (Skinner, 1974).

According to French et al. (1984), Gestalt theory is based on the belief that persons function as a whole, total organisms. And each person possess positive and negative characteristics that must be 'owned up to' and permitted expression. People get into trouble when they get fragmented, when they do not accept their total selves....basically, one must come to terms with oneself,....must stop blocking off awareness, authenticity, and the like by dysfunctional behaviors" Thus from Gestalt-Field perspective, behavior is not just a product of external stimuli, rather it arises from how individual uses reason to interpret these stimuli.

### **Henry Mintzberg Leadership Theory**

Managers according to Mintzberg, (1973), serve in ten different but closely related roles

**Interpersonal Roles:**

**Figurehead Role-** For instance official launching of a new product.

**Leadership role:** Involves directing and co-coordinating the activities of subordinates,

**Liaison role:** involves managers in interpersonal relationship outside of their area of command.

**Informational Role:** This role establishes the manager as the central point for receiving and sending non-routine information.

**The Monitor role:** Involves examining the environment in order to gather information, changes, and opportunities and problems that may affect the unit.

**The disseminator role-** Involves providing important or privileged information to subordinates.

**Spokesperson role-**The manager represents the unit to other people.

**Decisional role.**

**Entrepreneur Role-**The objective of this role is to change the unit for better.

**Disturbance handler role:** This role involves taking decisions or corrective actions in

response to unusual circumstances.

**Resource allocator role:** Involves decisions on how the resources of the unit will be distributed for optimal results.

**The negotiator role:** involves bargaining with other units to obtain advantages of his/her unit in terms of effectively discharging its mandate.

### **Simons bounded rationality model of decision making**

According to Simon's, (1979), bounded rationality model of decision making, the rational manager does not always have complete information, and that optimal choices are not always required. Simon states that human rational behaviour is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor. These scissors cut the problem space into a much smaller area that is feasible to search. Bounded rationality is characterized by the activities of searching and satisfying. Alternatives are searched for and evaluated sequentially. If an alternative satisfies certain implicitly or explicitly stated minimum criteria, it is said to satisfy and the search is terminated. The process of searching might be made easier by the identification of regularities in the task environment.

### **Kurt Lewin's Force Theory of Change**

Kurt Lewin (1957) introduced the three-step change model. This social scientist views behavior as a dynamic balance of forces working in opposing directions. Driving forces facilitate change because they push employees in the desired direction. Restraining forces hinder change because they push employees in the opposite direction. Therefore, these forces must be analyzed and Lewin's three-step model can help shift the balance in the direction of the planned change.

**Unfreeze:** According to Lewin, the first step in the process of changing behavior is to unfreeze the existing situation or status quo. First, increase the driving forces that direct behavior away from the existing situation or status quo. Some activities that can assist in the unfreezing step include: motivate participants by preparing them for change, build trust and recognition for the need to change, and actively participate in recognizing problems and brainstorming solutions within a group.

**Change:** Lewin's second step in the process of changing behavior is movement. In this step, it is necessary to move the target system to a new level of equilibrium. Three actions that can assist in the movement step include: persuading employees to agree that the status quo is not beneficial to them and encouraging them to view the problem from a fresh perspective, work together on a quest for new, relevant information, and connect the views of the group to well-respected, powerful leaders that also support the change.

**Refreeze:** The third step of Lewin's three-step change model is refreezing. This step needs to take place after the change has been implemented in order for it to be sustained or "stick" over time. It is highly likely that the change will be short lived and the employees will revert to their old equilibrium (behaviors) if this step is not taken. It is the actual integration of the new values into the community values and traditions. The purpose of refreezing is to stabilize the new equilibrium resulting from the change by balancing both the driving and restraining forces. One action that can be used to implement Lewin's third step is to reinforce new

patterns and institutionalize them through formal and informal mechanisms including policies and procedures.

### III. REVIEW OF VARIABLES

#### **Strategic leadership**

Change has become a constant phenomenon which must be managed properly for an organization to survive. Knowledge and awareness about many of the critical issues involved in the management of such change is often lacking. Many organizations are occasionally faced with challenges that force them to adjust or change, (Burnes, 2004). Development organizations, in particular, regularly have to go through change processes when having to respond to new development scenarios or simply as part of their expansion or restructuring processes. The implications of change processes are regularly under-estimated by senior management and not managed adequately. Ansoff (1987) asserts that it's known that leadership can make a great difference, and that its importance for organizational success is intensifying. Yet we still know too little about the qualities and practice of effective organizational leadership and change management.

The massive, often turbulent change that characterized business organizations in the 1970s and 1980s led to what has been described as the "new paradigm", with its emphasis on being charismatic, visionary and transformational (Bass, 1985). These were seen as revealing a conception of the leader as someone who, by defining an organization's mission and the values which will support it, defines organizational reality. Thus, in the "New Leadership" approach, leaders are seen as managers of meaning, rather than in terms of simply an influence process. However, over the last few years – arguably fuelled by increased fanaticism, the rapid changes in the global world such as rapidly-evolving technologies, and political and social factors have also called for the development of effective leadership skills. Consequently, leadership development programs have become an increasing priority for government organizations. The concept of leadership has generated lively interest, debate and occasional confusion as management thought has evolved. Even today, it is not easy to define leadership, and given the complexity of the subject, there is no general consensus about delimitation of the field of analysis.

According to Burnes (2009), definition of leadership is related to the purpose associated with the attempt to define it, and so presents a wide range of possibilities. Leadership can be seen as a group process, an attribute of personality, the art of inducing complaisance, an exercise of influence, a particular type of action or behaviour, a form of persuasion, a power relationship, an instrument to achieve goals, the result of an interaction, a differentiated role or initiation of a structure (Bass, 2000). The concept of leadership is defined, according to Haveman, (1979), "as the process of influencing the activities of an individual or a group in efforts toward goal accomplishment". According to Senge, (1990), leadership is associated with stimulants and incentives that motivate people to reach common objectives. Haveman et al. (2001), states that the essence of leadership involves achieving objectives with and through people. Koontz (2008) define leadership as the process of influencing people so that they make an effort by their own will and enthusiasm

towards obtaining the group's goals. According to Kotter (2002), without leadership, the probability of mistakes occurring increases and the opportunities for success become more and more reduced. For these same authors, and in this context, leadership allows cooperation, diminishes conflicts, contributes to creativity and has an integrating role, as it keeps people united even when not physically so. In this way, leadership, together with stimulants and incentives, promotes people's motivation towards achieving common goals, having a relevant role in the processes of forming, transmitting and changing organizational culture (Senge, 1990).

The launch of Huduma Centers realized significant progress in the provision of service through ICT. The centres provide one-stop shops for services such as registration of business, registration for National Social Security Fund (NSSF) and National Hospital Insurance Fund (NHIF) among other services. The result has been that there is an increase in the number of MDAs providing services through ICT. Instead of one hoping from one office to another seeking for government services, he/she can get them from one office hence saving time and enhancing satisfaction. (Psck, 2014).

Leadership is a process influence between leaders and subordinates where a leader attempts to influence the behaviour of subordinates to achieve the organizational goals. Organizational success in achieving its goals and objectives depends on the leaders of the organization and their leadership styles. By adopting the appropriate leadership styles, leaders can affect employee job satisfaction, commitment and productivity at Huduma Centers.

#### **Strategic Decision Making**

In any organization, decision making takes place at three levels and so strategies can also be formulated at all these different levels. Strategies are formulated at all these levels because a single strategy is not only inadequate, but also insufficient. These different levels of strategic decision making and strategic formulation in any organization include; corporate level, business level and functional level. The corporate level takes major strategic decisions. The performance of any organization will be succinctly hinged on the strategic decision it takes. (Willmot, 1997)

Generally, it is assumed that managers are in favour for or against a (new) strategy "neither as a habit nor as a mindless repertoire." But for rational reasons and on the basis of objective facts. And one can hear a lot about the official reasons for managerialistic change; to increase efficiency and reduce costs, to increase profits and growth, to become more business-like and to secure the survival of the organization – you name it. All these claims might be true, many managers may really believe in what they say and work very hard to achieve the changes and results proclaimed. However, behind such claims there can be also reasons and drivers which are being mentioned less often, if at all. Despite all assurances by the proponents of new public management that the new agenda is solely about rational strategic responses and "technical" aspects, organizational politics imply otherwise. Strategic change initiatives, their formulation and implementation are much about influence, power and control (Diefenbach 2006).



Willmott, (1997), draws the attention to the fact that the struggle for power in an organization is often a struggle to impose and legitimize a self-serving construction of meaning for others. Managers want to get their version through, their interpretation of how the world is and what the organization should be doing – because they know very well that getting ones “meaning” through will generate further chances and possibilities. Organizational change is a socially constructed reality with negotiated meaning as outcomes of power relationships and struggles for supremacy (Grant et al., 2005). “Between the lines” a particular strategy is primarily about power and control, dominance and supremacy, whose access to resources will be enlarged or reduced, who can stay and who has to go.

Managers might have to deliver results and therefore are not absolutely free in their choices. But they make decisions on quite a rational basis – seen from their perspective. Hence, many managers – like many other people – make decisions first with regard to their personal interests (in the West, at least), to their own position and career aspirations, to their families and social affairs and the like (Willmott, 1997). These personal interests usually fit to group interests, i.e. to strengthen the roles, position and influence of managers (in comparison and against other professions, lower ranks or external stakeholders). Strategic change initiatives, discourses about strategy, change, and other management issues provide excellent opportunities for senior and middle managers to set the agenda, to get their ideology through as the organization’s primary strategic objectives, to strengthen their role and position, to keep, gain or increase internal influence. Managerialistic strategies and change management are “the modernist project which has as its heart the transcendence of professional management as a means of achieving control in organizations” (McAuley et al., 2000): For those who believe in the principles that underlie it, managerialism as a philosophy legitimize ‘the interests of management in how organizations are managed, stressing the role and accountability of individual managers and their positions as managers’ (Lawler and Hearn, 1996; McAuley et al., 2000). By pursuing their personal interests they also pursue group interests. New public management change initiative is an odd combination of managerialistic ideology, personal and group interests.

### **Change Management**

According to Burnes, (2009), In line with the classic argument on environmental determinism, change in organizations is perceived by internal change agents in this study as being triggered by change in environmental conditions such as competitive pressures, legislation, environmental and safety regulations, world-wide economic threats, key stakeholders and leadership preferences and technological advancements. However, the wider political struggles to gain control over scarce resources emerge as the most powerful stimulator of change. As far as the cases are concerned, considerable time is invested into building relationships to this end.

According to Senge, (1990), unity in goals and full participation in change efforts, despite the fact that such participation may not generate a complete agreement on various aspects of the change process, are seen as desirable conditions for effective implementation of organizational change. These

espoused values reflect a unitary frame of reference which emphasizes the philosophy that organizations have goals to which all organizational members subscribe, with all working towards their attainment. The need for united efforts is exemplified by the need for integrated systems and change initiatives.

Kurt Lewin (1957) introduced the three-step change model. This social scientist views behavior as a dynamic balance of forces working in opposing directions. Driving forces facilitate change because they push employees in the desired direction. Restraining forces hinder change because they push employees in the opposite direction. Therefore, these forces must be analyzed and Lewin’s three-step model can help shift the balance in the direction of the planned change.

**Unfreeze:** According to Lewin, the first step in the process of changing behavior is to unfreeze the existing situation or status quo. First, increase the driving forces that direct behavior away from the existing situation or status quo. Some activities that can assist in the unfreezing step include: motivate participants by preparing them for change, build trust and recognition for the need to change, and actively participate in recognizing problems and brainstorming solutions within a group.

**Change:** Lewin’s second step in the process of changing behavior is movement. In this step, it is necessary to move the target system to a new level of equilibrium. Three actions that can assist in the movement step include: persuading employees to agree that the status quo is not beneficial to them and encouraging them to view the problem from a fresh perspective, work together on a quest for new, relevant information, and connect the views of the group to well-respected, powerful leaders that also support the change.

**Refreeze:** The third step of Lewin’s three-step change model is refreezing. This step needs to take place after the change has been implemented in order for it to be sustained or “stick” over time. It is highly likely that the change will be short lived and the employees will revert to their old equilibrium (behaviors) if this step is not taken. It is the actual integration of the new values into the community values and traditions. The purpose of refreezing is to stabilize the new equilibrium resulting from the change by balancing both the driving and restraining forces. One action that can be used to implement Lewin’s third step is to reinforce new patterns and institutionalize them through formal and informal mechanisms including policies and procedures. Therefore, Lewin’s model illustrates the effects of forces that either promote or inhibit change. Specifically, driving forces promote change while restraining forces oppose change. Hence, change will occur when the combined strength of one force is greater than the combined strength of the opposing set of forces.

Change has become a constant phenomenon which must be managed properly for an organization to survive. Knowledge and awareness about many of the critical issues involved in the management of such change is often lacking. Many organizations are occasionally faced with challenges that force them to adjust or change, (Burnes, 2004). Development organizations, in particular, regularly have to go through change processes when having to respond to new development scenarios or simply as part of their expansion or restructuring processes. The implications of change processes are regularly under-estimated

by senior management and not managed adequately. Ansoff (1987) asserts that it's known that leadership can make a great difference, and that its importance for organizational success is intensifying. Yet we still know too little about the qualities and practice of effective organizational leadership and change management.

### **Empirical review**

Sagimo (2002) observed that most managers are very casual in ensuring efficiency in service delivery. This has made employees attach little value to the process of change and decision making and due to the belief that it is just a routine activity. Chapman (2006) refers to the same issue labeling it 'negative cascaded attitudes'. He says that in some cases managers are reluctant to implement because they are uncomfortable and inexperienced. The attitude and behavior will cascade to the staff who develop a negative attitude to the process. He emphasizes the need for training, explanation and consultation, without which change management will be poorly conducted and thus a waste of time for those involved. However he caution against blaming the process, we should find out if the participants are properly trained and the process of change conducted through mutual agreement and all parties understanding such changes.

Efficiency and effective service delivery in the Public sector is generally presented as mechanisms to save money and hold bureaucrats and contractors accountable, even more so in periods when governments see performance tools as a way of cutting spending. This basic narrative about performance management may work well as political rhetoric, but it sends an essentially negative message to the public employees who are the service deliverers. This message suggests that there is need therefore for employees to be closely monitored via performance control systems, managers to adapt appropriate leadership style and support the service delivery as well manage change effectively (Mintzberg 1996). This study therefore seeks to establish if this is so by examining the factors influencing the choice of huduma center's services in Mombasa County.

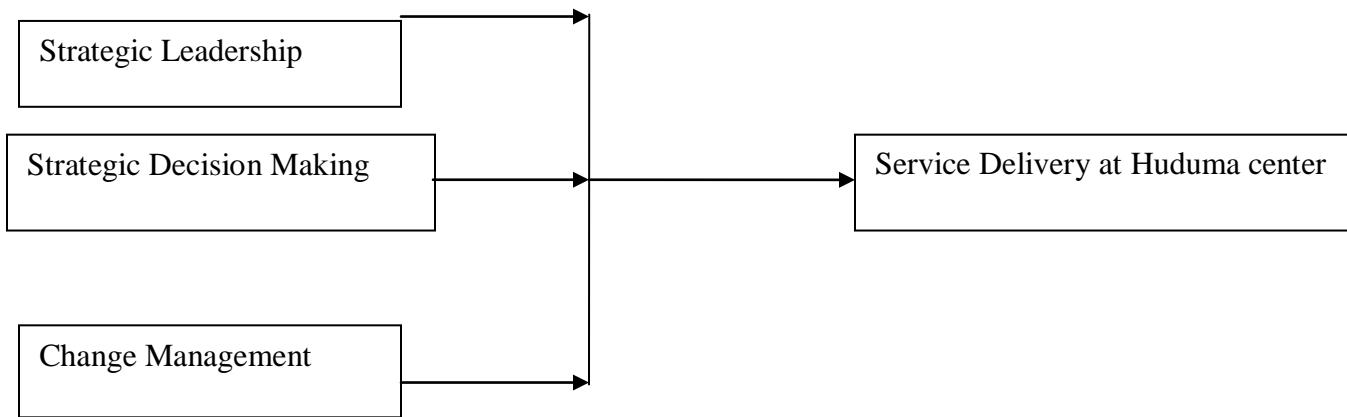
Opiyo, (2005), established that in order to move the implementation of the PSRP forward, the Government developed and launched the Strategy for Performance Improvement in the Public Service in 2001. The Strategy sought to increase productivity and improve service delivery. It outlined the actions that were necessary to imbed long lasting and sustainable change in the way public services are offered. Underpinning this strategy

was the Results Oriented Management (ROM) approach, which makes it necessary to adjust operations to respond to predetermined objectives, outputs and results. The adoption of this approach therefore demanded a paradigm shift in Government. This called for a transformation from a passive, inward looking bureaucracy to one which is pro-active, outward looking and results oriented one that seeks 'customer satisfaction' and 'value for money'. Consequently the ministries'/departments are required to develop strategic plans which reflected their objectives derived from the 9th National Development Plan, the Poverty Reduction Strategy Paper and based on the Medium Term Expenditure Framework (MTEF), Sectoral Priorities and Millennium Development Goals.

According to the new Constitution, the devolution policy adopted as well as redefines institutional structures and relationships across the three arms of Government. Additionally, given the platform against which the citizens adopted the constitution i.e. the push for improved governance, accountability and service, it is imperative that the Government bring on board or strengthen the existing mechanisms in order to allow for realization of the citizen's aspirations. This can also be achieved through proper management of resources. Strategic leadership, effective change management and strategic decision making is part of the broader Public Sector Reforms (that have been going on in Kenya) aimed at improving efficiency and effectiveness in the management of the public service. This study seeks to establish whether this is so in the public sector by examining the factors influencing the choice of huduma center's services in Mombasa County.

Public services in many African countries are confronted with many challenges, which constrain their delivery capacities (Lienert, 2003). They include, but not limited to poor leadership styles, poor decision making, poor change management strategies, lack of appropriate mindsets, and socio-psychological dispositions. There has also the perennial problem of the shortage of financial and material logistics that are necessary to support effective service delivery. On the other hand, the gradual erosion of the ethics and accountability has continued to bedevil the public sector in delivering public services to the people effectively. The new constitution of Kenya meant to address these challenges, have achieved minimal results (Cok, 2010). This study seeks to assess the factors influencing the choice of huduma center's services in Mombasa County.

### Conceptual Framework



### Independent variables

Source: Researcher 2015

### Dependant variable

Figure 1.1 Conceptual framework

The independent variables which are strategic leadership, strategic decision making, and change management affect service delivery at Huduma center, which is dependent variable. The management of the centre needs to ensure that the independent variables are addressed so that the customers' satisfaction and access of quality service delivery is attained.

customer service, utilize modern facilities and be served with efficiency by professional service personnel. (GoK, 2014)

In line with Kenya's Economic and Policy Blueprint, plans are underway to open Huduma Centers across all 47 Counties in the country by the Year 2015. This will ensure government services are accessible to citizens in every part of the country and all citizens can benefit from an enhanced service delivery experience. (Vision 2030)

### IV. METHODOLOGY

A descriptive research design is one that describes the situation as it is (Mugenda, 2008). This was a case study as the research study was conducted at the Huduma Centre, Mombasa. The study predominantly adopted a desk study whose source of data was secondary. This was derived from books, various websites, Public Service periodicals, journals and newspapers.

According to Senge, (1990), leadership is associated with stimulants and incentives that motivate people to reach common objectives. Haveman et al. (2001), states that the essence of leadership involves achieving objectives with and through people. Koontz (2008) define leadership as the process of influencing people so that they make an effort by their own will and enthusiasm towards obtaining the group's goals. According to Kotter (2002), without leadership, the probability of mistakes occurring increases and the opportunities for success become more and more reduced. For these same authors, and in this context, leadership allows cooperation, diminishes conflicts, contributes to creativity and has an integrating role, as it keeps people united even when not physically so. In this way, leadership, together with stimulants and incentives, promotes people's motivation towards achieving common goals, having a relevant role in the processes of forming, transmitting and changing organizational culture (Senge, 1990).

### V. CONCLUSION

It is four years since Kenya adopted a new Constitution in August 2010. Under the Constitution, the public service has specific obligations whose objective is to provide a solid base for the effective and efficient delivery of public services. One of these foundations is expressed in terms of the values and principles mentioned in Articles 10 and 232 of the Constitution. The evaluation on the extent to which the public service has complied with these values and principles provides a mechanism for confirming the progress realized in the fulfillment of the obligations. (GoK, 2010).

The launch of Huduma Centers realized significant progress in the provision of service through ICT. The centers provide one-stop shops for over thirty different services such as registration of business, registration for National Social Security Fund (NSSF) and National Hospital Insurance Fund (NHIF), pension status, renewal of drivers licenses, among other services. The result has been that there is an increase in the number of MDAs providing services through ICT. Instead of one hoping from one office to another seeking for government services, service seekers get them from one office hence saving time and enhancing satisfaction. (Psck, 2014).

The Huduma Kenya Programme was launched in November 2014 as a part of the Government of Kenya public service reform programme. The aim of the programme is to use innovation to transform the quality of public service delivery in Kenya. The Huduma centers are fast becoming the government front office where citizens are guaranteed they will access a majority of citizen services under the same roof, receive good quality

In any organization, decision making takes place at three levels and so strategies can also be formulated at all these different levels. Strategies are formulated at all these levels because a single strategy is not only inadequate, but also insufficient. These different levels of strategic decision making and strategic formulation in any organization include; corporate level, business level and functional level. The corporate level takes major strategic decisions. The performance of any organization will be succinctly hinged on the strategic decision it takes. (Willmott, 1997).

Kurt Lewin (1957) introduced the three-step change model. The three driving forces unfreeze, transition and refreeze, facilitate change because they push employees in the desired direction. Restraining forces hinder change because they push employees in the opposite direction. Therefore, these forces must be analyzed and Lewin's three-step model can help shift the balance in the direction of the planned change.

## VI. RECOMMENDATION

Since most of the services offered by Huduma Centers are also replicated in several public offices all over the country, it is recommended that:

(i) Leaders should adopt appropriate leadership styles in order to influence a sustainable employee job satisfaction, commitment and efficiency of service delivery at Huduma Centers.

(ii) The adopted leadership style should auger well with majority of the employees in order for it to have a profound impact on service delivery

(iii) There should be full stakeholder's participation and involvement in strategic change initiatives, their formulation and implementation so that everybody owns the process and fully supports the change

(iv) Strategic evaluation should be regularly done to determine whether the organization is headed in the right direction.

(v) Managers should absolutely be rational while making decisions and avoid the temptations of being influenced by their own personal interests, positions and career aspirations, families and social affairs.

(vi) Before any change process is initiated in an organization, all the stakeholders should be actively involved to mitigate the problem of resistance to change.

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AUTHORS

**First Author** – Sarah Wanjiru Ng’aru, Deputy Center Manager  
Huduma Center Mombasa

**Second Author** – Moses Kimani Wafula, Senior Assistant  
Librarian Jomo Kenyatta University of Agriculture and  
Technology Mombasa CBD

# The Reno-protective effect of gum Arabic in gamma-irradiated and cisplatin treated rats

Heba A. Mohamed \*, Ahmed S. Nada\*, Neamat Hanafi \*\*, Hala F. Zaki and Sanaa A. Kenawy

Pharmacology and Toxicology Department, Faculty of Pharmacy, Cairo University, Egypt

\* Drug Radiation Research Department, National Center for Radiation Research and Technology, Atomic Energy Authority, Cairo, Egypt

\*\* Radiation Biology Department, National Center for Radiation Research and Technology, Atomic Energy Authority, Cairo, Egypt

**Abstract-** Nephrotoxicity is a dose-dependent side effect of cisplatin and  $\gamma$ -radiation that limits their clinical usage in the field of cancer treatments. The present study was designed to evaluate the protective effect of gum Arabic (GA) on nephrotoxicity induced in rats by cisplatin and  $\gamma$ -radiation each alone or combined together. Biochemical investigation of kidney function tests, oxidative stress markers, tumor necrosis factor-alpha (TNF- $\alpha$ ) and myeloperoxidase (MPO) was carried out. Renal trace elements contents (Cu, Zn, Fe, Ca, Mg, Mn, Se and Pt), histopathological examination of kidney tissues and immunohistochemical determination of inducible nitric oxide synthase (iNOS) and endothelial nitric oxide synthase (eNOS) were also performed. Results obtained revealed significant elevation in serum urea and creatinine; propagation in lipid peroxidation (MDA); elevation in nitric oxide (NO) concentration, with subsequent elevation of proinflammatory cytokines as TNF- $\alpha$  as well as increased activities of iNOS, eNOS and myeloperoxidase (MPO), parallel to decline in reduced glutathione (GSH) content. Alterations in renal trace elements contents were detected due to treatment with cisplatin and/or  $\gamma$ -radiation. Moreover, histopathological examination of kidney tissue reflected marked injury. Supplementation with GA significantly ameliorated these parameters, indicating its renoprotective and antioxidant properties. In conclusion, pretreatment with GA offers protection against cisplatin and  $\gamma$ -radiation-induced renal cellular damage.

**Index Terms-** cisplatin,  $\gamma$ -radiation, gum Arabic, kidney function, oxidative stress.

## I. INTRODUCTION

The new generation of platinum-based cytotoxic agents, cisplatin (cis-diamminedichloroplatinum II, CDDP) remains a highly effective and widely used anti-neoplastic drug against various solid tumors, including endometrial, testicular, ovarian, breast, bladder, head, neck and lung cancers. Molecular mechanism of chemotherapy-induced toxicity revealed that cisplatin-induced nephrotoxicity occurs mainly through accumulation of cisplatin in renal tubular cells [1]. Cisplatin-induced renal damage is associated with increased renal vascular resistance and histological damage to proximal tubular cells. The alterations induced by cisplatin in the kidney functions are characterized by sign of injury, such as increase in creatinine and urea, decrease in body weight, decrease in GSH content and increase of lipid peroxidation products [2].

Ionizing radiation (IR) is an important environmental risk factor for various cancers and is also a major therapeutic agent for cancer treatment. Exposure of mammalian cells to IR induces several types of damage to DNA, including double and single-strand breaks, base and sugar damage, as well as DNA-DNA and DNA-protein cross-links. During radiotherapy, IR particles interact with biological systems to induce excessive oxygen free radicals or reactive oxygen species (ROS), which attack various cellular components including DNA, proteins and membrane lipids, thereby leading to significant cellular damage. ROS has negative impact on the antioxidant defense mechanisms by reducing the intracellular concentration of GSH, and decreasing the activities of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx) [3]. One of the indices of oxidative damage is malondialdehyde (MDA) formation as an end product of lipid peroxidation. Lipid peroxidation products such as MDA form adducts with cellular DNA [4] and thus, scavenging free radicals and inhibiting lipid peroxidation are likely key target activities for developing successful radioprotection strategies.

Gum Arabic (GA) is a dried gummy exudate from the stems and branches of *Acacia senegal* (*Leguminosae*). It contains calcium, magnesium, and potassium salts of the polysaccharide GA acid. GA has been used in Arab's folk medicine to reduce both the frequency and the need for hemodialysis in chronic renal failure patients [6]. Furthermore, GA has been shown to reduce urinary nitrogen excretion by increasing urea disposal in the cecum and lowering serum urea concentration in rat and human [5]. Additionally, it was reported that treatment with GA significantly prevented gentamicin-induced lipid peroxidation in the kidney tissue and protected against gentamicin-induced

changes in renal function and histological changes [6]. GA also possesses a powerful antioxidant effect through scavenging of superoxide anions [7].

The present work aimed to throw more light on the potentiality of GA as a powerful antioxidant in reducing  $\gamma$ -radiation and cisplatin-induced renal cellular damage.

## II. MATERIALS AND METHODS

### Animals

Adult male Wistar albino rats, weighing 120-150 g, were obtained from the institute of ophthalmology (Giza, Egypt). The animals were kept under suitable laboratory conditions throughout the period of investigation. They were allowed free access to food consisting of standard pellets obtained from El-Nasr chemical company (Cairo, Egypt) and water *ad-libitum*. The study was carried out according to the approval of Ethics Committee for Animal Experimentation at Faculty of Pharmacy, Cairo University and in accordance with the guidelines set by the EEC regulations (revised directive 86/609/EEC) at the National Center for Radiation Research and Technology.

### Chemicals

Gum Arabic powder was purchased from El-gomhouria company (Cairo, Egypt), freshly suspended in distilled water and administered p.o. daily for two weeks in dose of 7.5% g/kg [2]. Cisplatin was obtained from Hospira (UK, Australia), injected intraperitoneally in a single nephrotoxic dose of 7.5 mg/kg [2]. All other chemicals and used solvents were of the highest purity and analytical grade.

### Irradiation

Whole-body  $\gamma$ -irradiation was performed at the National Centre for Radiation Research and Technology (NCRRT; Cairo, Egypt) using an AECL Ci-137 Gamma Cell-40 biological irradiator. Animals were irradiated at an acute single dose level of 6.5 Gy of gamma radiation at dose rate of 0.758 rad/ sec calculated according to the dosimeter department in the NCRRT.

### Experimental design

Adult male Wistar rats were classified into eight groups (n=8). Group I received distilled H<sub>2</sub>O p.o. daily for two weeks and served as normal group. Group II received GA (7.5% g/kg; p.o.) daily for two weeks. Group III received cisplatin (7.5 mg/kg; i.p.) as a single dose at the 10<sup>th</sup> day. Group IV received GA daily for ten days followed by a single i.p. injection of cisplatin then GA daily for another 4 days. Group V was irradiated with a single dose of  $\gamma$ -radiation (6.5 Gy). Group VI received GA daily for one week then irradiated at 7<sup>th</sup> day followed by GA daily for another week. Group VII were irradiated (6.5 Gy) then subjected to single i.p. injection of cisplatin after 2 days of irradiation. Group VIII received GA daily for two weeks, subjected to irradiation treatment at the 7<sup>th</sup> day and cisplatin injection at the 10<sup>th</sup> day. Twenty-four hours after the last dose of specific treatments, blood samples were withdrawn via the retro-orbital venous plexus using heparinized capillary tubes [8]. Serum was separated by centrifugation at 3000 rpm for 15 min and kept frozen. Animals were anesthetized with ether and were sacrificed. Kidneys were quickly excised, washed with distilled water, blotted with a piece of filter paper

and homogenized using a Branson sonifier (250, VWR Scientific, Danbury, CT, USA) to prepare 10% homogenate in saline. Samples were then kept frozen until analysis of biochemical parameters. Other kidney samples were fixed in 10% formalin for histopathological and immunohistochemical study.

### Estimation of serum creatinine, urea, uric acid and glucose levels

Serum creatinine [9], urea [10], uric acid [11] and glucose [12] were measured colorimetrically using a test reagent kits.

### Estimation of renal lipid peroxide, reduced glutathione and nitric oxide contents

Lipid peroxidation was determined by estimation of thiobarbituric acid reactive substances (TBARS) measured as MDA [13]. On the other hand reduced glutathione (GSH) was determined according to Ellman's method [14]. Total nitric oxide (NO) was determined spectrophotometrically [15] based on the enzymatic conversion of nitrate to nitrite by nitrate reductase.

### Estimation of renal myeloperoxidase activity and tumor necrosis factor- $\alpha$ content

Myeloperoxidase activity was measured [16] in tissues. Meanwhile, TNF- $\alpha$  was determined using ELISA (Quantikin R & D system, USA) according to the manufacturer's instructions [17].

### Histopathological study

For histopathological examination kidney paraffin sections (5  $\mu$ m thick) were stained with hematoxylin and eosin [18] and examined under light microscope.

### Immunohistopathological study

For immunohistochemical determination of inducible nitric oxide (iNOS) and endothelial (eNOS), sections 4  $\mu$ m thick were cut from paraffin-embedded rat kidney tissues. The samples were first exposed to 60°C overnight and then kept in xylene for 30 min and rehydrated using a series of ethanol solutions for 2 min each, thereafter the sections were washed with distilled water and phosphate buffer saline (PBS) for 10 min. Then they were kept in 2% trypsin in Tris buffer at 37°C for 15 min and washed with PBS three times for 5 min. The sections were incubated in 3% hydrogen peroxidase for 15 min to inhibit endogenous peroxidase activity. Then the tissues were washed with PBS three times for 5 min each and stained with primary antibodies; polyclonal anti-iNOS (clone RB-9242-R7, ready to use; Thermo Fisher Scientific Anatomical Pathology, Cheshire, United Kingdom) and monoclonal anti-eNOS (clone RB-9279; Thermo Fisher Scientific Anatomical Pathology, Cheshire, United Kingdom) for 18 h. After washing the secondary antibody (biotinylated goat IgG anti-rabbit/mouse IgG, Histostain-plus bulk kit Zymed 85-9043, California, USA) was applied for 30 min. followed by three washes in PBS. The streptavidinperoxidase complex was added for 30 min and washed in PBS three times. Sections were then stained with diaminobenzidine (DAB, Dako) to detect immunoreactivity and then counter-stained with Mayer's hematoxylin. The presence of a brown precipitate indicated positive findings for the primary

antibodies. The negative controls received the same treatment with rabbit IgG or mouse IgG instead of primary antibodies [19]. They were covered with mounting medium and observed under an Olympus BX-40 light microscope.

### Trace metals analysis

Iron (Fe), copper (Cu), zinc (Zn), calcium (Ca), magnesium (Mg), manganese (Mn), selenium (Se) and platinum (Pt) concentrations were measured in kidney tissue as well as in GA solution. The digestion process used Milestone MLS-1200 Mega and High Performance Microwave Digestor Unit (Italy). Of each organ 0.5-1 g was put in special vessels with 6 ml nitric acid and 1 ml hydrogen peroxide. After complete digestion, samples were diluted to suitable levels for metals analysis by Thermo Scientific ICE 3000 series Atomic Absorption Spectrophotometer (AAS) (England) [20].

### Statistical analysis

Values were calculated as mean  $\pm$  standard error (S.E) of the mean. Comparison between different groups was carried out by one-way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test using InStat software, version 3 (Graph pad Software, Inc., San Diego, USA). The *p* value was set at  $< 0.05$ . The figures were drawn using instant software program (Microsoft Office Excel 2003).

## III. RESULTS AND DISCUSSION

### Effect of GA on serum creatinine, urea, uric acid and glucose levels in rats subjected to cisplatin and/or $\gamma$ -irradiation-induced nephrotoxicity.

Daily GA administration in a dose of 7.5% g/kg to normal animals for two weeks did not significantly alter kidney functions tests or glucose level. Administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased rat serum levels of creatinine to 467%, 250% and 489% and urea to 298%, 218% and 314%, respectively as compared to the normal group, while, serum uric acid level did not show any changes compared to normal value. Rats treated with cisplatin, exposed to  $\gamma$ -radiation or both when supplemented with GA significantly reduced levels of serum creatinine to 50%, 29% and 13% and urea to 76%, 62% and 67%, respectively as compared to their respective controls (*Table 1*).

In the current study administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased serum levels of creatinine and urea compared to the normal group.

It has been shown that cisplatin caused a significant increase in blood urea nitrogen and creatinine levels when compared to control group [21]. The increase in blood creatinine and urea has been reported after exposure to radiation and secondary to renal damage. In addition, the elevation in urea may be attributed to an increase in nitrogen retention or excessive protein breakdown [22]. The results obtained are similar to those recorded in another study [23] and add further to the fact that cisplatin at a dose of 7 mg/kg severely impairs renal function in rats. Uptake of cisplatin is mainly through the organic transporter pathway. The kidney accumulates cisplatin to a greater degree than other organs and is the major route for its excretion. Accumulation of cisplatin in kidney tissue contributes to cisplatin-induced nephrotoxicity.

Cisplatin is accumulated by peritubular uptake in both the proximal and distal nephrons [24].

Treatment with GA was associated with 24 h increased creatinine clearance in healthy mice [25]. GA is fermented by intestinal bacteria leading to formation of various degradation products, such as short-chain fatty acids [26, 27]. Serum butyrate concentrations were increased following treatment with GA in healthy subjects and this may have a role in the claimed salutatory effect on creatinine clearance and glomerular filtration rate. GA was given at an oral dose of 50 g/day for 3 months, with or without supplementing the diet with ferrous sulfate (200 mg/day) and folic acid (5 mg/day) [28]. Serum creatinine, urea, phosphate and uric acid concentrations were reported to be significantly reduced by GA, while the treatment significantly increased that of serum calcium.

Administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased rat serum level of glucose to 99%, 114% and 122%, respectively as compared to the normal group. GA also normalized the hyperglycemia condition to 84.80%, 62.33% and 92.49% respectively as compared to their respective controls (*Table 1*).

A significant hypoglycemic effect was exerted by GA in normal but not in alloxan diabetic rabbits. GA may act as hypoglycemic agent by initiating the release of insulin from pancreatic beta cells of normal rabbits [29]. Mixtures of different types of gum have been shown to inhibit glucose movement in vitro, and lower postprandial blood glucose and plasma insulin in human subjects when incorporated in a drink containing 50 g glucose [30, 31].

### Effect of GA on renal MDA, GSH and NO contents in rats subjected to cisplatin and/or $\gamma$ -irradiation-induced nephrotoxicity.

Administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased contents of MDA to 152%, 136% and 164% and NO to 166%, 156% and 174%, respectively as compared to the normal group. Meanwhile, renal GSH contents were significantly decreased to 53%, 53% and 55%, respectively as compared to the normal group. Daily treatments of rats with GA significantly reduced MDA contents to 56%, 76% and 55% and NO to 76%, 72% and 61%, respectively as compared with their respective controls. This was coupled by enhanced renal GSH contents to 176%, 188% and 145%, respectively as compared with respective control values (*Table 1*).

Administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased renal lipid peroxidation and decreased GSH content compared to the normal group in the present study. Cisplatin-induced mitochondrial ROS generation triggered inflammatory response, cell death and kidney dysfunction/ nephropathy. These findings point to the presence of oxidative stress and are in accordance with data reported in the literature [32].

Cisplatin has a synergistic cytotoxic action with radiation and other chemotherapeutic agents [33]. Cisplatin administration induced overproduction of ROS such as hydrogen peroxide and hydroxyl radicals, which abstract a hydrogen atom from polyunsaturated fatty acids and depletes the cellular antioxidant capacity [34]. Overproduction of ROS is a harmful process that can be an important mediator of damage to cell structures,



including lipids, membranes, proteins, and DNA. Most cell damage caused by IR is also mediated by ROS generated from the interaction between radiation and water molecules in cells [35, 36].

The mechanism of cisplatin-induced nephrotoxicity is still not fully clear. *In vitro* and *in vivo* studies provide strong evidence that implicates oxidative stress as a contributor of cisplatin-induced nephrotoxicity [37]. Cisplatin was found to generate superoxide and hydroxyl radicals and to stimulate renal lipid peroxidation. As a result, an imbalance between generation of oxygen-derived radicals and endogenous enzymatic and non enzymatic antioxidants will occur leading to oxidative damage of cell components [37]. The nephrotoxicity of cisplatin is the result of the binding of cisplatin to GSH and the subsequent metabolism of the cisplatin-GSH complex (a platinum- GSH conjugate) via a  $\gamma$ -glutamyl transpeptidase (GGT)-dependent pathway in the proximal tubules [38]. Additionally, increased kidney content of platinum caused GSH depletion after cisplatin administration and induced its nephrotoxicity. Therapeutic effects of cisplatin based on its interaction with DNA in the cell, prevent proliferation and induce apoptosis in tumor cells. Renal insufficiency is the major and most severe form of toxicity associated with use of cisplatin as a chemotherapeutic agent.

In the current work, administration of cisplatin, exposure to  $\gamma$ -radiation or both of them significantly increased NO contents coupled with increased activity of iNOS and eNOS in kidney tissues compared to the normal group. The renal content of peroxynitrite and NO is increased in cisplatin treated rats [24]. Peroxynitrite causes changes in protein structure and function, lipid peroxidation, chemical cleavage of DNA, and reduction in cellular defenses by oxidation of thiol pools [24].

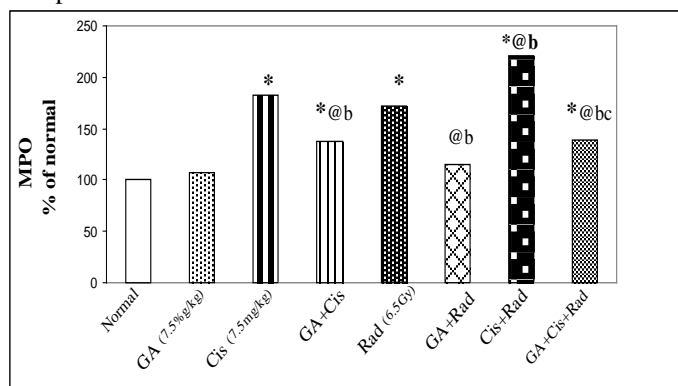
In addition, it has been shown that cisplatin increased thiobarbituric acid reactive substances (TBARS) and NO which are known among the pathogenic intermediates triggering DNA damage [39]. Cisplatin triggers cellular responses involving multiple pathways, including DNA repair, transcription inhibition, cell cycle arrest, cellular transport system impairment, ATPase activity reduction and mitochondrial damage [40]. Cisplatin administration caused remarkable deterioration in antioxidant defense as evidenced by decreased glutathione-S-transferase (GST), glutathione peroxidase (GP<sub>x</sub>), catalase (CAT) and superoxide dismutase (SOD) in kidney of control, and treated animals and increased TBARS, NO and xanthine oxidase in renal tissues. The oxidative stress mainly results from formation of cisplatin-GSH conjugation. The conjugation contributes to GSH depletion and alteration of redox state in kidney and consequently leads to an increase in generation of superoxide and other oxygen radicals [39].

Gum acacia, which was useful for protection against gentamicin-induced nephrotoxicity [41], offers some protection in renal MDA induced by cisplatin indicating a possible antioxidant effect. Treatment with GA reduced the cisplatin-induced renal and mitochondrial oxidative stress, restored mitochondrial respiratory enzyme activities and attenuated expressions of apoptosis and inflammation related proteins, thus forming the molecular basis for protective mechanism of GA against cisplatin-induced nephrotoxicity [42].

### Effect of GA on renal MPO activity and TNF- $\alpha$ content in rats subjected to cisplatin and/or $\gamma$ -irradiation-induced nephrotoxicity.

Kidney MPO activity and TNF- $\alpha$  content of the normal animals were 4.08 $\pm$ 0.12 U/g and 30.08 $\pm$ 1.72 pg/g tissue, respectively. Administration of cisplatin,  $\gamma$ -radiation and both of them significantly increased kidney MPO activities to 182%, 172% and 220%, and of TNF- $\alpha$  contents to 331%, 315% and 375%, respectively as compared to the normal group. Daily treatments of rats with GA significantly reduced MPO activities in kidney to 76%, 67% and 63%, and contents of TNF- $\alpha$  in kidney to 64%, 60% and 68%, respectively as compared with their respective control values **Figure (1 & 2)**.

Cisplatin, exposure to  $\gamma$ -radiation or both of them significantly enhanced renal TNF- $\alpha$  content and MPO activity as a major neutrophil protein in kidney compared to normal group. MPO is an essential enzyme for normal neutrophil function and it's a heme enzyme that uses the superoxide and hydrogen peroxide generated by the neutrophil oxidative burst to produce hypochlorous acid and other reactive oxidants, and when neutrophils are stimulated by various stimulants, MPO increases like other cellular tissue-damaging substances [43]. MPO is considered as an important component of the neutrophils antimicrobial defense mechanism [44]. TNF- $\alpha$  induces apoptosis that produces ROS and coordinates the activation of large network of chemokines and cytokines in kidney [34, 45]. The *in vivo* mechanisms of cisplatin nephrotoxicity are oxidative stress, apoptosis, inflammation, and fibrogenesis. ROS are produced via the xanthine-xanthine oxidase system, mitochondria, and NADPH oxidase in cells. Cisplatin induces glucose-6-phosphate dehydrogenase and hexokinase activity, which increase free radical production and decrease antioxidant production [24]. Cisplatin increased kidney levels of TNF- $\alpha$ , TNF- $\alpha$  mRNA, interleukin 6 mRNA and tumor suppressor protein p53 mRNA in rats treated with cisplatin [39]. Also, the present results of histology showed obvious tissue damage in kidney, including vacuolization, severe necrosis, degenerative changes in lining epithelium of renal tubules and desquamation of degenerated cells present in the lumen of the tubules.



**Figure (1): Effect of gum Arabic (GA) on renal myeloperoxidase (MPO) activity in rats subjected to cisplatin and/or  $\gamma$ -irradiation-induced nephrotoxicity.**

Each value represents mean  $\pm$  S.E of the mean. Statistical analysis was carried out by one-way ANOVA followed by the Tukey-Kramer multiple comparisons test.

\*Significantly different from normal group at  $p < 0.05$ .

@Significantly different from cisplatin group at  $p < 0.05$ .

<sup>b</sup>Significantly different from  $\gamma$ -irradiated group at  $p < 0.05$ .

<sup>c</sup>Significantly different from cisplatin and  $\gamma$ -irradiated group at  $p < 0.05$ .

**Table (1): Effect of gum Arabic (GA) on serum levels of creatinine, urea, uric acid and glucose as well as renal contents of malondialdehyde (MDA), glutathione (GSH) and nitric oxide (NO) in rats subjected to cisplatin and/or  $\gamma$ -irradiation-induced nephrotoxicity.**

<i>Parameters</i> <i>Groups</i>	<b>Creatinine</b> (mg/dl)	<b>Urea</b> (mg/dl)	<b>Uric acid</b> (mg/dl)	<b>Glucose</b> (mg/dl)	<b>MDA</b> (nmol/g) tissue	<b>GSH</b> (mg/g) tissue	<b>NO</b> ( $\mu$ mol/g) tissue
<i>Normal</i> (distilled H <sub>2</sub> O)	0.64 $\pm$ 0.05	8.19 $\pm$ 0.44	2.07 $\pm$ 0.13	102.60 $\pm$ 5.25	161.70 $\pm$ 14.11	263.40 $\pm$ 19.50	159.00 $\pm$ 4.09
<i>GA</i> (7.5% g/kg; p.o.)	0.75 $\pm$ 0.01	9.67 $\pm$ 0.69	2.06 $\pm$ 0.20	108.20 $\pm$ 2.72	143.11 $\pm$ 11.38	250.00 $\pm$ 10.32	167.50 $\pm$ 2.47
<i>Cisplatin</i> (7.5mg/kg;i.p.)	* 2.99 $\pm$ 0.20	* 24.37 $\pm$ 1.22	2.22 $\pm$ 0.11	101.90 $\pm$ 8.55	* 245.30 $\pm$ 7.87	* 138.20 $\pm$ 9.33	* 263.20 $\pm$ 3.71
<i>GA + Cisplatin</i>	*@ 1.49 $\pm$ 0.09	*@ 18.44 $\pm$ 0.92	1.89 $\pm$ 0.08	<sup>b</sup> 86.42 $\pm$ 1.74	@ <sup>b</sup> 136.60 $\pm$ 6.73	@ <sup>b</sup> 243.70 $\pm$ 12.64	*@ <sup>b</sup> 200.20 $\pm$ 1.50
<i><math>\gamma</math>-radiation</i> (6.5 Gy)	*@ 1.60 $\pm$ 0.02	*@ 17.81 $\pm$ 0.57	2.11 $\pm$ 0.08	117.10 $\pm$ 5.97	* 219.90 $\pm$ 15.07	* 140.00 $\pm$ 5.55	*@ 247.30 $\pm$ 0.86
<i>GA + <math>\gamma</math>-radiation</i>	@ <sup>b</sup> 0.46 $\pm$ 0.01	@ <sup>b</sup> 10.96 $\pm$ 0.79	2.37 $\pm$ 0.13	*@ <sup>b</sup> 73.00 $\pm$ 2.36	@ <sup>b</sup> 167.00 $\pm$ 6.21	@ <sup>b</sup> 263.60 $\pm$ 12.83	*@ <sup>b</sup> 177.20 $\pm$ 0.51
<i>Cisplatin+ <math>\gamma</math>-radiation</i>	* <sup>b</sup> 3.13 $\pm$ 0.18	* <sup>b</sup> 25.68 $\pm$ 0.54	2.26 $\pm$ 0.14	*@ 125.20 $\pm$ 2.39	* <sup>b</sup> 265.30 $\pm$ 7.87	* 143.90 $\pm$ 5.72	*@ <sup>b</sup> 277.10 $\pm$ 1.18
<i>GA + Cisplatin + <math>\gamma</math>-radiation</i>	@ <sup>bc</sup> 0.41 $\pm$ 0.01	*@ <sup>c</sup> 17.10 $\pm$ 0.99	<sup>c</sup> 1.67 $\pm$ 0.06	115.80 $\pm$ 2.17	*@ <sup>bc</sup> 146.90 $\pm$ 2.63	* <sup>bc</sup> 208.20 $\pm$ 14.46	*@ <sup>bc</sup> 170.20 $\pm$ 1.81

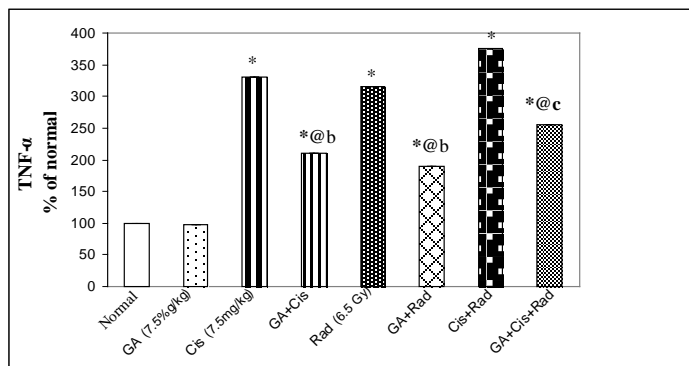
Each value represents mean  $\pm$  S.E of the mean. Statistical analysis was carried out by one-way ANOVA followed by the Tukey-Kramer multiple comparisons test.

\* Significantly different from normal group at  $p < 0.05$ .

@ Significantly different from cisplatin group at  $p < 0.05$ .

<sup>b</sup> Significantly different from  $\gamma$ -irradiated group at  $p < 0.05$ .

<sup>c</sup> Significantly different from cisplatin and  $\gamma$ -irradiated group at  $p < 0.05$ .



**Figure (2): Effect of gum Arabic (GA) on renal tumor necrosis factor-alpha (TNF- $\alpha$ ) content in rats subjected to cisplatin and/or  $\gamma$ -irradiation-induced nephrotoxicity.**

Each value represents mean  $\pm$  S.E of the mean. Statistical analysis was carried out by one-way ANOVA followed by the Tukey-Kramer multiple comparisons test.

\*Significantly different from normal group at  $p < 0.05$ .

<sup>@</sup>Significantly different from cisplatin group at  $p < 0.05$ .

<sup>b</sup>Significantly different from  $\gamma$ -irradiated group at  $p < 0.05$ .

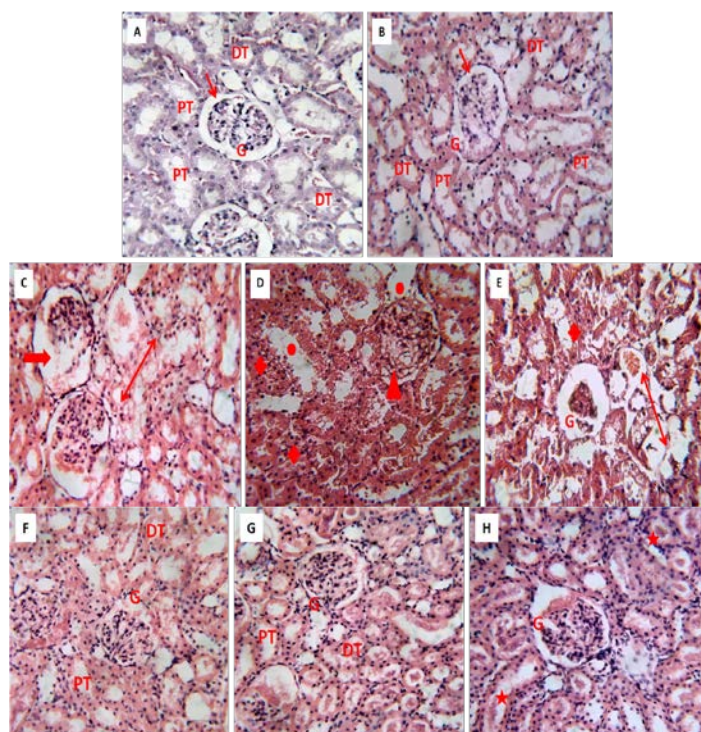
<sup>c</sup>Significantly different from cisplatin and  $\gamma$ -irradiated group at  $p < 0.05$ .

### Histopathological study

Subjection of rats to cisplatin or  $\gamma$ -irradiation either alone or combined resulted in marked histopathological alterations shown by the appearance of damaged glomeruli, profligacy lesion in the convoluted tubules, mesangial disorganization inside the Bowman's capsule and inflammable obstructed appearance of cortical convoluted tubules (**Figures 3 A, C, D & E**). GA administration retarded the previous histopathological alterations where the normal appearance of renal Bowman's capsule, glomeruli, proximal tubules and distal convoluted tubules was shown (**Figures 3 B, F, G & H**).

### Effect of GA on renal eNOS and iNOS immunohistochemical expressions in rats subjected to cisplatin and/or $\gamma$ -irradiation-induced nephrotoxicity.

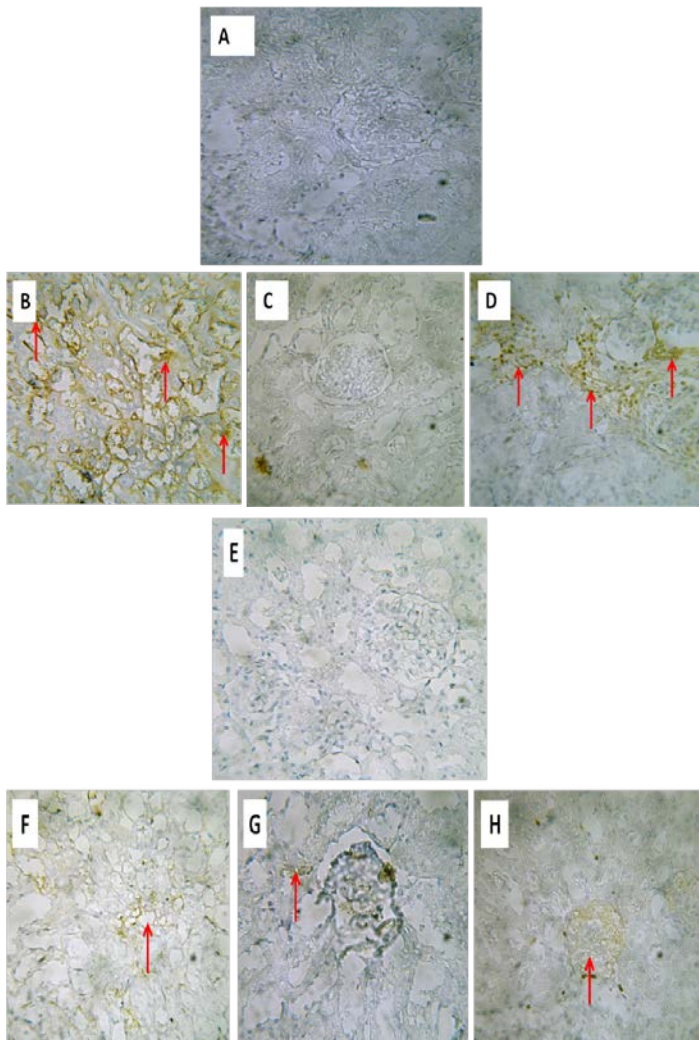
Administration of cisplatin, exposure to  $\gamma$ -radiation and their combination increased expression in iNOS and eNOS staining in renal tissues as compared to the normal group (**Figures 4 & 5**). Daily treatments of rats with GA for two weeks reduced iNOS and eNOS expression as compared with their respective controls (**Figures 4 & 5**).



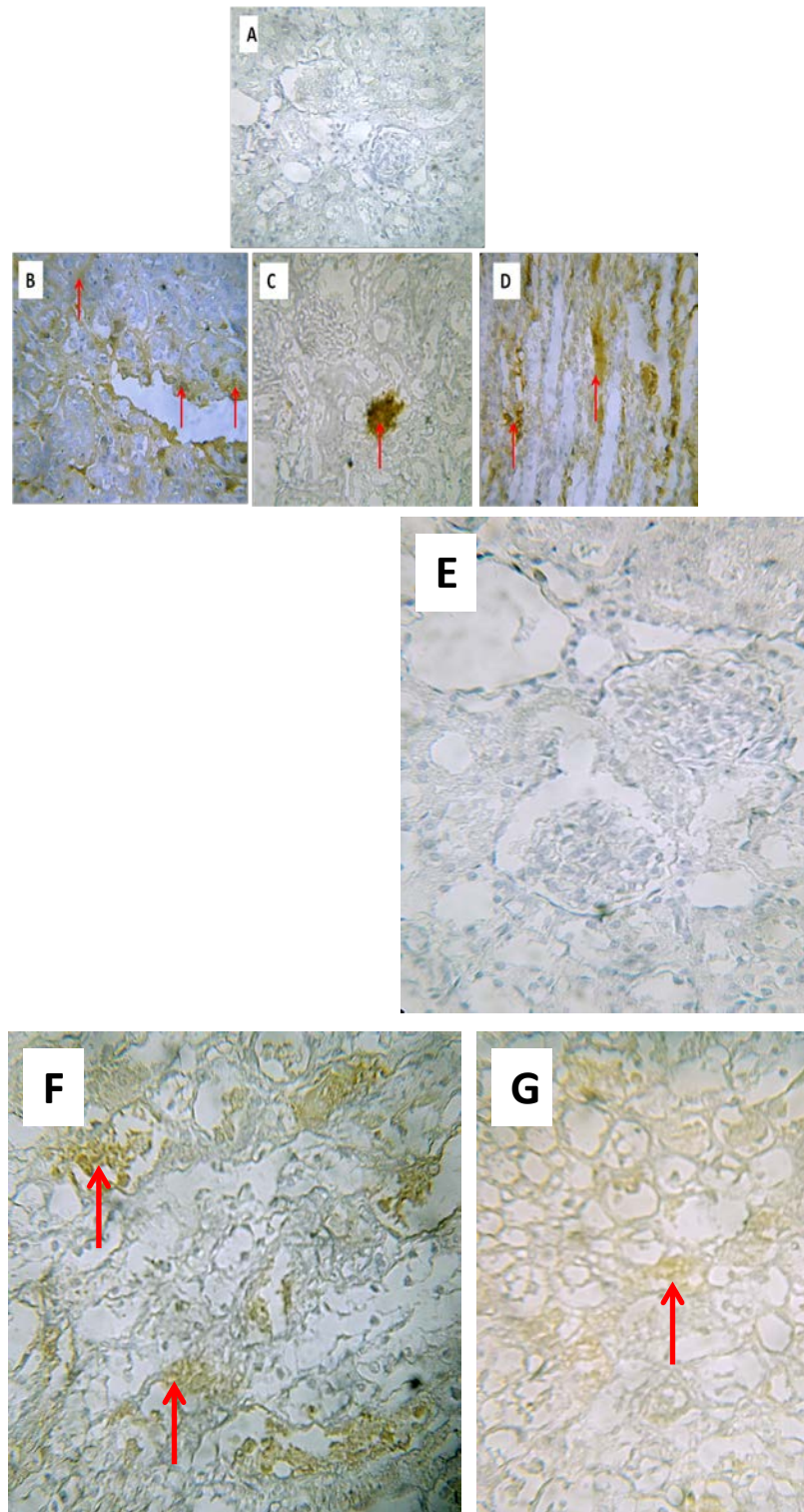
**Figure (3): Photomicrographs of kidney sections in rat.**

**A.** Normal control rat showing cortical part of a control rat. The renal Bowman's capsule ( $\downarrow$ ) and glomeruli (G) show normal structure and the proximal tubules (PT) lined with typical thick cubic epithelium and distal (DT) convoluted tubules lined with the relatively low simple cubic epithelium. **B.** Arabic gum control rat showing the normal appearance of renal Bowman's capsule ( $\downarrow$ ), glomeruli (G), proximal tubules (PT) and distal (DT) convoluted tubules. **C.** Cisplatin control rat showing the appearance of damaged glomeruli ( $\uparrow$ ) and profligacy lesion ( $\leftrightarrow$ ) in the convoluted tubules. Meanwhile, other convoluted tubules containing marginal chromatin and debris of rupture cells. **D.**  $\gamma$ -Irradiated control rat showing damaged glomeruli, mesangial disorganization and amorphous eosinophilic content ( $\blacktriangle$ ) inside the Bowman's capsule, inflammable obstructed appearance ( $\blacklozenge$ ) of cortical convoluted tubules in addition to the presence profligacy lesion in others ( $\bullet$ ). **E.** Irradiated rat treated with cisplatin showing the presence of atrophied glomeruli (G), some obstruction ( $\blacklozenge$ ) profligacy lesion ( $\perp$ ) in other convoluted tubules. **F.** Cisplatin rat treated with AG showing the normal appearance of renal Bowman's capsule, glomeruli (G), proximal tubules (PT) and distal (DT) convoluted tubules. **G.** Irradiated rat treated with AG showing the the normal appearance of renal Bowman's capsule, glomeruli (G), proximal tubules (PT) and distal (DT) convoluted tubules. **H.** Irradiated rat treated with cisplatin and AG showing the normal appearance of renal Bowman's capsule and glomerulus (G), in addition some convoluted tubules show some blood coagulation ( $\star$ ). (H&E X400)





**Figure (4):** Immunohistochemical staining of inducible nitric oxide synthase (iNOS) (↑) in the rat kidney of different experimental groups (X 400). **A:** Control rat showing focal very poor staining with iNOS in convoluted tubular cells. **B:** Cisplatin treated rat showing diffuse iNOS staining in convoluted tubular cells (↑). **C:**  $\gamma$ -irradiated treated rat showing focal poor staining with iNOS in convoluted tubular cells. **D:** Cisplatin,  $\gamma$ -irradiated treated rat showing diffuse, intensive iNOS expression (↑) in convoluted tubular cells. **E:** GA treated rats showing negative diffuse staining with iNOS in convoluted tubules. **F:** GA, cisplatin treated rat showing poor diffuse staining with iNOS (↑) in convoluted tubules. **G:** GA,  $\gamma$ -irradiated treated rat showing poor diffuse staining with iNOS (↑) in convoluted tubules. **H:** GA, cisplatin and  $\gamma$ -irradiated treated rat showing poor diffuse staining with iNOS (↑) in convoluted tubules.



**Figure (5):** Immunohistochemical staining of endothelial nitric oxide synthase (eNOS) (↑) in the rat kidney of different experimental groups (X 400). **A:** Control rat showing focal very poor staining with eNOS in convoluted tubular cells. **B:** Cisplatin treated rat showing diffuse eNOS staining in convoluted tubular cells (↑). **C:**  $\gamma$ -irradiated treated rat showing focal poor staining with eNOS in convoluted tubular cells (↑). **D:** Cisplatin,  $\gamma$ -irradiated treated rat showing diffuse, intensive eNOS expression in convoluted tubular cells (↑). **E:** GA treated rats showing

negative diffuse staining with eNOS in convoluted tubules. **F:** GA, cisplatin treated rat showing poor or less diffuse staining with eNOS (↑) in convoluted tubules. **G:** GA,  $\gamma$ -irradiated treated rat showing poor diffuse staining with iNOS (↑) in convoluted tubules. **H & H':** GA, cisplatin and  $\gamma$ -irradiated treated rat showing poor diffuse staining with eNOS (↑) in convoluted tubules.

NO is a highly unstable, free radical gas synthesized from L-arginine mediated by NO synthase [46]. The increased NO production after iNOS induction can lead to direct DNA damage, mitochondrial membrane damage, or apoptosis. Although NO is a vasodilator molecule, excess production may lead to dose-dependent apoptotic or necrotic injury [47].

An increase in the iNOS expression level in tubular epithelial cells developing damage and increased iNOS expression parallel to apoptotic injury as well as necrotic injury [48, 43] were determined. Acute nephrotoxicity was confirmed by pathological changes including swelling and vacuolation of the lining endothelium of the glomerulus tuft as well as tubular degeneration and dilation of the blood vessel with focal minute haemorrhage in the cortical portion. Endothelial NO may have a beneficial role as a vasodilator by inducing an increase in renal blood flow and in glomerular filtration in these animals. Excessive NO production can lead to cytotoxic injury. Peroxynitrite anion formation, protein tyrosine nitration, and hydroxyl radical production may be responsible for the evolution of the renal injury induced by cisplatin [43].

Essential antioxidants are either endogenous or exogenous. They are typically categorized as free radicals scavengers and protective antioxidants. GA acts as an antioxidant that modulates inflammatory and/or immunological processes. The cytoprotective effects of GA against cisplatin-induced nephrotoxicity and cyclophosphamide-induced urinary bladder cytotoxicity in rats have been ascribed to a scavenging action against ROS [26]. Daily treatments of rats with GA for two weeks significantly reduced serum creatinine, urea and glucose levels and renal contents of MDA, NO, TNF- $\alpha$ , iNOS and eNOS as well as MPO activity. Meanwhile, an improvement in renal GSH content in groups receiving GA was observed when compared to respective control values.

**Effect of GA on renal iron (Fe), copper (Cu), zinc (Zn), calcium (Ca), magnesium (Mg), manganese (Mn), selenium (Se) and platinum (Pt) contents in rats subjected to cisplatin and/or  $\gamma$ -irradiation-induced nephrotoxicity.**

Combined treatment of cisplatin and  $\gamma$ -irradiation-induced a reduction in renal Fe, Cu, Mn, Ca and Se contents whereas Zn and Mg contents were unchanged. On the other hand, cisplatin alone or combined with  $\gamma$ -irradiation-induced more retention of platinum in renal tissues. Administration of GA significantly modulated these alterations in renal trace element contents (**Table 2**).

**Concentrations of essential trace elements in gum Arabic:**

Results shown in **Table (3)** revealed the high contents of essential trace elements in GA. The concentrations trace elements were in the following order:

$$\text{Mg} > \text{Ca} > \text{Zn} > \text{Fe} > \text{Mn} > \text{Cu} > \text{Se}$$

**Table (3): Concentration levels of trace elements in gum Arabic.**

<i>Element</i>	<b>Concentration in GA (mg/L)</b>
<i>Fe</i>	31.45 ± 2.99
<i>Cu</i>	1.02 ± 0.03
<i>Zn</i>	46.63 ± 3.01
<i>Ca</i>	2483 ± 137.50
<i>Mg</i>	2611 ± 161.90
<i>Mn</i>	2.65 ± 0.13
<i>Se</i>	0.28 ± 0.02

Each value represents the mean of 6 samples ± S.E of the mean.

In the present study, combination of cisplatin and  $\gamma$ -irradiation induced alteration in renal trace elements, manifested by declined levels of Cu, Mn, Ca, Mg, Se and Fe contrary to Zn which was slightly increased and Pt which was retained in renal tissues. Many investigators observed trace element alterations after whole body irradiation [49, 50], and cisplatin administration [51]. The authors attributed the changes in Cu, Mn and Zn to the excess utilization of Zn, Mn and Cu enzymes after irradiation or due to *denovo* synthesis of metalloenzymes required for utilization of oxygen and prevention of superoxide anion radical accumulation. Rats supplemented with GA which represents an excellent source of metalloelements (Fe, Cu, Zn, Ca, Mg, Mn and Se), could attenuate the changes in renal contents induced by  $\gamma$ -irradiation and cisplatin treatment. These metalloelements are involved in multiple biological processes which correlate with the antioxidant capacities and the induction of endogenous

metalloelement dependant enzymes. These enzymes play important roles in preventing the accumulation of pathological concentration of oxygen radicals or in repairing damage caused by irradiation injury [52].

## **V. CONCLUSION**

Based on the results obtained in the current study, it appears that, GA attenuated the severity of biochemical disorders in renal tissues. This is mainly attributed to its free radical scavenging ability, high contents of bioactive components and essential trace elements in addition to antioxidant properties, implying minimization of lipid peroxidation and cytokines and enhancement of GSH contents.

**Table (2): Effect of gum Arabic (GA) on renal iron (Fe), copper (Cu), zinc (Zn), calcium (Ca), magnesium (Mg), manganese (Mn), selenium (Se) and platinum (Pt) contents in rats subjected to cisplatin and/or  $\gamma$ -irradiation-induced nephrotoxicity.**

<i>Groups</i> <i>Parameters</i>	<i>Normal</i>	<i>GA</i> (7.5%g/kg)	<i>Cisplatin</i> (7.5mg/kg)	<i>GA</i> + <i>Cisplatin</i>	<i><math>\gamma</math>-radiation</i> (6.5 Gy)	<i>GA</i> + <i><math>\gamma</math>-radiation</i>	<i>Cisplatin</i> + <i><math>\gamma</math>-radiation</i>	<i>GA</i> + <i>Cisplatin</i> + <i><math>\gamma</math>-radiation</i>
<b>Fe</b> ( $\mu\text{g/g}$ )	62.80 $\pm$ 0.65	60.08 $\pm$ 1.46	* 45.10 $\pm$ 2.31	*b 50.45 $\pm$ 0.57	@ 69.66 $\pm$ 1.77	b 53.15 $\pm$ 2.26	*b 48.51 $\pm$ 0.76	b 53.97 $\pm$ 4.44
<b>Cu</b> ( $\mu\text{g/g}$ )	4.73 $\pm$ 0.29	4.60 $\pm$ 0.22	* 3.15 $\pm$ 0.19	* 3.11 $\pm$ 0.08	4.01 $\pm$ 0.45	4.40 $\pm$ 0.32	* 3.35 $\pm$ 0.20	* 3.28 $\pm$ 0.22
<b>Zn</b> ( $\mu\text{g/g}$ )	20.29 $\pm$ 0.53	20.90 $\pm$ 0.85	23.35 $\pm$ 0.90	* 22.87 $\pm$ 0.25	21.30 $\pm$ 0.50	23.72 $\pm$ 1.39	24.08 $\pm$ 0.50	24.42 $\pm$ 1.52
<b>Ca</b> ( $\mu\text{g/g}$ )	83.91 $\pm$ 3.15	82.09 $\pm$ 4.85	78.79 $\pm$ 5.75	b 65.62 $\pm$ 5.13	97.79 $\pm$ 8.50	*@b 48.26 $\pm$ 1.56	*@b 54.36 $\pm$ 3.94	c 82.73 $\pm$ 2.60
<b>Mg</b> ( $\mu\text{g/g}$ )	317.80 $\pm$ 15.43	277.20 $\pm$ 10.59	267.40 $\pm$ 16.75	263.60 $\pm$ 11.45	319.20 $\pm$ 24.40	*b 196.10 $\pm$ 11.35	252.70 $\pm$ 13.58	284.40 $\pm$ 28.80
<b>Mn</b> ( $\mu\text{g/g}$ )	1.93 $\pm$ 0.09	* 1.29 $\pm$ 0.06	* 1.24 $\pm$ 0.04	*b 0.98 $\pm$ 0.05	* 1.55 $\pm$ 0.04	* 1.47 $\pm$ 0.10	*b 1.14 $\pm$ 0.07	*b 1.07 $\pm$ 0.09
<b>Se</b> ( $\mu\text{g/g}$ )	0.56 $\pm$ 0.01	* 0.44 $\pm$ 0.02	* 0.36 $\pm$ 0.01	*b 0.43 $\pm$ 0.01	@ 0.55 $\pm$ 0.01	0.45 $\pm$ 0.02	*b 0.44 $\pm$ 0.03	*b 0.42 $\pm$ 0.02
<b>Pt</b> ( $\mu\text{g/g}$ )	0.02 $\pm$ 0.00	N.D	* 0.41 $\pm$ 0.03	*@ 0.26 $\pm$ 0.01	N.D	N.D	*@ 0.30 $\pm$ 0.02	*@ 0.24 $\pm$ 0.01

Each value represents mean  $\pm$  S.E of the mean. Statistical analysis was carried out by one-way ANOVA followed by the Tukey-Kramer multiple comparisons test.

\*Significantly different from normal group at  $p < 0.05$ .

@Significantly different from cisplatin group at  $p < 0.05$ .

<sup>b</sup>Significantly different from  $\gamma$ -irradiated group at  $p < 0.05$ .

<sup>c</sup>Significantly different from cisplatin and  $\gamma$ -irradiated group at  $p < 0.05$ .

N.D: not detectable.



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## AUTHORS

**Heba A. Mohamed-** Assistant Lecturer in Drug Radiation Research Department – National Center for Radiation Research and Technology – Atomic Energy Authority, Egypt. [Heba\\_am1@yahoo.com](mailto:Heba_am1@yahoo.com),

**Ahmed S. Nada-** Professor in Drug Radiation Research Department – National Center for Radiation Research and Technology – Atomic Energy Authority, Egypt. [Ashnada59@hotmail.com](mailto:Ashnada59@hotmail.com)

**Neamat Hanafi** – Professor in Radiation Biology Department – National Center for Radiation Research and Technology – Atomic Energy Authority, Egypt. [neamathanafi@ymail.com](mailto:neamathanafi@ymail.com)

**Hala F. Zaki** – Professor of Pharmacology & Toxicology Faculty of Pharmacy – Cairo University. [Halafzaki@gmail.com](mailto:Halafzaki@gmail.com)

**Sanaa A. Kenawy** – Professor of Pharmacology & Toxicology Faculty of Pharmacy – Cairo University. [Sanaa\\_kenawy@hotmail.com](mailto:Sanaa_kenawy@hotmail.com)

**Correspondence Author** – Heba A. Mohamed, [Heba\\_am1@yahoo.com](mailto:Heba_am1@yahoo.com),  
or [heba\\_am1@hotmail.com](mailto:heba_am1@hotmail.com), +201227407691

# Non Parametric Method of Estimation of Survival and Hazard Functions for Patients with Uterine Fibroid

Dr. J. Jothikumar \*, V. Sumathy \*\*

\* Associate Dean, Faculty of Science and Humanities, SRM University, Kattangulathur, jjothikumar@yahoo.co.in

\*\* Assistant Professor in Statistics, Kumararani Meena Muthiah College of Arts and Science, Adyar, Chennai, v.sumathy@yahoo.com

**Abstract-**The present study aims at the analysis of data obtained from patients with Uterine Fibroid. The studies consist of data obtained from 105 patients in respect of clinical and follow up actions for the treatment of Fibroid. Non-parametric methods viz., Kaplan-Meier, Product-limit method, Log Rank Test and Cox Regression models have been used for analyzing the Fibroid data. The analysis revealed the significant role played by certain variables in the survival of patients with Fibroids.

**Index Terms-** Distribution-Free methods, Cox regression, Survival function Log Rank Test, Uterine Fibroid.

## I. INTRODUCTION

In survival analysis we fit statistical distributions for empirical data and assess the fitness of the theoretical distribution form. There are some situations in which the experimenter has no knowledge of the form of the theoretical distribution for which the data has to be fitted and the validity has to be assessed. In such situations the experimenter resort to apply non-parametric or distribution free methods for analyzing the survival data. In the present study we have collected data from a sample of 105 patients with Uterine Fibroid disease. An attempt is made to arrange the data in a retrospective way. Using non-parametric methods we have computed estimates based on survival function. A comparison among the groups of patients is also carried out using Log Rank Test. Based on Cox regression model we have carried out multivariate analysis and detected the independent risk factors among the patients.

### A. Non parametric approach in life time data analysis

Kaplan and Meier [10] have made significant contributions for the study of survival analysis and in its related areas. They have identified Product-limit (PL) method for the estimating survival function with graphical representation. In the subsequent decades attempts were made for estimating survival function through different methods and the actuarial life method has become popular Berkson and Gage [2], Cutler and Ederer [8] have developed life tables and estimated the survival function. Gehan [9] in his celebrated paper has given procedures for the estimation of the basic functions viz., survival function, hazard function and density function. Breslow and Crowley [3] and Meier [12] have shown that under certain conditions the Kaplan –Meier estimate is consistent and asymptotically normal. Recently Zou et al.,[4] have applied non-parametric maximum likelihood approach to study the multiple change point problems.

### B. Comparison of two groups of survival data

Cox [6] made initial attempts for studying the comparison of survival data between two groups of patients. Mantel [11] has generalized the Savage Test which is termed as Log Rank Test. Subsequently contributions for the study of log rank test were made by Cox [7], Peto and Peto [13] and Peto et al., [14]. The details of the log rank test are discussed in the subsequent sections.

### C. Objective of the study

The objectives of the study are;

- (i) Estimation of the proportion of population which will survive past a certain time.
- (ii) Computation of the survival rate and the recurrence rate
- (iii) To take into account the multiple causes of death and its implications or not.
- (iv) To identify the circumstances this causes either increase or decrease in the odds of survival.

### Basics of survival analysis

Let the random variable T denotes the survival time. The distribution function of the survival time is given by

$$F(t) = P(T < t) = \int_0^t f(u). du, \quad (1.1)$$

The density function is viz.,

$$f(t) = \frac{dF(t)}{du}, \quad (1.2)$$

We can define the survival function as,

$$S(t) = P(T \geq t) = 1 - F(t). \tag{1.3}$$

The hazard function  $h(t)$  of the survival time  $T$  gives the conditional failure rate and the same is given by

$$h(t) = \lim_{\delta t \rightarrow 0} \left\{ \frac{P(t \leq T < t + \delta t | T \geq t)}{\delta t} \right\} = \frac{f(t)}{S(t)} \tag{1.4}$$

Then it follows that

$$h(t) = - \left[ \frac{dS(t)/dt}{S(t)} \right] \tag{1.5}$$

and

$$S(t) = \exp \left[ - \int_0^t h(u) du \right] \tag{1.6}$$

## II. NON PARAMETRIC APPROACH FOR CENSORED SURVIVAL DATA

### A. Kaplan-Meier estimation

The Kaplan- Meier (KM) Survival Analysis procedure is a method of estimating time-to-event models in the presence of censored cases. The Kaplan-Meier model is based on estimating conditional probabilities at each time point when an event occurs and taking the product limit (any KM formula for a survival probability is limited to product terms up to the survival week being specified. Then the KM formula is often referred to as a “product-limit” formula) of those probabilities to estimate the survival rate at each point in time.

To compute KM curves, we must form a data layout that orders the failure times from smallest to largest. For each ordered failure time, the estimated survival probability is computed using the **product limit formula**.

$t(j) : j$  th ordered failure time

$$\hat{S}(t(j)) = \prod_{i=1}^j \hat{Pr}(T > t(i) | T \geq t(i))$$

$$= \hat{S}(t(j-1)) \times \hat{Pr}(T > t(i) | T \geq t(i)) \tag{2.1}$$

Alternatively, this estimate can be computed as the product of the survival estimate for the previous failure time multiplied by the conditional probability of surviving past the current failure time.

Let  $t_{(1)} < t_{(2)} < \dots < t_{(n)}$  denote the distinct ordered times of death. Let  $d_i$  be the number of deaths at  $t_{(i)}$ , and let  $n_i$  be the number alive just before  $t_{(i)}$ . This is the number exposed to risk at time  $t_{(i)}$ . Then the KaplanMeier or product limit estimate of the survivor function is

$$\hat{S}(t) = \prod_{i: t_{(i)} < t} \left( 1 - \frac{d_i}{n_i} \right) \tag{2.2}$$

### B. Cox regression model

The hazard function for the  $i^{\text{th}}$  individual can be written as:

$$h_i(t) = (e^{\beta' x_i}) h_0(t), \tag{2.3}$$

Suppose the data consists of  $n$  observed survival times, denoted by  $t_1, t_2, \dots, t_n$  and  $\delta_i$  is an indicator variable

$$\delta_i = \begin{cases} 1, & \text{if uncensored} \\ 0, & \text{if censored} \end{cases}$$

Collett[5] derived the likelihood function for the Cox Proportional Hazard model is given by

$$L(\beta) = \prod_{i=1}^n \left[ \frac{e^{\beta' X_i(t_i)}}{\sum_{l \in R(t_i)} e^{\beta' X_l(t_i)}} \right], \tag{2.4}$$

where  $R(t_i)$  is the risk set at time  $t_i$ . The log likelihood function is given by:

$$\log L(\beta) = \sum_{i=1}^n \delta_i \left\{ \beta' X_i - \log \sum_{l \in R(t_i)} e^{\beta' X_l(t_i)} \right\} \tag{2.5}$$

### C. Comparison of two survival distributions

The problem of comparing survival distributions arises often in biomedical research. Invariably, the disease free or survival times of the different groups vary. These differences can be illustrated by drawing graphs of the estimated survivorship functions, but that gives only a rough idea of the difference between the distributions. It does not reveal whether the differences are significant or merely chance variations. A statistical test is necessary. To evaluate whether or not KM curves [1] for two or more groups are statistically equivalent, we use the most popular testing method viz., Log Rank Test.

#### Logrank test

The Log Rank Test statistic  $S$  is equal to the sum of the failures observed minus the conditional failures expected computed at each failure time, or simply the difference between the observed and expected failures in one of the groups. The Log Rank Test is a Chi-square test. It Provides an overall comparison of KM curves. It uses observed versus expected cell outcomes over categories of

outcomes. The categories for the log rank statistic are defined by each of the ordered failure times for the entire set of data being analyzed.

The Log Rank Test statistics compares estimates of the hazard functions of two groups at each observed event time based on the sum  $S$  of the 'w' scores of the two groups. The permutational variance of  $S$  is given by,

$$Var(S) = \frac{n_1 n_2 \sum_{i=1}^{n_1+n_2} w_i^2}{(n_1+n_2)(n_1+n_2-1)} \quad (2.6)$$

The test statistics  $L = \frac{S}{\sqrt{Var(S)}}$  has an asymptotically standard normal distribution.

### III. DATA DESCRIPTION AND DATA BASE

#### 3.0 Meaning of Fibroid

Fibroids are muscular tumors that grow in the wall of the uterus (womb). In medical terminology Fibroids is also called "leiomyoma" (leye-oh-meye-OH-muh) or just "myoma". Fibroids are almost always benign (not cancerous). Fibroids can grow as a single tumor, or there can be many of them in the uterus. They can be as small as an apple seed or as big as a grapefruit. In unusual cases they can become very large. There are factors that can increase a woman's risk of developing Fibroids.

The general features of Fibroid include the following:

- (i) **Age:** Fibroids become more common as women age, especially during the 30s and 40s through menopause. After menopause, fibroids usually shrink.
- (ii) **Family history:** Prior information on family history will reveal the severity of Fibroids.
- (iii) **Ethnic origin:** It is stated that African-American women are more likely to develop fibroids than white women.
- (iv) **Obesity:** Women who are overweight are at higher risk for fibroids. It may be noted that for very heavy women, the risk is two to three times greater than average.
- (v) **Eating habits:** This plays a greater role with higher risk of Fibroids. Most fibroids grow in the wall of the uterus.

Medical practitioners classify the Fibroids as given below:

- (i) **Submucosal** (sub-myoo-KOH-zuhl)- Fibroids grow into the uterine cavity.
- (ii) **Intramural** (ihn-truh-MYOOR-uhl) -Fibroids grow within the wall of the uterus.
- (iii) **Subserosal** (sub-suh-ROH-zuhl) -Fibroids grow on the outside of the uterus.

Some fibroids grow on stalks that grow out from the surface of the uterus or into the cavity of the uterus. They might look like mushrooms. These are called **pedunculated** fibroids.

Most Fibroids do not cause any symptoms. The consequences of Fibroids with some women are noted below:

- Heavy bleeding (which can be heavy enough to cause anemia) or painful periods
- Feeling of fullness in the pelvic area (lower stomach area)
- Enlargement of the lower abdomen
- Frequent urination
- Pain during sex
- Lower back pain
- Complications during pregnancy and labor, including a six-time greater risk of cesarean section
- Reproductive problems, such as infertility, which is very rare

Medical researchers are trying to find the probable causes for the Fibroids. They have identified two main factors viz., Hormonal (affected by [estrogen](#) and [progesterone](#) levels) and Genetic (runs in families). Fibroids grow rapidly during pregnancy, when hormone levels are high. They shrink when anti-hormone medication is used. They also stop growing or shrink once a woman reaches menopause

#### *A. Data Base for the study and Data description.*

The reference period of the study is 2007-2012. The data relating to fibroids were collected from a sample of 105 women who have undergone treatment for uterine fibroid in a private hospital, Chennai. About 50% of the patients had fibroid in intramural position, 30% in submucosal position and 20% in subserosal position. As far as the severity of the symptoms about 26% of the patients suffered from severe pain in abdomen during periods, 51% complaints with heavy bleeding and they seem to be anemic, 1% with inconception, 1% bleeding after menopause, 1% misconception etc.,

The variables collected under study are Age, Blood group, Age of menarche (age at puberty), Age at marriage, Family income, Place of residence, Position of Fibroid in uterus, Fibroid size, Symptoms persisted due to Fibroid, Number of children of the patient,

The time reference considered in the study are :

**Time of diagnosis:** It is the month and the year in which the abnormality is diagnosed.

**Time of treatment:** After diagnosis it is the time when treatment is given.

**Waiting time:** It is duration in months between the time when fibroid is diagnosed to the time when treatment is taken.

The basic statistics with reference to the variables are given in the following Table 1.

Table 1. Basic Statistics of covariates

Variables		Mean	Standard deviation
		$\bar{x}$	S
Age(years)	$[x_1]$	38	11.63
Age at menarche(years)	$[x_2]$	13	1.7
Age at marriage(years)	$[x_3]$	26	0.5
Number of children	$[x_4]$	1	1.5
Waiting time(months)	$[x_5]$	21	19.22

It is observed from above Table 1, there is greater variation in respect of the variables viz., Age and Waiting Time.

**B. Empirical Analysis**

*Computation of estimate of survival function and hazard function*

The survival time forms the basis for the computation of the functions viz., Survival function and Hazard function. The survival times observed among the women with Fibroids are not uniform. The estimates of the survival function, hazard function and survival standard error are given in Table 2.

We observe the following based on the results given Table 2:

- (i) Estimates of the survival function tends to zero as the survival time increases in a non-uniform manner
- (ii) Estimates of the hazard function tend to one as the survival time increases in non-uniform manner.

The following figures [Fig.1- Fig.6] illustrate the survival plots under different factors.

The steps clearly reveals the Waiting time of patients (in months) in Figure 1. In Figure 2, we observe that the hazard function exhibits an approximate S curve. Figure 3, the shape of survival function reveals the same as that of waiting time curve. Figure 4, gives the estimated survivor curves for the two age of menarche of patients in two groups less than or equal to 13 and more than 13.

Table 2. Estimated Survival and hazard function of patients with Uterine fibroid

SurvivalTime	Survival function $\hat{S}(t)$	Hazard function $\hat{h}(t)$	Survival Standard Error
0	1.0000	0	0
1	0.9810	0.0190	0.0133
2	0.8190	0.1810	0.0376
3	0.7333	0.2667	0.0432
5	0.7048	0.2952	0.0445
6	0.6571	0.3429	0.0463
10	0.6476	0.3524	0.0466
11	0.6286	0.3714	0.0472
12	0.5714	0.4286	0.0483
13	0.5429	0.4571	0.0486
14	0.5328	0.4672	0.0487
16	0.5115	0.4885	0.0491
17	0.5008	0.4992	0.0492
18	0.4582	0.5418	0.0494
21	0.4262	0.5738	0.0493

24	0.3917	0.6083	0.0492
27	0.3341	0.6659	0.0482
28	0.3110	0.6890	0.0476
30	0.2995	0.7005	0.0472
33	0.2875	0.7125	0.0468
35	0.2750	0.7250	0.0464
41	0.2475	0.7525	0.0456
42	0.2338	0.7662	0.0451
51	0.2192	0.7808	0.0446
58	0.1948	0.8052	0.0458
59	0.1623	0.8377	0.0483
72	0	1.0000	.

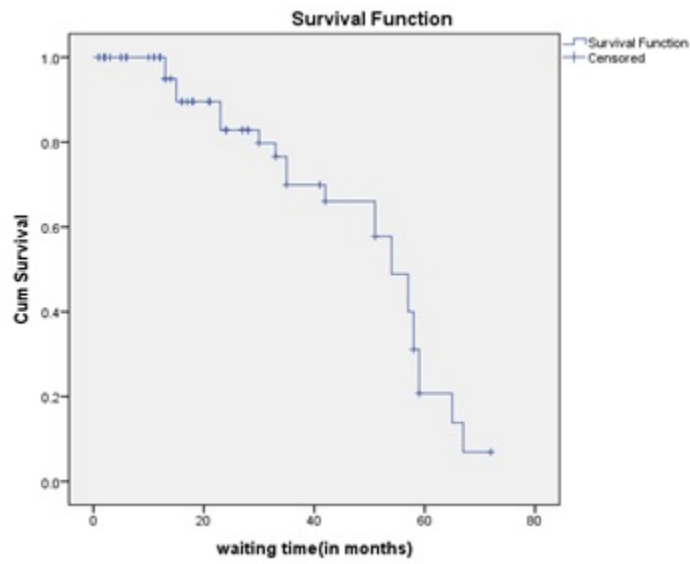


Figure 1. Survival curve of 105 patients with uterine fibroid

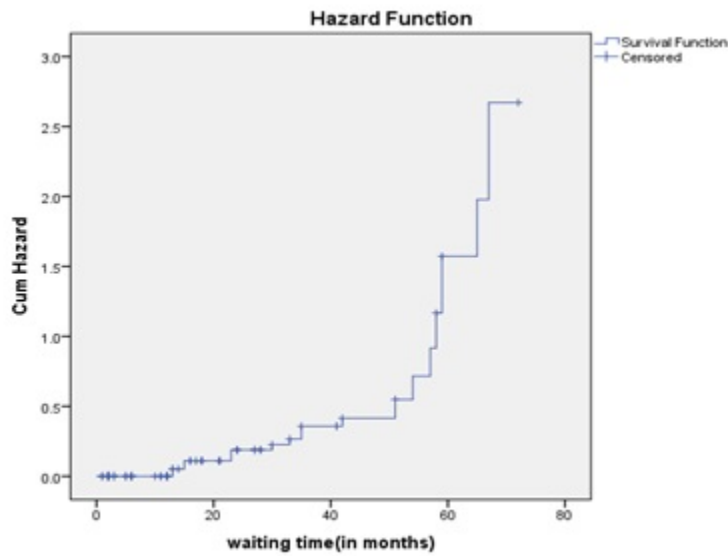


Figure 2. The hazard curve of 105 patients with Uterine fibroid



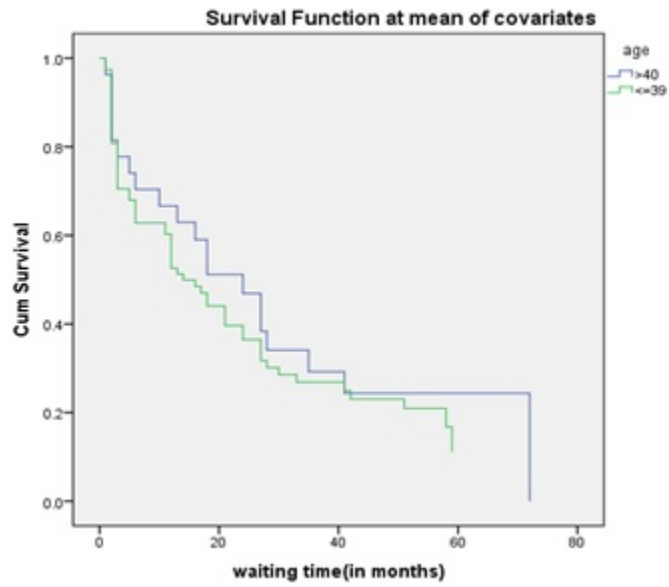


Figure 3. Overall survival curves of patients with uterine fibroid in different age group

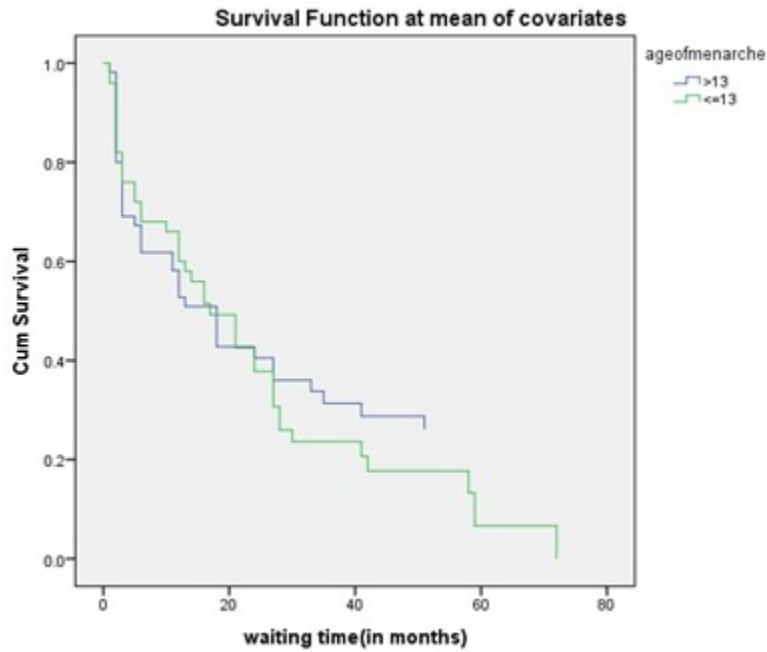


Figure 4. Overall survival curves of patients with Uterine fibroid in different age group of menarche

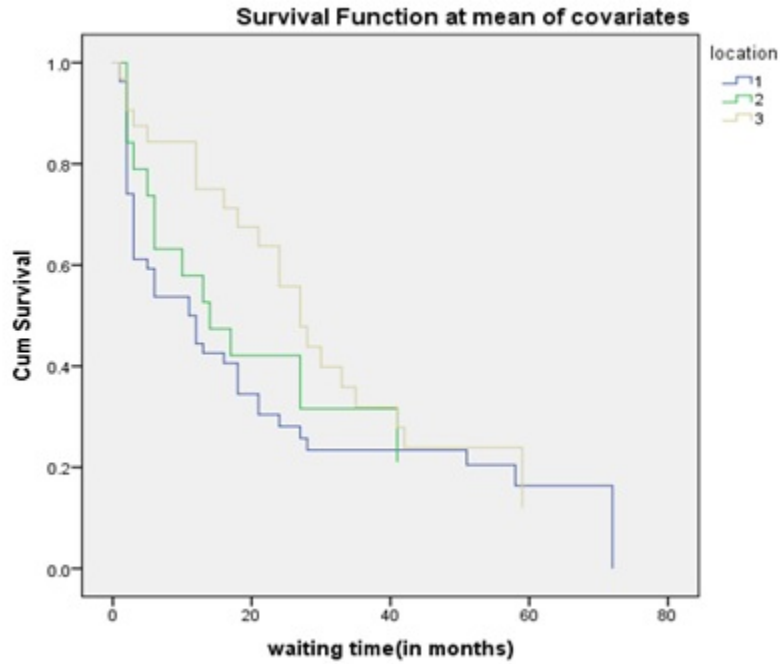


Figure 5. Overall Survival curves of patients with Uterine fibroid with fibroid in different locations.  
1-intramural,2-subserosal,3-submucal.

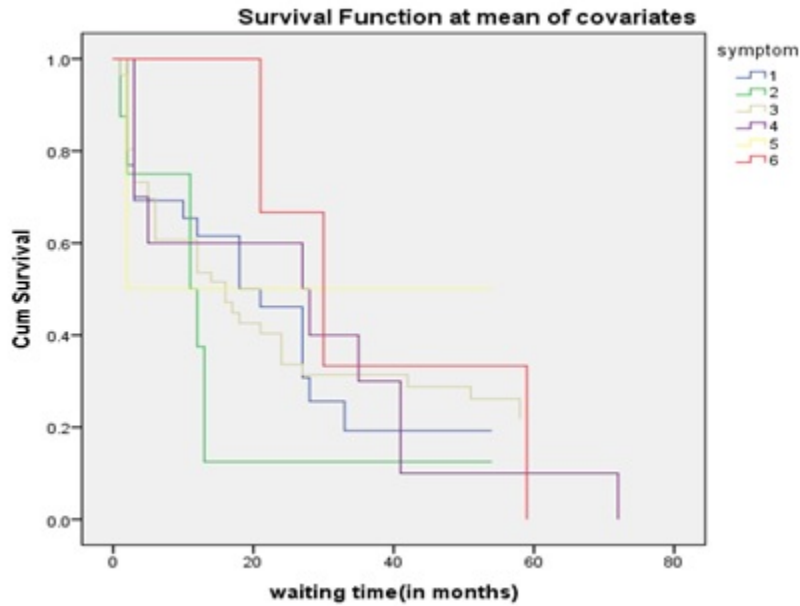


Figure 6 Overall survival curves of patients with Uterine fibroid with different symptoms.  
1-pain in abdomen,2-inconception,3-heavy bleeding,anemic,4-Bleeding after menopause,5-irregular periods,6-misconception

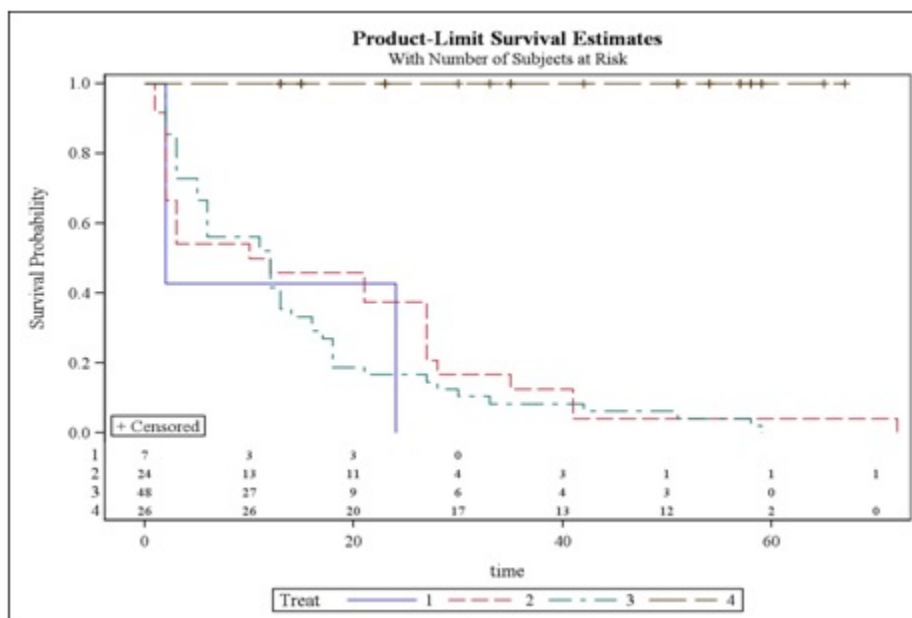


Figure 7. Overall Survival curves of patients with Uterine fibroid with different modes of treatment taken.

The graph of the survivor function of the two age group  $\leq 13$  and  $> 13$  more or less coincide till the waiting time of 25 months. However, after 25 months the survivor function of the group  $> 13$  lies above the  $\leq 13$ . Also it is noted the event of interest of the age group is  $> 13$ .

In Figure 5 the graph of survival function of patients with Fibroid in submucal position lies above the survival curves of subserosal and intramural positions. However, the survival curve of subserosal position lies above intramural position. The functions due to three different positions of Fibroid coincide at waiting time 1 month, 40 months and 60 months.

The symptom of Fibroid in respect of the survival time and hazard shows a mixed pattern in Figure 6. Figure 7 gives the survival curves of different types of treatments. Survival curves of treatment myomectomy and hysterectomy experience more or less same survival time except those in the waiting period 15 months to 30 months.

*Univariate analysis of the basic data*

In this section we have attempted Univariate analysis of the data with respect to the variables viz., Age, Age of menarche, Age of marriage, Location of Fibroids and Symptoms for a deeper understanding of the survival rate. It is important to note that we have used the grouping the data in respect of the 3 variables viz., age, age of menarche and age of marriage in two distinct categories. In respect of position of Fibroid, we have adopted 3 distinct categories. For the variable viz “Symptoms” 6 categories have been considered. The usage of different categories adopted here in conforming with the standard analysis carried out in survival studies. The results are presented in the following Table 3.

Table 3. Univariate analysis of survival of 105 patients with Uterine fibroid.

Variable	Cases	Survival rate	-2log likelihood	P value (log rank)
Age				
$\leq 39$	59	23.980	544.147	0.6121
$> 39$	20	29.510		
Age of menarche				
$\leq 13$	41	23.711	523.234	0.0267*
$> 13$	38	27.133		
Age at marriage				
$\leq 23$	28	25.831	477.303	0.9306
$> 23$	43	26.760		
Position of fibroid				
1-Intramural	43	22.394	434.131	0.2965
2-Subserosal	14	25.053		
3-Submucal	22	30.090		
Symptoms				
1-pain in abdomen	19	23.282		

2-inconception	17	15.000		
3-Heavy bleeding,anemic	39	26.188	488.130	0.7265
4- bleeding after menopause	10	25.800		
5-irregular periods	1	28.000		
6-misconception	3	36.667		

\*p<0.05

*Interpretation of results.*

We observe that age of menarche plays an important role and the results relating to this category are significant. The other variables viz., Age, Age at marriage, Position of Fibroid and symptoms do not reveal significant effect.

*Multiple comparisons of treatments using log rank test:*

We have attempted to compare the types of treatments using Log Rank Test. We have classified the treatments as given below:

- Treatment 1: Control Treatment
- Treatment 2: Myomectomy
- Treatment 3: Hysterectomy
- Treatment 4: Gnrh

The data relating to the 4 categories of treatments were treated as 4 different strata. The data analysis has been carried out using Chi-square Test and the results are presented in the following Table 4.

Table 4. Multiple comparison of treatments using Log rank test

Multiple Comparisons for the Logrank Test			
Strata Comparison		Chi-Square	p-Values
Treat	Treat		
1	2	0.9972	0.3180
1	3	12.4764	0.0004
1	4	56.1662	<.0001
2	3	4.0507	0.0442
2	4	38.3361	<.0001
3	4	50.7488	<.0001

1-Control Treatment,2-myomectomy,3-hysterectomy,4-GnrH

A closer analysis of the results presented in the above table reveals the following:

- (i) The Chi-square values for Control Treatment with GrnH, Myomectomy and GnrH and Hysterectomy and GrnH are significant. This clearly reveals the major effect of GrnH.
- (ii) Chi-square values for Control Treatment with Myomectomy and Myomectomy and Hysterectomy are not significant.

*Cox-Regression Model for patients with Uterine Fibroid*

We have also made attempts for analyzing the effects of multi factors involved in this study. Cox-Regression Model is fitted using the variables viz., Age (X<sub>1</sub>), Age of Menarche (X<sub>2</sub>), Age at marriage (X<sub>3</sub>), Location (X<sub>4</sub>), and Symptoms (X<sub>5</sub>) and the results are presented in the following Table 5.

As noted earlier here also we observe that the variables viz., Age of Menarche plays the key role and it reveals that the effect is significant.

Table 5. Cox regression analysis of patients with Uterine fibroid

Variable	B	Standard Error	P
Age X <sub>1</sub>	-0.0490	0.2415	0.8391
Age of menarche X <sub>2</sub>	-0.5727	0.2775	0.0391*
Age at marriage X <sub>3</sub>	-0.0183	0.2393	0.9390
Location X <sub>4</sub>	-0.1279	0.1589	0.4207
Symptoms X <sub>5</sub>	-0.0374	0.0566	0.5087

\*p<0.05

### Results and Discussion

The analysis and results of the study are given below:-

- (i) The percentage of patients with position of fibroids is: intramural (50%), submucal (30%) and subserosal (20%)
- (ii) Estimates of the survival function tend to zero as the survival time increase in a non-uniform manner.
- (iii) Estimates of the hazard function tend to one as the survival time increases in non-uniform manner.
- (iv) The symptoms of Fibroid in respect of survival time and hazard show a mixed pattern.
- (v) The variable viz., Age of menarche plays a significant role among the patients with Fibroids.
- (vi) Comparison of treatments based on strata analysis clearly reveals the significant effect of the treatment Gonadotrophin releasing Hormone (GnrH) which is a hormone medicine that causes low level of oestrogen in the body. Fibroids shrink if the level of oestrogen falls. This can ease heavy periods and pressure symptoms due to fibroids. However, a oestrogen level can cause symptoms similar to going through the menopause (hot flushes etc.).It may also increase the risk of 'thinning' of the bones (osteoporosis).Therefore, this treatment is given for a maximum of six months.

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### AUTHORS

**First Author** - Dr. J. Jothikumar, Associate Dean, Faculty of Science and Humanities, SRM University, Kattangulathur.

Email id : [jjothikumar@yahoo.co.in](mailto:jjothikumar@yahoo.co.in).

**Secind Author** -V. Sumathy, Assistant Professor in Statistics, Kumararani Meena Muthiah College of Arts and Science, Adyar, Chennai.

Email id : [v.sumathy@yahoo.com](mailto:v.sumathy@yahoo.com)

**Correspondance Author** : V. Sumathy, Assistant Professor in Statistics, Kumararani Meena Muthiah College of Arts and Science, Adyar, Chennai.

Email id : [v.sumathy@yahoo.com](mailto:v.sumathy@yahoo.com), Phone num: 9884682386/9941732000.

# Understanding Elderly Abuse- A Special Reference to Elderly in an Urban Slum of Coimbatore, Tamil Nadu

S.Sampath Kumar<sup>1</sup>, S.Girijakumari<sup>2</sup> & V.Brindha<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Sociology, Bharathidasan University, Tiruchirappalli- 620 024, Tamil Nadu, India.  
drsampathsrinivasan@gmail.com

<sup>2</sup>Vice Principal, Sri Ramakrishna College of Nursing, Coimbatore- 641044

<sup>3</sup>Professor, Department of Community Health Nursing, Sri Ramakrishna College of Nursing, Coimbatore

**Abstract-** A descriptive study was conducted among 80 elderly people using convenient sampling technique at Jawahar Nagar, Coimbatore to identify the prevalence of elderly abuse. The data was collected through an interview schedule by adopting the Elder Abuse Suspicion Index (EASI) tool. The finding reveals that 70% of them were between 60 and 70 years, females and were not working. Half of them had some form of assets and lived with their spouse, while 20% lived with their married daughter and 30% with their sons. Seventy percent of them had one or more medical problems like Hypertension, Diabetes mellitus and Asthma. Half of them expected help from their spouse, 40% from their children and 10% from their grand children. Further the finding reveals that 56% of them relied on others for carrying out their activities of daily living. About 30% of them complained about limitation of freedom and psychological abuse, while 19% complained of financial abuse and none of them notified of physical abuse. In 10% of the elderly the researcher was able to notice behaviours like poor eye contact and withdrawn behaviour which can be related to some form of abuse. The notable finding in the study was that, the elderly who lives with their married daughters were faced lesser abuse than the old people reside with their son.

**Index Terms-** Elderly, Abuse

## I. INTRODUCTION

The world is today at the brink of a paradigm shift with an increasing population of older people as compared to children and more people at extreme old age than ever before. (World Health Organisation, 2011). United Nations report projected the number of people aged 65 or older to grow from an estimated 524 million in 2010 to nearly 105 billion in 2050, with most of the increase in developing countries (United Nations, 2013)

India is growing old. The stark reality of the ageing scenario in India is that there are 77 million older persons in India today, and the number is growing to grow to 177 million in another 25 years. With life expectancy having increased from 40 years in 1951 to 64 years today, a person today has 20 years more to live than he would have 50 years back. (Shubha Soneja 2011). Census shows an increase in the percentage of population over the age of 60 years from 6.8 in 1991 to 8.6 in 2011 (Census of India, 2011)

A 'senior citizen' or 'elderly' is a person who is of age 60 years or above. (National Policy on Older Persons, 1999).

Although projections indicate that India's population above 60 years will be double in size between 2001 and 2026, the elders will account for 12.17 percent of overall population in 2026, and being a vast country, India may face the problems differently at rural and urban part. India will have another kind of a problem as despite of rapid and consistent economic growth, it will have a huge ageing population who may be far poorer than their counterpart in the West. In India, most of those who have worked in organized sector get pension and other retirement benefits after attaining the age of superannuation varying between 60 to 65 years. But for others, Government of India and State Governments, at present, have very nominal old-age pension coverage. It varies from Rs. 75/- to 150/- in a month. In addition some other additional benefits for the elderly are also being provided by the Central and State Governments. But much is to be done as at the old age their medical expenses go up and dependency on children / relative goes up for physical, mental and economic support.

Among economically dependent elderly men 6-7% was financially supported by their spouses, almost 85% by their own children, 2% by grand children and 6% by others. Of elderly women, less than 20% depended on their spouses, more than 70% on their children, 3% on grand children and 6% or more on others including the non-relations. Nearly 40% of persons aged 60 years and above (60% of men and 19% of women) were working. In rural areas 66% of elderly men and above 23% of aged women were still participating in economic activity, while in urban areas only 39% of elderly men and about 7% of elderly women were economically active.(Central statistics office 2011)

With this kind of an ageing scenario, there is pressure on all aspects of care for the older persons – be it financial, health or shelter. With older people living longer, the households are getting smaller and congested, causing stress in joint and extended families. Even where they are co residing isolation and insecurity is felt among the older persons due to the generation gap and change in lifestyles. Increase in lifespan also results in chronic functional disabilities creating a need for assistance required by the older person to manage chores as simple as the activities of daily living. With the traditional system of the lady of the house looking after the older family members at home is slowly getting changed as the women at home are also participating in activities outside home and have their own career ambitions. There is growing realisation among older persons that they are more often than not being perceived by their children as a burden. (Shubha Soneja 2011)

Old Age has never been a problem for India where a value based, joint family system is supposed to prevail. Indian culture is automatically respectful and supportive of elders. With that background, elder abuse has never been considered as a problem in India and has always been thought of as a western problem. Also the traditional Indian society and the age-old joint family system have been instrumental in safeguarding the social and economic security of the elderly people in the country. However, the coping capacities of the younger and older family members are now being challenged and more often than not there is unwanted behaviour by the younger family members, which is experienced as abnormal by the older family member but cannot however be labelled. However, with the rapid changes in the social scenario and the emerging prevalence of nuclear family set-ups in India in recent years the elderly people are likely to be exposed to emotional, physical and financial insecurity in the years to come.

Elder abuse is defined as a single or repeated act, or lack of appropriate action, occurring in any relationship where there is an expectation of trust, that causes harm or stress to an older person. It includes physical, psychological, and sexual abuse, financial exploitation, and neglect. Elder abuse is any knowing, intended, or careless act that causes harm or serious risk of harm to an older person— physically, mentally, emotionally, or financially. In actuality, most cases of elder abuse go unidentified and hence unreported by health and welfare practitioners. Consequently, many victims of abuse or neglect do not receive the help that might improve their quality of life and their psychological and physical health. Abuse in older adults is related to increased morbidity and reduced survival even after adjustment for other risk factors for mortality. In addition, elder adults are frequently reluctant to tell health care or welfare practitioners of the mistreatment they suffer out of fear, shame, or a sense of hopelessness. (Miri Coilen 2011)

## II. REVIEW OF LITERATURE

A Community Response to Financial Abuse of Older Adults addresses the phenomenon of financial/material abuse against dependent older adults who live in the community and are being cared for by a family member, friend or neighbour or who are living in a residence or nursing home and cared for by paid caregivers. It is hard for us to imagine that such abuse exists and in fact, has always existed in our society. Violence against older adults is yet another manifestation of domestic violence, about which we, as a society, are becoming more and more aware. It is important for all members of society, as well as health care professionals, to be aware of the signs and symptoms of this phenomenon so that we can find ways to detect the presence of such a problem and thus enable the victim to get the help they need. As well, we need to find ways of preventing such abuse from occurring and how to avoid them (Daphne Nahmiash and Rhonda Schwartz, 2008)

Jain (2008) traces a pattern of increasing elderly abuse amidst changes in the Indian family structure and function. The transition in interaction pattern, interpersonal relations and communication pattern leads to a serious threat for healthy aging. The exemplary short case studies reported indicate that elders are encountering both physical and psychological distancing in joint

as well as nuclear families. Youths in general have started asserting strongly for individual self, and are in a great hurry to have every source of pleasure regardless of its legitimacy. Their behaviour and unconcerned attitudes towards aged family members are becoming apparent. With increasing individualism family members seem to assert for individual freedom, prefer to live with individualized likings. This life style does not allow them to care for the personal, physical and emotional needs of elders.

World Health Organization reported that, India is growing old! The stark reality of the ageing scenario in India is that there are 77 million older persons in India today, and the number is growing to grow to 177 million in another 25 years. With life expectancy having increased from 40 years in 1951 to 64 years today, a person today has 20 years more to live than he would have 50 years back. Old Age has never been a problem for India where a value based, joint family system is supposed to prevail. Indian culture is automatically respectful and supportive of elders. With that background, elder abuse has never been considered as a problem in India and has always been thought of as a western problem. However, the coping capacities of the younger and older family members are now being challenged and more often than not there is unwanted behaviour by the younger family members, which is experienced as abnormal by the older family member but cannot however be labeled (Shubha Soneja 2011)

A study examined the prevalence of and factors related to mistreatment among 400 elderly individuals (65 years old and older) living in Chennai, India reveals that Chronic verbal abuse was the most common type of mistreatment, followed by financial abuse, and physical abuse and neglect (similar rates). Half of those who had been mistreated experienced more than one type of mistreatment. With the exception of financial abuse, a significantly greater number of women experienced verbal and physical abuse as well as neglect compared to men. Perpetrators of mistreatment were adult children, daughters-in-law, spouses, and sons-in-law. Victims tended to be more depressed and less satisfied with life than those elderly individuals who were not mistreated (Chokkanathan and Lee 2005)

A cross sectional study conducted among 480 elderly populations in slum and non-slum areas of West Delhi, India brings out that more than sixteen percent of elderly have reported any types of abuse mostly originated by their son and daughter in law. Major context of elderly abuse occurred either due to property related issue, health care and basic amenities, dependency and household related problems. The study further suggested protecting and strengthening the institution of family and community to enable to support and care the elderly ( Kishor and Kataria, 2013)

## III. METHODOLOGY

A descriptive study was conducted among 80 elderly people using convenient sampling technique at Jawahar nagar, Coimbatore, Tamil Nadu. The data were collected through an interview schedule by adopting the Elder Abuse Suspicion Index (EASI) tool. The tool had 2 sections, of which section A consisted of items related to the demographic profile which includes age, sex, number of children, working status, the mode

income and income, availability of assets, people with whom they reside, number of family members, presence of medical problems and assistance received. Section B is the EASI scale consists of 6 items, of which 5 items including, reliance on people, affiliation with the people, feel shamed or threatened, tried to force touched you in ways that you did not want, or hurt you physically were directly asked to the samples and the sixth item was assessed by the health care provider to identify the signs of abuse which includes poor eye contact, withdrawn nature, malnourishment, hygiene issues, cuts, bruises, inappropriate clothing, or medication compliance issues. The collected data were analysed using descriptive statistics and the results were interpreted.

#### IV. FINDINGS

The finding of section A, reveals that 70% of them were between 60 and 70 years, females and were not working. Most of them, (50%) had some form of assets and lived with their spouses, while 20% lived with their daughter and in laws and 30% with their sons and in laws. 70% of them had one or more medical problems like Hypertension, Diabetes mellitus and Asthma. 50% of them expected help from their spouse, 40% from their children and 10% from their grand children.

The finding of section B reveals that 56% of them relied on others for carrying out their activities of daily living. About 30% of them complained about limitation of freedom and psychological abuse were elderly women, while 19% complained of financial abuse and none of them complained of physical abuse. In 10% of the elderly the researcher was able to notice behaviours like poor eye contact and withdrawn behaviour which can be related to abuse were women.

About 19 % of the elderly complained about financial abuse and when noticed it was among the 30% of elderly who lived with their son and daughter in law. No elderly women were working and relied on others for their living. The mere word old age is associated with medical problems and 70% of them suffer with one or more non communicable problems which make them highly dependent on others for the following activities like taking them to the hospital for regular follow up, buying medicines, financial assistance and sometimes for carrying out the activities of daily living. Elderly were complaining of restrictions for going out as they are in a position to take care of the house and household work as their son and daughter in laws were working. The notable finding in the study was that, the elderly who lives with their married daughters were faced lesser abuse than the old people reside with their son.

#### V. CONCLUSION

In India, the problems and issues of its grey population has not been given serious considerations. The solutions cited to handle the “problems of older persons” were in the form of a recreation centre/day care centre and elderly counselling services. Deliberate public actions, sensitizing the issue and educating the public helps to mitigate the adverse consequences of our aging population.

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#### AUTHORS

**First Author** – S.Sampath Kumar, Assistant Professor, Department of Sociology, Bharathidasan University, Tiruchirappalli 620 024, Tamil Nadu, India. E.Mail: [drsampathsrinivasan@gmail.com](mailto:drsampathsrinivasan@gmail.com)

**Second Author** – S.Girijakumari, Vice Principal, Sri Ramakrishna College of Nursing, Coimbatore- 641044 Tamil Nadu, India. E.Mail: [girija1626@gmail.com](mailto:girija1626@gmail.com)

**Third Author** – V.Brindha, Professor, Department of Community Health Nursing, Sri Ramakrishna College of Nursing, Coimbatore 641044, Tamil Nadu, India. E.Mail: [jbyuktha2007@gmail.com](mailto:jbyuktha2007@gmail.com)



# Effect of weeds *Diya siyambala* (*Aeschynomene indica*), *Kudamatta* (*Fimbristylis miliacea*) and *Thunassa* (*Cyperus iria*) on growth and yield of Rice (*Oryza sativa* *L.*) variety Bg 379-2, Ld 365, Bg 357

Dahanayake Nilanthi, Inoka KPI, Madhushani, P.A, Dissanayaka D. M. P and Kumarasinghe S

Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka

**Abstract-** *Aeschynomene indica* (Fabaceae) (Singhala: *Diyasiyambala*) is a nitrogen-fixing weed commonly found in paddy fields. This study was undertaken to determine the effect of *A. indica* on growth and yield of rice variety Bg 357 in comparison with two non-nitrogen fixing weeds *Fimbristylis miliacea* (Singhala: *Kudamatta*) and *Cyperus iria* (Singhala: *Thunassa*).

Observations were made on the growth and yield of the potted rice with *A. indica*, *F. miliacea* and *C. iria* separately. Shoot length, number of panicles per plant, number of seeds per panicle, weight of hundred seeds were measured. The experiment was conducted in a Complete Randomized design (CRD) with 3 replicates. Statistical analysis was carried out using the Student Newman-Kuells Means Separation Test of SAS program (9.1.3). Bg 379-2, Ld 365, Bg 357 plants grown with *A. indica* (1:1) had 14.55%, 25.8% and 14.87% higher shoot length, 43.33%, 29.4% and 27.27% more number of tillers per plant, 43.33%, 29.4% and 10.48% number of panicles per plant, 29%, 61.6% and 9.23% more number of seeds per panicle and 5.3%, 13% and 9.58% higher seed weight than control respectively. Furthermore, rice cultivars grown with other weeds negatively affected on growth and yield of rice plant. Rice is Nitrogen (N) demanding crop for better growth and higher yield, therefore N-fixing weeds could be integrated into rice ecosystem for better productivity with less fertilizer inputs.

**Index Terms-** *Oryza sativa*, *Aeschynomene indica*, *Fimbristylis miliacea*, *Cyperus iria*, N fixation

## I. INTRODUCTION

Rice (*Oryza sativa* L.; Family Graminae) is the staple food of around 30-40% of the world population. Over 90% of rice is cultivated in Asia. It is an important source of carbohydrate for human consumption and also provides feed and forage. The rice production has been increasing worldwide by large-scale adoption of modern high-yielding rice varieties and improved cultural practices. In modern world usage of chemical fertilizer for crop improvement is highly adopted and Urea, TSP (Triple Super Phosphate), MOP (Murate of Potash) was introduced to paddy cultivation. Long term use of chemical fertilizer may cause environmental pollution and health problems (Department of government information, 2013). Nitrogen is the most important and limiting nutrient to rice cultivation in Sri

Lanka. As basal dressing 50Kg/ha and top dressing 37.5 Kg/ha nitrogen requirement is supplying by urea fertilizer in paddy cultivation.

*Diyasiyambala* (*Aeschynomene indica*; Family fabaceae) is a mycotrophic plant and freely nodulating nitrogen fixing species which grown in paddy lands as a weed. *Diyasiyambala* can be used as green manure and livestock feed. This species bear nodules on the aerial parts of the stems under natural condition. *Thunassa* (*Cyperus iria* L, Family Cyperaceae) is sedge grown in paddy field that is competed with rice plant throughout the growing season. Yield and quality of the rice goes down due to weeds in the cultivated lands. *Kudamatta* (*Fimbristylis miliacea*, Family Cyperaceae) is a serious and widespread weed that are competed with rice. This affect negatively on rice yield and quality of seeds. Andalso *Kudamatta* acts as an alternate host for pest and disease. Therefore, the objective of this study was to evaluate the effect of *Diyasiyambala*, *Thunassa* and *Kudamatta* on growth and yield of rice varieties Bg 379-2, Ld 365 and Bg 357.

## II. METHODOLOGY

### Experimental location

Study was conducted at Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya. Mapalana is located in the low country wet zone (WL<sub>2</sub>) where the annual rainfall is > 1900 mm. The mean monthly temperature is 27.5 °C and relative humidity is around 72%.

*Oryza sativa* (variety Bg 379-2, Ld 365, Bg 357) seeds were obtained by Department of Agriculture. Pots (1.5x1.5x1.5 ft<sup>3</sup>) were filled with paddy mud. After 14 days of nursery period healthy same size (7 cm) rice seedlings were transplant to the pots. After 24days of nursery period same size (12 cm) *Diyasiyambala* seedlings were transplanted to the pots with rice plants. Same size *Kudamatta* and *Thunassa* seedlings were taken from the existing paddy land separately and transplant them to the recommended pots. Throughout the experiment maintained 4 plants per pot. The treatments were; 4 rice seedlings (control T 1), Two rice seedlings with 2 *Diyasiyambala* seedlings (T 2), two rice seedlings with 2 *Kudamatta* (T 3) and two rice seedling with 2 *Thunassa* seedlings per pot (T 4) (fig. 1). Basal dressing applied to the soil before sowing seeds Urea 50 Kg /ha, Triple Super Phosphate 62.5 Kg/ha, Murate Of Potash 50 Kg /ha. After 3 ½ months paddy were harvested. Shoot

length, number of panicles, no of tillers, no of seeds, thousand seed weight was measured.

Each treatment was replicated three times. All management practices were conducted according to recommendation of the department of Agriculture from seed germination to harvesting. Data was analyzed using SAS program (9.1.3). Mean separation was determined by Duncan’s multiple range test at ( P=0.05).

### III. RESULT & DISCUSSION

Result indicates that there is a significant effect of weeds for yield (quality and quantity) and growth of all rice varieties. Highest growth and yield performance of rice was observed with Diyasiyambala where least was observed with Kudamatta and Thunassa compare to control.

Diyasiyambala (Legume) significantly affects on the plant growth and yield of rice plants at (P< 0.05). Comparing to the control, shoot length (14.55%), number of tillers per plant, number of panicles per plant (44.33%), number of seeds per plant (29%) and hundred seed weight (5.3%) were increased in rice variety Bg 379-2 with Diya siyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (19.18%, 19.18%), number of tillers per plant/number of panicles per plant (22.33%, 33.33%), number of seeds per plant (27.03%, 31.25% ) and hundred seed weight (2.66%, 3.42%) respectively (Table 1).

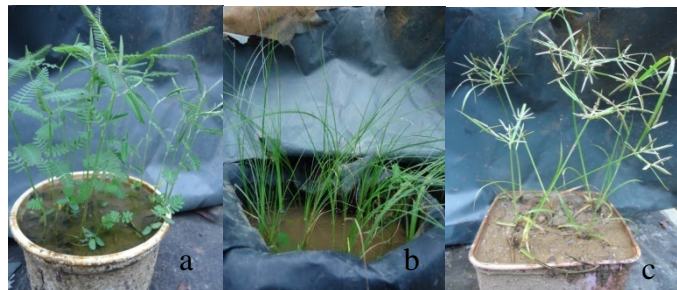


Figure 1: Selected weeds for the experiment. a. Diyasiyambala, b. Kudamatta, c. Thunassa

**Table 1. Rice growth and yield performance (variety Bg 379-2)**

Treatment	Height of rice plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T1 (rice + rice)	57.3 b	3.0 b	3.0 b	331.7 b	2.6 b
T2 (rice+Diyasiyambala)	65.7 a	4.3 a	4.3 a	428.0 a	2.8 a
T3 (rice + Kudamatta)	46.3 c	2.3 c	2.3 b	242.0c	2.6 c
T4 (rice + Thunassa)	43.3 c	2.0 c	2.0 b	228.0 c	2.5 c

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test ( P=0.05). Values in same column with same letter denoted non- significant difference.

Comparing to the control, shoot length (25.8%), number of tillers per plant, number of panicles per plant (29.4%), number of seeds per plant (61.6%) and hundred seed weight (13%) were

increased in rice variety Ld 365 with Diya siyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (36.6%, 39%), number of tillers per plant, number of panicles per plant (23.5%, 29%), number of seeds per plant (34%, 37% ) and hundred seed weight (10%, 10.3%) respectively (Table 2) (Figure 2).

**Table 2. Rice growth and yield performance (variety- Ld 365).**

Treatment	Height of rice plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T <sub>1</sub> (rice + rice)	46.3 b	2.8 b	2.8 b	301.3 b	3.0 b
T <sub>2</sub> (rice+Diyasiyambala)	58.2 a	3.7 a	3.7 a	486.8 a	3.4 a
T <sub>3</sub> (rice + Kudamatta)	29.3 c	2.2 c	2.2 c	198.3 c	2.7 c
T <sub>4</sub> (rice + Thunassa)	28.2 c	2.0 c	2.0 c	189.0 c	2.7 c

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test ( P=0.05).Values in same column with same letter denoted non- significant difference.



**Figure 2: Growth of rice plant with Diyasiyambala, Kudamatta and Thunassa**

Comparing to the control, shoot length (14.87%), number of tillers per plant (27.27%), number of panicles per plant (10.46%), number of seeds per plant (9.23%) and hundred seed weight (9.58%) were increased in rice variety Bg 357 with Diyasiyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (5.40%, 6.19%), number of tillers per plant(36.37%,36.37%), number of panicles per plant (30.2%, 39.5%), number of seeds per plant (24.5%, 26.5% ) and hundred seed weight ( 11.75%, 11.75%) respectively (Table 3).

**Table 3.Rice growth and yield performance (variety Bg 357)**

Treatment	Height of rice per plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T1 (rice + rice)	63.3 b	3.7 b	7.2 a	453.0 b	2.8 b
T2 (rice + Diyasiyambala)	72.7 a	4.7 a	6.4 a	494.8 a	3.2 b
T3 (rice + Kudamatta)	59.8 c	2.3 c	5.0 b	342.0c	2.5 c
T4 (rice + Thunassa)	59.3 c	2.3 c	4.3 b	332.7 c	2.5 c

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test( P=0.05).Values in same column with same letter denoted non- significant difference.

**IV. CONCLUSION**

Diyasiyambala (*Aeschynomene indica*- legume weed) in the paddy field increase the growth and yield of selected rice

varieties (variety Bg 379-2, Ld 365, Bg 357) in the case of Diyasiyambala increase the soil fertility by adding nitrogenous organic matter to the soil.

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**AUTHORS**

**First Author** – Dahanayake Nilanthi, Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka, Email: [nilanthi@agbio.ruh.ac.lk](mailto:nilanthi@agbio.ruh.ac.lk)  
**Second Author** – Inoka KPI, Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka  
**Third Author** – Madhushani, P.A, Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka  
**Fourth Author** – Dissanayaka D. M. P, Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka  
**Fifth Author** – Kumarasinghe S, Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka

# Representation of the character of men and women in Poetry – A Critical Discourse Analysis of Robert Browning's Poems

Tahmina Rafiq, Faiza Noureen

English, University of Sargodha Women Campus Faisalabad

**Abstract-** The paper focuses on the linguistics analysis of male and female representation in Robert Browning's poems "Porphyria's Lover" and "My Last Duchess". The study is based on the critical discourse analysis serves as the theoretical standpoints for the general analysis. The aim of this paper is to reveal the philosophy of Browning and provides of his poetry. He has given the meaning of human life through these poems. His poetry is like a room or cabinet of interest. Browning is of the view that to acquire the power is the aim of life. He realized that the power of knowledge was not enough unless it is followed by love.

**Index Terms-** Critical Discourse Analysis, Gender, Representation, Power, Language.

sources of power and inequality. Through critical discourse analysis, it can be examines how to maintain and reproduce these discursive sources within the political, historical and social contexts.

To expose the representation of the character of men and women, it is valuable to study Browning, as he is considered as the most important poet of the Victorian age. He writes about the power of gender in his poems. Furthermore, this study tried to find out the representation of gender in the text (poetry). Through Critical Discourse Analysis both the transparent and hidden political as well as social values and norms can be uncovered. The use of Critical Discourse Analysis grabs the attention of many researchers to investigate the textbooks from different points of view like ethnicity, gender representation or cultural factors.

## I. INTRODUCTION

Discourse is a broad term with different definitions which have different meanings. Discourse is related with the study of study of meaning beyond the sentence. Critical Discourse Analysis stalks from the critical theory of language. Critical Discourse Analysis is related to the use of language as a phenomenon of social structure. Specific historical context is also included in the social structure. The roots of Critical Discourse Analysis lie in Sociolinguistics, Applied linguistics, Pragmatics, Textlinguistics and classical Rhetoric. According to Fairclough and Wodak (1997) "Critical Discourse Analysis can be seen as language as social practice". The context of language is considered as very crucial. Through Critical Discourse Analysis language can be used in writing and speech as a form of social practice.

Critical Discourse Analysis is related to the "power". It is observed that power is a main part in the social life. Discursive differences can be negotiated in the text. They are ruled by differences in power which can be determined by genre and by discourse. Therefore, texts are used to show the different ideologies and discourses for dominance. Power is related to effects of difference and relations of differences in the social structures. Language is used to challenge the power because power is not derived from language. Power can be signaled by the control of a person in a social context or the genre of a text. Power can be challenged or exercised within the genres related with the given social context. According to Dijk (1998) Critical Discourse Analysis is concerned with analyzing and studying texts. Texts can be in the written or spoken form. These types of texts can be used to reveal the dominance, bias, discursive

## II. LITERATURE REVIEW

Representation is one of the significant areas in postmodern studies. It has been studied from multiple and diverse viewpoints by adopting different theoretical standpoints. In recent times postcolonial, gender, cultural and anthropological studies have done the research in this area more significant and revealing. It is an act of stating and restating an opinion that would let the people to represent themselves instead of being represented/misrepresented by those in authority. According to Hall, "Representation is the production of the meaning of the concepts in our minds through language. It is the link between concepts and language which enables us to refer to either the 'real' world of objects, people or events, or indeed to imaginary worlds of fictional objects, people and events"(1997:17). Hall proposes two diverse ways, operating in the system of representation. The first one deals with the direct suggestiveness of the object of representation with a set of concepts and beliefs within the mind of people. It refers about the dependency of meanings on the basis of free associations. The second system deals with language in order to produce and convey meanings. For Hall language is comprised of words, both written and their utterances, images, music and any kind of facial expressions.

For Feminist writers and theorists' the issues regarding representation occupy a very high place. Feminist scholars revolted against the stereotypical representation of the female gender by male in media, art and literature. Carter and Steiner state about the stereotypical representation of female gender and its motif, "The concern was that the sexist messages of these media forms socialized people, especially children, into thinking

that dichotomized and hierarchical sex-role stereotypes were 'natural' and 'normal'" (2004: 2).

Berger puts forward that women are conscious about constant surveillance of male dominance, which makes them critical towards themselves. In this way, women are both inspector and the inspected, which converts herself merely into an object. Berger articulates, "Women are depicted in quite a different way to men – not because the feminine is different from the masculine – but because the 'ideal' spectator is always assumed to be male and the image of the woman is designed to flatter him" (1972: 64).

Wolf is one of the greatest advocates of feminism having her strong faith in the fact that the ideal image of a female and her beauty is a kind of weapon directed towards the progress and advancement of women. Throughout the nineteenth century, especially in the Victorian era, women had to confront with the ideal image how she should look like. Feminist started a movement against the social myths or stereotypes associated with femininity and female ideals of beauty. Wolf says :

As the economy, law, religion, sexual mores, education, and culture were forcibly opened up to include women more fairly, a private reality colonized female consciousness. By using ideas about "beauty," it reconstructed an alternative female world with its own laws, economy, religion, sexuality, education, and culture, each element as repressive as any that had gone before" (1991: 16).

Wolf hints that these myths of beauty are still able to make their existence possible in the form of an idealized stereotypical feminine image created by male for the currency of power and dominance in social order. Max Weber, who classifies power as "the probability that one actor within a social relationship will be in a position to carry out his own will despite resistance..." (1978, 53).

In a quiet similar way, but theoretically in a different background, Michel Foucault has proposed the over empowering nature of power, and he states this, "if we speak of the structures or the mechanisms of power, it is only insofar as we suppose that certain persons exercise power over others" (1983, 217). Foucault further defines the nature of power as:

Power is exercised only over free subjects, and only insofar as they are free. Consequently, there is no face to face confrontation of power and freedom which is mutually exclusive (freedom disappears everywhere power is exercised), but a much more complicated interplay. In this game freedom may well appear as the condition for the exercise of power. (982: 221)

Foucault linked power with freedom, which offers an intricate play of power and freedom.

Victorian age is a complex and revolutionary era which is dominated by patriarchal standards of morality and aesthetics. The emergence of middle class and advancement in diverse fields of science and anthropology was confronting conservativeness of Victorian standards of morality. The restlessness and uncertainty of the age was depicted in the arts and literature of the time, which offers a double vision of reality. Moral standards and desires both are having their depiction in the David G. Riede (2005) commented: "Poetry became... a hoped-for means of universalizing middle-class values, and especially of extending them to the lower classes—the majority of the British population, which was becoming increasingly

restive and influential with the gradual spread of democracy." (p.426)

Beauvoir states that men in male dominated society have gained the position of transcendent subject, whereas woman is regarded as another. She suggests these ideas in *The Second Sex*.

"She is defined and differentiated with reference to man and not he with reference to her; she is the incidental, the inessential as opposed to the essential. He is the Subject, he is the Absolute — she is the Other" (Beauvoir, xxii)

### III. METHODOLOGY

The methodology adopted for this descriptive research paper is Critical Discourse Analysis (CDA) which paves the way for analytical study of the ways in which power relations and unjustified dominance manage to retain their currency. The researcher will employ CDA to investigate the representation of the characters of male and female in Robert Browning's poetry. It will allow to dig deep into the phenomenon and critically investigate it from multiple view points by unveiling the interconnection between the discourses of power and male dominance. CDA welcomes multiplicity of interpretations and gives the liberty to study the use of power in terms of both language and theory.

### IV. ANALYSIS

Through the discourse of Robert Browning's poems "Porphyria's Lover" and "My Last Duchess" it has been observed that both poems are very similar to each other. Both poems are based on the feelings and behavior of men who were mentally disturbed because they feel insecure from women's power. They had a strong relationship with a strong woman who, love their men, but their men ended the story by killing their women. They feel very happy after committing the murder. The most captivating similarity between the poems is that, the writer has given power to the male on the bases of gender. In these poems initially the women have the power, but men took this power by killing the women. The men used murder as a tool to get the power. In *Porphyria's Lover* the man is distrustful. He has a lower social status than women. The man in this poem is behaving like an abnormal person as the storm is going on and he is sitting in his cottage without any heat. Through the discourse of this poem it has been observed that the man in this poem is feeling insecure because of women's power.

So, he killed the woman to get the power. In *My Last Duchess* the main character of this poem is understated. The main character of this poem is Duke. He also killed his wife. The most interesting predictor of his madness is his tune and the way he describes. The way he reveals himself to the reader is very strange i.e. The marriage broker and his use of humility. He also has a problem with the behavior of his wife. He treats with his wife like an animal which seems cruel to the reader.

Both men and woman hold power, but there is a difference between the powers that they have. Power may be defined in different ways. He defined power in his poems in two ways. The first kind of power is of man, the ability to control over other. The Second kind of power is of a woman, is the ability and

freedom to do what one wants to do which means that the women what wants? Is only freedom, not control over other. Only because of this they receive the sympathy of their readers

Through the discourse of these poems it has been observed that Robert expressed his feelings through his writing. He is supporting his gender by giving the power on the bases of gender. No doubt, Robert has given power to the both genders. But, there are two types of power which have been found in his poems. The first power is found in the men. Who want to control others according to their desires. Men want to control the behavior of women as they are threatened and offended by it. Another type of power is related with the women. Through this power women can do anything what they want to do. They don't want to control the behavior of their life partners. They just want to spend a free life. Both powers have its own significance because the power of both genders reflects the value of their character.

## V. CONCLUSION

Through the analysis of his poem, it is concluded that Robert Browning wants to convey that women have more importance in the society. He is presenting both genders in such a way that men are feeling as a slave of women and they had not high status in their societies. That's why they killed women to gain the higher status in the society. Furthermore, the text of his poems adopting the discourse of advertising and marking by exploiting the male gender.

He is giving importance to the women. No doubt, she has been killed by men, but it is not men who win the race of his life, it is the women who seem to win.

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## AUTHORS

**First Author** – Tahmina Rafiq, Lecturer in English, University of Sargodha Women Campus Faisalabad, lastisland176@gmail.com

**Second Author** – Faiza Noureen, Lecturer in English, University of Sargodha Women Campus Faisalabad, Fazaiftikhar00@yahoo.com

# Impact of Information Technology in Banking Innovations: A Case of Azania Bank Limited Tegeta- Dar ES Salaam

Gladness L. Kotoroi

Directorate of Library and Technical Services, Mzumbe University, Assistant Librarian Mzumbe University

**Abstract-** Innovation is broadly seen as an essential component of competitiveness, embedded in the organizational structures, processes, products, and services within a firm. The objective of this paper is to explore the impacts of technological innovation to the performance, in banking industry. The study was conducted in Dar es Salaam using Azania Bank Ltd at Tegeta branch as a case study. The population of the study included all Azania staff and its costumes the sample size of 58 respondents was drawn randomly from the entire population. Primary and secondary data were collected using interview, and observation. The qualitative data were content analyzed while quantitative data were analysis' numerically, analyzed. Results of this study reveal that ICT has impacted positively on banking performance. It is also observed that market performance indicators' such as net income and market share are supported by innovation types performed. The researcher suggests that banks should continue to employ farther technological innovation in "back-office" technologies, as well as to "front-office" technologies in order to improve their performance and increase customer satisfaction. The research also suggests that organizational research should be done before the implementation of any new technological application as well as periodical evaluation must be done after the implementation to ensure progressively market performance. The findings provided by this research have significant implications for the commercial applications when designing marketing strategies to improve business performance in banking industry. Having a clear understanding of the exact nature of innovations will help banks to prioritize their market, services and technology strategies, to be followed by appropriate subsequent action plan.

## I. INTRODUCTION

Azania Bank Ltd (formally 1<sup>st</sup> Adili Bancorp Ltd) is now a Commercial Bank which was established in 1995 following the liberalization of the banking sector. The initiative of setting up the bank came from indigenous Tanzanians who teamed up with the two social security fund in the country, National Social Security Fund (NSSF) and Parastatal Pension Fund (PPF) to support the start up of the bank. The bank also obtained participation from international aid organizations such as Swedish International Development Agency (through Swedish Funds) and American bullion trader and merchant bank, Gerald Metals Inc.

Today the major shareholders of the Azania Bank are National Social Security Fund (NSSF) 34.8%, Parastatal Pensions Fund (PPF) 30.1%, Public Service Pensions Fund

(PSPF) 17.2%, Local Authorities Pensions Fund (LAPF) 14.2%, East African Development Bank (EADB) 2.3% and same indigenous shareholders such as staff holding 1.4% of the shares. The Bank is currently providing banking services at 15 locations in Tanzania whereby 11 are full branches and 4 are agencies. In this shared infrastructure member banks are now implementing additional services like internet banking that will facilitate online fund transfers through accounts in different banks, mobile banking, online air time recharge, utility bill payments and exploring options for institution of gateway to other international networks like VISA, Master Card etc.

In the past two decades before the technological innovation in the banking industry activities were mainly done manually. Despite the fact that, the main goal of Azania Bank Ltd is to be the one stop financial centre for the small and medium sized enterprises and becoming a leading bank in providing banking and financial services to the small and medium sized customers, low level of technology become among the obstacles to its performance. Due to the desire of banks on improving performance and increased competitive advantages every bank tries to come up with new innovations (Kuratko & Hodgetts, 1998), "The comprehensive competition, which became particularly tough after 80's, forced the company's focus on their business strategies, especially on innovations" (Drucker, 1985; Hult et al., 2003). Because of the tough global competition, both individuals and companies begin to evaluate and apply their innovation strategies and entrepreneurial abilities with the purpose of gaining competitive advantage (Hult et al., 2003). Essentially, the key reason for innovativeness is the desire of firms to obtain increased performance and increased competitive edge. As Miller (2001) stated that "most firms seek technological innovation to gain competitive advantage in their market". Azania Bank also procures new technology and using it in order to increase its competitive advantages in the market

For specifying such a period of 2007 to 2011, where the Azania Bank's management set out a five years comprehensive plan on the strength of sound business performance shareholder agreed to inject additional capital of Tshs. 19.5 billion within two years to support further expansion of branches, and investment in robust Communication and Information Technology. As shown below some background statistics on changes on performance in Azania bank over time due to new technological innovation. The data shows that between 2007 and 2008 the revenues drop off from Tshs. 839 million to Tshs. 701 million equivalents to 0.836% annual negative growth. Also the report show that to the year 2009 the Azania Bank net income continue to decrease to



Tshs. 652 million equivalent to 0.93% from income earned in 2008 this approximated to falling in the average of 0.883% annually between two consecutive years. From 2009 to 2010 the income has been raised to Tshs. 1,178 million equivalent to the growth of 1.807%, from 2010 to 2011 the income also continue to rise up to Tshs. 2,694 millions equivalent to the growth of 2.287% annually this is equivalent to the average of 2.047% growth between two consecutive years.<sup>1</sup>

Despite the fact that every organization in banking industry uses technology to convert its inputs into output to attain its organizational objectives, structures and strategic planning processes, (the quality of strategic planning is limited by the quality of Information and Communication Technology (ICT) available to the decision makers and executive information system (Glover, 1993). The adoption of Information and Communication Technology (ICT) by these banks has increased its operational efficiencies, reduced cost through high utilization rates in the ICT environment to ensure compliance with changing time and to gain competitive advantage (Haggani, 2003). Information and communication Technology has become a potential tool in the hands of banks for sustainable growth it has revolutionized the banking industry and its advent has enormously increased the capabilities of banks as they are now able to offer wider range of services to their customers including internet banking , mobile banking and also expand at a great rate. Despite all these innovations in the banking industry, it is highly disheartening to observe that banks are still finding it difficult to meet the expectations for their customers as regards to service delivery. This was proved by the findings of *Sullivan (2000); on his study about* "the impact of the introduction of transactional Internet banking on performance and risk profile" that "Internet banking variable did not show a significant association with the performance as well as with operating risk variable. Thus, Internet banking did not prove to be a performance enhancing tool, it neither reduced nor enhanced risk profile". In motive of these challenges that facing the *banking industry, the researcher* has been interested to undertake the study on "*assessment of the impact of Information Technological* innovation to the banking industry performance in Tanzania" so as *to determine* the types of technological innovation used by Azania bank in *the* recent years, to *assess the effect of ICT* innovations in improving customer satisfaction and to establish the impact of technological innovation towards operational cost.

**Drivers of innovation:** Various factors push an organization to innovate whereby each of these drivers demands continuous innovation and learning so that the process can be repeated continuously. These drivers also help to create a sense of urgency around the need to create new organizational goals and generate new ideas for meeting these goals. According to (Sullivan, 2008) there are four (4) drivers of innovation as follows.

**Emerging technologies:** These have the potential for significant innovation across the organization and can be the basis for innovative products, processes, and services that can revolutionize the fortunes of an organization. In the past, organizations developed technologies in large R&D laboratories; however, in today's environment the sources of emerging technology are often far too prolific for any one organization to

develop internally. Sources of emerging technology can include universities, high-technology startups, and competing organizations.

**Competitor actions:** The innovative actions of competitors and other organizations can be another driver of innovation. Competitors can provide a benchmark regarding which projects and initiatives to pursue. Copying competitor innovations reduces risk because the products may have already been adopted by the market

**New ideas:** In the past, innovations were developed from the insights of a small number of designers and engineers. Now, however, with greater technological complexity and market segmentation, modern organizations are engaging as many stakeholders as possible in the innovation process. This can result in increased scanning capabilities and better information about market needs. Engaging employees, suppliers, customers, and other lead users can reveal new opportunities that otherwise might have gone undiscovered.

**External environment:** All organizations are affected by changes in their external environment; these changes can be another driver of innovation. Environmental changes can occur because of competitor actions that have revolutionized the business environment or can happen through macro shifts in the political, economic, cultural, or technological environment. As organizations struggle to realign with their new business environment, they must innovate their products, processes, and services accordingly.

#### Types of innovation (4p's of innovations)

**Product innovation:** Refers the form of innovation that, introduce or improve a product or services which an organization offer. Product innovation is about making beneficial changes to physical products. Related terms that are often used interchangeably include *product design, research and development, and new product development (NPD)*. Each of these terms offers a particular perspective on the degree of changes to products while service innovation is about making changes to products that cannot be touched or seen (i.e., intangible products). Services are often associated with work, play, and recreation. Examples of this type of service include banking, recreation, hospitals, government, entertainment, retail stores, and education (Wheelwright& Clark, 1992).

**Process innovation:** It innovation can be viewed as the introduction of a new or significantly improved method for the production or delivery of output that adds value to the organization. The term *process* refers to an interrelated set of activities designed to transform inputs into a specified output for the customer. It implies a strong emphasis on how work is done within an organization rather than what an organization does. Processes relate to all operational activities by which value is offered to the customer, such as the acquisition of raw materials, manufacturing, logistics, and after-sales service (Davenport, 1992).

**Position innovation:** Is the innovation involves re-positioning the perception of an established product/service or process in a specific context, refers to changes in how specific product /service or process is perceived symbolically and how they are used. You may consider 'position' similar to 'promotion' in marketing mix, but it is not. Position is related to

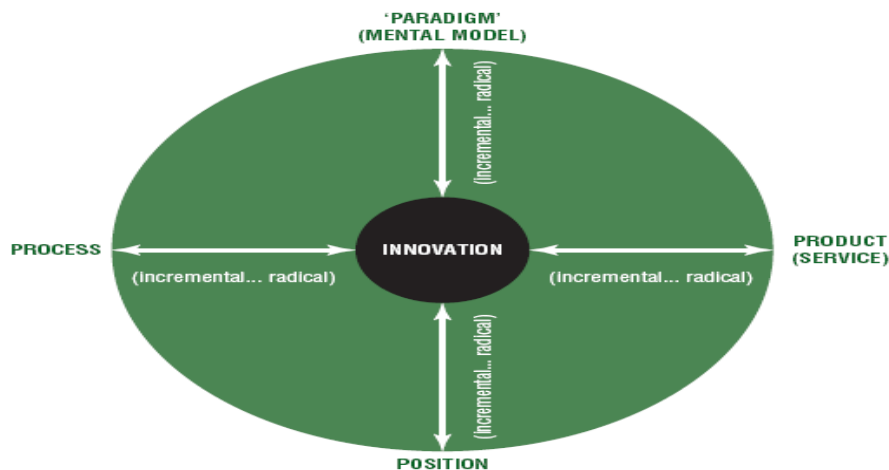


our own perception. It is a psychological category, and promotion is just one of the processes in the organization that affects this aspect of the innovation. So many things could affect people's perception. Today, on the global marketplace, position is everything. What makes the organization profitable is not how good its products or services are, but what their customers perceive about them. (Tidd & Bessant, 2005).

**Paradigms innovation:** Is the form of innovation that defines or redefines the dominant paradigms of an organization or entire sector, paradigms based innovation relate to the mental model which shape what an organization business is about. This is somewhat specific innovation category. It concerns the change in the way something is done in the organization. It could be anything. For example it may be in the way the products are sold,

from selling on production area to selling on the Internet. As per municipalities, they can also innovate by shifting the paradigm in the way they do 'businesses. They may use Internet to enable on-line application for products and even payment for services. Document delivery may be worked out over the post office. Don't forget that these 'Innovation P's' are not narrow categories. Their borders are foggy and intertwined. Company or organization can use some of them, or all of them at the same time. Improving the processes could result in better products. Better products would result in better position. What is important is that all of them have one single purpose, to make organization better, more efficient, and at the end more profitable.

**Figure 2:1 4p's of Innovation**



**Source:** Managing Innovation Tools using the 4p's Approach. (Tidd & Bessant, 2005)

**Meaning of innovation in current research**

In the light of the above thought, the current researcher defined innovation as a "process of making superior changes to something already existing by introducing something new of higher quality than before that adds value to business performance".

In this study, the researcher intended to explore innovations and their impacts on banking industry performance by focusing on product, process and paradigm innovations, therefore the main involvement of this study is the comprehensive innovation-performance analysis based on banking industry.

**Banking technological innovation**

Within the changing financial world, a company can try to win its competitive battle in four ways; give a better offer, a different offer, or a faster offer. Many smart companies are placing their bet today on being faster. Speeding up innovations is essential in an age of shorter product life cycle. Competitors in the banking industry learn about new technologies and new market opportunities at about the same time (Afuah, 1998). However not all firms are caught up in trying to be faster. Some companies rightfully worry that speed-ups might hurt their quality. Smart companies invest in redesigning their operations to be not only faster but better. All it takes is one company in the industry to find a way to serve customers & better to force others to re-examine their performance on innovation, distributions and

retailing time (Ibid). Speaking of recent Technological Innovations in the banking industry, the first idea that comes up into mind is the term "E-Banking" The following part gives an insight to E-banking.

**E-Banking:** Is the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels. It includes the system that enable financial institutions customers, individuals/business to access accounts, transact business, or obtaining information of financial products and services through public or private network (Akamavi ,2005).

**Automated teller machine (ATM):**Is an electronic telecommunications device that enables the clients of a financial institution to perform financial transactions without the need for a cashier, human clerk or bank teller. ATMs are known by various other names including ATM machine, automated banking machine and various regional variants derived from trademarks on ATM systems held by particular banks. Using an ATM, customers can access their bank accounts in order to make cash withdrawals, debit card cash advances, and check their account balances as well as purchase pre-paid mobile phone credit. If the currency being withdrawn from the ATM is different from that which the bank account is denominated in (e.g.: Withdrawing Japanese Yen from a bank account containing US Dollars), the

money will be converted at an official wholesale [exchange rate](#). Thus, ATMs often provide one of the best possible official exchange rates for foreign travelers, and are also widely used for this purpose (Sarah, 2007).

**Web-linking storage system:** Some financial institutions host websites for both themselves as well as for other businesses. Financial institutions that host a business customer’s website usually store, or arrange for the storage of, the electronic files that make up the website. These files are stored on one or more servers that may be located on the hosting financial institution’s premises. Website hosting services require strong skills in networking, security and programming. The technology and software change rapidly. According to **Crede & Andreas (1995)** risk issues examiners should consider when reviewing website hosting services include damage to reputation, loss of customers, or potential liability resulting from; downtime (i.e. times when website is not available) or inability to meet service levels specified in the contract, inaccurate website content (e.g. products, pricing) resulting from actions of the institution’s staff or unauthorized changes by third parties (e.g. hackers), unauthorized disclosure of confidential information stemming from security breaches and damage to computer systems of website visitors due to malicious code (e.g. virus, worm, active content) spread through institution-hosted sites.

Internet banking is a service that allows banks customer to view their account and transaction from anywhere with an internet connection. Internet is a vast network of individual computers and computer networks connected to and communicate with each other using the same communication protocol – TCP/IP (Transmission Control Protocol / Internet Protocol). When two or more computers are connected a network is created; connecting two or more networks create ‘internetwork’ or Internet. The Internet, as commonly understood, is the largest example of such a system. Internet is often and aptly described as ‘Information Superhighway’, a means to reach innumerable potential destinations. Internet Banking offers different online services like balance enquiry, requests for cheque books, recording stop-payment instructions, balance transfer instructions, account opening and other forms of traditional banking services. Mostly, these are traditional services offered through Internet as a new delivery channel. Banks are also offering payment services on behalf of their customers who shop in different e-shops, emalls etc. Further, different banks have different levels of such services offered, starting.

**Electronic Funds Transfer (EFT):** Is a form of payment where by funds move from one account to another account by electronic means. It may take place in the same bank or across different banks. The customer requests or authorizes his/her bank to make regular payments to a named payee/beneficiary and it is done within a faster period of time (Bank of Africa, 2007). Electronic Funds Transfer has mainly two features, the credit transfer and the debit transfer. Credit transfer involves a customer’s request which instructs the bank to debit his/her account with funds which are then transferred to another account in the same or another financial institution. On the other hand, debit transfers involve a customer’s request where by his account is credited with funds that are received from the customer’s debtors following an agreement independently arranged between

the customer and his debtors for example utilities. Electronic Funds Transfer is highly emphasized compared to the traditional payment systems because it facilitates secure and timely payments.

## II. RESEARCH METHODOLOGY

A mixed method combining both quantitative and qualitative research design was employed in order to get both quantitative and qualitative data. As stated by Creswell (2005), mixed methods research is a good research design as it allows the researcher to assess both outcomes of the study (quantitative) as well as the process (qualitative). Creswell further stated that the combination of research design provides a rich and comprehensive picture of any social phenomena. There are three types of mixed method research designs presented by Creswell (2005) which are the triangulation design, explanatory design and exploratory design. For the purpose of this study, the exploratory design was used as it permitted the researcher to simultaneously collect both quantitative and qualitative data, merge the data compiled and use the results to understand a research problem. A survey method using a questionnaire specially designed for this study was utilized to gather both quantitative and qualitative data. The study population included authorized staffs and customers of Azania Bank Ltd. A sample size of the study was 58 respondents. The study involved convenience, a non-probability sampling technique for customers where by researcher developed sample from customers of the bank regarding their availability, ability, and willingness to respond. In case of staff the researcher applied [consecutive were used as a sample non-probability sampling](#) where by all staffs that available at study center during the study were used. Researcher prefers these techniques as were economical, simple and normally leads to the required sample size (Mugo, 2002).

## III. FINDINGS AND DISCUSSION

### Customers’ awareness on new technology

About fifty questionnaires were distributed to customer and all were returned to the researcher. The table below summarizes the results regarding customer awareness on these new technologies.

**Table: 4.1. Customer awareness on new technological service**

Degree of Awareness	Frequency	Percentage
Not aware at all	0	0
Slightly aware	6	12
Aware	27	54
Very aware	17	34
<b>Total</b>	<b>50</b>	<b>100</b>

**Source:** Field survey, 2014

In view of service awareness on customer examination, the findings show that about 12% of respondents are slightly aware on new technological services, 54% shows that they were aware while 34% indicated that they were very aware with these services. The results imply that there is awareness of these technological services to customers in view of the fact that about 88% of them confirmed to be aware.

**Table: 4.2. Technological services users’ statistics**

Variables	ATMs services	EFT	Internet Banking
Agree	50	22	8
Disagree	0	28	42
<b>Total</b>	<b>50</b>	<b>50</b>	<b>50</b>

Source: Field survey, 2014

The findings indicated that the degree of satisfaction to user was very high since the findings have shown that there is a big numbers of users of this technology and no one have shown to be dissatisfied. This can be evidenced through the collected data from the respondents whereby twenty two (22) 44% indicated to have using EFT while eight(8) respondents 16% specify to have not using Internet banking.

**Effect of technological innovation in improving customer satisfaction**

Service quality today has become not only the rhetoric of every business enterprise, but also occupies eminent position in every dialogue. No business organization can survive without building its customer satisfaction and brand loyalty; likewise no organization can make a healthy living without meeting the needs of its customers. Based on information collected during the study from the customers through both questionnaires and face to face interview they said they that they are satisfied with new services where by more than 50% confirmed to be very satisfied. Their satisfaction lies on the following reasons.

**Improved in customer privacy and security**

Customer privacy and security has been improved and increase satisfaction since transactions take place in the best security conditions in electronic meas. For example by using ATM a customer use PIN, in case of internet banking a customers use a user name and a password also in EFT there is high security in transferring money. So when compared with old manual system, manual transferring data storing systems was not safe enough, because they exist as hard copies rather than digital files because paper files can also be easily destroyed.

**Improvement of services accessibility**

From customers’ data collected it shows that satisfaction has been improved as because a customer can access to the bank’s services 24 hours a days, 7 days a week, any time and everywhere he/she is without depending on the bank’s schedule in case of ATM services and internet banking compared to before where all transaction were done during banking hours only.

**Improvement of customer’s service saving time**

According to staffs opinion and customer views the current study examine that customer satisfaction has been improved because a customer can acquire a service at very reasonable time, for instance on ATM a customer can use only two minutes to make withdraw compared to cashier withdrawal where it take ten to fifteen minutes. Also in case of EFT a customer use fifteen to thirty minutes money to reach destination area compared to old system where it take three to seven days. Then on IB transaction can be done within five minutes only.

**The impact of new technology on customer satisfaction**

Table below summarizes the results obtained from the questionnaires about their satisfaction.

**Table: 4.3. The impact of new technology on customer satisfaction**

Satisfaction scale	Frequency	Percentage
Dissatisfied	0	0
Less dissatisfied	0	0
Satisfied	19	38
Very satisfied	31	62
<b>Total</b>	<b>50</b>	<b>100</b>

Source: Field Survey, 2014

In case of customer satisfaction among 50 respondents no customers were dissatisfied with new technological services’. The results show that about 38% of customers were satisfied while 62% are very satisfied with these services. This implies that new technological services plays a significant impact on the overall customer satisfaction since more than a half were very satisfied and none of them are not satisfied.

**Impacts of technological innovation on operation costs**

On the other side of this study the researcher wanted to assess the impacts of technological innovation on operation cost. Based on data obtained by the researcher during the study from the staffs, branch executive and organizational documents there is reduction of some operation costs and their arguments based on following factors.

**Reduction of transportation costs**

IT has increased information availability and processing capacity, thus facilitating the performance of other participants in the relationship. This enabled the bank to reduce transportation cost unlike before in manual system where money was manually transferred from one sender’s branch to receiver’s branch.

**Reduction in wages cost**

Contrary to the old manual system of labor intensive system new technological innovation is an electronic system. Due to the application of computers now days there is reduction in labor employment as the system simplify work hence reduced cost in case of wages and salaries. According to data gathered from staff management shows that one labor with a computer replaced a work done by five to eight labors.

**Reduction of stationeries costs**

Unlike to manual system nowadays due to electronic applications in both front and back office equipment office like papers, pens, envelopes, carbon paper has been declined due to computerization system. For instance information from customer service approved that one ream can be used within a week compared to early where not less than five reams were used per week.

**Staffs’ opinions on the impact of new technology on operation cost**

About eight questionnaires were distributed to staffs and all were returned to the researcher. The table below summarizes the results obtained from the questionnaires.

**Table: 4.4. Efficiency of operational cost on new technological services’**

Agreement degree	Frequency	Percentage
Strong Disagree	0	0
Disagree	0	0
Neutral	0	0
Agree	2	25
Strong Agree	6	75
<b>Total</b>	<b>8</b>	<b>100</b>

Source: Field survey, 2014

In analysis of staffs’ opinions on operation cost, the findings show that 25% of staffs agreed that the service is cost-effective while on the other side 75% of respondents were strongly agreed that the services’ are cost-effective. There were no respondent who disagree on the matter. The findings designate that these new technological services were vital drivers of effectual operation cost.

**Banking performance**

The findings of the current research verified that, the bank performance has been improved due to new technological innovations in terms of service accessibility, service operation time, services’ costs, and security. Also the performance approved to be improved by the level of profitability growth after the full implementation of these technological services in 2009. The findings shows that, from 2009 to 2010 the income was raised to Tshs. 1,178 million equivalents to the growth of 1.807%, as compared in 2009 where revenues falls from Tshs. 839 million in 2008 to Tshs. 701 million equivalents to 0.836% annual negative growth rate. Also from 2010 to 2011 the income also continues to rise up to Tshs. 2,694 millions equivalents to the growth of 2.287% annually this is equivalent to the average of 2.047% growth between two consecutive years.<sup>2</sup> Therefore from this revenue information the researcher can argue that these new technological innovations have contributed to the increase of bank performance.

**IV. SUMMARY OF THE FINDING CONCLUSION AND RECOMMENDATIONS**

**Summary of the finding**

This study was conducted for the purpose of assessing the impact of information technological innovation on performance of banking industry. The specific objective was to determine the types of technological innovation used by Azania bank, to assess the effect of information technological innovations in improving customer satisfaction and to determine the impacts of information technological innovation towards operational cost. In determining the types of technological innovation the current study determined four types of innovative services which adapted and used at ABL namely, EFT, ATM services, Flex cube banking software where by the results showed that 88% of respondents confirmed to be aware of them.

In analysis of the effect of information technological innovation in improving customer satisfaction the findings revealed that those innovative services have enabled the bank to improve customer satisfaction statistics shows that no customers who were absolutely dissatisfied while 62% of customers are very satisfied with these innovative services. In assessing the impact of these innovative technological services the results demonstrated that there is improvement of operation cost as 75% of staffs were strongly agreed that the services’ are cost-effective, also this approved by persistence increase in net profits from 2009 to

**Conclusions**

Based on the real findings from the study the researcher come up with the following conclusions and recommendations: The findings of the study showed that ABL has new innovation product these are FLEXCUBE software system, AMT services, Electronic Funds Transfer and internet banking, where’s among these technological channels observed, ATM was most frequently used followed EFT and internet banking, in spite of the quality of these services there still low responses to customer to some services like EFT and IB as the researcher found that 44% of sample adopted EFT services and 16% using IB. Also the research finding shows that investment in technological innovation has advanced effects on improvement of customer satisfaction which manifested by the improvements in service quality in terms of services’ accessibility, timely services deliverable, rational services’ charges, privileged services’ safety, and variety services offered. Furthermore, technological progresses a have also important positive impacts on the reduction of banking operational costs which can seen from the decrease in the bank’s expenses and continuous raise in net income generated.

**Recommendations**

Azania Bank ICT department should continuance to employ other new modern technological services as the market demand is, in both “front-office” and “back-office” for instance mobile banking. In order to increase customer awareness on these new technological services, the bank marketing department should make advertisements not only on their website as they do now but also to the mass media like to via televisions and radio

stations, newspapers and through social networks like face book and twitter. ICT and marketing department of ABL should improve their website in order to attract customer to visits and use it, because it inadequacy in terms of a logical road map, crucial business information, clear navigation, complete content, good hosting and social media integration. ABL, ICT and R&D departments should lean technological competitive intelligent in order to gather in a systematic manner a wide range of information that when collected and analyzed provides a fuller understand of a competitors technological structure, behavior, capabilities and weakness in order to use opportunities available to take technological competitive advantage.

The bank management should design special program to measure service quality and customer satisfaction. Branch managers need to develop a systematic assessment programs to monitor service quality and customer satisfaction overtime. Bank staffs should be kept informed of results and be encouraged to take part in figuring out an effective resolution strategy. Before the implementation of any new technological product advanced research on operational cost should be done this should be accompany with the review of changes in curriculum and control over technology applications, hardware, and software in order to guarantee a long run returns.

#### **Conclusively,**

The findings of the current study generally signify that, these new delivery channels due to technological innovation have contributed positively to the performance of banking industry therefore banks should create a technology plan that is progressive, rather than one which simply focuses on bringing them to the present instead of to the future.

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#### AUTHORS

**First Author** – Gladness L. Kotoroi, Directorate of Library and Technical Services , Mzumbe University, Assistant Librarian  
Mzumbe University, Gladnessdaudi1@yahoo.com

# Address Cancer Awareness among Rural Women: A Case Study of Morogoro Rural District

Gladness Lucas Kotoro

Assistant Librarian, Mzumbe University- DLIS

**Abstract-** The paper aims at establishing strategies for improving access to, and use of information on cancer by women in Morogoro Rural District for addressing cancer. Specific objectives were to: assess the status of cancer awareness among women in Morogoro Rural District, identify challenges encountered by rural women when accessing information on cancer and to recommend strategies that will enhance dissemination and use of information on cancer. Social survey method was used for conducting this study. The data were collected from a total of 100 respondents through questionnaires, interviews, focus group discussions and observations. The respondents were drawn from four villages of two wards of the study area. The findings revealed that cancer is still not well known by rural women. The findings indicated that rural women faced many challenges on access and use information on cancer. They had limited access to information on cancer namely: unawareness about cancer disease, levels of illiteracy, lack of time, limited sources of information, and unavailability of proper places at which information could be accessed. The study recommended that in order to deal with the problem of illiteracy adult education programmes should be organized. On the other hand the study recommends that several media be used for disseminating information so that information can be accessed conveniently by different stakeholders according to their preferences. On top of that, health workers in collaboration with other stakeholders, should be encouraged to diversify ways of disseminating health information. The government should also set aside budget for dissemination of information on cancer as is the case for other diseases such as malaria and HIV/AIDS.

**Index Terms-** Cancer awareness; rural women; information need; information dissemination; sources of information

## I. INTRODUCTION

Cancer is defined by WHO (2011) as a “large group of diseases that can affect any part of the body” and by the Medical Dictionary (2010) as “a large group of almost 100 diseases” whose “two main characteristics are uncontrolled growth of the cells in the human body and the ability of these cells to migrate from the original site and spread to distant sites” and “if the spread is not controlled, can result in death. It is a critical global issue that affects all people regardless of their sex, age, economic status or nationality. According to the World Health Organization (2010) and Ocean Road Cancer Institute (2010) reports, cancer is among the leading killer diseases in the world, particularly in developing countries like Tanzania, and is the second most common cause of death worldwide after

cardiovascular disease (IAEA, 2006). The estimation of the WHO (2010) and The International Agency for Research on Cancer (2010) shows that by 2020, seventy percent (70%) of all cancer cases will be in developing countries. More than 70% of all cancer deaths occurred in low and middle-income countries and that deaths from cancer worldwide are projected to continue to rise to over 11 million in 2030 (WHO 2011).

Tanzania, like other developing countries has many patients living in rural areas suffering from cancer. According to Cancer Care Africa (2007), based on the Ocean Road Cancer Institute’s (in Dar es Salaam) estimates, each year there are over 20,000 new patients with cancer in Tanzania. Most of them, particularly women, have no hope for getting information relating to cancer.

### 1.1 Cancer Awareness at Global Level

According to Wikipedia Encyclopedia (2011) WHO and the International Agency for Research on Cancer, the specialized cancer agency of WHO, collaborates with other United Nations organizations and partners in the areas of international cancer prevention, detection, and treatment at global level. World Cancer Day is marked on 4th February every year to raise awareness of cancer (Wikipedia Encyclopedia, 2011). The World Cancer Campaign was initiated by the International Union against Cancer (UICC) in 2005 in response to the Charter of Paris of 2000 and since 2006 UICC has been coordinating the activities of the Day at the global level. The campaign emphasizes that 40 percent of cancers can be prevented through these healthy behaviors:

- Provide a smoke-free environment for children
- Be physically active, eat a balanced, healthy diet, and avoid obesity
- Learn about vaccines for virus-related liver and cervical cancers
- Avoid over-exposure to the sun

The worldwide average for infection-related cancers is about 22 per cent; in Africa, the figures are much higher: 40 per cent of cases in women and 30 per cent in men (Kagashe, 2011). The fact that 40 percent of cancers can be prevented and yet it is the second most common cause of death worldwide attests that the level of cancer awareness is still very low worldwide, particularly in developing countries.

### 1.2 Cancer Awareness in Tanzania

According to Dr Ngoma (2011), the Executive Director of Ocean Road Cancer Institute (2011) as quoted by The Citizen newspaper reporter, Beatus Kagashe, about 40,000 people are detected with different kinds of cancer every year, out of whom

30,000 die for lack of proper treatment or late detection of the disease. This was attributed mainly to lack of awareness among Tanzanians about cancer (rural women belong to the underserved group thus more likely to be unaware of cancer than men). According to Ngoma, most of the patients go to hospitals at the last stage of the disease. He lamented that despite the fact that cancer is killing many people than malaria, tuberculosis and HIV/Aids; the allocation of funds to combat cancer is very little. Treatment is mainly done through well wishers.

### 1.3 Importance of Information to Rural Women

Information is a very important asset to any individual to make any development in life (Mchombu, 2000; Jiyane, 2002). Moreover, he noted that one cannot have knowledge about various issues unless she/he gets information regarding that matter from the reliable source, arguing that information equips a person with power, the power to choose and to act in an informed manner. It empowers people towards actions that can transform lives and allows for a great sense of independence (Mchombu, 2000).

Women need information because it provides a context and a reason for gathering together to discuss problems and seek solutions (Jiyane, 2002). It also helps them to improve their health status and hence their development. According to Luanda (2007) and Ndenje (2003), information is an important resource that contributes to the development of a nation. It is a key commodity for the progress of a society. It is also noted by Olorunda and Oyelude (2003) that information has become a strategic resource, a commodity and the foundation of every activity in human life. It increases the capacity to see things from a broader perspective hence to become more knowledgeable. In addition to that, information has a major part to play in the improvement of health issues, particularly the rural women in handling cancer issues. If well informed about health issues, rural women will be in a better position to know the symptoms, causes and effects of diseases (Wathen, and Harris, 2006), including cancer and where to seek treatment. This will help them to improve their health status, hence prevent deaths associated with cancer.

Access to information for the under-served is generally problematic in many sectors. For instance, Ndenje (2003) in her study about *Information Needs of Women in Small Scale Business* noted that sources of information were unreliable. This phenomenon was also noted by Kreps (2005) on *Disseminating Relevant Health Information to Underserved Audience*. As seen in the above example, access to health information in general and cancer in particular to rural women is critical. One can imagine if one coming from the urban setting (as illustrated in the example above) is not aware of symptoms of cancer, what the situation would be in rural settings. Thus, it is clear that women in Tanzania require access to information on cancer. This is only possible when one is information literate, knows the sources of information to consult, knows information needs and aware of the constraints faced in sourcing for information required to combat health problems, including that of cancer.

Appropriate information plays a critical role in addressing societal problems, including health problems. For decades now, cancer has been one of the most difficult and fatal diseases in the world (Ngoma, 2006; WHO, 2010). Chilimo (2002) in her study

on *Accessibility and Use of Nutrition Information in Addressing Under-five Child Malnutrition in Morogoro Urban* noted that the awareness of malnutrition on the part of mothers and the Maternal and Child Health clinics' staff and the general public was poor mainly because of lack of information. This Paper therefore undertaken in order to contribute towards an understanding of:

- Cancer awareness to women in Morogoro Rural District
- Challenges encountered by rural women when accessing information relating to cancer,
- Recommend strategies that will enhance dissemination and use of information on cancer.

## II. METHODOLOGY

The study was carried out in Morogoro Rural District. It composed only women who were selected from two wards out of twenty five wards of Morogoro rural District. The area was selected as a case study due to the fact that, so far no study has been done on access to, and use of health information in this area. The researcher decided to conduct this study because of the important role played by information in dealing with health issues. Strategies for enhancing access to and use of information are very important for rural women in dealing with their own health and that of their respective families. In addition, rural women are the most disadvantaged and neglected group in accessing and using information, especially information on health issues because they are economically disadvantaged, thus unable to purchase channels used to disseminate information such as television, radio and newspapers. The challenges they faced include illiteracy, poor infrastructure and lack of informal sources of information like libraries/information centers.

The researcher used multi-stage technique to select a sample size of the study. This was done through multi-stage sampling. This is a probability type of sampling for selecting geographical location (Adam 2008). At the beginning the researcher identified all the wards of Morogoro Rural District. Out of these districts Mikese and Kiroka wards were purposively selected.

The second stage involved the selection of four villages, two villages from Mikese ward and two from Kiroka wards. The selection of the villages was done randomly. This is a probability sampling whereby all members in the population have equal chance of being selected to form a sample (Adam 2008; Kothari, 2008). From Kiroka ward, Kiroka and Kiziwa villages were selected randomly and Mikese Station as well as Lubungo village was selected from Mikese ward.

The third stage involved the selection of women from the four villages. With the help of village leaders the stratified sampling was undertaken to ensure that women of different ages and levels of education were included in the study. From each village a proportionate sample was drawn in order to give equal chance of participation in the study to all study population.

The total sample size was 100 respondents. The sample distribution was as follows: 38 women were from Kiroka village, 27 from Kiziwa, 21 from Lubungo and 14 from Mikese village. Respondents for interviews and focus group discussion were purposively selected, while rural women were selected randomly.



As defined by Adam (2008), purposive sampling is a decision with regard to which element should be included or excluded in the sample size. The researcher used a combination of both primary and secondary methods for collecting information. Primary data were gathered using interviews observation, focused group discussion and questionnaires while secondary data were collected through library search and documentary evidence such as journals, books, published articles, and the Internet.

### III. FINDINGS AND DISCUSSION

The researcher conducted an analysis on strategy to improve access and use of information on cancer by rural women so as to find out ways of improving the accessibility and the use of information on cancer to rural women is clear and well understood to the targeted group.

#### 3.1 Cancer Awareness

For anyone to become knowledgeable, on the existing matters, access of information relating to that matter is the key factor. Therefore, in order for rural women to become aware about cancer issues there is a need for them to have access and use of information relating to cancer.

The researcher used open -ended questions to find out what does rural women know about cancer. The respondents were

asked to indicate whether or not they were aware of cancer as indicated in figure 1 below.

The findings indicate that 74 (74%) have never heard of cancer, 21 (21%) had heard of the disease while 5 (5%) did not respond to the question.

This implies that most of rural women are most likely to be badly affected by this kind of disease due to their ignorance. The reason might be that health service providers were not disseminating cancer information to rural women, or it might be that rural women are not interested in looking for information relating to cancer, or maybe the information about cancer is not as available in their areas as those of other diseases. This can be proved by written report by Dr Twalib Ngoma (2011), the Executive Director of Ocean Road Cancer Institute (2011) as quoted by The Citizen newspaper reporter, Beatus Kagashe, which indicated that about 40,000 people are detected with different kinds of cancer every year, out of whom 30,000 die for lack of proper treatment or late detection of the disease. This was attributed mainly to lack of awareness among Tanzanians about cancer (rural women belong to the underserved group thus more likely to be unaware of cancer than men).

In order to alleviate the problem there is a need for the government to employ health workers who are committed and competent as regards health issues so as to disseminate health information to women in rural areas. In addition, the government should invest money in rural areas so as to improve the environment to enable health experts to stay longer.

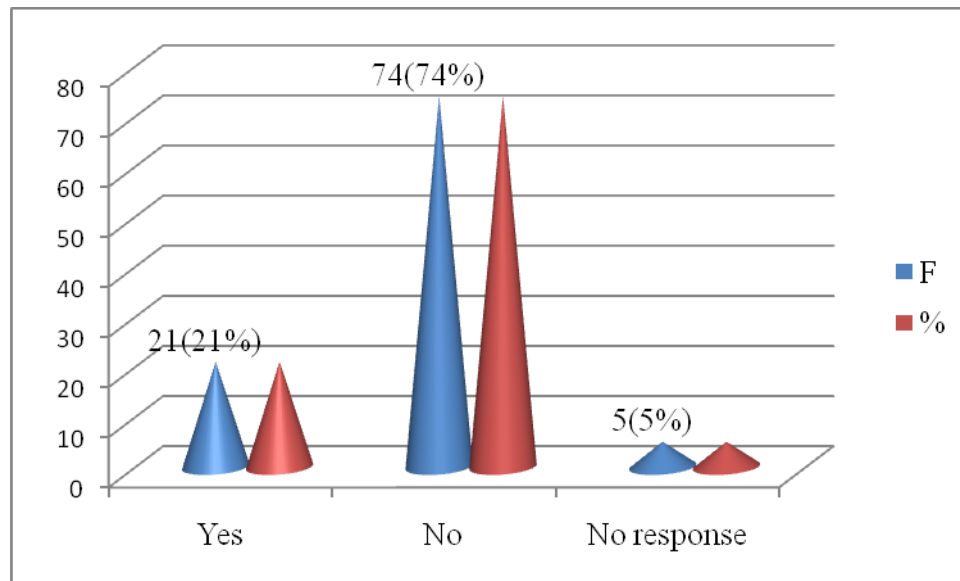


Figure 1: Cancer Awareness  
 Source: Field Data 2011.

#### 3.2 Rural Women's Perception of Cancer

Respondents were asked to express the knowledge they have on the matters with regard to cancer disease. The researcher's intention was to capture rural women's opinion about cancer disease. The findings indicated that 36 (36%) knew nothing about cancer, 28 (28%) responded that it is a killer disease, associated with the punishment from God, 26 (26%) indicated that cancer is a disease which has no treatment and 10 (10%)

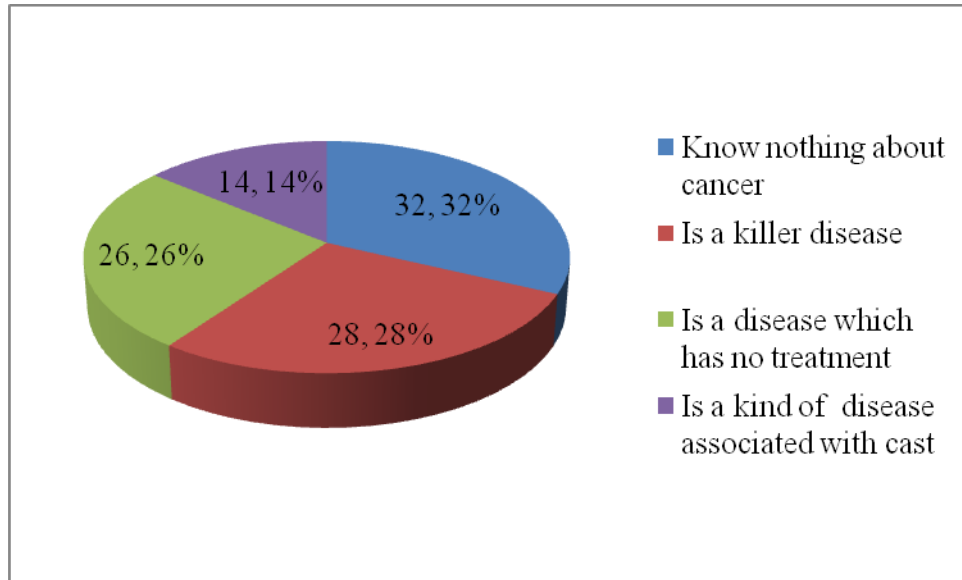
indicated that it is just a disease which attacks various parts of the body.

The findings revealed that cancer is still not well known by rural women. During the focus group discussions it was noted that skin cancer, which was referred to as *donda ndugu* (a wound that does not heal like other wounds) was fairly well known. The only symptom described was its persistence nature and that it cannot be treated through 'modern medicines'. They also mentioned breast cancer. But respondents were not quite sure of



what it was like. Information on breast cancer was acquired from friends and relatives and MEWATA campaigns. However, none of them had benefited from MEWATA breast cancer screening services. This observation is supported by Ngoma's (2011)

observation regarding cancer awareness in Tanzania and the reasons he gave for low level of cancer awareness in the country.

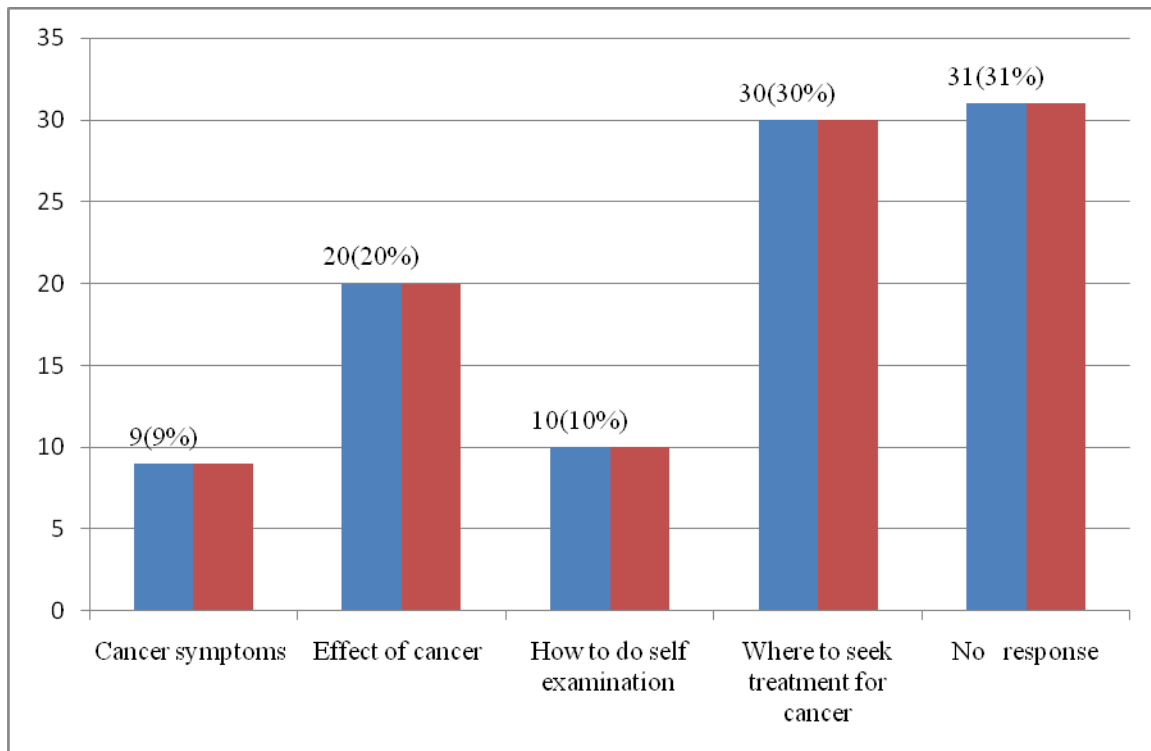


**Figure 2: Women's Perception of Cancer**  
**Source: Field Data 2011-----**

### 3.4 Rural Women's Knowledge about Cancer

The researcher wanted to capture the knowledge that rural women have about cancer: cancer symptoms, effects of cancer, how to do self examination and where to seek treatment for cancer. As shown in Figure 3 below 31 (31%) did not respond to the question, 30 (30%) knew where to seek treatment, 20 (20%) effect of cancer, 10 (10%) how to do self examination and 9 (9%) knew cancer symptoms. As there is only one referral

hospital for cancer it is not surprising to have 30% of the respondents knowing where to go for treatment (and obviously since the name of the hospital is associated with cancer possibility of people knowing it is higher); but it is also possible that treatment is locally sought since cancer was considered not treatable by 'modern medicine'. Probing questions during the focus group discussions indicated that women's understanding of cancer is very limited and were skeptical about it being treatable using 'modern hospitals' if early diagnosis is made.



**Figure 3: Rural Women's Knowledge about Cancer**  
Source: Field Data 2011

### 3.6 Challenges Faced in Accessing Cancer Information

Rural women worldwide are active information seekers, particularly in the context of managing health information for themselves and their families as noted by Wathen and Harris (2006) in Canada and Abu-Bakar (2009) in Malaysia. Wathen and Harris (2006) testify this:

*“There are unique challenges and enablers to health information*

*Seeking for women living in rural areas, including the role of formal, informal and ICT-based information intermediaries, the availability to women of required literacies for health information seeking and uptake”.*

It is well known that most people preferred to access information from media such as radios, televisions, books, magazines, posters, health centers, community groups and clubs. However, in the process of accessing and use information one may encounter various problems (Ikoja-Odongo, 2001). These include ignorance resulting from illiteracy, poor infrastructure, unreliable information, inability to locate information and economic stress testifies this. Respondents were asked to indicate if they face any problems in accessing information on cancer. The findings are indicated in the table below.

**Table 2: Challenges Faced by Rural Women in Accessing Cancer Information**

Problem	F	%
Domestic chores	21	21
The lack of time and poor radio frequency in my area hinder me to access information	18	18
No health service provider in my village	7	7

I cannot afford to buy a television or radio, magazines or leaflets	10	10
Lack of knowledge on how to seek health information	22	22
Lack of knowledge on how to seek health information	22	22
<b>Total Sample Size = 100</b>	<b>100</b>	<b>100</b>

Source: Field Data 2011.

The findings revealed that a number of problems are faced by rural women in accessing cancer information. 22 (22%) mentioned lacks knowledge on how to seek health information, 21(21%) domestic chores, 20 (20%) sources of information such as library/information centers are no available in their villages, 18 (18%) lack of time to listen to radio and watch television programmes,10 (10%) said that they cannot afford to buy a television set or radio and magazines, 7 (7%) no health service providers in the village and 20 (20%) indicated that they were not able to access cancer information easily due to lack of sources of information in their areas such as library/information centers.

The lack of time and poor radio frequency was another constraint mentioned by rural women that hindered them from accessing cancer information. They said that they fail to have time to listen to health information programmes on radio and television. The main reason is that rural women spend most of their time taking care of their family and are tired during the evening. In one of in-depth interviews one woman from Kiziwa village argued that:

*“Even if I had a radio and a television at home still I cannot sit down and listen to the radio or watch programmes on television because I have a lot of work to do every day.”*

### 3.7 Recommendations on Strategies for Creating Cancer

Respondents were asked to recommend strategies for enhancing access to and use of cancer information. Their recommendations are:

- The government should employ health workers who are committed and competent as regards health issues, in order to disseminate health information to women in rural areas. In addition, the government should invest money in rural areas so as to improve the environment to enable health experts to stay longer. Failure to that means that they will leave to look for greener pastures,
- Establishing a local F M radio station which could air health information in a local language,
- Use of cell phones to disseminate cancer information since they are now becoming commonly used in rural areas. If this media were to be used effectively, this could be the most useful way of accessing cancer information, since one does not need to travel in order to access the information that is disseminated through this channel,
- The government should sponsor workshops and seminars in rural areas. This will help both nurses and rural women to increase their knowledge about cancer. On top of that the provision of reading material written in a language that can be understood by rural women should also be taken into consideration by the government,
- Establishing tele-centres, visual aids such as films and videos and many others for rural areas could act as a source of health information and a method through which such information could be disseminated,
- More time should be allocated to information on cancer on radio and television programmes as is the case for other common diseases. Television is a good media for disseminating information since it has a wide coverage. They suggested that if these sources were used effectively to disseminate cancer information it would help to reduce the barriers to accessing cancer information. For example, during an interview one respondent from Kiroka village commented that:

*“If radio and television were to broadcast cancer information several times like other diseases, I would be able to get time to listen to one of the sessions because if I miss one session there will be a possibility of getting the other sessions.”*

- Moreover, respondents suggested that it should be helpful if local FM radio will be established in their area which would broadcast health information without using technical language,
- Another strategy mentioned by respondent's about rural electrification. They suggested that in order for them to have access to information from reliable sources such as radio, television and the Internet, like urban dwellers, the government has to speed up the rural electrification process. They will be motivated to work hard and save money in order to buy these necessities,

- Health workers should come during market days since these are days when rural women always meet together to sell and purchase different goods and so they will be found easily,
- Posters should be posted at health centres just as is done for other diseases and nurses should spend their time training and counseling patients when they go for any type of treatment,
- Clinics and hospitals should be built in rural area because women suffer very much when they need health services including health-related information, and
- Adult Education classes are expanded.

## IV. CONCLUSION

The findings of the study indicated that only few women in Morogoro Rural District were aware of cancer; mainly breast and skin cancer. However, women were aware of skin cancer, which was locally referred to as *donda ndugu*. Women mainly relied on informal information obtained from colleagues, relatives, family members. However, information specific to cancer is scanty. It is not surprising that this is the case, because even at national level it has not been taken as seriously as diseases like malaria, HIV/AIDS, tuberculosis or cholera.

The study also find out that rural women faced a number of challenges while seeking for information in general and that of cancer in particular include lack of formal sources of information, illiteracy/low literacy level, poor infrastructure, social-economic factors that make it difficult for women to access radios and televisions; channels expected to reach wider community easily, delivery of programmes at times inconvenient to women, and lack or inadequate health facilities and personnel who could provide more reliable information.

## V. RECOMMENDATION

Health information is critical for development as human resource is a key factor. For one to be productive he/she must be healthy and this depends significantly on ones access to and use of health information. Its value as a crucial factor in socio-economic, health and cultural development is being increasingly felt. Information is very important because the progress of everything is determined by the availability of information. Improvement of the health status of rural community is heavily dependent on access to health information. As noted by Wathen and Harries (2006), understanding of the contexts of information seeking and the preferences and behaviour of those with information needs is critical for decision making on strategies to be used in enhancing access to and use of health information.

This observation is also supported by Meyer (2009) who noted that information behaviour evolves as a result of the interplay between elements in cultural contexts. It seems these elements had not been given due attention in radio and television programmes that were intended to reach a wider community because, apart from problems of infrastructure the timing of the programmes was noted to be problematic in this study. Therefore in order to improve strategy for access and use of cancer as condensed into four main groups:

The government should allocate adequate funds to the health sector so that the health sector can build health units in villages and equip them with facilities and staff that would provide services, including health information for all diseases, including cancer. For the community members should sponsor workshops and seminars in rural areas. This will help both nurses and rural women to increase their knowledge about cancer, and should provide reading material written in a language that can be understood by rural women, and

It was recommended that health workers should: Conduct awareness campaigns on market days in order to reach more women. On market days rural women always meet together to sell and purchase different goods, so they will be found easily, and , put posters at health centers just as is done for other diseases and nurses, should spend their time training and counseling patients when they go for any type of treatment.

More time be allocated to information on cancer on radio and television programmes as is the case for other common diseases, and, cancer programmes are aired at times convenient to rural women, programmes be aired in local languages understood by the communities.

Non-Governmental organizations should study the environment and provide the service in cultural context, and, NGOs should treat cancer like other diseases and give it its due attention.

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#### AUTHORS

**First Author** – Gladness Lucas Kotoro, Assistant Librarian, Mzumbe University- DLIS

# Study of Delay in Execution of Infrastructure Projects – Highway Construction

Ms.Yogita Honrao \*, Prof.D.B.Desai \*\*

\* P.G. Student, Department of Civil Engineering, Dr.J.J.Magdum Engineering College, Jaysingpur, India

\*\* Associate Professor, Department of Civil Engineering, Dr.J.J.Magdum Engineering College, Jaysingpur, India

**Abstract-** Nowadays, highway construction suffers from delay and cost overruns, which causes traffic problems, changes of design, poor planning, disputes, cost overruns, poor safety practices and time delays. Researchers in developed countries have realized the seriousness of this shortfall and suggested solutions to resolve it. Due to the inherent risks and increasing complexity of modern construction projects, delays and cost overruns have become common facts in the industry. Researchers and practitioners have used many techniques to assess project delays and apportion delay responsibility among the parties involved. This research deals with the causes which severely effect in delay of infrastructure projects in India. The delays and cost overruns have become a hallmark of infrastructure projects in India, research in delay and cost overrun in highway projects has not been popular researched yet. Any construction project success can be realized by achieving its objectives within the planned time, budget and level of quality. One of the major problems that face the construction projects in general and road projects in specific is being behind the schedule, i.e., delay in submission. Delay can be defined as postponing the project completion time due to predicted and unpredicted causes. Completion time is very essential in construction; because “Time is Money”. In some cases, to the contractor, delay causes higher overhead costs because of longer construction period. As well as that, material costs may increase due to inflation. To the client, especially if he is investor, delay means losing profits that are planned to be earned after starting the investment on the scheduled time.

**Index Terms-** Cost overruns; Time overruns; Causes of Delay; Frequency Index; Severity Index; Importance Index.

## I. INTRODUCTION

A commonality among state departments of transportation is the inability to complete transportation projects on time and within budget. Time delay, cost overruns are generally due to factors such as design errors, unexpected site conditions, increases in project scope, weather conditions, and other project changes. A cost overrun may be generally expressed as a percent difference between the final cost of the project and the contract award amount. When this value is negative, it is called a cost under run. A time delay is simply the difference between a project’s original contract period at the time of bidding and its overall actual contract period at the end of construction. Indian infrastructure investment in general and highway construction in particular have seen manifold increase in the recent times. This

has brought about a paradigm shift in the way in which the highway construction industry has been conducting its business with increased pressure on its stakeholders, namely the employers, the contractors and the consultants for high quality and timely project delivery. A primary goal of highway agencies is to serve the public by providing timely construction of highways with the least disruption to the public. A significant annoyance to the public is when important projects are not completed in a timely manner and when the actual progress of the construction work is longer than necessary, thereby prolonging the inconvenience. The problem of delays in highway construction has been a priority issue for years.

## II. LITERATURE REVIEW

In analyzing time and cost overruns of construction projects in India, Iyer and Jha (2006) concluded that two success factors and one failure factor; commitment of project participants, owner’s competence and conflict among project participants contributed significantly in the enhancement of the performance of a project.

Root causes of delays in construction projects were defined as situations and conditions in sufficient detail that violated the fundamental principles to allow corrective action to be taken (Ellis and Randolph 2003). A listing of most common root causes categorized under seven major categories such as business practices, procedures, utilities, site conditions, planning and scheduling, traffic management and design errors has been provided. Although the survey for root cause of delay from both state highway agencies and constructors were listed separately, it was found that most of them were common for both sides.

Arun and Rao (2007) dealt with an innovative Decision Support Tool that could predict the duration overrun, cost overrun and activities associated with any specific delay in highway construction projects. Simulation models for duration and cost overrun of the project was developed based on the nature of delay, activities associated with the delay and classified as controllable and uncontrollable factors. Based on the opinion of senior project implementers from sixty four consultants and professionals in highway construction sector of India, the main risk factors were categorized in this work.

The actual problems connected with highway projects of large size with illustrations from one of the packages of the Golden Quadrilateral project spanning between Delhi and Kolkata, India was reported (Sharma 2004).

### III. RESERACH METHODOLOGY

The research through literature reviews and discussion with some parties involved in the construction industry identified a total of 53 causes and 11 effects which are mainly affecting in the delay of Highway construction projects. A questionnaire was developed in order to evaluate the frequency of occurrence, severity and importance of the identified causes. Data were gathered through a survey, analysed by using frequency, severity and importance indices, taking in view owners, contractors and consultants. Agreement on the ranking of the importance of the causes of delay between each two groups of parties was also tested. Recommendations for minimizing delay in construction projects were emphasized in view of the results of the study.

#### Questionnaire Design:

Data were gathered through a questionnaire. The questionnaire is divided into two main parts. Part 1 is related to general information for both the company and respondent. Owners, contractors and consultants were further requested to answer questions pertaining to their experience in the construction industry and their opinions about the percentage average time delay in projects they experienced. Part 2 includes the list of the identified causes of delay in construction project. These causes are classified into nine groups according to the sources of delay: factors related to owner, contractor, consultant, services and utilities, government regulations and external environment.

For each factor or cause two questions were asked: What is the frequency of occurrence for this cause? &

What is the degree of severity of this cause in project delay? Both Frequency of occurrence and severity were categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly, degree of severity was categorized as follows: extreme, great, moderate, and little (on 4 to 1 point scale).

#### Data Analysis Approach:

The collected data were analyzed through the following statistical techniques and indices:

1. Frequency Index: A formula is used to rank causes of delay based on frequency of occurrence as identified by the participants.
2. Frequency Index =  $(\sum (a n) \div N) * (100 \div 4)$  Where a is the constant expressing weighting given to each response (ranges from 1 for rarely up to 4 for always), n is the frequency of the responses, and N is the total number of responses.
3. Severity Index: A formula is used to rank causes of delay based on severity of occurrence as identified by the participants.
4. Severity Index =  $(\sum (a n) \div N) * (100 \div 4)$  Where a is the constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe), n is the frequency of the responses, and N is the total number of responses.
5. Importance Index: The importance index of cause is calculated as a function of both frequency and severity indices, as follows:
6. Importance Index (I.I %) =  $(\text{Frequency Index} \% * \text{Severity Index} \%) \div 100$

#### Questionnaire Format:

Questionnaire Form For Delay Analysis In Infrastructure Projects

This Questionnaire focuses on the study of causes of delay highway construction Projects. This questionnaire consists of 53 causes of delay and 11 effects on which a detailed analysis will be carried out by using statistical concept. These causes are classified into six groups according to the sources of delay: Factors related to owner, contractor, consultant, services and utilities, government regulations and external environment.

#### PART I

Please respond to the following details to be filled either by writing your answer in the space provided.

Please note:-

The answers should be based on your experience in construction projects.

All information provided will be treated in the strictest of confidence.

#### Questions related to the respondent's experience.

##### 1.1. What is your type of business?

- Contractor
- Owner
- Consultant
- Client/ Client representative
- Other please specify \_\_\_\_\_

##### 1.2. What are the organization being involved?

- Public
- Private
- Both

##### 1.3. How long have you been involved in the infrastructure construction projects?

- <5 years
- 6-10 years
- 11-15 years
- >16 years

##### 1.4. What is the value of the current project you are involved? (You might select more than one)

- Very large
- Large
- Medium
- Small

#### PART II

Questions related to the performance of project/s you have been involved in.

##### 2.1. How many Highway projects have you participated in?

Please specify \_\_\_\_\_

##### 2.2. Was one or more of them delayed?

- Yes
- No

If the answer to question 2.2 is NO please go to question 2.6

##### 2.3. How many of them were delayed?

Please specify \_\_\_\_\_

##### 2.4. What is the average delay time of the delayed project/s?

- Less than 10%
- 10 to 30 %
- 31 to 50 %
- 51 to 100%

Over 100 % please specify \_\_\_\_\_

**2.5. What is the average of delayed time that was authorized by client/s?**

- All the delayed time
- About 75% of delayed time
- About 50 % of delayed time
- About 25% of delayed time
- The contractor paid the liquidated damages<sup>9</sup> for all delayed time.

**2.6 Who is the first responsible party for the delay?**

- Contractor
- Consultant
- Client

**2.7 According to your opinion rate the effect of delay.**

(4- Always, 3-Mostly, 2-Sometimes, 1-Seldom, 0-Never)

**Table 1. Effects of delay**

Sr.No.	Effect	Never	Seldom	Sometimes	Mostly	Always
1	Time overrun					
2	Cost overrun					
3	Litigation					
4	Dispute					
5	Arbitration					
6	Total abandonment					
7	Disruption of traffic movement					
8	Delay of other projects related to the main one					
9	Obstruction of economical and urban development					
10	Discredit the Ministry of Works among the people and in the press					
11	Breach of contract					

**PART III**

For each factor or cause two questions were asked: What is the frequency of occurrence for this cause? & what is the degree of severity of this cause in project delay? Both frequency of occurrence and severity were categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly,

degree of severity was categorized as follows: extreme, great, moderate, and little (on 4 to 1 point scale). Respondents are required to fill the respective places with only scale points (1, 2, 3, and 4) of their opinion.

**Table 2. Frequency of Occurrence**

Scale Points	Category	Explanation
1	Rarely	Occurs only 1 time out of 10 projects (>10%).
2	Sometimes	Occurs in 1 to 5 projects out of 10 projects (10%-50%).
3	Often	Occurs in 5 to 7 projects out of 10 projects (50%-70%).
4	Always	Generally occurs in all the projects (70%-100%).

**Table 3. Degree of Severity**

Scale Points	Category	Explanation
1	Little	Less than 10% increase in cost and time of project.
2	Moderate	10% to 25% increase in cost and time of project.
3	Great	25% to 50% increase in cost and time of project.
4	Extreme	Greater than 50% increase in cost and time

**The Six Categories of Delay are:**

1. Causes related to Contractor
2. Causes related to Owner
3. Cases related to Consultant
4. Cases related to Services and Utilities
5. Causes related to Government Regulations

**Table 4.Importance and ranking of contractor related delay causes**

Cause no.	causes of delay	F.I %	S.I%	I.I%	Overall Rank
7	Ineffective construction method implemented by contractor	47.91667	75	35.9375	21
9	Shortage of materials	47.91667	75	35.9375	22
10	Payment problems between contractor and his employees	50	62.5	31.25	27
5	Improper planning and scheduling of project by contractor	43.75	70.83333	30.98958	28
2	Rework due to errors during execution	37.5	75	28.125	32
4	Poor communication between contractor and other project parties	43.75	58.33333	25.52083	34
6	Inexperienced contractor's manpower	41.66667	56.25	23.4375	39
8	Shortage of manpower	31.25	66.66667	20.83333	44
1	Difficulties in project financing by contractor	43.75	45.83333	20.05208	45
3	Poor site management and supervision by contractor	32.69231	50	16.34615	50
11	Shortage of equipment	20.83333	75	15.625	53

**Table 5.Importance and ranking of owner related delay causes**

Cause No.	Causes Of Delay	F.I %	S.I %	I.I %	Overall Rank
14	Interference by the owner during execution operation	64.58333	60.41667	39.0191	17
13	Delay in decision making by the owner	58.33333	62.5	36.45833	19
15	Delay in progress payments by owner	64.58333	56.25	36.32813	20
12	Budget availability for the project	52.08333	64.58333	33.63715	24
16	Lateness in reviewing and approving contract documents by the owner	54.16667	56.25	30.46875	29



17	Delay in approving shop drawings and sample materials	50	56.25	28.125	31
20	Poor communication between owner and other project parties	41.66667	62.5	26.04167	34
19	Suspension of work by owner	35.41667	70.83333	25.08681	37
18	Change of project scope	31.25	72.91667	22.78646	40

**Table 6.Importance and ranking of consultant related delay causes**

Cause No.	Causes Of Delay	F.I%	S.I%	I.I%	Overall Rank
31	Delay in solving design problems	41.66667	72.91667	30.38194	30
32	Major change of design during construction by consultant	35.41667	77.08333	27.30035	33
27	Bad project cost estimation	31.25	81.25	25.39063	36
28	Missing dimensions in the drawings	31.25	79.16667	24.73958	38
26	Discrepancies between specifications and drawings prepared by consultant	32.69231	68.75	22.47596	41
29	Lack of competent person to monitor the progress at site	35.41667	62.5	22.13542	42
22	Delay in approving major changes in the scope of work by consultant	31.25	62.5	19.53125	46
30	Delay in issuing the drawings	35.41667	54.16667	19.18403	47
25	Insufficient experience by consultant	31.25	56.25	17.57813	48
24	Delay in reviewing and approving design documents by consultant	33.33333	52.08333	17.36111	49
23	Poor communication between consultant and other project parties	35.41667	45.83333	16.23264	51
21	Delay in performing testing and inspection by consultant	33.33333	47.91667	15.97222	52

**Table 7.Importance and ranking of services and utilities related delay causes**

Cause No.	Causes Of Delay	F.I%	S.I%	I.I%	Overall Rank
33	Utilities are unidentified or incorrectly located	81.25	81.25	66.01563	2
38	The standard of practice for designers with regard to communicating utility information on drawings is not clearly defined	79.16667	77.08333	61.02431	4
37	Utility location information provided on drawings is not clear particularly for complex intersections	77.08333	79.16667	61.02431	5
34	Many smaller utilities have no as-built drawings	72.91667	79.16667	57.72569	7
41	Delays in the relocation of utilities	77.08333	72.91667	56.2066	8
42	Utilities may not see work as a priority	75	72.91667	54.6875	9
35	Often, the as-built drawings are incorrect	72.91667	72.91667	53.1684	10
39	Slow response by utilities to improve their processes	70.83333	70.83333	50.17361	12
36	As-built location information may not	68.75	72.91667	50.13021	13

	include vertical location				
40	Smaller utilities are restrained by funding limitation	66.66667	72.91667	48.61111	16

**Table 8.Importance and ranking of Government regulations related delay causes**

Cause No.	Causes Of Delay	F.I%	S.I%	I.I%	Overall Rank
43	Difficulties in obtaining work permits	87.5	87.5	76.5625	1
44	Tendering system requirement of selecting the lowest bidder	70.83333	70.83333	50.17361	11
47	Land acquisition	62.5	79.16667	49.47917	14
46	Change in government regulations and rule	37.5	83.33333	31.25	26
45	Summer restriction on time of work	29.16667	72.91667	21.26736	43

**Table 9.Importance and ranking of External Environment related delay causes**

Cause No.	Causes Of Delay	F.I%	S.I%	I.I%	Overall Rank
49	Traffic diversion	79.16667	79.16667	62.67361	3
48	Hot weather effect on execution activities	79.16667	77.08333	61.02431	6
53	Scarcity of materials in the market	54.16667	75	40.625	16
51	Accidents at execution site	54.16667	70.83333	38.36806	18
50	Effect of social and cultural conditions of inhabitants	62.5	56.25	35.15625	23
52	Political situation and security	45.83333	70.83333	32.46528	25

<b>Extremely Severe</b>	
<b>Very Severe</b>	
<b>Severe</b>	

**IV. DISCUSSIONS AND RESULTS**

This section discusses the results obtained in the previous section. First, we discuss the severest and most frequent causes of delay within each group. Second, we discuss the most frequent effects of delay

**Causes related to owner**

- Interference in work by owner: interference in work was ranked as the first severest cause related to owner. According to conditions of contract, the owner has the right to suspend any part of work if it is required to restudy or redesign the project to make the necessary modifications . If interference by owner will frequent without reason it may obstruct the work of contractor, and causes delay for the project.
- Delay in decision making: The results indicated that delay in decision making is the second severest cause related to owner. Slowness of owner in making decisions may hold back some of project activities, and

delay in settlement of contractor’s claims by the owner, such as approval of new work items, prices and additional costs for changes in design. This may obstruct the progress of work and subject the project for delay.

- Delay in progress payments by owner: the results shows that progress payment is third severest cause related to owner. This may occur due to unavailable financial resources to other projects. Without providing the budget, the project remains only in papers without execution.

**Causes related to contractor**

- Ineffective construction method implemented by contractor: this was ranked as the first severest cause related to contractor. Contractors may fail to come out with a practical work program at the initial work stage. This failure is interrelated with lack of effective methods of construction and insufficient contractor’s experience towards the projects. Improper planning at

the initial stages of a project causes delays at various stages.

- Shortage of materials: The contractor obligates himself to provide the required equipment and materials to execute the project within the time schedule. Shortage or unavailability of the required equipment and materials may obstruct the progress of work and may subject the project for delay.
- Payment problems between contractor and his employees: Some contractors encountered reduction in their financial resources due to the "Credit Crunch", the global financial crisis. Cash requirement for procurement of materials and other expenses could lead the contractor into a very critical situation which may obstruct the progress of work and postpone the project completion time.

#### **Causes related to consultant**

- Results showed that there are three severe causes related to consultant, these are: Delay in solving design problems, Major change of design during construction by consultant, Bad project cost estimation. It can be observed that these causes are related to insufficient experience of the consultant's staff. When consultant makes fundamental changes in design, the contractor may face difficulties in construction or in finance because these changes weren't planned. Moreover, when projects' costs are under-estimated, it may be suspended by the owner due to his inability to finance additional costs. Additionally, delay in approvals by consultant could delay the progress of work and may cause delay in completion time of the project.

#### **Causes related to services and utilities**

- All causes related to services and utilities were ranked as frequent and severe, which indicates the importance of this group. Utilities are unidentified or incorrectly located is ranked as the first most frequent and severest cause in this group. This may result from unavailability of designs and exact location maps. Unclear or undefined positions of services networks in drawings can subject the project to delay; because the schedule will be changed and the newly discovered pipe or cable is required to be moved or diverted temporarily which requires additional time and money.

#### **Causes related to Government regulations**

- Difficulties in obtaining work permits: Among the severest problems related to Government regulations which affect the progress of public road projects is the issuance of work permits. The contractor must obtain work permits from all concerned Government authorities. Each of these authorities has its own regulations and rules in issuing work permits. Contractor may face difficulties in obtaining these permits causing delay for the project.
- Tendering system requirement of selecting the lowest bidder: It is important to reconsider the governmental strategies that encourage the selection of the lowest bidding contractors and to improve the routine procedures and requirements that are required for obtaining work permits.

- Land acquisition: Land acquisition is a sensitive issue so humane, systematic and transparent approach need to be adopted for early and peaceful acquisition. Land acquisition must take place in a manner that fully protects the interests of land-owners and also of those whose livelihoods depend on the land being acquired. So an adequate compensation package which shall included reasonable compensation for land and resettlement and rehabilitation measures to assuage the sufferings of the affected persons and projects.

#### **Causes related to external environment**

- Traffic diversion: Traffic diversion is found to be the first severest and most frequent cause related to external environment. Improving the performance of an intersection by constructing a flyover and / or subway involves working at already used highway. If this highway is linking between important regions in the country, it is difficult to close it until the construction finishes. Congestions in this highway are required to be diverted for temporary ways and this may obstruct the progress of work and causes delay for the project.
- Hot weather effect on construction activities: The climate in Bahrain is very hot, where the temperature may exceed 49 °C in summer which makes the construction very difficult. The weather may affect the productivity of labours and equipment, which may delay the progress of work.
- Scarcity of materials in the market: The factor "scarcity of materials in the market" was Ranked third. Construction projects are physical projects, and the timely availability of Materials is very important.

#### **Delay effects**

Results indicated that the four most frequent effects of delay are:

- . Cost overrun
- Time overrun
- Disruption of traffic movement
- Dispute

When the project is subjected to delay, it will exceed the specified period which means waste of time that may be used in other profit making projects. As well as that, delay causes cost overrun because time is money. The contractor will pay more for overhead, labours and machinery. On the other hand, owner's money will be tied up with this delayed project. Moreover, closing main roads for development and construction will disrupt traffic movement. Additionally, roads provide links that connect the road users to other areas that may include recreational and investment projects. So delay in road projects may lead to delay in these investment projects that depend on them.

## **V. CONCLUSION AND RECOMMENDATIONS**

The first step in reducing the delays in highway construction project is to understand the root causes of the delay. The results provide a listing of root causes and issues that are directly responsible for most infrastructure construction project delays. Additionally, it is found that fundamental principles must be adopted before significant improvements can be made. The data were collected from the following respondents....

Landmark Corporation Pvt Ltd Mumbai, Construct Infotech Mumbai, Patils Constructions Sangli, P.S.C Infracon Pvt Ltd Dattawadi, M/S Anant Associates Pune, Fabstruc Signs Pvt Ltd Mumbai, Destech Pvt Ltd Mumbai, J Kumars Construction Pvt Ltd Mumbai Etc.

This work discussed the delay in road projects in Bahrain. It studied the frequency and severity of delay causes, as well as the frequency of delay effects. The research is a field survey through a questionnaire directed to contractors, consultants, and owner who is the Ministry of Works. It was concluded that there are many causes of delay related to contractors such as Ineffective construction method implementation, Shortage of materials

Payment problems between contractor and his employees . The major causes related to the owner, i.e. MOW, are Interference by the owner during execution operation, Delay in decision making by the owner, Delay in progress payments by owner. The main problems related to consultants are due to lack of experience. Delay causes related to services and utilities are the most critical factors as indicated by the high values of their severity means. Moreover, cost and time overruns and disruption of traffic movement were the most frequent effects of delay.

### Recommendations for future studies

It is recommended to further this research by investigating actual delay case studies in India. Furthermore the associated cost of delay in highway projects should be studied and analysed.

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### AUTHORS

**First Author** – Yogita Honrao has received the B.E. and in Civil Engineering from Shivaji university Kolhapur in year 2009, email Id: yogitahonrao88@gmail.com

**Second Author** – Dadaso Desai has received the B.E. and M.E. degree in Civil Engineering from Shivaji university Kolhapur in year 1994 & 2006 respectively. From year 1995 onwards he is working as a Asso. Professor in Dr. J.J. Magdum College of Engineering Jaysingpur. He has also having 18 year wide teaching experience. He published 11 papers in international journal. He has also presented 12 papers in international conference. Dadaso Desai has guided 18 students for their Master Degree in engineering. email id: dbdesai1008@yahoo.co.in

# Preparation and Evaluation of novel ocular inserts of Diclofenac sodium amino acid conjugate for controlled Drug Delivery

Tasneem Ara<sup>\*\*\*</sup>, Dr.Sanjay Sharma<sup>\*\*\*</sup>, Dr.Shibeer Ahmad Bhat<sup>\*</sup>, Dr.Anil Bhandari<sup>\*\*\*</sup>, Dr.Abdul Samieh Deva<sup>\*\*</sup>, Dr.Rathore M.S<sup>\*\*\*\*</sup>, Rifat Arifa khan<sup>\*</sup>, Dr.Nitish Bhatia<sup>\*\*\*\*\*</sup>

<sup>\*\*\*</sup> Department of Pharmaceutics, Jodhpur National University, Jodhpur Rajasthan  
<sup>\*\*</sup>Deva Polyclinic Anantnag Kashmir.

<sup>\*</sup> Drug Testing Lab Dalgate Srinagar Kashmir.

<sup>\*\*\*\*</sup> Department of Pharmaceutics M.M.College of pharmacy, Maharishi Markandeshwar University Mullana Ambala 133207

<sup>\*\*\*\*\*</sup>Khalsa college of pharmacy, Amritsar Punjab.

**Abstract-** The Aim and Objective of the present study was to formulate and evaluate the novel ocular Inserts of Diclofenac amino acid conjugate using different polymers such as HPMC, Eudragit L100 at various concentrations and combinations using dibutylphthalate as plasticizer. The ocuserts were prepared by using solvent casting technique. The main aim was to enhance the trancorneal permeation of diclofenac sodium using different amino acids. Ex vivo trancorneal permeation was studied across goat cornea. The study revealed that Diclofenac sodium and amino acid conjugate ocular inserts had greater permeation than Diclofenac sodium ocular inserts. Effect of concentration of Amino acids on the permeation of Diclofenac sodium was also studied and it was found that on increasing the concentration of amino Acid, permeation of Diclofenac Sodium increases. Diclofenac sodium and Lysine conjugate produced maximum ocular bioavailability. Formulations (F1) of Diclofenac sodium was prepared and compared, with different formulations ( F2, F3, F4) of Diclofenac sodium and Amino Acid Conjugates and it was found that F4 has maximum ocular availability. The optimized formulation was subjected to stability studies as per ICH guidelines.

**Index Terms-** Diclofenac sodium,

Hydroxypropymethylcellulose, ocular inserts, Eudragit L100, solvent casting, Dibutylphthalate, amino acids, lysine, glycine, arginine.

## I. INTRODUCTION

Drugs administered in traditional topical ophthalmic formulation such as aqueous eye drops have poor bioavailability due to rapid pre-coeneal elimination. To reach therapeutic levels frequent instillation of the drug are required, leading to a low patient compliance. Furthermore, the drug level in the tear film is pulsed with an initial period of overdosing, followed by a longer period of under dosing.<sup>1,2</sup> Generally efforts have been directed along the following lines:

1. Prolongation of the ocular residence time of the medicine.

2. Enhancement of corneal permeability (enhancer approach).
3. Increasing drug penetration characteristic (chemical Approach).
4. Use of phase transition systems<sup>3</sup>.
5. Use of Nanoparticle preparation.
6. Use of Liposomes preparation.
7. Use of cyclodextrins

The ocular inserts, which are solid devices placed in the cul-de-sac of the eye in comparison with liquid formulation might present valuable advantages, such as:

- Increased ocular permanence with respect to standard vehicles hence prolonged drug activity and a higher drug bioavailability.
- Increased ocular contact time.
- Accurate dosing (theoretically all of the drug is retained at the absorption site);
- Capacity to provide, in some cases, a constant rate of drug release;
- Possible reduction to systemic absorption, which occurs freely with standard eye –drops via the nasal mucosa;
- Better patient compliance, resulting from a reduced frequency of medication and a lower incidence of visual and systemic side effects;
- Possibility of targeting internal ocular tissues through non-corneal conjunctival-scleral penetration routes; and
- Increased shelf life with respect to eye –drops due to the absence of water. Another potential advantage of ocular insert therapy is the possibility of promoting non-corneal drug penetration, thus increasing the efficacy of some hydrophilic drugs that are poorly absorbed through the cornea

Conventional dosage forms for topical drug delivery are associated with their inherent limitations that make less drug availability and hence require frequent dosing to attain desired therapeutic concentration. Utilization of the principles of controlled release by means of ocusert formulation development seems attractive approach to enhance drug availability at the desired site.

Diclofenac sodium is an excellent non steroidal anti-inflammatory, analgesic and antipyretic drug. Eye solutions (0.1% w/v) of Diclofenac are available to treat ocular inflammatory conditions. Diclofenac sodium is a weakly acidic drug having low water solubility. It has also limited therapeutic availability across cornea because of lipophilic corneal epithelium. To overcome the less bioavailability, usually eye drops with higher concentrations are formulated or controlled release formulations have been formulated for many drugs. Diclofenac sodium is sparingly soluble in water hence high concentrated formulations are not suitable. Frequent dosing is required to attain desired therapeutic concentration of the available eye drops of Diclofenac (0.1% w/v).

Controlled release of drug from ocular inserts is an approach to increase drug availability.

Diclofenac is applied topically in the eye for management of pain in corneal epithelial defects following surgery or accidental trauma, treatment of post operative ocular inflammations, chronic non-infectious inflammations and prevention of intra-operative miosis during cataract surgery and symptomatic relief of seasonal allergic conjunctivitis. Less ocular availability of topically applied eye drops is a matter of concern for longer time. Various strategies have been investigated in an attempt to enhance the corneal permeability of topically administered diclofenac sodium and it comprises formulation approaches such as liposomes, nanoparticles, ointments and collagen shields. Other than this various penetration enhancers can be used to increase the transcorneal penetration. The use of absorption enhancers could be advantageous for most drugs and to be convenient in the manufacturing of ophthalmic preparations. However, possibility of corneal tissue damage is a major risk associated with the use of penetration enhancers.

Currently the most attractive approach to enhance the transcorneal permeability of hydrophilic moieties appears to be targeted drug delivery via transporters. Drug amino acid conjugates are prepared and these transporters are targeted to increase the permeability of drug. Amino acid and peptide transporters are considered most effective for drug targeting as these transporters have huge range of substrates and direction of transport from epithelium to endothelium providing a potential role in the permeation of substrate molecule. There are evidences for the presence of amino acid transporters such as LAT1, ATB<sup>0+</sup> and ASCT1 in the cornea. ASCT1 and ASCT2 are having different substrate specificities and sensitivities to pH and also these transporters recognize small neutral amino acids like alanine, serine, threonine. ATB<sup>0+</sup> is a Na<sup>+</sup> and Cl<sup>-</sup> coupled amino acid transporter that belongs to the neurotransmitter transporter gene family SLC6, having affinity for neutral as well as cationic amino acids. ATB<sup>0+</sup> does not recognize anionic amino acids as substrate because of the presence of negative charge in the side chain of amino acids. Amino acid derivatives of certain drugs (e.g. acyclovir) have been reported to have enhanced aqueous solubility along with improved ocular availability. Improved availability has been attributed to the interaction of amino acid derivative with amino acid transporters present on corneal epithelium. Keeping in view the above facts, efforts have been made to develop novel ophthalmic inserts of amino acid diclofenac sodium conjugate.

## II. MATERIALS AND METHODS

Diclofenac sodium was procured as gift sample from Combitic Global Caplet Pvt.Ltd.Sonepat(Haryana). Polymers such HPMC and Eudragit L100 were obtained as gift samples from Combitic Global Caplet Pvt.Ltd.Sonepat(Haryana) and Excellent Pharmatech vikas puri, New delhi. Arginine, glycine and lysine were procured from Hi Media Laboratories Pvt.Ltd Mumbai.

The ocuserts were prepared by using solvent casting technique

### Preparation of the drug reservoir

The reservoir containing 200mg of Diclofenac sodium with polymer at 3% concentration were dissolved in ethanol and casted on Petri dish having 16ml capacity and 8cm diameter (an area of 50.24 cm<sup>2</sup>), circular films of 9mm (0.9cm) diameter (an area of 0.63 cm<sup>2</sup>) each containing 2.006 mg (theoretical) drug were cut.

### Preparation of the rate controlling membrane

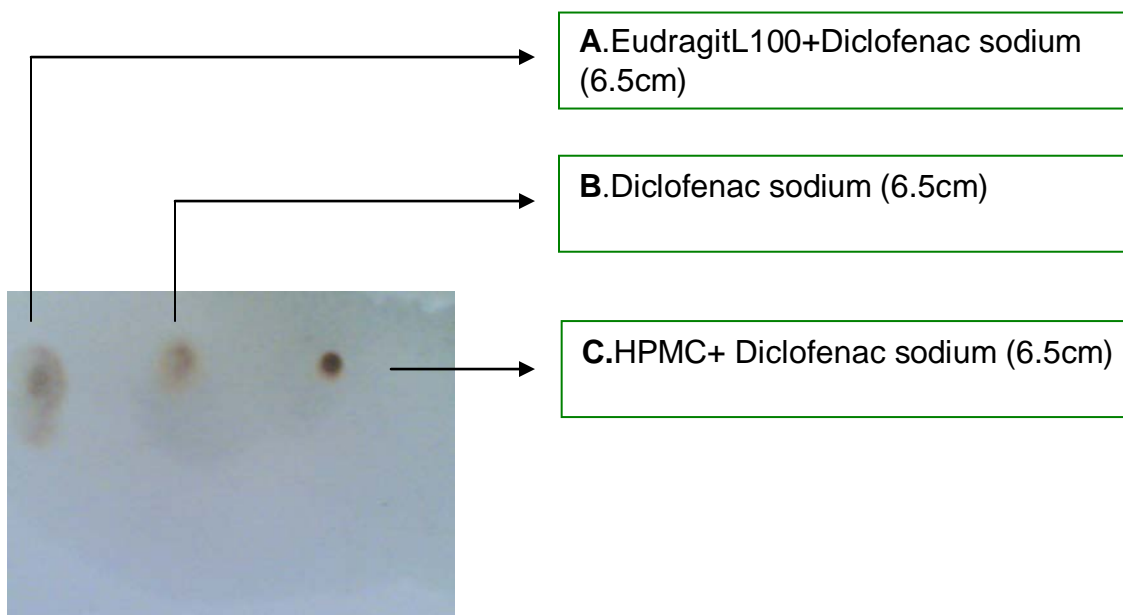
The rate controlling membrane was casted on Petri dish using different polymers and dibutylphthalate (30% w/w of polymer) as plasticizer and circular membrane of 10mm (1cm) diameter were cut

**Sealing** The drug reservoir was sandwiched in between the two rate controlling membranes and sealing was done by applying chloroform on the edges of the rate controlling membrane so that both the sides of the drug reservoir were sealed to control the release from periphery.

**Drug-excipient interaction study using TLC** Drug-excipient interaction may be determined by simple Thin Layer Chromatography method. Mobile phase consists of 100 volumes of toluene, 10 volumes of n-hexane and 10 volumes of anhydrous formic acid. The TLC chamber was saturated with the solvent system for 20 minutes to ensure a concentrated zone of compound with better resolution. 2 µl of each of the following solutions was applied separately to the plate. The solutions were prepared separately as -

1. Prepared 250 mg of Diclofenac sodium pure drug solution in 5 ml of Methanol.
2. Prepared 5% w/v solution of physical mixture of EudragitL100 and Diclofenac sodium in Methanol.
3. Prepared 5% w/v solution of physical mixture of HPMC and Diclofenac sodium in Methanol.

After spotting; the TLC plates were developed in this chamber. After development the TLC plates were dried using hot air oven. It was sprayed with a 0.5% solution of potassium dichromate in sulphuric acid (20%). The R<sub>f</sub> value of pure drug sample (R<sub>f</sub> = 0.53) and physical mixtures (R<sub>f</sub> = 0.53) obtained correspond to each other as shown in figure (Fig. 18).



**Figure 1. Photograph of TLC plate, A– spot of pure drug (Diclofenac sodium), B and C spot of physical mixtures**

Looking upon similar R<sub>f</sub> values, it seems there no interaction between Drug and excipients used to prepare ocuserts.

#### **Characterization of prepared ocular inserts**

Ocuserts prepared were evaluated for different parameters as follows:

##### **1 Thickness**

Thickness was measured using a screw gauge at different places of the ocusert and the average was calculated<sup>5</sup>

##### **2 Weight**

Weight was calculated on Digital balance. Three ocuserts were weighed individually and the average weight was calculated<sup>6</sup>

##### **3 Drug content**

Three ocuserts were taken and cut into small pieces, put into 100ml buffer (pH7.4) and shaken continuously until they dissolve. The solution was ultrasonicated for 15 minutes. After filtration, the drug was suitably diluted and analyzed at 276nm in UV visible spectrophotometer<sup>7</sup>

##### **4 Folding Endurance**

Folding Endurance was determined by repeatedly folding the film at the same place till breaking or appearance of breaking signs. The number of times the film could be folded at the same place without breaking gives the folding endurance value<sup>7</sup>

##### **5 Moisture Uptake**

The ocuserts were subjected to desiccation over calcium chloride at room temperature for 48h. These ocuserts were then weighed and the weight was recorded as initial weight. The ocuserts were then exposed to 75% relative humidity (a saturated mple was taken

solution of ammonium chloride) in a desicator until a constant weight of the ocuserts was obtained. The percentage of moisture uptake was calculated as the difference between final and initial weight with respect to initial weight<sup>8</sup>

##### **6 Surface pH**

The ocuserts were first allowed to swell by keeping them in contact with 5ml of distilled water for one hour in petridish. pH was noted by bringing the glass electrode near the surface of the formulation (ocusert) and allowing it to equilibrate for one minute<sup>9</sup>

**7 In-vitro drug release<sup>6</sup>** In vitro release of drug from ocusert was studied using Franz diffusion cell containing a donor and receptor cells. the donor cell was clamped over the receptor compartment, which was provided with a side arm for sampling and had an internal capacity of 50 ml. The receptor contained phosphate buffer of pH 7.4 as dissolution medium (50ml) The medium in the receptor compartment was agitated using a magnetic stirrer at 50rpm±4% maintaining a temperature at 37<sup>0</sup>C±1<sup>0</sup>C through the water jacket surrounding the receptor cell. ocusert was placed on the epithelial surface of the cornea and placing a glass cover slip over the opening of the donor cell retarded the possible contamination in the donar compartment. The donor compartment represented the conjunctival sac of the eye where as the receptor compartment represented the anterior segment of the eye. After specified intervals of time; 3 ml of the sample was taken and replaced with fresh dissolution medium. Then after suitable dilution the absorbance of the sa

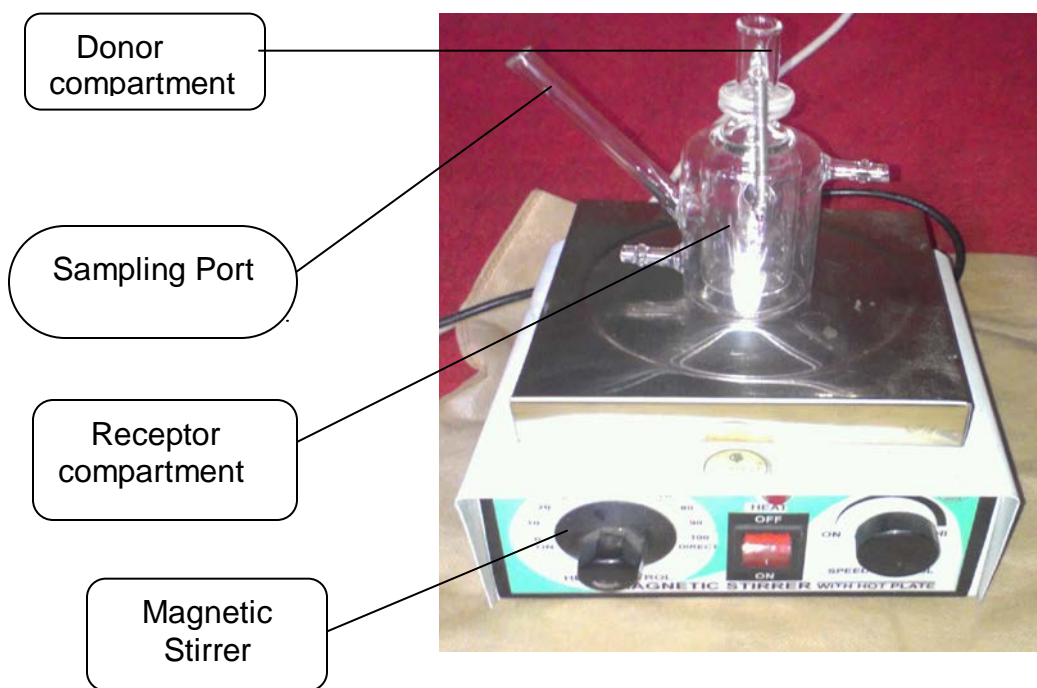
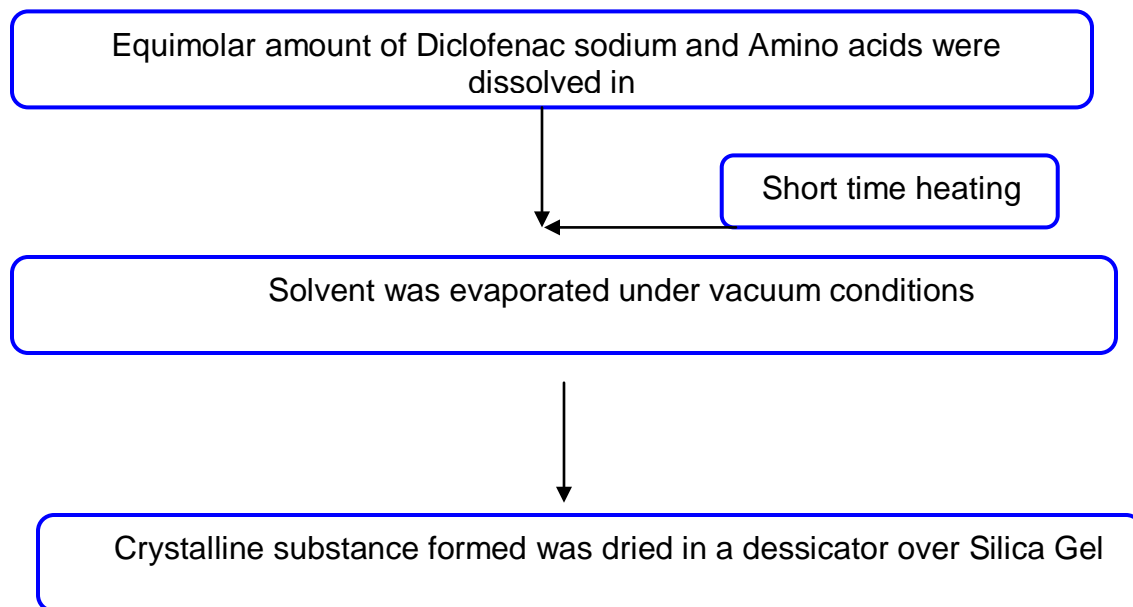


Figure 2 . Apparatus to study drug release from ocusert

### III. SYNTHESIS OF DICLOFENAC AMINO ACID CONJUGATES

It was synthesized by the following scheme:

#### Synthesis of Diclofenac sodium and amino acid Conjugates<sup>10</sup>



#### Preparation of the drug reservoir for formulation F1

The reservoir film containing 200mg of Diclofenac Sodium with polymer at 3% concentration were dissolved in ethanol and casted on Petri dish having 16ml capacity and 8cm diameter (an area of 50.24 cm<sup>2</sup>), circular films of 0.8cm diameter (an area of

0.5024 cm<sup>2</sup>) each containing 2mg of Diclofenac sodium drug were cut.

#### Preparation of the drug reservoir for formulation F2(Diclofenac sodium arginine conjugate)



The reservoir film containing 309.48 mg of Diclofenac Amino acid conjugate equivalent to 200mg of Diclofenac Sodium with polymer at 3% concentration were dissolved in ethanol and casted on Petri dish having 20ml capacity and 8cm diameter (an area of 50.24 cm<sup>2</sup>), circular films of 0.8cm diameter (an area of 0.5024 cm<sup>2</sup>) each containing 3.0948mg of Diclofenac amino acid conjugate equivalent to 2.0 mg (theoretical) drug were cut.

**Preparation of the drug reservoir for formulation F3(Diclofenac sodium Glycine conjugate)**

The reservoir film containing 247.16mg of Diclofenac Amino acid conjugate equivalent to 200mg of Diclofenac Sodium with polymer at 3% concentration were dissolved in

ethanol and casted on Petri dish having 20ml capacity and 8cm diameter (an area of 50.24 cm<sup>2</sup>), circular films of 0.8cm diameter (an area of 0.5024 cm<sup>2</sup>) each containing 2.4716 mg of Diclofenac amino acid conjugate equivalent to 2.002 mg (theoretical) drug were cut.

**Preparation of the drug reservoir for formulation F4(Diclofenac sodium Lysine conjugate)**

The reservoir film containing 314.8mg of Diclofenac Amino acid conjugate equivalent to 200mg of Diclofenac Sodium with polymer at 3% concentration were dissolved in ethanol and casted on Petri dish having 20ml capacity and 8cm diameter (an area of 50.24 cm<sup>2</sup>), circular films of 0.8cm diameter (an area of 0.5024 cm<sup>2</sup>) each containing 3.148 mg of Diclofenac amino acid conjugate equivalent to 2.002 mg (theoretical) drug were cut

IV. RESULTS AND DISCUSSION

EVALUATION OF THE OCUSERTS

**Table 1. Comparative evaluation of formulated ocuserts with different proportions of polymers (Values are mean ±SEM of three experiments in each group)**

Formulation code	Thickness (mm)	Weight (mg)	Drug content (mg)	Folding endurance	Moisture uptake	Surface pH
F1	0.48 ± 0.014	50.66 ± 3.480	1.64 ± 0.020	45 ± 2.906	4.47 ± 0.396	6.68 ± 0.225
F2	0.51 ± 0.020	60.33 ± 1.453	2.19 ± 0.024	65 ± 2.887	7.42 ± 0.389	7.17 ± 0.055
F3	0.53 ± 0.037	76.66 ± 0.881	1.77 ± 0.010	54.33 ± 1.764	8.69 ± 0.465	7.18 ± 0.040
F4	0.44 ± 0.017	57.66 ± 1.202	1.89 ± 0.048	48.33 ± 1.667	5.72 ± 0.469	7.02 ± 0.020

The thickness measured for different formulations (F1, F2, F3, F4,) was in the range of 0.44 to 0.55mm. Formulation F4 was thinnest (0.44mm) while F3 was thickest (0.55mm). Weight of ophthalmic inserts was in the range of 50.66 to 76.66mg. The drug content was found from 1.64mg to 2.19mg as compared to theoretical 2mg of drug to be incorporated in each ocusert. The weight and drug content results showed less extent of patch variability.

Folding endurance of a film is a measure of breaking strength and endurance. This is the number of times the film may be folded at one place until it breaks or sign of breakage appears. This was in the range of 45 to 65 times. The folding endurance results shows enough strength of ocuserts to withstand handling shocks. Sometimes ocuserts comprises of hydrophilic polymers and likely to gain moisture from environment. Hence, it becomes imperative to measure moisture uptake extent for such formulation. Moisture uptake value for prepared formulations

was from 4.47 to 8.69% of total ocusert weight after exposing this to predetermined environment having 75% RH.

Eye can tolerate fairly a wide range of pH from 4 to 11. However from comfort point of view the favorable pH should be around physiologic pH of tears i.e. pH 7.4. The surface pH of ocuserts was found 6.68 to 7.18 that indicates these should not cause any discomfort (tear flow stimulation) and damage to eye.

**IN-VITRO RELEASE STUDIES OF DICLOFENAC SODIUM FROM OCUSERTS:**

Whole eye ball of goat was transported from the butcher shop to the laboratory in cold (4<sup>0</sup>C) normal saline (0.9% NaCl) within 1hour of slaughtering of the animal. The cornea was immediately excised along with 2 to 4 mm Scleral portion remaining adhered to the cornea for ease of mounting. Cornea was d washed with normal Saline till the washing was free from proteins. Excised cornea was mounted between donar and

receptor compartment. The receptor compartment was filled with phosphate buffer pH 7.4 and ensured that no air bubble was present in the compartment. To study the drug release characteristics from ocuserts, a two chambered diffusion cell was

used. Ocuserts was placed in the donor compartment with 0.7 ml of pH 7.4 phosphate<sup>12</sup>. At specified time interval the drug released from ocuserts was measured.

**Table 2. Comparative in-vitro drug release from ocuserts F1, F2, F3, F4 (Values are mean ± SEM of three experiments in each group)**

Time	Cumulative % Drug Release			
[2] (hrs)	[3] F1	[5] F2	[6] F3	[7] F4
[9] 0	[10] 0	[12] 0	[13] 0	[14] 0
[15] 0.25	[16] 2.22±0.156	[18] 0.98±0.230	[19] 2.24±0.480	[20] 5.64±0.049
[21] 0.50	[22] 3.29±0.417	[24] 1.98±0.057	[25] 3.54±0.479	[26] 6.82±0.354
[34] 1	[35] 5.81±0.190	[37] 5.11±0.300	[38] 10.82±0.383	[39] 8.80±0.073
[41] 2	[42] 7.42±0.296	[44] 6.78±0.204	[45] 12.76±0.118	[46] 10.49±0.406
[48] 3	[49] 10.81±0.180	[51] 9.79±0.108	[52] 17.63±0.148	[53] 16.88±0.167
[55] 4	[56] 15.49±0.328	[58] 10.75±0.16	[59] 20.57±0.554	[60] 20.45±1.080
[61] 5	[62] 18.05±0.376	[64] 13.11±0.208	[65] 23.05±0.205	[66] 25.12±0.324
[68] 6	[69] 19.87±0.349	[71] 16.31±0.086	[72] 24.82±0.132	[73] 29.31±0.111
[75] 7	[76] 21.47±0.448	[78] 20.23±0.846	[79] 26.66±0.249	[80] 32.48±0.160
[81] 8	[82] 24.26±0.398	[84] 23.84±0.074	[85] 29.07±0.439	[86] 37.5±0.242
[88] 9	[89] 27.08±0.133	[91] 28.81±0.326	[92] 33.86±1.915	[93] 41.07±0.399

[94] 1 0	[95] 28. 76 ±0. 22 6	[97] 31.39± 0.539	[98] 39.11± 0.552	[99] 44.91 ±0.30 7
[100]1 1	[101]31. 08 ±0. 24 4	[103]38.99± 0.459	[104]43.11± 0.389	[105]48.52 ±0.23 8

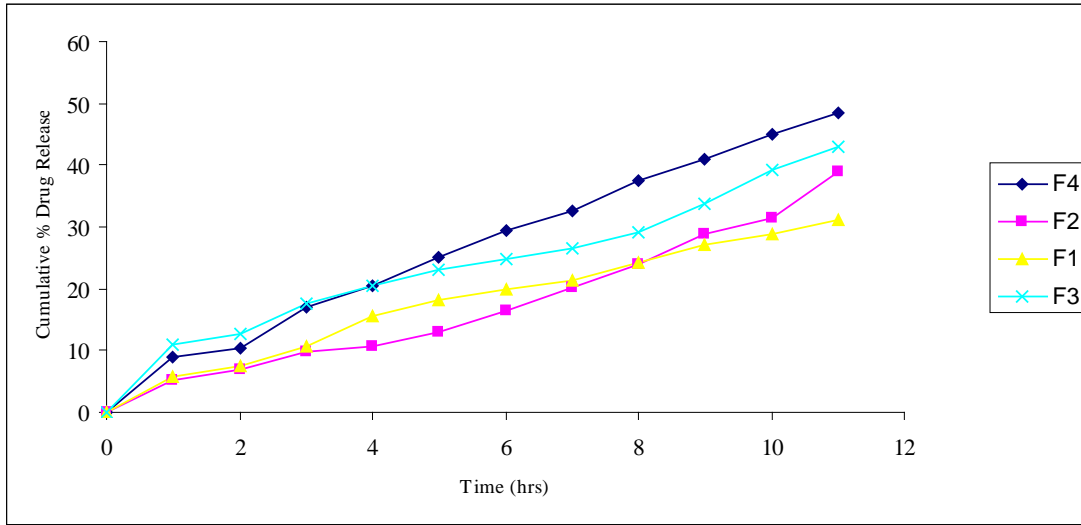


Figure 3. In-vitro Release of ophthalmic inserts from F1,F2,F3,F4.

Table3. In-vitro Release of ophthalmic inserts from F4 after increasing the amino acid content

Time(hrs)	1	2	3	Mean±SEM
0	0	0	0	0
1	14.61	14.66	14.38	14.57±0.085
2	19.38	20.61	19.77	19.92±0.362
3	27.77	28.5	27.11	27.79±0.401
4	33.33	34.05	33.72	33.7±0.208
5	39.66	41	40.11	40.25±0.393
6	49.11	50.5	49.55	49.72±0.410
7	57.88	59.38	58.38	58.54±0.441
8	64.88	68.61	72	68.49±2.056
9	79.33	80	79	79.44±0.294

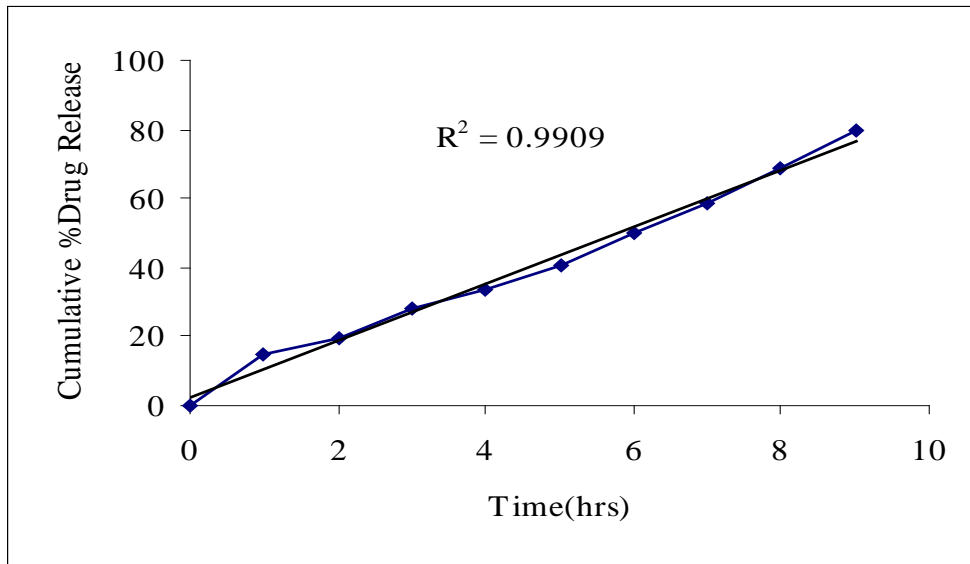


Figure 4. In-vitro Release of ophthalmic inserts from F4 after increasing the amino acid content

Table 4. In vitro drug release from formulation F4 containing Diclofenac sodium lysine conjugate in drug reservoir for 24 hours

Time(hrs)	1	2	3	Mean±SEM
0	0	0	0	0
0.25	6.23	5.90	5.90	6.01±0.110
0.50	8.31	6.45	7.44	7.40±0.537
2	17.18	14.28	14.41	15.29±0.945
4	18.92	18.84	21.56	19.77±0.893
6	32.73	27.74	29.71	30.06±1.451
8	36.17	35.89	38.97	37.01±0.983
10	48.58	46.73	47.66	47.65±0.534
12	57.82	56.89	55.42	56.71±0.698
14	64.32	63.55	63.44	63.77±0.276
16	73.72	72.77	70.70	72.39±0.891
18	83.34	82.21	80.34	81.98±0.859
20	88.35	87.69	86.06	87.36±0.680
22	93.40	92.25	91.76	92.47±0.486
24	97.68	96.75	96.15	96.86±0.445

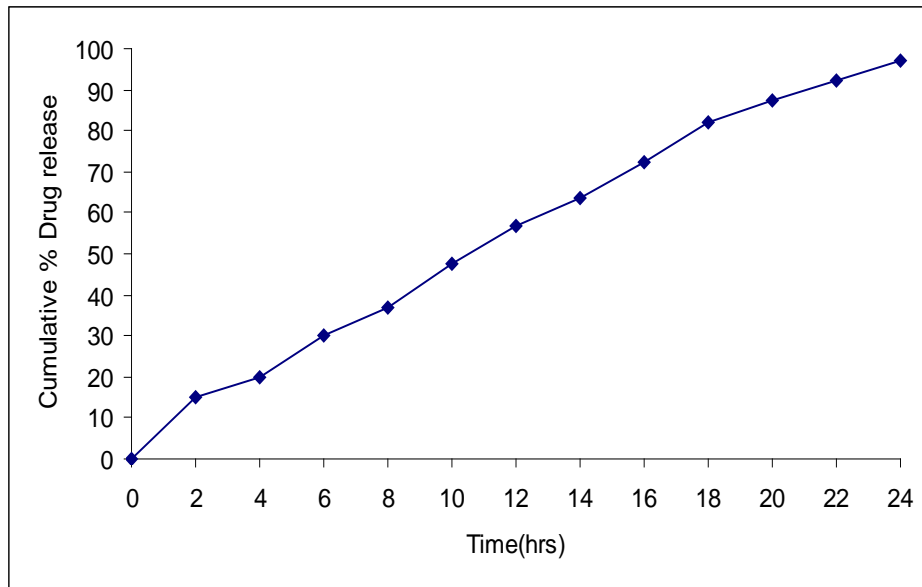


Figure 5. In vitro drug release from formulation F4 containing Diclofenac sodium lysine conjugate in drug reservoir for 24 hours

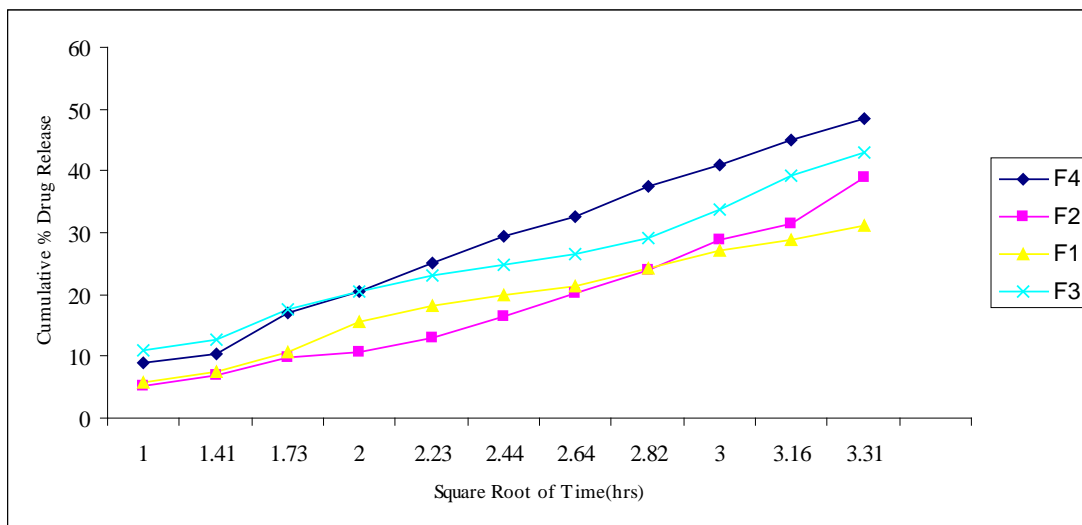


Figure 6. Higuchi plot of ophthalmic inserts from F1, F2, F3, F4

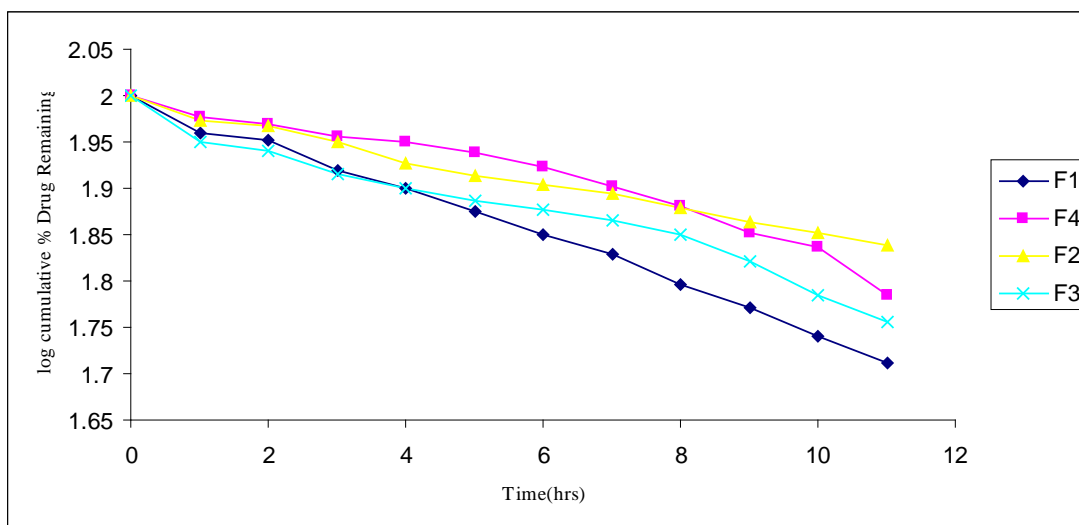


Figure 7. First order plot of ophthalmic inserts from F1, F2, F3, F4

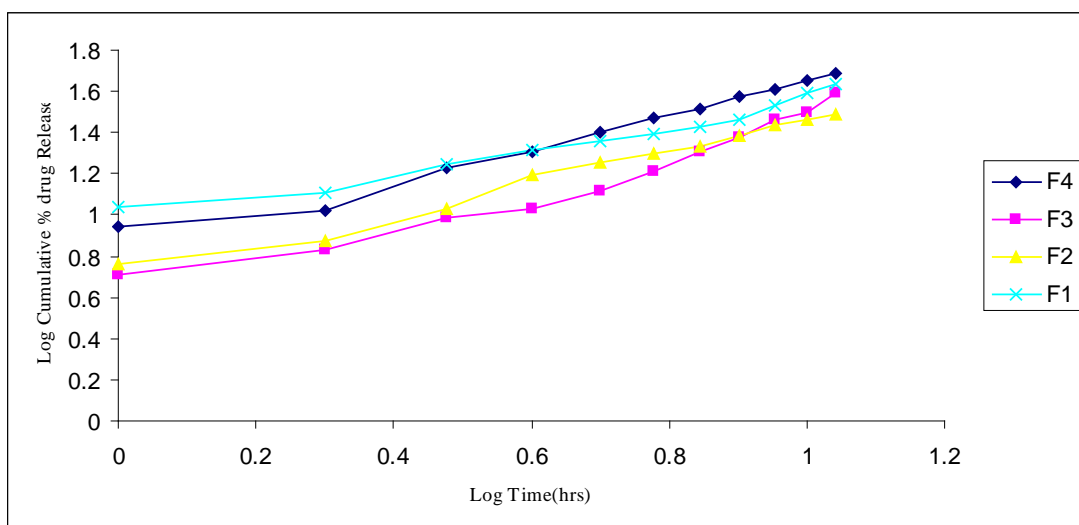


Figure 8. Korsmeyer plot of ophthalmic inserts from F1, F2, F3, F4

Table 5. Comparative Release kinetics of ocular inserts of Diclofenac sodium from formulations F1, F2, F3 and F4

[106] Formulation [107] code	[108] Zero order model	[109] Highuchi model	[110] First order model	[111] Korsmeyer et al,s model	
	[112] R <sup>2</sup>	[113] R <sup>2</sup>	[114] R <sup>2</sup>	[115] R <sup>2</sup>	[116] n
[117] F4	[118] 0.9896	[119] 0.9651	[120] 0.9799	[121] 0.9787	[122] 0.76
[123] F2	[124] 0.9711	[125] 0.9640	[126] 0.9468	[127] 0.9469	[128] 0.85
[129] F1	[130] 0.9823	[131] 0.9922	[132] 0.9916	[133] 0.9833	[134] 0.74
[135] F3	[136] 0.9639	[137] 0.9786	[138] 0.9661	[139] 0.9609	[140] 0.57

Release studies were carried out for 11 hours for all formulations (Table 2). To know the mechanism of drug release from these formulations, the data were treated according to zero order (cumulative % of the drug released vs. time), First order

(log cumulative % of drug remaining vs. time), Highuchi,s model (cumulative % of the drug released vs. Square root of time) and Korsmeyer,s model( log cumulative % of drug released vs log time)<sup>11</sup>

After 11 hours the cumulative drug release from formulation F4, F2, F1, F3, was found to be 48.52%, 38.99%, 31.08% and 43.11%, respectively. Drug release from F4, F3 was faster compared to formulation F1, F2 during 11 hr. Further it was seen on increasing the amino acid (Lysine) content in the formulation F4 increases the release of drug from 48.52% to 79.44%.

It is evident from the correlation coefficients for zero order model (Table 5) that neither of the above four formulations shows a perfect or complete zero order pattern. The values of  $R^2$  for Higuchi's model (0.9640 to 0.9922) also suggest the same result. When the data was plotted according to first order equation, the formulations showed a fair linearity, with  $R^2$  values between 0.9468 to 0.9916. In order to confirm the release kinetics of the formulations the data was fit into Korsmeyer's

equation. As is evident from Korsmeyer's equation that for all the formulations the value of  $n$  (slope value of  $\log mt/m^\infty$ ) is less than 1 (0.57 to 0.85), which further confirms that release rate is not independent of time. In other words none of the formulations obeys zero order equation (case II transport). In all the four formulations the value of  $n$  obtained was between 0.57 to 0.85, which indicates that there is a coupling diffusion and erosion mechanism (anomalous diffusion/non-Fickian transport) in these formulations. Presence of swellable polymer (HPMC) within such formulations might be responsible for the drug release controlled by more than one process. The presence of plastic polymer Eudragit L100 might be responsible for diffusion type of drug release mechanism from such formulations.



**Figure 9. Formulation F1 before 24 hours**



**Figure 10. Formulation F1 after 24 hours**

On the basis of above drug release studies it may be stated that drug release from all the four formulations is anomalous diffusion controlled with predominately first order kinetics. On the basis of the drug release study it was seen that maximum amount of drug is released within 24 hrs (96.86%) from formulation F4 as compared to rest of the formulations. Further it

has got minimum thickness (0.44mm) and other parameters are also within the limit i.e. it will not produce any discomfort upon insertion. So formulation F4 containing 3% Eudragit L100 in Rate controlling membrane and 3% HPMC in Drug Reservoir seems best optimized formulation among the four formulated Formulations.



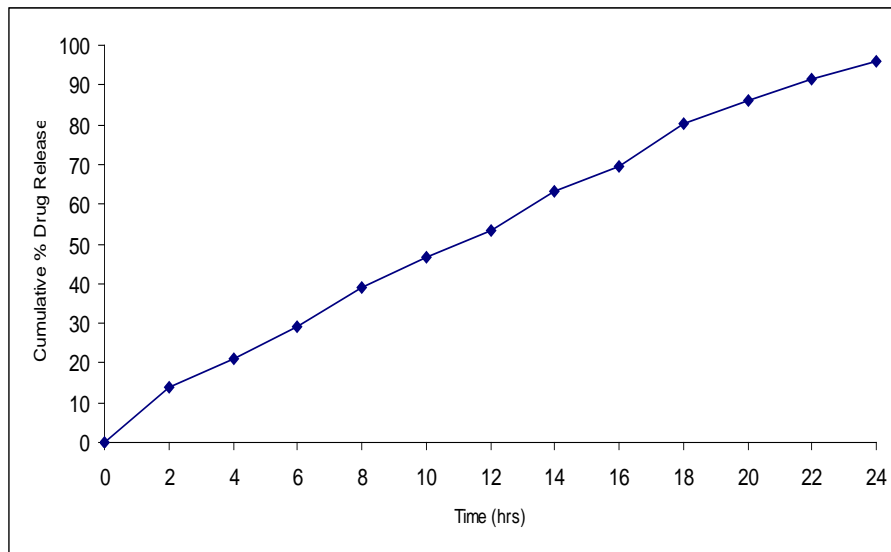
**Figure 11. Photograph of optimized formulation (F4)**

**STABILITY STUDIES FOR OPTIMIZED FORMULATION<sup>13</sup>**

In view of the potential utility of F-4 formulation for targeting of Diclofenac sodium to eye, stability studies were carried out 40°C/75% RH. The protocol of the stability studies was in conformation with the recommendation in the ICH document for stability testing of products intended for global market. After storage the formulation was subjected to evaluation of physical parameters, drug content and in-vitro drug release studies.

**Table 6. Characteristics of ocuserts containing Diclofenac sodium lysine conjugate in the Drug reservoir (optimized Formulation F4) at accelerated conditions: (Values are mean ±SEM of three experiments in each group) before and after stability studies**

Days	Thickness (mm)	Weight (mg)	Drug Content (mg)	Folding endurance	Surface pH
0	0.44± 0.017	57.66± 1.202	1.89±0.048	48.33±1.667	7.02± 0.020
30	0.44±0.005	57±2.517	1.88±0.008	47.66±1.453	6.98±0.044



**Figure 12. In vitro drug release from formulation F4 containing Diclofenac sodium lysine conjugate in the Drug reservoir at accelerated conditions**

**Table 7. In vitro drug release from formulation F4 containing Diclofenac sodium lysine conjugate in the Drug reservoir**

Time(hrs)	Before	After
0	0	0
0.25	6.01±0.110	5.45±0.147
0.50	7.40±0.537	6.48±0.192
2	15.29±0.945	13.99±0.410
4	19.77±0.893	21.01±0.605
6	30.06±1.451	29.20±0.203
8	37.01±0.983	38.99±0.251



10	47.65±0.534	46.46±0.043
12	56.71±0.698	53.26±0.859
14	63.77±0.276	63.17±0.472
16	72.39±0.891	69.57±0.275
18	81.98±0.859	80.39±0.330
20	87.36±0.680	86.13±0.345
22	92.47±0.486	91.30±0.438
24	96.86±0.445	96.13±0.224

When the ocuserts were stored at accelerated conditions (400C/75% RH), there appeared no significant change in their physiochemical properties viz. thickness, weight, folding endurance, drug content, surface pH & in vitro drug release when compared to physiochemical properties and in vitro drug release from the same formulation before storage.

### V. CONCLUSION

The conclusions drawn from the present study are

Drug –polymer compatibility studies were carried out using FT-IR and TLC study. It shows there is no significant interaction between polymers and Drug. Ocular inserts of Diclofenac sodium and Diclofenac sodium Amino acid Conjugates were Prepared successfully by solvent casting method using different polymers (HPMC, Eudragit L100) in different combinations and proportions. Dibutylphthalate was used as plasticizer.

Conventional ocular drug delivery such as eye drops, ointments, gels etc; have got various disadvantages like Precorneal loss, Evaporation by tears, Drug-protein interaction, Drug metabolism, Drainage, Induced lacrimation, Sticking of eye lids, Poor patient compliance, blurred vision; systemic side effects etc; Utilization of the principles of controlled release by means of ocular inserts offers an attractive approach to the problem of prolonging precorneal drug residence time. Thus reducing frequency of administration & hence increasing patient compliance. Besides the systemic side effects of the drug taken (Diclofenac sodium) could be overcome by utilizing the ophthalmic insert approach.

The prepared ocusert were evaluated for different parameters & in vitro drug release. On the basis of the Drug release studies it was concluded that drug release from all of the four formulations anomalous diffusion controlled with predominately first order kinetics. On the basis of the drug release study it was seen that maximum amount of drug is release within 24hrs (96.86%) from formulation F4 as compared to rest of the formulations. Further it has got minimum thickness (0.44mm) and other parameters are also within the limit i.e. it will not produce any discomfort upon insertion. So formulation F4 containing 3% Eudragit L100 in Rate controlling membrane and 3% HPMC in Drug Reservoir seems best optimized formulation among the six formulated Formulations.

The study revealed that Diclofenac sodium and amino acid conjugate ocular inserts had greater permeation than Diclofenac sodium ocular inserts. Effect of concentration of Amino acids on the permeation of Diclofenac sodium was also studied and it was found that on increasing the concentration of amino Acid, permeation of Diclofenac Sodium increases. Diclofenac sodium and Lysine conjugate produced maximum ocular bioavailability. Formulations (F1) of Diclofenac sodium was prepared and compared, with different formulations (F2, F3, F4) of Diclofenac sodium and Amino Acid Conjugates and it was found that F4 has maximum ocular availability. Method of preparation of Novel amino Acid conjugates was found to be simple and reproducible. The polymers used were non-toxic, relatively less expensive and easily available. Polymers were found to be effective at different concentrations in providing constant release of the drug from the formulations for a long period of time. The optimized formulation was subjected to stability studies as per ICH guidelines.

So by formulation of Novel ocuserts the undesirable side effects of conventional dosage forms like frequent administration, poor availability, massive and unpredictable doses, drainage of medication by tear and nasolacrimal fluid, visual and systemic side effects can be overcome. Thus the formulated ocuserts will eliminate such undesirable effects and will provide the therapeutic effect over a prolonged period of time. Thus will increase the patient compliance and therapeutic efficacy with minimal or no side effects.

The present study showed that Novel amino acid conjugate ophthalmic inserts can be a choice of drug delivery for the treatment of inflammatory conditions of eye as a controlled ocular drug delivery system and conjugation technique was effective to enhance the drug release and it can be concluded that Amino Acids can be used as a better tool for targeted drug Delivery to the eye.

Conventional ocular drug delivery such as eye drops, ointments, gels etc; have got various disadvantages like Precorneal loss, Evaporation by tears, Drug-protein interaction, Drug metabolism, Drainage, Induced lacrimation, Sticking of eye lids, Poor patient compliance, blurred vision; systemic side effects etc; Utilization of the principles of controlled release by means of ocular inserts offers an attractive approach to the problem of prolonging precorneal drug residence time. Thus reducing frequency of administration & hence increasing patient

compliance. Besides the systemic side effects of the drug taken (Diclofenac sodium) could be overcome by utilizing the ophthalmic insert approach. Various formulations of Diclofenac sodium ocular inserts were prepared using solvent casting method and were evaluated for various physicochemical parameters and Drug release. Method of preparation of Novel amino Acid conjugates was found to be simple and reproducible. The polymers used were non-toxic, relatively less expensive and easily available. Polymers were found to be effective at different concentrations in providing constant release of the drug from the formulations for a long period of time.

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#### AUTHORS

**First Author** – Tasneem Ara, Department of Pharmaceutics, Jodhpur National University, Jodhpur Rajasthan  
**Second Author** – Dr.Sanjay Sharma, Department of Pharmaceutics, Jodhpur National University, Jodhpur Rajasthan  
**Third Author** – Dr.Shibeer Ahmad Bhat, Drug Testing Lab Dalgate Srinagar Kashmir  
**Fourth Author** – Dr.Anil Bhandari, Department of Pharmaceutics, Jodhpur National University, Jodhpur Rajasthan  
**Fifth Author** – Dr.Abdul Samieh Deva, Deva Polyclinic Anantnag Kashmir  
**Sixth Author** – Dr.Rathore M..S, Department of Pharmaceutics M.M.College of pharmacy, Maharishi Markandeshwar University Mullana Ambala 133207  
**Seventh Author** – Rifat Arifa khan, Drug Testing Lab Dalgate Srinagar Kashmir  
**Eight Author** – Dr.Nitish Bhatia, Khalsa college of pharmacy,Amritsar Punjab.

# Accuracy of OAE and BERA to Detect the Incidence of Hearing Loss in Newborn

Dr Jaideep Bhatt,\* Dr Laltanpuia Chhangte\*\*

\*Department of Otorhinolaryngology, GMC, Haldwani  
\*\*Department of Ophthalmology, GMC, Haldwani, Uttarakhand.

**Abstract- Objective:** The aim of this study was to assess the sensitivity and specificity of otoacoustic emission (OAE) test in newborns comparing with auditory brain stem response (ABR) in the age of 3 months and 6 month and to analyze the incidence of hearing loss in newborn.

**Method:** A prospective study was conducted between October 2012- October 2014 in Government medical college haldwani. 500 newborns were assessed. First, all of neonates were evaluated by OAE in 24h after birth. If responses of OAE were failing, they were retested in 3 month after birth by OAE. Also, All Neonates were assessed by ABR at the age of 3 month and 6 months. Descriptive Statistics was used to analyze data.

**Results:** The incidence of permanent congenital hearing loss according to diagnostic testings was five out of hundred newborn with risk factors (5%). And in well nursing baby it was 0.5% which is 10 times less than high risk population. In our study sensitivity & specificity of OAE 70% and 61% at 0 month and 70% and 99% at 3 month and BERA sensitivity and specificity at 3 month 90% and 99% and at 6 month 100% and 99% .

## I. INTRODUCTION

Early detection of hearing loss has been a long-standing priority in the field of audiology. Hearing screening tests have been used for the last 60 years to identify children of school going age who require further audiological evaluation, and ultimately to identify those children who require further audiological and educational intervention.<sup>1</sup> However, owing to the fact that hearing loss is an invisible disability, it may often go undetected until school age, especially in children with no additional disabilities. The identification of hearing loss in developing countries is often passive, and poor reactions of a child to acoustic stimuli are ignored or only identified following an underlying disease, such as suppurative Otitis Media.<sup>2</sup> This late identification of hearing loss leads to delays in speech, language, reading and writing, academic achievement, and personal and social development.<sup>3</sup>

The last 35 years have therefore seen the implementation and development of infant hearing screening (IHS) programs in order to identify hearing loss as early in life as possible. If hearing loss is identified early, early intervention services can be provided, in order to prevent developmental delays in children with hearing loss.<sup>4</sup> IHS programs have evolved from early behavioural observation techniques to sophisticated, screening technologies relying on physiologic measurements, such as otoacoustic emissions (OAEs) and brainstem responses evoke audiometry (BERA).<sup>5</sup>

## AIMS & OBJECTIVE

- Accuracy of OAE & BERA to detect the incidence of hearing loss in newborn.

## II. METHOD & MATERIAL

**STUDY DESIGN:** Hospital Based Prospective longitudinal Study. (follow up)

**Study Place :** Audiology department of ENT, department of Paediatric (NICU) and Obstetrics & Gynaecology department under the of the Government Medical College, Haldwani.

**Study Population :** The newborns admitted in the NICU of the STH and well nursing care newborn (n=800) during the entire study period.

**Study Sample/Subjects :** All those newborns (n=500) from the above study population whose mothers gave consent for screening tests to be done on their newborns and also they were not lost to follow up upto 6 months from the birth of the child during the entire study period.

**Exclusion criteria :** Unstable newborns needing urgent referral to higher centers were excluded.

**Sample size :** n=500 ( Using Purposive sampling)

**Study Period :** 2 years (Oct 2012-october 2014)

### Study Tools :

- a) A semistructured questionnaire
- b) For hearing tests in the newborn : Screening tests like OAE and BERA

### Description of the Study Sample

800 newborn and their caregivers enrolled in the NHS program between October 2012 to April 2014 were selected for participation in the study, based on participants meeting the predetermined participant selection criteria. 300 are lost from follow up and newborn that received their initial hearing screening within 72 hour of birth. Routine follow-up visits were scheduled three monthly, in order to enable the identification of late-onset or progressive hearing loss. Again all they were requested to return in three months time. Either they were PASS or REFER. Follow-up visits for infants participating in the NHS (Newborn health screening) program were scheduled until infants reached 6months of age. Records of visits to the NHS were complete for all 500 newborn in terms of demographic information for each newborn and their caregiver; auditory tests conducted and their results; risk factors for hearing loss and number of visits to the NHS.

**Data collection procedure**

**PHASE 1 ( AT BIRTH)**

(Biographical information and risk factors, assessment for hearing loss and OAE SCREENING)

**PHASE 2 (3MONTHS)**

(OAE & BERA screening protocol)

**PHASE 3(6MONTHS)**

(Diagnostic BERA assessment)

**FIGURE 1: Graphic representation of the research design**

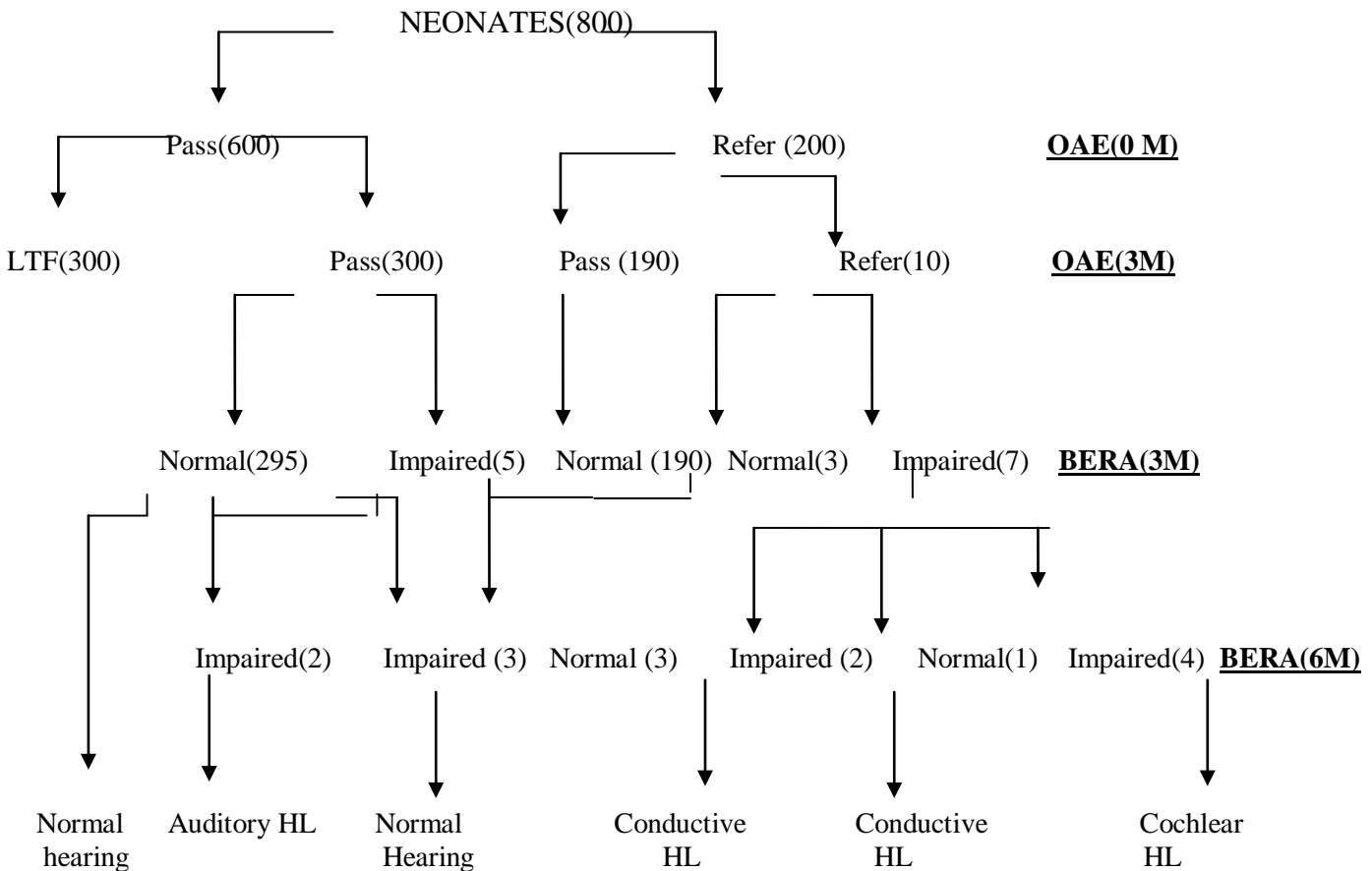
profile of at risk newborns for hearing loss and the results of the screening hearing tests was checked properly for any missing information. After ensured checking for data cleaning, the data entered in the MS excel after proper coding of data to prepare master chart. Appropriate analysis was carried out like percentage for descriptive information and fisher’s exact test/chi-square to find the association between established risk factors & hearing loss, relationship of mother age, education with hearing loss in the newborns. By comparing the results of screening tests with confirmatory BERA at 6 months, the percentages of false positive, false negative, true positive and true negative was find out so as to calculate the accuracy (sensitivity/specificity) of the used screening test.

**III. STATISTICAL ANALYSIS**

The elicited socio-demographic information from the mothers of the newborns along with obtaining different exposure

**IV. OBSERVATION & RESULT**

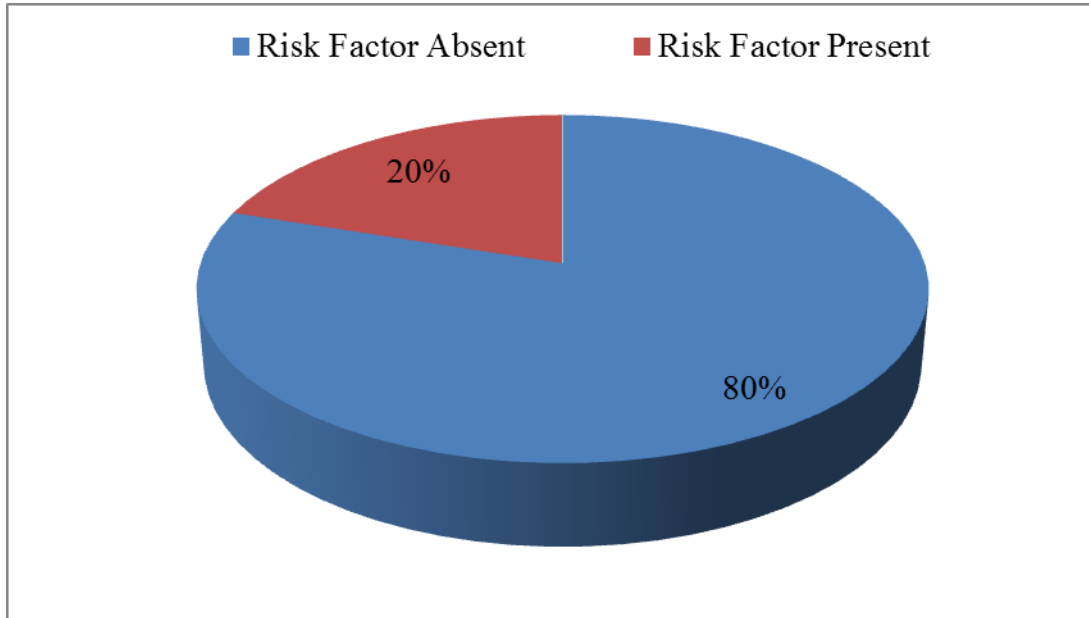
The present study was carried over a period of almost 2 years in the department of Otorhinolaryngology, Sushila Tiwari Hospital, Haldwani. The study included 500 newborn that were born in this hospital. and follow up for next 6 months by applying OAE at Omt 3 mt and BERA at 3 mt &6 mt.



**TABLE 1: Risk factor Exposure/Non exposure profile of the newborn**

Exposure/Established risk factors	Frequency	Percent
ABSENT	400	80.0
PRESENT	100	20.0
Total	500	100.0

The 100 newborns were found to be exposed to different causes which can lead to neonatal hearing loss. While the remaining 400 newborns were free from different exposures responsible for neonatal hearing loss.

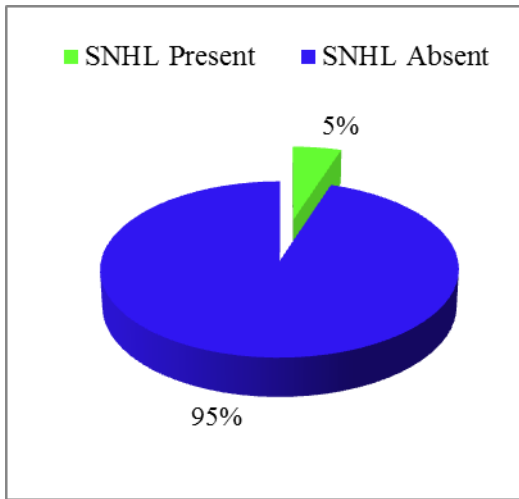


**Fig. 1: Exposure to Risk Factor**

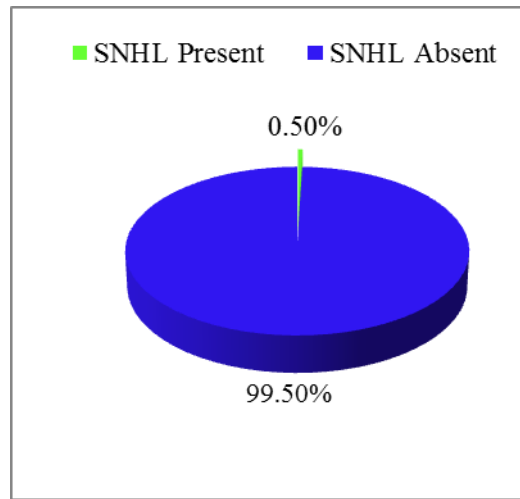
**Table2: Sensorineural hearing Loss in Children With and Without Risk Factors**

RISK FACTOR	SNHL +	SNHL -	TOTAL
PRESENT	5	95	100
ABSENT	2	398	400
Total	7	493	500

- Incidence of SNHL in high risk newborn in this hospital based study = 5%
- Incidence of SNHL in well nursing newborn = 0.5%
- Incidence of hearing loss in high risk newborn is 10 time higher than normal newborn
- FISHER EXACT test showing p value 0.004 statistical significant



**Fig.2: Hearing Loss in Children Exposed to Risk Factor**



**Fig 3: Hearing Loss In Children not Exposed to Risk Factor**

**Table 3 : Accuracy of OAE at birth**

Newborns	OAE at birth	OAE at birth
	Positive	Negative
Hearing loss found (10)	7 (TP)	3 (FN)
No hearing loss found (490)	188 (FP)	302 (TN)

On comparing the final hearing loss in the total 500 newborns confirmed by the final confirmatory test of BERA done at 1 year, it was found that only 10 newborns had confirmed hearing loss. Hence the false positivity by OAE at birth was more i.e 188 newborns were falsely detected by OAE at birth to have hearing loss.

The sensitivity of OAE at birth  
 =  $TP / (TP + FN)$  and whole multiplied by 100  
 =  $7 / (7 + 3) = 70\%$

The specificity of OAE at birth  
 =  $TN / (TN + FP)$  and whole multiplied by 100  
 =  $302 / (302 + 188) = 61.63\%$

**Table 4 : Accuracy of OAE at 3 months**

Newborn	OAE at 3 months	OAE at 3 months
	Positive	Negative
Hearing loss found (10)	7 (TP)	3 (FN)
No hearing loss found (490)	3 (FP)	487 (TN)

The false positivity decreased with OAE at 3 months.

The sensitivity of OAE at 3 months  
 =  $TP / (TP + FN)$  and whole multiplied by 100  
 =  $7 / (7 + 3) = 70\%$

The specificity of OAE at 3 months  
 =  $TN / (TN + FP)$   
 =  $487 / (487 + 3) = 99.39\%$

**Table 5 : Accuracy of BERA at 3 months**

Newborns	BERA at 3 months	BERA at 3 months
	Positive	Negative
Hearing loss found (10)	9 (TP)	1 (FN)
No hearing loss founds (490)	3 (FP)	487 (TN)

The sensitivity of BERA at 3 months  
 = TP/TP+FN and whole multiplied by 100  
 = 9/9+1=90%

The specificity of BERA at 3 months  
 = TN/TN+FP and whole multiplied by 100  
 = 487/487+3=99.39%

**TABLE 6: Accuracy of BERA at 6 months**

Newborns	BERA at 6 months	BERA at 6 months
	Positive	Negative
Hearing loss found (10)	10 (TP)	0 (FN)
No hearing loss found (490)	1 (FP)	489 (TN)

The sensitivity of BERA at 6 months  
 =TP/TP+FN and whole multiplied by 100  
 =10/10+0=100%

The specificity of BERA at 6 months  
 =TN/TN+FP and whole multiplied by 100  
 =489/489+1=99.8%

**V. DISCUSSION**

Congenital hearing loss is one of the most common congenital anomalies which can be identified early in life. Its early recognition and intervention helps in the overall development of the child. The developed countries are aware of the burden of congenital hearing loss and have taken significant steps by way of government policies for identification and rehabilitation. On the other hand, in developing countries like India there is no estimate of the magnitude of this problem.

The incidence of permanent congenital hearing loss as found in this sample of subjects is displayed above in figure 3&4.

Figure 3&4 displays the fact that 5% (n=5) of the high risk sample were found to have sensory or neural impairment. The literature estimates 0.15%-0.6% of the general newborn population to be born with congenital hearing loss.<sup>6</sup> This incidence is reported to be 10 to 20 times higher in the high-risk NICU population.<sup>7</sup> The sample of NICU infants in the current study displayed a 5% incidence rate of permanent congenital hearing loss, which is in keeping with the literature. And in well nursing baby it display 0.5% which is 10 times less than high risk population, which is studied in 325 children for 1year or more after discharge from their intensive care nursery<sup>8</sup> They found 8 children (2.14%) with severe hearing loss. Galambos et al<sup>9</sup> in a more recent large follow up study continues to maintain a higher incidence of significant mileage to other studies.

In hearing loss of 4-9%. hearing loss could be confimed in only 2.3% in another recent large follow up study.<sup>10</sup> Therefore this issue remains Controversial<sup>[11]</sup>.

The current study’s incidence rate of permanent hearing loss is nevertheless still in accordance with reported incidence rates in the NICU population, although it is at the upper limit when taking the estimated actual who did not return for follow-up.<sup>7, 4, 6</sup>

**VI. CONCLUSION**

In summary, technologic advances now make it possible to assess auditory function in neonates and infants. These electrophysiologic and acoustic responses can be safely applied without reliance on a behavioral response. However, neither OAE nor BERA tests evaluate hearing or describe how a particular person will use available hearing. OAE and BERA are physiologic responses related to peripheral hearing status but constitute indirect measures of hearing.

To predict hearing status in children 0 to 12 months of age, a multicenter longitudinal study compared the accuracy of click-evoked BERA and TEOAEs. The results indicated no significant differences among these measures.<sup>[12]</sup> However, a recent study comparing two-step TEOAEs and BERA found that BERA was more effective for NHS because it yields fewer false-positive results and a lower referral rate compared with TEOAE, resulting in a smaller percentage of infants lost during follow-up<sup>13</sup>

Hyde and associates<sup>14</sup> reported BERA sensitivity of 98% and specificity of 96% if the average target hearing loss is 40 dBHL at 2 and 4 kHz. If the target degree of hearing loss is 30 dBHL, sensitivity and specificity were 100% and 91%, respectively.

Norton and coworkers held specificity at 80% and determined sensitivity for TEOAE, and BERA alone and in combination for a target loss of 30 dBHL. Sensitivity ranged from 80% to 90%. If those infants with known progressive hearing loss were excluded, sensitivity improved.<sup>12</sup>

In our study sensitivity & specificity of OAE 70% and 61% at 0 month and 70% and 99% at 3 month which is less than the above study and BERA sensitivity and specificity at 3 month 90% and 99% and at month 100% and 99% which is relatively similar to above study.

However, according to the American Academy of Family Physicians studies (2007), the sensitivity of OAE in identification of hearing loss was 84 % and the specificity of it was 90 %. As well as, in our study, the sensitivity (70%) and specificity (99.3%) of TEOAE for detecting of hearing loss were high; therefore, it is effective tool for screening of neonates in birth.

Yousefi, Jaleh et al<sup>15</sup> did a study of comparing specificity and sensitivity of TEOAE and BERA. In their study, 18 cases out of 1000 neonates had failed double-checked TEOAE tests. From these 18 failed cases, 6 were confirmed by ABR test (12 false positive results). 9 out of 1000 neonates had impaired ABR tests, from these patients, 6 had failed OAE as well, but 3 had normal OAE (3 false negative result). From these 9 patients 2 had profound hearing loss so cochlear implantation was scheduled for them. They found that OAE has 66.7% sensitivity and 98.8% specificity in diagnosis of neonatal hearing impairment. Similar results were shown in our study for sensitivity and specificity of TEOAE for diagnosis of neonatal hearing impairment.

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#### AUTHORS

**First Author** – Dr Jaideep Bhatt, Department of Otorhinolaryngology, GMC, Haldwani  
**Second Author** – Dr Laltanpuia Chhangte, Department of Ophthalmology, GMC, Haldwani, Uttarakhand



# Study of Compressed Stabilised Earth Block

B. N. Patowary<sup>1</sup>, N. Nath<sup>2</sup>, I. Hussain<sup>3</sup>, H. J. Kakoti<sup>4</sup>

<sup>1</sup>Assistant Professor, E-mail: bhaskarendra@gmail.com

<sup>2</sup>Under-Graduate Student, E-mail: nitiznath@gmail.com

<sup>3</sup>Under-Graduate Student, E-mail: imranhussain0792@gmail.com

<sup>4</sup>Under-Graduate Student, E-mail: cikukakoti@gmail.com

Department of Civil Engineering, Assam down town University,  
Guwahati, Assam- 781026.

**Abstract-** In the growing concern of awareness regarding sustainable building material and environmental issue, Compressed Stabilized Earth Block (CSEB) gives the view of energy efficient, cost reduction and environmental friendly building materials, overall contribution on the sustainable development. Different research workers have contributions on the Compressed Stabilized Earth Blocks in terms of different parameters. CSEBs are eco-friendly and as these blocks are un-burnt products, during production no coal or burning material is needed. So, it does not produce any harmful gases during production. In this paper, result of test of soil that has been used in the production of CSEB is shown. Highly compressed un-burnt blocks have been prepared in the laboratory with different composition and varying proportions of sand, clay and stabilizers such as lime, cement etc. Fly ash is also used as stabilizer in replacement of cement. The strength of different blocks are determined and compared to find the composition which gives highest strength and also to compare between different blocks to get the optimized composition and proportion in terms of economy and strength.

**Keywords-** strength, economy, un-burnt, lime, cement, fly-ash

## I. INTRODUCTION

Earth, undoubtedly is the oldest building material known. Even though building with earth once fell out of popularity when the modern building materials and methods were discovered, but then it gains its revival time following the energy crisis. Moreover, growing concern and interest about environmental and ecological issue globally also increased the use of earth as a building material.

The compressed earth block is the modern descendent of the moulded earth block, more commonly known as the adobe block. The idea of compacting earth to improve the quality and performance of moulded earth blocks is, however, far from new, and it was with wooden tamps that the first compressed earth blocks were produced. This process is still used in some parts of

the world. The first machines for compressing earth probably date from the 18<sup>th</sup> century.

Compressed Stabilised Earth Blocks (CSEB) represents a considerable improvement over traditional earth building techniques. When guaranteed by quality control, CSEB products can very easily bear comparison with other materials such as the fired brick. Hence the allegiance it inspires amongst decision-makers, builders and end-users alike.

## II. METHODOLOGY

### A. Soil Identification

Soil identification can be performed with sensitive analyses.

The main points were examined as:

1. Grain size distribution to know quality of each grain size
2. Plasticity characteristics to know the quality and properties of each of the binders
3. Sample Details : Red Earth
4. Plastic Limit =56%
5. Liquid Limit=66%
6. Plasticity Index = 10 =Slightly plastic
7. LI= 1, hence the remoulded soil is at the liquid limit and it has un-drained shear strength of about 2KPa.

### B. Procedure for Making CSEB (Compressed Stabilized Earth Blocks)

1. Collected the soil sample.
2. Test for soil classification.
3. Various mixing of ingredients/stabilizers with clay soil and sand varies in percentage of mixing.
4. The various mixes are placed in the proposed brick mold.
5. The mold is compressed in a process (manually compress).
6. Then it is dried for 28 days.
7. Strength determination on UTM/CTM.

(N.B: since it is not burned, it was not cured)



**Figure 1:** Mix of sand, clay & OPC



**Figure 2:** Mix of lime, sand & clay



**Figure 3:** Compressed Earth Block without Stabilizer

**III. MIX PROPORTIONS**

Soil samples have been mixed in various proportions and stabilizers are also mixed in various proportions with the mixed quantity of soil samples to find the strength of Compressed Stabilized Earth Blocks (CSEB) with different composition and at different proportions.

The table below shows the proportion of different models of CSEB prepared along with different composition.

**Table 1:** Mix proportion with varying percentage of soil and stabilizers

Block Serial No.	Quantity of Stabilizer/ingredients					
	Lime %	Clay %	Sand %	OPC %	Fly ash %	PPC %
CSEB 1	-	20	70	10	-	-
CSEB 2	-	30	70	-	-	-
CSEB 3	10	20	70	-	-	-
CSEB 4	-	20	70	-	-	10
CSEB 5	5	20	70	-	-	5
CSEB 6	-	20	70	-	10	-
CSEB 7	-	20	70	5	5	-
CSEB 8	5	20	70	-	5	-

(N.B.: Percentages has been taken in total weight of 5kg)



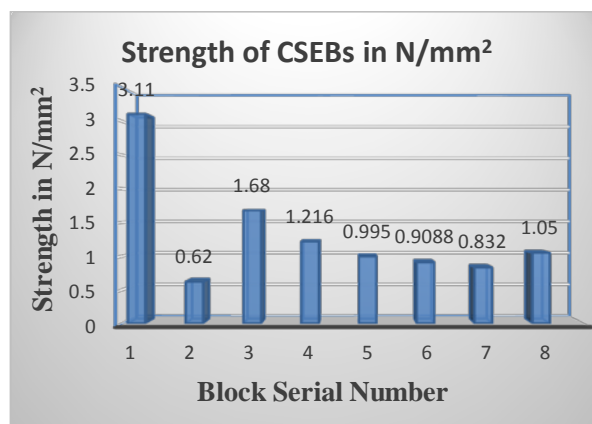
**Figure 4:** CSEB with Sand (70%) + Clay (20%) + Lime (10%)



**Figure 5:** CSEB with Sand (70%) + Clay (30 %)



**Figure 6:** Breaking of CSEBs in CTM



**Figure 7:** Chart showing strength varying per CSEB

The table below shows the strength of CSEB obtained from test.

**Table 2:** Result of Strength of the built CSEB (un-burnt)

Block Serial No.	Stabilizers & Ingredients	Strength (N/mm <sup>2</sup> )	Load (KN)
1	Sand (70%) + Clay (20%) + OPC (10%)	3.11	97.30
2	Sand (70%) + Clay (30%)	0.62	19.40
3	Sand (70%) + Clay (20%) + Lime (10%)	1.68	52.80
4	Sand (70%) + Clay (20%) + PPC (10%)	1.216	38.00
5	Sand (70%) + Clay (20%) + Lime (5%) + PPC (5%)	0.995	37.10
6	Sand (70%) + Clay (20%) + Fly ash (10%)	0.9088	28.40
7	Sand (70%) + Clay (20%) + Fly ash (5%) + OPC (5%)	0.832	26.00
8	Sand (70%) + Clay (20%) + Fly ash (5%) + Lime (5%)	1.05	32.50

❖ The strength of standard fired brick is found to be 3.984 N/mm<sup>2</sup>

#### IV. DISCUSSIONS

1. The Compressed Stabilized Earth Blocks (CSEB) was taken for strength determination after 28 days.
2. The blocks were un-burnt
3. After breaking the blocks strengths for various CSEBs were determined as shown on the Table 4.2 above.
4. The maximum strength obtained was 3.11 N/mm<sup>2</sup> for CSEB 1 i.e. Mix of Sand (70%), Clay (20%) & OPC (10%)
5. The minimum strength obtained was 0.63 N/mm<sup>2</sup> (CSEB 2) i.e. the block without stabilizer. But if we see the CSEB 7, with stabilizer and mix with Sand (70%), Clay (20%), Fly ash (5%) & OPC (5%), strength obtained was 0.832 N/mm<sup>2</sup>.
6. The standard block which was brought from manufactured factory and which was also burnt and used for construction of building, the strength for that block was found to be 3.21 N/mm<sup>2</sup>.

#### V. CONCLUSION

From the results obtained from different tests, it can be concluded that:

1. Different research workers have contributions on the Compressed Stabilised Earth Blocks in terms of different parameters. CSEBs are eco-friendly and as these blocks are un-burnt products, during production no coal or burning material is needed. So, it does not produce any harmful gases during production
2. Comparing the strength of the standard block (the block brought from the manufacturing brick factory) with CSEB 1 [i.e. Mix of Sand (70%), Clay (20%) & OPC (10%)], the strength of burnt brick obtained is higher than the un-burnt CSEB. The strength obtained from CSEB1 is 3.11N/mm<sup>2</sup>. If CSEB 1, CSEB 3 [Sand (70%) + Clay (20%) + Lime (10%)], CSEB 4 [Sand (70%) + Clay (20%) + PPC (10%)] are burnt, it is obvious that the strength of the blocks will increase eventually, but un-burnt bricks are more economic than the standard fired one as the production of CSEBs require less labour and does not require coal.

3. Without utilization of stabilizer, the strength of CSEB obtained is very less or negligible. So, mixing of stabiliser with sand and clay in CSEB is must.
4. Use of OPC as stabilizer in place of PPC gives more strength to the CSEB with same proportion of sand, clay and stabilizer.
5. Use of lime in place of OPC at constant proportion of sand, clay and fly ash increases the strength of CSEB.
6. Introduction of Fly ash as a replacement to lime at constant proportion of sand and clay does not contribute to the increase in strength of CSEB, rather it decreases the strength of CSEB.
7. Introduction of PPC in place of lime does not contribute to the increase in strength of the CSEB, rather it decreases the strength.

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### AUTHORS

**First Author** – Bhaskarendra Nath Patowary, *B.E(Civil), M.E(Soil Mechanics and Foundation Engineering), Assistant Professor, Department of Civil Engineering, Assam down town University, Guwahati, Assam- 781026,*  
*E-mail: bhaskarendra@gmail.com*

**Second Author** – Nitish Nath, *Under-Graduate Student, Department of Civil Engineering, Assam down town University, Guwahati, Assam- 781026,*  
*E-mail: nitiznath@gmail.com*

**Third Author** – Imran Hussain, *Under-Graduate Student, Department of Civil Engineering, Assam down town University, Guwahati, Assam- 781026,*  
*E-mail: imranhussain0792@gmail.com*

**Fourth Author:** Hirak Jyoti Kakoti, *Under-Graduate Student, Department of Civil Engineering, Assam down town University, Guwahati, Assam- 781026,*  
*E-mail: cikukakoti@gmail.com*

# Going for Gold Medals: Factors affecting Olympic Performance

Jayantha K\*, Ubayachandra E. G.\*\*

\* Senior Lecturer, Sport and Recreation Management Degree Program, Faculty of Social Sciences, University of Kelaniya, Sri Lanka.

\*\* Professor, Department of Marketing Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka.

**Abstract-** This particular study titled “Going for Gold Medals: Factors affecting Olympic Performance” was carried out with special reference to 2000 Olympic Games. This study was thoroughly undertaken by the researchers by focusing on the problem that why countries show different performance in Olympics? There were three objectives set to be achieved by this study, which include a key objective namely ‘To examine the influences of factors affecting the Olympic performance and two specific objectives such as (i) To produce a mathematical model facilitating to predict the Olympic tally (ii) To identify the degree of factors influenced on the Olympic performance. The researchers carried out an extensive literature review to provide a conceptual background of the study, to develop a conceptual model, and to formulate hypotheses for the study. Olympic Games in 2000, 80 countries and 921 medals were selected for the survey. Certain conclusions were made from the study after carrying out detailed scientific analysis of data using appropriate statistical tools. The conclusions are that the factors such as size of population of countries, GDP *per capita*, HDI, communist background and host city advantages of certain countries in the particular Olympic year. It showed significant relationship with some variations between these variables and Olympic performance. Based on the findings of the study, recommendations were made to the sport authorities and researchers in the field of sport to improve sport performance in their countries in future.

**Index Terms-** Olympic performance, Olympic Medal tally, Prediction, Host City, GDP Per Capita, HDI

## I. INTRODUCTION

Why some countries win medals whilst others do not? Research conducted internationally to identify factors that affect sports performance focuses on resource endowments, a country’s population and cultural and social resources (Kiviahio and Makela 1978; Bernard and Busse 2004; Andreff 2001; Johnson and Ali 2004). It can be argued that a country’s success in sport should be evaluated relative to its economic resources and that medal achievement should therefore be weighted relative to a country’s GDP *per capita*. Utilizing these criteria, countries including Mongolia, Jamaica, Zimbabwe, and Kenya topped the list of achievement at the Beijing Olympics, while some other less developed countries performed below the expectations. Under such an environment, this research was conducted to clarify the factors that affect the Olympic performance.

The development of the Olympic Movement and the Olympic Games is one of the great success stories of the 20th Century. The Olympic Games, particularly over the last 20 years, have experienced matchless growth and worldwide popularity. It is the largest and most successful sporting event in the world, and has become the pinnacle of most athletes’ careers. More than 95% of countries participated in Olympic Games at present and athletes’ participation is greater than the 10,000. However, the result convinces that the majority of countries have failed to show successful performance even at the lowest level. In last Olympic Games 2000, 112 countries obtained no medals. In addition, in the 2000 Olympic Game 9 countries obtained 52% of total medal tally. Olympic Game as one of the biggest businesses in the world it is important to make a close look in one side. Besides, it is also important to study the factors influencing on the Olympic performance since the Olympic performances reciprocally influence the nation’s motivation on sport. Conversely sport leads to human health and then wealth of people at last in a country. On that ground, it is important to understand the factors affecting Olympic performance. Thus one nation can stimulate those factors to human wellbeing. So this study was completely planned to make a deeper study around this particular type of important sector regarding which more noticeable things discussed so far. In that sense it can be mentioned here that this study possesses a greater significance.

## II. LITERATURE REVIEW

There are number of research done related to Olympic Game and other Olympic movements. Those researches can be divided into two categories as macro level studies and micro level studies. Out of those micro level studies, 93 research articles were reviewed in deferent categories under this study. Mainly the literature review was divided into two divisions as sport performance and Olympic performance. Under the category of sport performance, articles relating to individual sport performance were reviewed and under the category of Olympic performance articles related to Olympic successes were associated. Under the Olympic successes, there were mainly two sub categories as Olympic in 2000 and other Olympic Games. Related to the sport performance which is under the first category, 41 of previous studies done by scholars in different point of views, using different methodologies in different years to understand the factors affecting individual sport performance were also used. In the category of Olympic performance itself, 14 articles on 2000 Olympic Games were reviewed. Hence, five number of variables emerging from previous studies were used in



this study. Those commonly emerged variables are country midyear population, GNP *per capita* in a particular country in the Olympic year, Social Development of the particular country (HDI), the political system of the particular country, and finally being hosting the Olympic Game. Accordingly, 05, number of studies done related to 2000 Olympic Game and Some of those important studies are as follows;

The first study to analyze the factors influencing on the success at the Olympic Games appeared after the 1952 Olympic Games in Helsinki. Accordingly to Rathke and Woitek (2007) Jokl and co-authors (1956) in the study sport in the cultural patterns of the world: A study of the Olympic Games in 1952 at Helsinki were the first to use gross Domestic Product index (GDP) or GDP *per capita* as a potential predictor of Olympic success. Using GPP is more justifiable since it can indicate the country's economic development and assumptions can be made about the resources for enabling athletes to be committed to sports preparation, building and maintaining training facilities, developing advanced educational system for coaches, supporting scientific research and consequently developing cutting edge training methods. Numbers recent studies used GDP or GDP *per capita* as a variable in Olympic Games success investigation (Bernard & Busse, 2000, 2004; Groot, 2007; Johnson & Ali, 2000,2004; Kuper & Sterken, 2001; Lui & Suen, 2008; Matros & Namoro, 2004; Rathke & Woitek, 2007; Roberts, 2006;Bernard 2008; Van 2010; Lozano, al et. 2002; Wade, 2006; Xun, 2004; Robert, 2002; anderw and Meghan, 2000;Custonja and Skoric, 2001;).

Johnson and Ali (2004) argued that countries with the single-party political system and communist regime send a similar number of athletes to the Olympic as the non-communist countries, but won more medals in both the summer and winter Olympics. A higher medals count for communist countries than expected was confirmed by Burnard and Busse (2000, 2004) and Kuper and Sterken (2001). Matros and Namoro (2004) argued that the change in the political system of communist countries to free market economy resulted in a lower medal count at the Olympics. Rathke and Woitek (2007) reported that the former communist countries used to outperform the other participants in absolute terms, given the same amount of available resources. These studies confirmed that in the past countries with the communist political system outperformed their counterparts. However, in the post cold war era, the effect of having the communist political system of being a former communist nation is no longer significant (Robert, 2006) Custonja al et (2001) was reviewed the importance of political system in winning Olympic medals was conformed especially in the case of the former communist countries. Hosting of the Olympic Games and certain climate conditions also significantly contribute to Olympic success.

According to Bernard and Busse (2000) 'host countries typically win an additional 1.8 percent of the medals beyond that would be predicted by their GDP alone. Similar results were reported by Johnson and Ali (2000) as well as by Rathke and Woitek (2007). They indicated undeniably large advantages of bringing the hosting nation, both in terms of participation and medal count. Lui and Suen (2008) predicted that 2008 Olympic Games held in China would win about 14% more medals than 2004 only on accounting of hosting the Games. Kuper and

Sterken (2001) underlined that a host effect is strong, especially for participation, but it used to be more important at the older editions of the Games. Such a host effect was not confirmed by Roberts (2006)

### III. OBJECTIVES

The key objective of the present study was to identify the factors that influences on Olympic performance and the Specific objectives were to produce a mathematical model facilitating to predict the Olympic tally, and to identify the degree of factors influence on the Olympic performance

### IV. HYPOTHESES

This study conveys five hypotheses viz., 1) the size of population directly affects Olympic performance, 2) GDP *per capita* is positively correlated with Olympic performance; 3) Olympic performance depends on HDI. 4) the political system might have a relationship with Olympic performance and finally 5) host city advantage may positively influence on Olympic performance.

### V. MATERIAL AND METHODS

As this study is exploratory in nature the researchers had to depend on secondary data. Therefore, as far as possible an attempt was made to collect secondary data from official publications and web sites. To maintain the validity and reliability of data well known cronbach's alpha was used. As it was more than 0.50 points it assured that there is a reliability and validity of data. Data of Olympic Medal count and information of hosting countries of Olympic Games were obtained from direct correspondence of international Olympic Committee (IOC). The data of population and per capita GDP (measured in PPP current international dollars) were extracted from World Development Report (World Bank Reports 2004 and 2010).

Though it is fruitful doing a macro study including all Olympic Games and all countries, this study was restricted to a selected sample due to the convenience of analysis. Accordingly one Olympic Game (one Olympiads) namely 2000 Sydney Olympic Game was selected for this study. There were two reasons not to include Olympic before 2000. The first as well as the basic one was that Olympic performances in many of those games were affected by non-socioeconomic factors. For example, due to Cold War, the United States did not participate in Moscow Olympics in 1980. Together with many other socialist countries, the Soviet Union boycotted the Los Angeles Olympics in 1984. The second reason was the Olympiad ranging from 1997-2000 recorded the highest national participation rate, which provided complete data set for analysis. Samples were selected from 2000 Olympic Games and sample was included represent nations who won least one medal at 2000 Olympic Games.

There are one dependent variable namely Medal count ( $M_i$ ) and five independent variables namely size of population, GDP *per capita*, Human Development Index (HDI), the political system (whether communist or not), and whether the host city or

not which were considered in this study. The processing of data pertaining to the medal count was handled carefully. As mentioned under the Sources of Data Collection, data were collected from International Olympic Committee (IOC) official documents to maintain the validity of the data and were then weighted by assigning 0.5, 0.3 and 0.2 for gold, silver and bronze medals respectively. Then calculated the weighted total for each country and prepared a weighted medal tallies for 2000 Olympic Games. Data connected to size of population in each country, were not needed to process and could employ them as it is in the *world population data sheet* of [http://www.prb.org/pdf04/04\\_worldDataSheet\\_ENG.pdf](http://www.prb.org/pdf04/04_worldDataSheet_ENG.pdf). It was measured the mid-year population in millions of countries in the Olympic year that is of year 2000. GDP *per capita* was derived by dividing the country GDP by mid-year population of the particular country. The World Bank reports were referred for the calculated GDP. Considering the social development the Human Development Index (HDI), that was taken as it is from the Human Development Report 2010, was used. If the country is hosting the game then used 1 and otherwise 0 and the country has or had a communist system then used 1 and otherwise 0.

Here in this research both descriptive and inferential statistical tools were used to present and analyze the data. When presenting the data collected through various secondary sources the researchers used descriptive statistical tools such as mean, and standard deviation to analyze the data and inferential statistical tools viz., regression and p value were employed. Regression and p value provide basis to determine the acceptance or rejection of each hypothesis formulated.

Universality of the sample was discussed in two ways; vertically and horizontally. With the beginning of modern Olympic in 1896, there are 26 Olympic Games have been summoned so far. Though out of those 26 Olympic Games only one game was considered in this study, it can be justified since these games cover all nations, biggest NOC participation, biggest player participation, biggest spectator participation, and the biggest number of medals total. Number of countries included in the sample is 80 out of 199 participated countries in 2000 Olympic game. And finally, all medals totaling to 921, in 2000, were considered and included the sample. Therefore, the sample chosen for this study is much more adequate to generalize the ideas, suggestions and findings. As such this study bears a huge universal nature.

This study used linear functions to estimate the influence of population size, economic resources, political and economic structure and hosting advantage on nations' Olympic performance.

$$M_t = \beta_0 + \beta_1 (N_t) + \beta_2 (Y_t/N_t) + \beta_3 HDI_t + \beta_4 (Pol) + \beta_5 H_t + E$$

Each variable presented in this equation was conceptualized as follows.

$M_t$  denotes the medal number for a country at a particular Olympic Game. In this study it was considered the Moosa and Smith's (2004) weighted system such as weights of 0.6, 0.3 and 0.1 for gold, silver and bronze medals respectively.  $N_t$  is the population size of the country at the year  $t$  when the particular Olympic Game is held.  $Y_t/N_t$  denotes the GDP *per capita* and  $HDI_t$

denotes the Human development Index of the country at the same year.  $Pol_t$ ,  $H_t$ , are dummy variables for political system of the particular country and hosting countries respectively.  $Pol_t$  Takes the value 1 if the country has communist background, when means the country is or was a communist country and it takes 0 if otherwise. Similarly, if the country was hosting the Olympic in the year,  $H_t$  the value of 1, and 0 if otherwise were used. For the research hypothesis to be true, the coefficient of all independent variables needs to be positive.

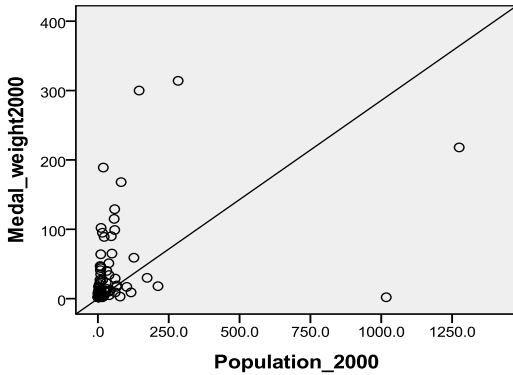
All variables mentioned above were operationalized with the aid of measurement criteria indicated in the table (Table 01) below.

Dimension	Dependent Variable:	Indicator	Hypothesized Sign
Olympic Performance	Medal Count ( $M_t$ )	The number of medal won by a country in a particular Olympics	N/A
	<b>Independent Variables :</b>		
Demographic Environment	Population ( $N_t$ )	The population size of a country at a particular Olympic year	+
Economic Development	GDP per capita ( $Y_t/N_t$ )	The per capita GDP (measured in PPP current international dollars) of a country at a particular Olympic year	+
Social Development	Human Development Index $HDI_t$	The Human Development Index of a country at a particular Olympic year	+
Political Environment	Political System (Pol)	1 if the country is or used to be a socialist country or 0 otherwise	+
Geographic Environment	Hosting country ( $H_t$ )	1 if the country is the hosting country of the year or 0 otherwise	+

## VI. RESULTS

### Size of population and Medal Talley

The below scatter diagram was drawn from the data collected with respect to population size of countries with at least one Olympic medal taken in 2000 Olympic games.



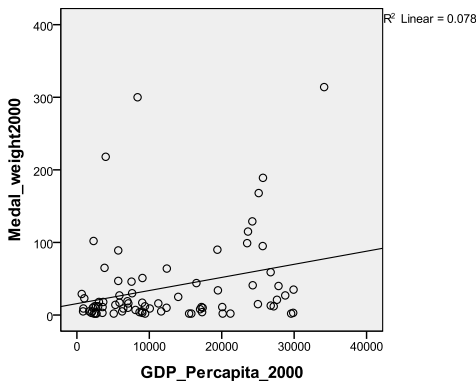
Source: Survey data

The line shows the trend of relationship Olympic performance and country population size. Accordingly, the scatter diagram shows very poor positive relationship between the size of population and the Olympic performance. However, it doesn't numerically show the strength of relationship between these variables and therefore, the statistical calculations such as correlation co-efficient; regression and p -value were calculated by using statistical software (SPSS 19.0).

There is a positive significant relationship between the size of population and the medal tally in 2000 Olympic Games. The correlation co-efficient between size of country populations and Olympic performances in the Olympic Games 2000, is 0.354 \*\*, and the regression equations is  $M_t = -1.665 + 0.419(\text{pop})$ , and the p values is 0.000. It is seen a good correlations (0.354 \*\*). However, the regression analysis supports the argument obtaining +0.419 (pop), with the p value taking 0.0000, and therefore the hypothesis can be accepted with respected to 2000 Olympic Games.

**GDP per capita and Medal Talley**

The below scatter diagram was drawn from the data collected with respect to GDP per capita of countries with at least one Olympic medal taken in 2000 Olympic games.



Source: survey data

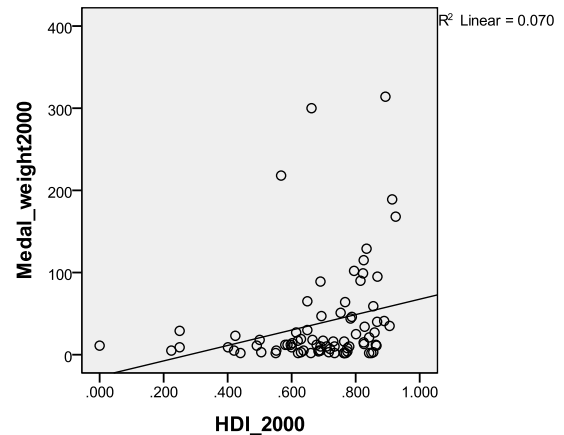
The line shows the trend of relationship Olympic performance and country GDP per capita. Accordingly, the scatter diagram shows very poor positive relationship between the GDP per capita and the Olympic performance. However, it

doesn't numerically show the strength of relationship between these variables and therefore, the statistical calculations such as correlation co-efficient; regression and p -value were calculated by using statistical software (SPSS 19.0).

The correlation co-efficient between GDP per capita and Olympic performances of the Olympic Games in 2000 is valued 0.280 \*\*. The regression equation is  $M_t = -1.665 + 0.315$  (GDP per capita) and p value is valued 0.000 level. The value statistically shows a good correlation (0.280 \*\*) in 2000 Sydney Olympic Games between GDP per capita and Olympic performance. Furthermore, regression analysis supports this through obtaining 0.315(GDP per capita) and since the p value is 0.0000, and therefore the hypothesis is accepted.

**HDI and Medal Talley**

The below scatter diagram is drawn from the data collected with respect to HDI of countries with at least one Olympic medal taken in particular Olympic games. The following diagram shows the relationship between HDI and Medal Talley in 2000 Olympic Games



Source: Survey Data

The line shows the trend of relationship Olympic performance and country HDI. Accordingly, the scatter diagram shows very poor positive relationship between the HDI and the Olympic performance. However, it doesn't numerically show the strength of relationship between these variables and therefore, the statistical calculations such as correlation co-efficient; regression and p -value were calculated by using statistical software (SPSS 19.0).

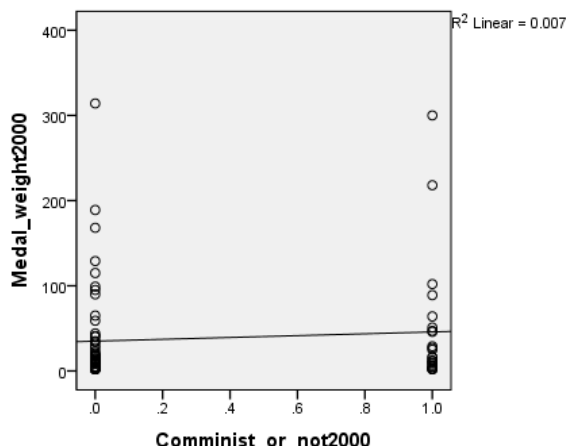
The correlation co-efficient between HDI and Olympic performances in the Olympic Games in 2000 is 0.265 \*\*. The regression equation is  $M_t = -1.665 + 0.152(\text{HDI})$  and p values are 0.000. There is weak correlations (0.265 \*\*) between Olympic medal tally and HDI. Furthermore, regression analysis supports this through obtaining 0.152 (HDI) in 2000. Since the p value is also 0.0000, the hypothesis is accepted with respect to 2000 Sydney Olympic Games.

**Whether it is a communist country or not and Medal Talley**

The below scatter diagram was drawn from the data collected with respect to Political system of countries with at least one Olympic medal taken in particular Olympic games. The



following diagram shows the relationship between Political system and Medal Talley in 2000 Olympic Games



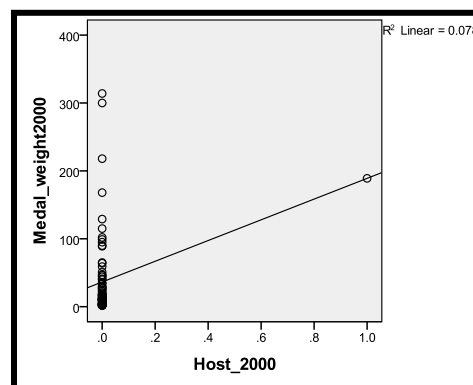
Source: Survey Data

The line shows the trend of relationship Olympic performance and country communist system. Accordingly, the scatter diagram shows very poor positive relationship between the communist system and the Olympic performance. However, it doesn't numerically show the strength of relationship between these variables and therefore, the statistical calculations such as correlation co-efficient; regression and p -value were calculated by using statistical software (SPSS 19.0).

The correlation co-efficient between communist system and Olympic performances of the Olympic Games 2000 is 0.081. The regression equation is  $M_t = -1.665 + 0.259(pol)$  and p value is 0.000. it shows a weak correlations (0.081) between medal tally in Olympic Games and communist system. Furthermore, regression analysis supports this through obtaining 0.259 (pol), values and since the p value is 0.0000, the hypothesis is accepted.

#### Host city and Medal Talley

The below scatter diagram was drawn from the data collected with respect to Host city of countries with at least one Olympic medal taken in particular Olympic games. The following diagram shows the relationship between host city and Medal Talley in 2000 Olympic Games



3Source: Survey Data

The line shows the trend of relationship Olympic performance and country Host city. Accordingly, the all scatter diagrams shows very poor positive relationship between the Host city and the Olympic performance. However, it doesn't numerically show the strength of relationship between these variables and therefore, the statistical calculations such as correlation co-efficient; regression and p -value were calculated by using statistical software (SPSS 19.0).

The correlation co-efficient between Host city and Olympic performance of the Olympic Games in 2000 is 0.279<sup>\*\*</sup>. The regression equation is  $M_t = -1.665 + 0.237(Host)$  and p value is 0.000. There is a weak correlation (0.279<sup>\*\*</sup>) in 2000 between Host city and Olympic performance. Furthermore, regression analysis supports this through obtaining 0.237(Host) values and since the p value is 0.0000, the hypothesis is accepted with respected 2000 Sydney Olympic Games.

## VII. DISCUSSION

As this study is exploratory in nature, it was intended to collect secondary data. Country population, Olympic medal tally, HDI that are the standard figures used in UN reports and IOC official reports to collect relevant data. Cluster sample method was used because this tool helps to select the countries which at least one Olympic medal. In addition, athletes' events continuously appear from the very first Olympic Games to date. Besides that, it is a common sport for every nation. Sample taken from the Summer Olympic Games only since the winter Games are still bias to specific countries.

The researchers have endeavored throughout the study to bring at a realistic report, which reflects some of the key factors affecting Olympic performance. As the researchers reviewed the comprehensively a larger number of literature, designed and employed data collection methods, interacted with people in order to collect data for this study, it was found that the undertaken task is not only challenging but also highly complex. Under the discussion part research findings and conclusion were made with the help of data analysis and hypotheses testing. In addition to this, it also provides several recommendations to improve Olympic performance and generally sport performance. Later part of this paper attempts to point out certain suggestions for future studies.

The regression formula derived by data analysis made above based on 2000 Olympic Game performance and matched with the regression model mentioned above is as follows;

#### The regression formula No 01: The regression formula for 2000

$$M_t = -1.665 + 0.419(\text{pop}) + 0.315(\text{GDP per capita}) + 0.152(\text{HDI}) + 0.259(\text{pol.}) + 0.237(\text{Host})$$

Based on findings of the study following are recommended towards the authorities of sport industry in order to improve the performance of sport and to show their proud to the rest of the world.

Only 2000 Sydney Olympic Games were chosen for this study. The findings based on the discussions made so far pertaining to size of population, GDP *per capita*, HDI, political system (whether communist or not), and finally Host country advantages are stated below in short. As far as the relationships between size of population, GDP *per capita*, HDI, political system (whether communist or not), as far as Host country advantages and Olympic performance are concerned it has been proved by this study that there is a considerable relationship.

When it comes to conclusions with the consideration of generated formula it can be said that the size of population, GDP *per capita*, HDI, political system (whether communist or not), Host country advantages considerably influence on Olympic performance.

Based on the conclusions of the study the researchers would recommend the followings to the authorities of sport industry in order to improve the performance of sport and to show their strength to the rest of the world.

- As this study revealed, five variables, size of population, GDP *per capita*, HDI, political system (whether communist or not), Host country advantages that greatly much influenced on Olympic performance, it is recommended to look for suitable sports factors and encourage them as much as possible.
- It is also recommended to identify inherited factors and identify how factors encourage the sports
- Further, national policies should be to encourage the national inherited factors.
- The sport authorities in every nation should make an attempt to identify the sportsmen with genetic capabilities on such sports.
- It is also recommended to identify sports match with the countrymen capabilities rather than going for popular sports.
- The researchers further recommend encouraging rural level sport clubs and events that is lead to fourth come the genetic capabilities.
- The present study thoroughly studied about five factors namely size of population, GDP *per capita*, HDI, political system (whether communist or not), Host country advantages that influence on Olympic performance and this study was strictly limited to macro level investigation. It was not investigated breakdowns of medal tally. Therefore, it is needed to go for more micro level study to identify the factors that influence

on sport performance. The events that countries more score and country geographical and other generic factors should be investigated.

#### ACKNOWLEDGEMENT

We highly appreciate all the scholars who have initiated several researches related to this study. Their findings and methodologies directed us to complete another research gap in the athletic sport management field. Last but not least, we convey our sincere thanks to all our colleagues at University of Kelaniya who helped a lot, by sharing their views on our research work, "Going for Gold Medals: Factors Affecting Olympic Performance".

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#### AUTHORS

**First Author** – Jayantha K, Senior Lecturer, Sport and Recreation Management Degree Program, Faculty of Social Sciences, University of Kelaniya, Sri Lanka.  
kala@kln.ac.lk

**Second Author** – Ubayachandra E. G, Professor, Department of Marketing Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka.  
eubaychandra@gmail.com

# Damage to the superior thyroid artery as a complication of Central venous catheterisation – An infrequent occurrence

K Senevirathne<sup>1</sup>, H Ganegedara<sup>2</sup>, A Jayasinghe<sup>3</sup>, K B Galketiya<sup>4</sup>, V Pinto<sup>5</sup>, A H Abayasinghe<sup>6</sup>

<sup>1</sup> Registrar in Emergency Medicine, Teaching Hospital Peradeniya

<sup>2</sup> Senior Registrar in Anaesthesia, Teaching Hospital Peradeniya

<sup>3</sup> Registrar in Anaesthesia, Teaching Hospital Peradeniya

<sup>4</sup> Consultant Surgeon, Teaching Hospital Peradeniya

<sup>5</sup> Consultant Anaesthetist, Teaching Hospital Peradeniya

<sup>6</sup> Temporary Lecturer, Department of Anaesthesiology

**Abstract-** Haemorrhagic complications of central venous catheterization (CVC) are well recognized. Accidental damage to carotid artery during CVC is frequently documented with accepted management guidelines. Acute respiratory distress due to complications of CVC is less frequent. However arterial damage causing acute life threatening respiratory distress with stridor is more infrequent. This causes a diagnostic challenge and difficulties in management due to the distortion of the anatomy of the larynx due to bleeding in to the anterior compartment of the neck. There are few reports of damage to thyroid arteries following CVC insertion. We report infrequent occurrence of the damage to superior thyroid artery and thyroid gland which caused acute stridor due to airway compromise. Our initial diagnosis was the more frequent damage to common carotid artery which was managed conventionally until the rapid onset of stridor and hypoxia. It necessitated immediate intubation using a narrow gauge endotracheal tube to overcome acute airway obstruction followed by surgical repair of the superior thyroid artery and evacuation of haematoma.

**Index Terms-** Central venous catheters, Superior thyroid artery, Thyroid

## I. INTRODUCTION

With an estimated 2.1 million central venous catheters (CVCs) being inserted annually, it is likely that unreported complications would occur rarely. Relevant extensive literature have revealed the nature and frequent causes of complications, varying from experience of operator, unsafe manipulation of dilators to patient factors such as severe dehydration and morbid obesity.<sup>1-5</sup> Associated morbidity and mortality due to infections, mechanical and thrombotic complications remain major concerns. Haemorrhagic complications following damage to the carotid artery continues to be the commonest complication reported.<sup>4-6</sup> The use of ultrasonography or Doppler guidance, though often lacking in many hospitals in developing countries has considerably decreased this occurrence.<sup>7</sup> However, severe respiratory distress may cause diagnostic dilemmas though reported following a pneumothorax, haemothorax and a mediastinal haematoma after CVC cannulation.<sup>3</sup> We report puncture of the superior thyroid artery and right lobe of thyroid

gland resulting in a large haematoma causing severe respiratory distress. The rapid onset of airway compromise due to distortion of the upper respiratory tract, presenting as a life threatening complication was novel to us as we were unable to identify this cause from the literature available to us.

## II. CASE REPORT

A 65 year old male with a history of hypertensive heart disease of 10 years duration and dyslipidaemia diabetes mellitus and chronic renal failure for 6 years. He was admitted to our hospital with right lower limb cellulitis and increasing blood urea (39.9 mg/dl), serum creatinine (1056  $\mu$ mol/l) and serum potassium (6.5 mmol/l). Treatment for cellulitis was initiated and haemodialysis was planned using a 12Fr 17cm gauge double lumen CVC. Patient's clotting profile was normal and the neck examination was normal except short neck. Insertion was carried out by the surface marking and palpation technique, by an experienced medical officer using a higher approach for the right internal jugular vein, venepuncture was assumed following the evidence of "venous" blood. A progressively enlarging swelling of the neck was observed followed by the guide wire and dilatation. Procedure was abandoned, cannula was withdrawn and continuous firm pressure applied for 10 minutes. Patient experienced a respiratory distress with stridor (respiratory rate of 35/min and SpO<sub>2</sub> 94% with 60% via venture mask) during the following 20 minutes. The patient was immediately transferred to the operating theatre and airway was secured with endotracheal intubation Laryngoscopy revealed distortion of laryngeal anatomy and a Comark and Lehane grade IV and a difficult intubation was successful only with size 6 tube.

The initial diagnosis of carotid haematoma was evaluated by ultrasound scan which revealed pseudo-aneurysm probably arising from the right common carotid artery and thrombosis at the distal end and a large haematoma displacing the larynx and trachea.

Clotting profile revealed a platelet count of  $316 \times 10^9$ , and an INR of 1.16 seconds, Bleeding time 3.5 min and

The patient was transferred to the ICU and ventilated a clotting time of 9.5 min. Thromboelastography revealed absence of any coagulation defects.

As the serum potassium had risen to 7.4mmol/l due to his renal failure, a decision was made to dialyse the patient to normalize the serum potassium prior to surgical exploration. A femoral vascular catheter was inserted for dialysis. Use of heparin became contentious as expansion of the haematoma was feared and dialysis was carried out without use of heparin. After a single cycle of dialysis, neck exploration was carried out which revealed a large haematoma but acute bleeding and intact right common carotid artery eliminating the diagnosis of the pseudo aneurism. The surgical dissection was extended and punctures of the superior thyroid artery and upper pole of the right lobe of the thyroid gland were detected. With a Subclinical enlargement of the thyroid gland. The artery was repaired and the haematoma was evacuated. Following close observation, the patient was extubated 24 hours after surgery and transferred to the ward.

### III. DISCUSSION

In this patient, ultrasonographic guidance would have prevented the infrequent complication of puncture of the superior thyroid artery and the right lobe of the thyroid gland. Frequency of carotid artery puncture ranges from 6% to 25% often associated with bleeding and a large Other vessels reported to be perforated during insertion of central venous catheters include the subclavian artery (0.1%– 1%), innominate artery (2 40%) and vertebral artery (0.2%).<sup>5 6 8</sup> Puncture of a lobe of the thyroid gland has not been reported to the best of our knowledge. However, excessive rotation and extension of the head is known to increase the likelihood of puncture of adjacent structures.<sup>4 9</sup>

This patient developed stridor within few minutes of cannulation. An expanding haematoma due to the puncture of superior thyroid artery and the thyroid gland which closely surrounds the larynx and trachea would Have caused the early onset of stridor Diagnosing this condition early is important as this would cause difficulty during endotracheal intubation due to laryngeal oedema and the anatomical displacement of the upper airway due to the haematoma challenging the management.

### IV. CONCLUSION

If rapidly expanding haematoma occurs following insertion of a CVC with sudden onset of respiratory distress, the possibility of puncture of a superior thyroid artery or thyroid gland should be suspected. Subclinical enlargement of the thyroid gland is a risk factor for an accidental puncture during

CVC insertion. This complication necessitates close monitoring of respiratory and cardiovascular parameters to detect early signs of airway obstruction to enable quick intervention.

Declaration of interest: none

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### AUTHORS

**First Author** – K Senevirathne, Registrar in Emergency Medicine, Teaching Hospital Peradeniya

**Second Author** – H Ganegedara, Senior Registrar in Anaesthesia, Teaching Hospital Peradeniya

**Third Author** – A Jayasinghe, Registrar in Anaesthesia, Teaching Hospital Peradeniya

**Fourth Author** – K B Galketiya, Consultant Surgeon, Teaching Hospital Peradeniya

**Fifth Author** – V Pinto, Consultant Anaesthetist, Teaching Hospital Peradeniya

**Sixth Author** – A H Abayasinghe, Temporary Lecturer, Department of Anaesthesiology

# A Review on *Butea monosperma* (Lam.) kuntze: A Great Therapeutic Valuable Leguminous Plant

Divya fageria, Dr. D.V. Rao

Biotechnology lab, lab no.5 , Department of Botany , University of Rajasthan, Jaipur

**Abstract-** *Butea monosperma* (Lam.) kuntze [Family: leguminosae] is a medium-sized deciduous tree popularly known as Flame of forest, Dhak or palas in Hindi, Bastard Teak in English, Parasa in Tamil which is widely distributed throughout India, Burma and Ceylon The family fabaceae comprises of 630 genera and 18000 species. It is adaptable tree for sub-tropical regions which requires alkaline, swampy badly drained soils and a sunny location. It grows easily from seed. It finds use both medicinally and commercially with each part of the plant having utility. Extract of the plant possess significant astringent , aphrodisiac, anti-helminthic, anti-inflammatory anti- bacterial , anti-fungal , anti-diabetic and anti -asthmatic properties. This article briefly reviews the botany, distribution, ecology, uses of the plant, chemical composition , pharmacological activities of the plant and its constituents .This is an attempt to compile and document information on different aspect of *Butea monosperma* (Lam) Kuntze and its potential uses.

**Index Terms-** *Butea monosperma* (Lam.) kuntze, Dhak, Palas, Flame of forest, Astringent, Aphrodisiac, Anti-asthmatic, Anti-helminthic, Chemical composition.

## I. INTRODUCTION

From the time immemorial, plants have been widely used as curative agents for variety of ailments. Concentrated flowers or seeds extract can be found in various herbal preparations which are widely available in market today .Herbs have always been the principal form of medicine in India and presently they are becoming popular through the world,as people strive to stay healthy in the face of chronic stress and pollution, and to treat illness with medicines that work in count with the body's own defence .There is a widespread belief that green medicines are healthier and more harmless or safer than synthetic ones. In traditional medicine , there are many natural crude drugs that have the potential to treat many disease and disorders . *Butea monosperma* (palas) is a medium-sized deciduous tree belongs to family fabaceae and sub- family papilionaceae. This tree is also called 'Flame of the Forest' and Bastard Teak ( Kirtikar and Basu, 1935) .They comprise one of the largest families of flowering plants numbering 630 genera and 18000 species (The wealth of India, 1988) . It grows through the Indian subcontinent especially in Indo-Gangetic Plains (Chopra et al., 1958). It is said that the tree is a form of Agnidev,'God of Fire'. This tree grows up to 50 ft high ,with clusters of flowers. Flowers are offered in place of blood in sacrifice rituals to goddess Kali (Ambasta, 1994). The genus *Butea* includes *Butea monosperma*, *Butea parviflora*,*Butea minor* and *Butea superba* widely distributed

through India. It is one of the most beautiful tree has been put to some useful purpose. All parts of plant have been used as crude drug for the treatment of tumors, piles, skin diseases, wounds and ulcers (Mengi and Deshpande,1995). *Butea monosperma* is extensively used in Ayurveda , Unani and Homeopathic medicine and has become a treasure of modern medicine.The plants of this genus are well known for their colouring matters.Commonly *Butea monosperma* is used as tonic, astringent ,aphrodisiac and diuretics .(Nadkarni ,2002). The flowers are widely used in treatment of hepatic disorder, viral hepatitis, diarrhea ,depurative and tonic.The flowers are also good source of flavonoids. The contents of flowers are Butein, Butrin, Isobutrin ,Plastron ,coreipsin and isocoreipsin .Isolation of mediacarpin with antifungal activity from this part of plant has also been reported .The Euphane triterpenoid 3a-hydroxyeuph-25-ene and the alcohol 2,14-dihydroxy-11,12-dimethyl-8-oxo-octadec-11-enylcyclohexane has also been isolated from the stem (Mishra et al., 2000).The Imide palasimide has been isolated from the pods of this plant species. Studies on anti-oxidant status following ulceration indicate that free radicals seem to be associated with the pylorus ligation and ethanol induced ulceration in rats .The traditional system of medicine claims that the plant is a rejuvenator.Owing to its versatile characteristics, this plant is a multipurpose tree with immense medicinal and economical value.

## A. Botanical Classification

Kingdom : Plantae  
Division : Magnoliophyta  
Class : Magnoliopsida  
Order : Fabales  
Family : Fabaceae  
Genus : *Butea*  
Species : *monosperma*

## B. Botanical Name

*Butea monosperma* ( Lam.) kuntze

## C. Common Names

According to Kirtikar and Basu (1935) all the common names of this plant are listed .

Sanskrit : Palasah  
Hindi : Dhak, Palas, Chalcha  
English : Bastard Teak, Parrot Tree  
Bengali : Palas, Polashi  
Marathi : Kakracha  
Gujarati : Khakharo  
Tamil : Parasa

## II. DOCUMENTED SPECIES DISTRIBUTION

### A. Native

Tropical South Asia, especially from the region of Pakistan, India (Indo-Gangetic plains), Vietnam, Malaysia, Western Indonesia, Laos, Cambodia, Bangladesh, Nepal, Sri-Lanka, Manmar, Thailand.

### B. Occurrence

It is common throughout the greater part of India, Burma and Ceylon extending in the north west Himalayas up to 1000 m, and higher in the outer Himalaya, Khandesh Akranj up to 1200m and Hill of South India up to 1300 m. (Chopra, 1991). It is especially found in Maharashtra (Kolhapur) Karnataka (Chikmagalur, Coorg, Mysore, Shimoga, S.Kanara) Kerala: Alapuzha, Idukki, Kasaragod, Kollam, Kozhikode, Malapuram, Palakkad. Rajasthan: Jaipur, Udaipur, Kota in throughout India, except Jammu & Kashmir, Himachal Pradesh, Sikkim, Arunachal Pradesh, Assam, Nagaland, Meghalaya, Manipur, Tripur, Mizoram.

### C. *Butea* species

The plant belongs to family Fabaceae which is widely distributed in throughout the world. Below mentioned species were recorded. *Butea acuminata*, *Butea affinis*, *Butea africana*, *Butea apoensis*, *Butea balansae*, *Butea braamiana*, *Butea bracteolate*, *Butea cuneiformis*, *Butea crassifolia*, *Butea dubia*, *Butea ferruginous*, *Butea gyrocarpa*, *Butea harmandii*, *Butea laotica*, *Butea listeria*, *Butea littoralis*, *Butea loureirii*, *Butea*

*parviflora*, *Butea pulchra*, *Butea purpurea*, *Butea minor*, *Butea macroptera*, *Butea maingayi*, *Butea merguensis*, *Butea rosea*, *Butea riparia*, *Butea suberecta*, *Butea superba*, *Butea oblongifolia*, *Butea varians*, *Butea volubilis*.

## III. ECOLOGY

Native to sub tropical environments, it is capable of growing in waterlogged situation, black cotton soil, saline, alkaline, swamy badly drained soils and on barren land except in arid region. This species grows to elevations of 1200m. It regenerates naturally and easily in mixed deciduous stands in temperate forests. Natural reproduction is profuse by seed.

## IV. MYTHOLOGICAL HISTORY

It is believed that the tree is a form of Agnidev, God of fire. It was a punishment given to him by Goddess Parvati for disturbing her and Lord Shiva's privacy (Murti et al., 1940).

## V. BOTANICAL DESCRIPTION

*Butea monosperma* is an erect medium sized dry season-deciduous tree, growing to 15m tall. All the botanical descriptive characters of this plant are listed in Table 1.

**Table 1. Botanical Description of *Butea monosperma***

<b>Plant type</b>	Medium sized, deciduous tree (figure A) Height:- 40 to 50 feet Growth rate:- Moderate Texture:- Medium Chromosome number:- 22
<b>Growing requirements</b>	Light requirement:- Tree grows in full sun Soil tolerance:- Black cotton soil, saline, alkaline, water logged situation Drought tolerance:- High Aerosol salt tolerance:- Moderate
<b>(a) Leaf</b>	Compound with three leaflets, obliquely ovate and broadly elliptic. The size varies from 15 cm to 20 cm by 10 cm x 15 cm. The leaves fall off by December and reappear during. (figure B)
<b>(b) Flower</b>	The size is nearly 2 to 4 cm in diameter. The flowers form a gorgeous canopy on the upper portion of the tree, wears a kind of exquisite orange and red colour. Flowers start appearing in February and stay on the end of April. (figure C)
<b>(c) Fruit</b>	Flat legumes, pods are stalked 12.5-20 by 2.5-5cm, thickened at the sutures. Young pods have a lot of hair, a velvety cover. (figure D)
<b>(d) Seed</b>	Flat 25 to 40 mm long, 15 to 25 mm wide and 1.5 to 2 mm thick. The seed-coat is reddish-brown in colour, wrinkled and two large yellowish cotyledons. (figure E)
<b>(e) Root</b>	Taproot is thick and long, lateral roots are numerous and well-developed (figure F)
<b>(f) Bark</b>	Fibrous and bluish-gray to light brown in color. When injured, it exudes a kind of red juice known as 'Butea gum' or 'Bengal kino'. (figure G)



**Figure A : Healthy *Butea monosperma* plant**



**Figure B :Leaf**



**Figure C : Flower**



**Figure D: Pods**



**Figure E: Seeds**



**Figure F: Root**



**Figure G : Bark**

## VI. GROWTH PATTERN

Growth is seen best from sea level to an altitude of 1200m and optimal rainfall of 500 to 2500mm. It sheds its leaves in Dec. and develops new leaves from March onwards. Flowers appear in February to end of the April (Cowen, 1984). Seed ripens from February to May as shown in Table 2.



**Table 2. General growth pattern of *Butea monosperma***

Months Plant parts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seed ripen												
Pods ripen												
Flowers												
Fruits												
Leaf fall												
New leaf												

VII. NUTRITIVE EVALUATION

Leaf extract of *Butea monosperma* contain nutritive value (Ramana et al., 2000) as shown in Table.

OM	-	889.2
CP	-	150.2
NDF	-	506.1
ADF	-	356.0
Cellulose	-	151.2
Hemicellulose	-	150.2
Lignin	-	130.7
Total phenolics	-	6.5
Condensed Tannins-		20.8

OM =Organic matter      ADF=Acid detergent fibre  
 CP = Crude protein      NDF=Neutral detergent fibre

VIII. CHEMICAL CONSTITUENTS

**Table 3. Chemical Constituents in *Butea monosperma***

<b>Flower</b>	Triterpene (Mishra et al., 2000) . Several flavonoids butein , butin , isobutrin , coreopsin, isocoreopsin (butin 7-glucoside) , sulphurein , monospermoside (butein 3 –e-D-glucoside) and isomonospermoside , chalcones , aurones, isobutyine, palasitrin, 3',4',7-trihydroxy flavones (Gupta et al.,1970) , myricyl alcohol , stearic,palmitic, arachidic and lignoceric acids (Murti et al.,1940) glucose, fructose, histidine, aspartic acid, alaine and phenylalanine (Shah et al.,1992).
<b>Seed</b>	Oil (yellow,tasteless proteolytic and lypolytic enzymes,protein proteinase and polypeptidase
<b>Root</b>	Glucose, glycine, a glycoside (aglycon) and an aromatic hydroxy compound (Tandon et al.,1969).
<b>Stem</b>	3-Z- hydroxyeuph-25-ene and 2,14- dihydroxy-11,12-dimethyl-8-oxo-octadec-11-enylcyclohexan (Guha et al.1990) stigmasterol-e-D-glucopyranoside and nonacosanoic acid (Mishra et al., 2000).
<b>Bark</b>	Kino-tannic acid, Gallic acid, pyrocatechin (Nadkarni , 2002). Also contains palastrin,and major glycosides as butrin,alanind, allophanic acid, butolic acid, cyaniding, histidine , lupenone, lupeol , (-)- medicarpin, miroestrol, palasimide and shelloic acid (4,5,3,4,16,17,18,19,20), Two compounds 3,9-

	dimethoxypterocarpan and triterpenoid ester , 3-hydroxyeuph-25-enyl heptacosanoate (Shukla et al.,2002).
<b>Leaves</b>	Glucoside, kino-oil containing oleic and linoleic, palmitic and lignoceric acid (Murti et al.,1940).
<b>Resin</b>	Jalaric esters , laccijalaric esters, Z-amyrin, e-sitosterone and its glucoside, sucrose, lactone-nheneicosanoic acid (Rastogi and Mehrotra,1979;Singh et al.,1974).

IX. ECONOMICAL AND MEDICINAL VALUE

The plant *Butea monosperma* has immense medicinal and economical values which are tabulated in Table 4.

**Table 4. Economic and Medicinal importance of *Butea monosperma***

<b>Root</b>	
<b>Economic value</b>	- Roots are used as an antidote.(Jain , 1991).
<b>Medicinal value</b>	- It is useful in filariasis and night blindness ( Mengi and Deshpande, 1995). - Roots are bitter,antihelminthic. It also causes temporary sterility in women. (The wealth of india,1988).
<b>Stem</b>	
<b>Economic value</b>	- Wood is used for well curbs and water scoop (Ambasta,1994). - It is a cheap board wood.(Ambasta,1994). - Wood pulp is suitable for newsprint manufacturing (Ambasta,1994). - It is also a host to the Lac insect,which produces natural lacquer (Sequeira and Bezkorowajnyj, 1998). - The dry stem pieces are used to make sacred fire.(The wealth of India, 1988).
<b>Medicinal value</b>	- It is useful indigenous medicine for the treatment of dyspepsia and sore throat. (The wealth of India,1988).
<b>Leaf</b>	
<b>Economic value</b>	- Used as cattle fodder. (The wealth of India ,1988). - Used as making platters, cups and bowls (The wealth of India, 1988). - It is used for wrapping tobacco to make biddies (The wealth of of India, 1988). - It is also used as packing material for parcels.
<b>Medicinal value</b>	- It promotes diuresis and menstrual flow. (Kirtikar and Basu, 1935;Kala, 2004).
<b>Seed</b>	
<b>Economic value</b>	- Seed are pounded with lemon juice and applied to the skin that act as rubefacient (kirtikar and Basu, 1935; Boutelje,1980).
<b>Medicinal value</b>	- It is used as remedy against intestinal worms (kirtikar and Basu, 1935; Boutelje, 1980). - It is used inflammation,bleeding piles,urinary stones and eye disease. (kirtikar and Basu, 1935; Boutelje, 1980).
<b>Flower</b>	
<b>Economic value</b>	- The flower yeild an orange dye.It is used to prepare traditional Holi colour.
<b>Medicinal value</b>	- It is used as tonic to cure skin disease, gout and burn sensation.(Kirtikar and Basu,1935; Kala, 2004). - It is also used in astringent diarrhoea and diuretic (Bhalla and Walter, 1999).

<b>Bark</b>	
<b>Economic value</b>	- Bark fibres are used for making cordage (Kirtikar and Basu, 1935).
<b>Medicinal value</b>	- The stem bark is used for the treatment dyspepsia,diarrhoea and dysentery(Kirtikar and Basu ,1935;Kala ,2004). - It is also used for the cure of ulcer, sore thorat and snake bite.
<b>Gum</b>	
<b>Economic value</b>	- It is known as Bengal Kino.it is used in certain food dishes. - Used for caulking boats as well.
<b>Medicinal value</b>	- The gum is used in stomatitis, ringworm, septic sore throat. - It is used for the treatment of leucorrhoea ,excessive perspiration and diarrhoea (Kirtikar and Basu, 1935; Boutelje, 1980).

## X. PHARMACOLOGICAL ACTIVITIES

### A. Antifungal activity, Antimicrobial activity and Antibacterial activity

The stem bark of *Butea monosperma* displays antifungal activity which is due to the presence of an active constituent (-)-medicarpin (Bandara et al.).The seed oil of *Butea monosperma* shows significant bactericidal and fungicidal effect in in-vitro testing (Mehta and Bokadia, 1981).

### B.Anti-inflammatory activity

The leaves of *Butea monosperma* exhibit ocular anti-inflammatory activity in rabbits (Mengi and Deshpande , 1995).The anti-inflammatory activity of methanolic extract of *Butea monosperma* evaluated by carrageenan induced paw edema at 600 and 800 mg/kg inhibition of paw edema by 26 and 35% in cotton pellet granuloma inhibition of granuloma tissue formation by 22 and 28% (Shahavi and Desai, 2008).

### C. Anticonvulsive activity

It shows anticonvulsive activity due to the presence of a triterpene. (Kasture et al.,2002).The ethanolic extracts of leaves of *Albizia lebbeck* and flowers of *Hibiscus rosa sinensis* and the petroleum ether extract of flowers of *Butea monosperma* exhibited anticonvulsant activity.The acetone soluble part of petroleum ether extract of *Butea monosperma* flowers showed anticonvulsant activity.The fractions protected animals from maximum electroshock electrical kindling pentylenetetrazole and lithium-pilocarpine induced convulsion but failed to protect animals from strychnine-induced convulsions.The fractions raised brain contents of gamma-aminobutyric acid (GABA) and serotonin (Kasture et al., 2000).

### D. Anti-esterogenic and anti-fertility activity

Alcoholic extract of flowers of *Butea monosperma* has also been reported to exhibit antiestrogenic (Shah et al., 1990). Hot alcoholic extract of *Butea monosperma* seeds have been reported for significant anti ovulatory and anti-implantation activities

when given to rats and rabbits.The active constituent has been identified as butin (Bhargava , 1986). Butin also exhibits male contraceptive properties (Dixit et al., 1981). Antifertility effect of seed extract of *Butea frondosa* has also been reported in mice (Razdan et al., 1970). The stem bark of *Butea monosperma* led to the isolation and identification of three new compounds named buteaspermin A, buteaspermin B and buteaspermanol along with 19 known compounds (Maurya et al., 2009).

### E. Anti-diabetic activity

The single dose treatment of ethanolic extract of *Butea monosperma* flowers at the dose of 200mg/kg P.O significantly improved glucose tolerance and cause reduction in blood glucose level in alloxan induced diabetic rats.(Somani et al., 2006). Oral administration of the ethanolic extract of the *Butea monosperma* seeds at the dose of 300mg/kg b.w.,exhibited significant antidiabetic,hypolipaemic and antiperoxidative effects in non-insulin dependent diabetes mellitus rats.

### F. Anti-diarrhoeal activity

*Butea monosperma* gum has also been found useful in cases of chronic diarrhoea.It is a powerful astringent and also decrease bilirubin level.(Ramana et al., 2000).The ethanolic extract of stem bark of *Butea monosperma* at 400 mg/kg and 800 mg/kg inhibited castor oil induced diarrhoea due to inhibiting gastro-intestinal motility and PGE2 induced enteropooling.It is used as nonspecific anti diarrhoeal agent in folk medicine .(Gunakkunru et al ,.2005).

### G.Free radical scavenging

Free radical scavenging activity of various extracts of flowers evaluated by using different in- vitro models like reducing power assay, scavenging of 2,2 diphenyl-1-picrylhydrazyl (DPPH) radical, nitric oxide radical, superoxide anion radical, hydroxyl radical and inhibition of erythrocytes hemolysis using 2,2' azo-bis (amid inopropane) dihydrochloride (AAPH). Methanolic extract along with its ethyl acetate and butanol fractions showed potent free radical scavenging activity.The observed activity could be due to higher phenolic contents in the extract (Schoeller et al., 1938).

## H. Anti helminthic activity

The seeds of the plant are used in Ayurvedic system as an anthelmintic drug. (Katti and Manjunath, 1929). The crude powder of *Butea monosperma* seeds (CP) showed a dose-dependent (1-3 g/kg) and a time-dependent anthelmintic activity in sheep. The anthelmintic activity of different species of *Butea* has been reported against *Ascaridia galli*, *Ascaris lumbricoides*, earthworms, *Toxocara canis*, oxyurids, *Dipylidium caninum* and taenia (Iqbal et al., 2006).

## I. Wound healing activity

The topical administration of an alcoholic bark extract of *Butea monosperma* on cutaneous wound healing in rats. Full-thickness excision wound were made on the back of rat. The granulation tissue formed on days 4, 8, 12 and 16 (post wound) was used to estimate total collagen hexosamine protein, DNA and uronic acid. The extract increased cellular proliferation and collagen synthesis at the wound site as evidenced by increase in DNA, total protein and total collagen content of granulation tissues. The extract treated wounds heal much faster than normal animals as indicated by improved rates of epithelialization and wound contraction, tensile strength and histopathological examinations. *Butea monosperma* exhibited wound healing activities due to its antioxidant properties (Sumitra et al., 2005).

## J. Thyroid inhibitory, Antiperoxidative and hypoglycemic effects

Stigmasterol isolated from the bark of *butea monosperma* was evaluated for thyroid hormone and glucose regulatory efficacy in mice. The administration at 2.6 mg/kg/d for 20 days reduced serum triiodothyronine (T3), thyroxine (T4) and glucose concentrations as well as the activity of hepatic glucose-6-phosphatase (G-6-Pase) with an increase in insulin. Showed its thyroid inhibiting and hypoglycemic properties. Antioxidative potential due to decrease in the hepatic lipid peroxidation (LPO) and an increase in the activities of catalase (CAT), superoxide dismutase (SOD) and glutathione (GSH). The highest concentration tested (5.2 mg/kg) evoked pro-oxidative activity (Panda et al., 2009).

## K. Liver disorders

An extract from the flowers of *Butea monosperma* is used in India for the treatment of liver disorders and two antihepatotoxic flavonoids, isobutrin and butrin have been isolated from the extract. (Wagner et al., 1986). The effect of pretreatment of methanolic *Butea monosperma* extract prior to TAA treatment at two doses and the results suggest that it may contribute to the chemo preventive effect. *Butea monosperma* showed a significant recovery in the level of glutathione and its metabolizing enzyme in the liver induced the detoxifying enzyme system, which is shown by the elevated levels of other QR, SOD and xanthine oxidase which are important second phase enzyme. (Sehrawat et al. 2006).

## L. Giardiasis

Giardiasis is a common gastrointestinal infection caused by a protozoal parasite, *Giardia lamblia*. Pippali rasayana (PR). An Ayurvedic herbal medicine prepared from piper longum (Pippali) and *Butea monosperma* (Palash) in which ash of stem

, root, flower and leaves of *Butea monosperma* is used has significant activity against Giardiasis it produced up to 98% recovery from the infection. The rasayana had no killing effect on the parasite in vitro. It induced significant activation of macrophages as evidenced by increased macrophages migration index (MMI) and phagocytic activity with higher doses of PR recovery increased up to 98% at 900 mg/kg. (Agarwal et al., 1994). Flowers of this plant are also effective in leprosy, leucorrhoea and gout (The wealth of India, 1988).

## XI. CONCLUSION

Today it is a challenge for scientists to provide efficient, safe and cheap medications. In this scenario *Butea monosperma* can be an exclusive medicine which is widely available through our country. The present paper enumerates various pharmacognostic and pharmacological aspects of the plant. This review also summarizes the therapeutic potential of this plant. The plant is used highly by the rural and tribal people in curing various disorders. *Butea monosperma* has an effective natural origin that has a tremendous future for research. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an ecofriendly system. The present review describes various traditional and medicinal utility of the plant and an attempt was made to gather information about the chemical composition and pharmacological activity of the plant and its constituents.

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#### AUTHORS

**First Author** – Divya fageria ,Ph.D scholar ,University of Rajasthan, Jaipur

**Second Author** – Dr.D.V.Rao, Associate professor, university of rajasthan, Jaipur

**Correspondence Author** – Institute address: Biotechnology lab, lab no.5, Department of botany, University of rajasthan, Jaipur. Residence address: Behind Police line, Balram nagar, Sikar, Email: divyafageria123@gmail.com



# Listening Anxiety in Iranian EFL learners

Samaneh Serraj

PhD in TESL

**Abstract-** Listening anxiety has a detrimental effect on language learners. In the Iranian EFL context listening comprehension remains as one of the most problematic skills for learners. To figure out learners' sources of listening comprehension anxiety and the factors that might reduce listening anxiety, the semi-structured interviews were conducted with fifteen participants. Through qualitative analysis several factors were identified as having influence on Iranian EFL learners' listening anxiety. These factors were divided into three categories, i.e. individual factors (nerves and emotionality, using inappropriate strategies and lack of practice), input factors (lack of time to process, lack of visual support, nature of speech and level of difficulty) and environmental factors (instructors, peers and class environment).

**Index Terms-** Listening Comprehension, Foreign Language Anxiety, Listening Anxiety, Foreign language learners

## I. INTRODUCTION

Listening is considered as the highest frequently used form of language skill and has a fundamental role in normal communication and educational performance. Students need to spend most of their time listening to what their teachers says, such as, presenting lectures, telling directions or asking questions. When students first start learning a new language, they generally have to hear the words of that language very frequently before they are able to recognize and then verbalize those words. Not only is listening skill the basis for improving other skills, it is also the main route through which learners make initial exposure to the target language (Curtain, Pesola, & Savignon, 1988). Through the process of language learning, the role of affective filters (Krashen, 1988) has been acknowledged. Anxiety among the affective variables is recognized as one of the most prominent variable, which influences learners in all process of language learning, whether during input, processing, or performance (MacIntyre & Gardner, 1989). It is defined as feeling tension, apprehension, nervousness, and worry related to an arousal of the autonomic nervous system (Horwitz, et al., 1986). MacIntyre & Gardner (1994) suggest that anxiety might lead to deficits in learning and performance and interferes with a learner's cognitive competence to gain, process, and produce a foreign language. As Horwitz (2001) noted many advanced and successful FL learners experience high levels of anxiety during learning and using a foreign language. The objective of the present study was to explore the factors that influence foreign language listening anxiety among Iranian EFL learners. This could have a great importance since it would help eliminate the factors that hinder listening comprehension while promoting those that might facilitate it.

## II. REVIEW OF THE LITERATURE

### Foreign Language Anxiety

Many scholars have examined anxiety and its association to listening comprehension (Gardner, et al. 1987; Bacon, 1989; Lund, 1991; Kim, 2000). The consensus is that anxiety impedes listening comprehension. The type of anxiety that occurs in a foreign language learning context is identified as foreign language anxiety (FL anxiety), which Horwitz, et al. (1986) defined it as "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (p. 128). This definition shows that learners might feel a threat to their self-image since they must be engaged in tasks in a new language over which they do not have a suffice command. Findings of the recent studies reviled that anxiety often interfere with the learning process, reduce learning motivation and eventually causes low performance (Elkhafaifi, 2005; Pappamihel, 2002; Sparks & Ganschow, 2007).

Studies into anxiety in language learning have focused on a type of anxiety related specifically to language situations, termed language anxiety. This is seen as "a distinct complex of self-perceptions, beliefs, feelings, and behaviors [...] arising from the uniqueness of the language learning process" (Horwitz, et al., 1986, p. 128) which does not appear to bear a strong relation to other forms of anxiety (MacIntyre, 1999). Regarding to the study of anxiety in language learning, there seem to have been fundamentally two different approaches, which are labelled as (1) the "anxiety transfer", and (2) the "unique anxiety" approach (Horwitz & Young, 1991; MacIntyre, 1999). These two approaches are based on various conceptualizations of L2-related anxiety. In the first approach it is assumed that the anxiety experienced in an L2 setting is just the transfer of other types of anxiety into the L2 context. It is assumed that an individual who is generally anxious or experiences anxiety in particular context has a predisposition to also be anxious during learning or using a foreign language.

More specifically, anxiety in the L2 domain has been considered either (1) as the manifestation of a general trait of anxiety or (2) as the transfer of some situation-specific anxiety (MacIntyre & Gardner, 1991; MacIntyre, 1999). Therefore rearsch adopting this approach either applied measures of trait/state anxiety (e.g., the Manifest Anxiety Scale (MAS), Taylor, 1953; the State/Trait Anxiety Inventory (STAI), Spielberger et al., 1970; Spielberger, 1983), or sclaes measuring situation-specific anxiety such as test anxiety (Sarason & Ganzer, 1962) and communication apprehension (McCroskey, 1970) in order to measure anxiety in the L2 contexts.

Unlike the first approach, in the second approach it is assumed that language learning creates a type of anxiety which is

unique. This conceptualization is based on Gardner's hypothesis that "a construct of anxiety which is not general but instead is specific to the language acquisition context is related to second language achievement" (1985, p. 34). In this perspective, anxiety experienced in second language learning domain is viewed as a situation-specific anxiety stimulated by the experience of learning and using a second language. Based on this conceptualization, studies adopting this approach employed those anxiety measures which were created to tap particularly into the anxiety experienced in second or foreign language contexts (e.g., the French Class/Use, English Class/Use Anxiety Scales Gardner, Clément, and associates have applied since the 1970s as parts of the Attitudes and Motivation Test Battery, developed by Gardner, Smythe, & Clément, 1979).

Comparing the two contrasting perspective mentioned earlier, the "unique anxiety" approach seemed to be the more practical one. Research applying the "anxiety transfer" approach shows inconsistent, contradictory results both across and within studies (MacIntyre, 1999). Through these early anxiety research (Scovel, 1978; Young, 1990, 1994), some were the indication of negative relationship between anxiety and L2 performance (e.g., Bartz, 1974 cited in Young, 1994), while other research showed a positive link between the two constructs (e.g., Kleinmann, 1977), and in some other studies no significant relation was found between the two variables (e.g., Westcott, 1973 cited in Young, 1994). Moreover, in some studies interpreting the finding seemed difficult, for example that anxiety was negatively related to one language skill but not to other skill (Swain & Burnaby, 1976; Tucker, Hamayan, & Genesee, 1976), or that anxiety related to one FL positively but negatively to another, and not significantly related to a third FL in the same research (Chastain, 1975).

In short, researches utilizing the "anxiety transfer" approach were not able to offer a vivid understanding of how anxiety was linked to second language learning. One plausible justification for the inconsistency in the findings of these studies is that different researches utilizing the "anxiety transfer" approach applied various measures of anxiety, as mentioned earlier, which itself makes the comparison across research more problematic (Young, 1994). More importantly, none of these measures used in these studies were specifically related to the type of anxiety experience in language learning contexts. In other words, there was no harmony between the anxiety definition or measure and the actual variables which were supposed to be measured (Scovel, 1978; MacIntyre, 1999; Young, 1994).

In contrast, research employing the "unique anxiety" approach using measures of anxiety specified to the L2 domain indicated a consistent negative relationship between L2-related (L2 class, L2 use) anxiety and different scales of L2 performance (Clément, Gardner, & Smythe, 1977, 1980; Gardner, Smythe, Clément, & Glikzman, 1976; Gardner, Smythe, & Lalonde, 1984). Therefore, since the idea that certain situation-specific anxiety or general trait of anxiety transferred from other situation operates in language learning did not receive support in empirical findings, the assumption that a unique type of anxiety might be involved seemed to be a more plausible hypothesis.

## **FL listening Anxiety**

Listening in foreign language contexts is a less thoroughly researched skill in general. Our knowledge is even more limited about the interaction between listening skill and foreign language learning anxiety. As Vogely (1999) asserted, while listening comprehension is one of the most ignored skills, some instructors are even unaware of the effect of listening exercises on provoking undermining anxiety in language learners. Some pioneers researchers have examined the relationship between anxiety and listening comprehension (Bacon, 1989; Gardner, Lalonde, Moorcroft, & Evers, 1987; Lund, 1991). The consensus of those studies is that anxiety could impede listening comprehension.

Research in second or foreign language has shown that anxiety directly debilitates motivation and causes a negative affective response to the foreign language (Gardner et al. 1987). Since then, recognising FL listening comprehension anxiety has been rapidly become a priority in the language classroom. Reviewing the literature related to language learning anxiety initially indicated that foreign language students believed that speaking creates the most anxiety (Young 1990; Phillips 1992). Gradually, through the studies related to speaking anxiety, foreign language listening comprehension anxiety has been emerged as a problematic area for language learners.

In this respect Krashen (cited in Young, 1992) asserted that, although speaking is reported as the most anxiety-provoking skill, listening comprehension is indeed "highly anxiety provoking if it is incomprehensible" (168).

Scarcella and Oxford (1992) believed that listening anxiety arises in a situation when learners feel that a task they are faced with is either unfamiliar or too difficult for them. This anxiety might be intensified if the learners are under the false assumption that they have to understand each and every word they hear. They inevitably feel anxiety when this theory fails and if they insist on this assumption, anxiety becomes a repetitive feeling. How students perceive their own listening skill can be another source of listening anxiety. A lot of learners presume that for being "good" at a language they must have perfect pronunciation, know massive number of vocabulary, be familiar with extensive grammar knowledge, have overseas experience, and be gifted by natural aptitude for language learning (Horwitz, 1987).

Therefore this type of anxiety that occurs during the listening comprehension process usually originates from a negative "listening self-concept" which is a low self confidence level in the listening skill area (Joiner, 1986). On the other hand as Chastain (1979) mentioned since listening is a complicated skill learners often have the fear of interpreting the message incorrectly. The reason that many students have difficulty in foreign language listening are the lack of confidence and feeling of inadequacies among them (Dunkel, 1991). Therefore foreign language listening anxiety might intervene in learning a language successfully by causing tension of fear in FL listening process. Christenberry (2003) emphasizes the problematic nature of foreign language listening and acknowledges that it is an extremely difficult skill to teach effectively; therefore, is likely to create anxiety. MacIntyre (1995) also highlighted that foreign language learners feel anxious about understanding linguistic structures incorrectly or inferring meaning from situational context because in such activities they might make embarrassing mistakes.



Furthermore Samuels (1984) and Bacon (1992) mentioned that students may experience anxiety while doing listening comprehension tasks due to several factors including the authenticity of the listening, lack of comprehensibility of the listening material and other external environmental variables such as noise and inaudibility.

### III. METHOD

Interview as one of the most frequently used method for collecting qualitative data is employed to understand how individuals think of a particular situation or specific issues and express them in their own words (Ary et al., 2010). Creswell (2008) and Kvale (2007) see interview as an effective tool to collect rich and detailed description from the respondents. Basit (2010) believes that the researcher benefits from the interview method by building a rapport with the interviewees, and creating a trustable relationship between the two, which eventually provides more honest and credible responses. Moreover since most of the interviews were conducted via face-to face, the response rate is 100 per cent.

The participants of this study were 15 Iranian English language learners studying at language schools in Isfahan Iran. The reason behind using interview method in this research is to obtain a better insight into the learners' attitudes towards the factors that might influence on their listening comprehension.

In current study the researcher conducted semi-structured interviews which are the most common form of interview in educational research. In this type of interview, unlike the structured one, it is not necessary to ask all participants the same number of question. The focus of this type of interview is on asking the questions that address the objectives of the research (Basit, 2010). Interview is particularly a helpful method for collecting data since through other methods the researchers is not able to come up with what the participants think of a particular phenomenon. Semi-structured interview is a technique that provides an accurate and detailed image of what the individuals think of a certain phenomenon under scrutiny. Creswell (2008) posits that by combining a set of open-ended and close-ended questions in an interview, a researcher can gather applicable information to support the theories and concepts in the literature. Moreover it gives the interviewees an opportunity to expand and elaborate on their personal ideas related to the area under investigation. Semi-structured interview was employed by other researchers in the studies related to anxiety and language skills (e.g., Vogely, 1998; Von Wörde, 2003; Woodrow, 2006; Al-Shboul et.al, 2013).

In current study the interview played a crucial role since it helped the researcher to understand participants' voices on the factors create listening comprehension anxiety in English language classes. The purpose of the interviews was to ask the respondents to expand and elaborate on their responses to the listening anxiety questionnaire. During the interviews, the respondents were asked to elaborate on the responses they had given to the questionnaire items as well as their point of view about the source of their listening anxiety. The interviews that were conducted provided some more specific and detailed information on the learners' listening anxiety. Moreover they

were asked to express their own idea about the factors that might influence on their listening comprehension.

For this purpose, an interview protocol was designed which comprised questions the participants were asked (see Appendix D). It contains instructions for the interview process and the questions to be asked (Creswell, 2008). To prepare interview questions, a group of questions related to the present study were selected based on Vogely (1998) and Von Worde (2003).

The arrangement of the questions was based on "funnel-shaped interview" (Kvale, 2007). In this approach the interviewees first reply to some general questions and gradually move forwards the more detailed ones. The interview respondents were asked to describe the factors that they believe might contribute to their listening anxiety. Sample interview coding is provided in appendix B.

### IV. RESULT AND DISCUSSION

The data were gathered through the interviews with language learners in order to obtain the factors that create listening anxiety. The following is a thorough description of the main results of the data as the factor mentioned by language learners that have influence on listening anxiety.

#### **Nerves and Emotionality**

One of the main factors the participants of the study highlighted as having an effect on their degree of listening anxiety are nerves and emotionality. Most of the respondents (12 out of 15) mentioned that that they do not feel confident in their listening skills. They are afraid that they might not have adequate knowledge about the topic. The majority of participants noted that their thoughts are jumbled and feel confused while they are listening to important information. They confessed that they get upset and uncomfortable when they are not certain if they have understood the information properly. Five interview respondents mentioned that they have fear of listening to public speech in English. Moreover such fear will be negatively evaluated when they are listening to or imagining themselves listening to a lecture.

To support such findings, Vogely (1998) explained the existence of such factor in learners' negative previous experiences or from the belief that they do not possess the prerequisites which is essential to be a competent language learner.

Nerves and emotionality seems to be basically related to the cognitive perceptions of the activity for L2 listeners. The participants perceive difficulties in coping with the information regarding interpersonal and social contexts, which creates negative emotion and nervousness. As MacIntyre and Gardner (1991) argued this feeling might also interfere with processing the language input effectively. Consequently such nervousness may decrease the listeners' ability to concentrate on the linguistic input in order to encode and interpret the information.

Finding the factor of emotionality and nerves affecting listening anxiety is in harmony with that of Kimura (2008) who found out that emotionality reflected in lack of confidence and other emotional reactions such as discomfort, dislike and annoyance in engaging listening comprehension tasks.

### **Inappropriate Strategies**

Another significant factor that was identified as having an influence on the learners' foreign language anxiety is the lack of appropriate strategies. In this regard, several clues indicating the usage of inappropriate strategies were raised by the interviewees of the study.

Most of the participants consider comprehension as understanding and translating every words rather than comprehending the message. Such assumption leads learners to feel anxious when they miss the other parts, while they try to translate one part of input. In most of listening classes in Iran, language learners especially in lower levels are required to transcribe the listening materials as an exercise. This type of task encourage them to perceive listening comprehension as word for word decoding which might be a source of anxiety and frustration in the whole process of listening comprehension.

Some participants are concerned about missing the key words or misunderstanding the content. They assume that they might hear the "wrong" information. The highest load of concern related to the situation when learners are not familiar with the topic. They tend to feel surrendered when they realize that the topic is unknown for them and they lose their concentration to listen effectively. In line with the findings of the study with respect to the effect of inappropriate strategies on increasing listening anxiety Sioson (2011) stated that being aware of listening strategies give learners specific skills to handle and manage their learning, which might reduce their anxiety.

Traditionally in most of English language classes in Iran listening is combined with other activities and merely is looked as a separate skill needs to be taught. As Mendelsohn (1984) mentioned, developing listening comprehension through "osmosis" is not adequate. For being succesful listeners, learners must be taught to strategically engage in listening process. According to Sioson (2011) when learners apply more metacognitive strategies, their level of communication apprehension, fear, and anxiety will be decreased. This might be due to the fact that metacognitive strategies are linked with goal setting and monitoring of learning process, which might reduce the anxiety level in learners. Therefore, Lack of strategies or inappropriate strategies in listening comprehension process as affective constraints can considerably increase one's degree of listening anxiety.

### **Lack of Time to Process**

Lack of time to process was another factor that was highlighted by the participants of the study as having an impact on their level of listening anxiety.

The traditional approach to listening comprehension practice which input is presented only once or twice was one of the sources of frustration among participants of the study. Such feeling was considerably more significant in a testing context while the students must interpret the question first and come up with, or choose, the correct answer. As Vogely (1998) explained this anxiety can be related to the "two strikes and you're out" approach to listening comprehension activities.

Some participants reported being anxious only because they are under test condition instead of listening activities where they do not have opportunity to replay the input as much as they need. Similarly in a condition where a question is read aloud and they

are not able to rewind it, they also feel anxious. Such nervousness may be due to fact that they require processing the linguistic elements and remembering input simultaneously, which seems to be a demanding task for untrained listener.

The finding is in line with Chang et al.'s (1993) and Teng's (1998) results that repeated input enhances the learners' comprehension and reduces their anxiety. While as Vogely (1998) asserted in listening tasks, learners are faced with spontaneous and instantaneous input, therefore the opportunity for processing the information is transitory. Hence the nature of listening process by itself can elevate anxiety in listeners.

### **Nature of speech**

Another important factors causing listening anxiety among the participants of the study is the nature of speech. The majority of the participants (11 out of 15) in this study complained about the speed of input. They believe that their anxiety alleviate if the input is presented in a lower speed rate. The finding is in line with the point of view of Derwing & Munro (2001) and Jensen & Vinther (2003) which believe that some specific aspects of the listening task, such as speech rate can influence performance in listening tasks. In a qualitative study conducted by Vogely (1998) almost one-third of the participants in her study reported the nature of speech as a source of anxiety.

It is inferred that for many learners who experience anxiety in listening tasks normal speed seems to be fast, and they are not able to catch up with strings of words that strike their ears, and therefore they feel anxious. Another factor related to the nature of speech that causes listening anxiety in the participants of the study is facing with the inputs that are presented in accents which they are not familiar with them. Understanding the listening materials that are pronounced in the accent which they are not exposed with it frequently seems to be a hard task for them. It is an indication that authenticity genuinely has an impact listening anxiety. Learners are accustomed to a type of mother ease used by their instructors in EFL context. Therefore, comprehending the authentic materials with normal speech rate and different pronunciation constitute a difficult task which contributes to learners' level of anxiety.

### **Level of Difficulty**

Through the interview with participants it is revealed that students generally feel anxious when they find the level of listening materials difficult. The participants associated the level of difficulty of listening input mainly to the use of unfamiliar vocabulary or complicated syntax, the use of unfamiliar idioms and expressions and facing with the texts with unfamiliar topics.

It seems that in these situations students are not able to cope with the difficulties listening imposes and they cannot tolerate ambiguities in listening comprehension process. Therefore they lose their concentration which may elevate their anxiety. This conforms Vogely's argue (1998) that the difficulty in listening comprehension is to some extent due to the structural component of the input. Some listeners may believe that comprehension exclusively resides within those vocabularies and structures that they are not familiar with. Therefore they require great amounts of vocabularies and grammatical knowledge. These listeners have difficulty in comprehending the text and they are engaged in unlocking the meaning of these structures

instead of inferring the meaning from the context. They are likely to miss key words integral to the understanding of the input. This would lead them to experience nervousness and anxiety during listening comprehension activities.

To decrease anxiety over new vocabulary, a list of new vocabulary with phonetic symbols can be presented by teachers before listening tasks to familiarize listeners with the new vocabulary. Although vocabulary list recently is falling out of favour among FL instructors, it seems to be a beneficial method for initial exposure to new vocabularies (Schmitt and Schmitt, 1995). However as Lund (1990) mentioned the issue of text difficulty that is the nature of authentic texts itself can have an impact on listeners' comprehension.

### **Environment**

Another factor interview respondents emphasised as contributing to their level of listening anxiety is the environment and classroom atmosphere. The respondents believe that the classroom atmosphere can either elevate or decrease their anxiety. Language learners feel less anxious in an environment which is friendly enough so that they feel comfortable and relaxed. However, creating such an atmosphere is primarily the teacher's responsibility that needs to be very deliberate in making a classroom an inviting place with the minimum stress. It goes without saying that a vibrant, stress-free learning situation can make a classroom less threatening for the students and a more effective and encouraging environment, which can lead to optimized educational achievements.

Respondents reported that noisy and crowded classes, distractors, the quality of audio materials and temperature of the class influence their level of anxiety and interfered with listening comprehension. In a stress-free environment, learners are able to build a better rapport with each other and with the instructor. In regard with a low-anxiety environment, Oxford and Shearin (1994) mentioned that the environment of listening classroom should be positive and nonthreatening. He suggested that in order to reduce anxiety before or during listening activities, using some strategies including deep breathing, listening to some relaxing music and positive affirmation can be effective. Young (1991) also emphasizes the need of creating a learner-centered, low-anxiety classroom environment.

### **Peers**

Another important factor that was identified as having an influence on the learners' degree of listening anxiety is the role of the interlocutor. In this regard, several features of the peers were raised by the interviewees of the study. The gender of the peer was shown to have an impact on the level of the participants' listening anxiety. During the interviews, of the seven respondents, three argued that they feel more comfortable with a person of the same sex in listening classes since they can interact more comfortably and understand each other better. However, two of the individuals, express having less listening anxiety with the opposite sex.

This can be explained by the fact that the presence of an interlocutor from an opposite gender for some learners is beneficial since it pushes them to be more careful with comprehending the input one makes while for some other

individuals the existence of opposite sex can be distractive and elevate their listening anxiety.

Another factor related to the effect of peers on the participants' level of listening anxiety was the risk of making errors in listening comprehension in front of other classmates. The participants in Jamshidnejad's (2010) study also reported that they are over-concerned about making mistakes and being negatively evaluated by other classmates. In the context where the study was carried out, keeping one's face has a great value for the individuals. The fear of making mistakes enhances the chance of losing one's face which is anxiety-provoking.

Being competitive with peers was another factor affecting the level of anxiety among some of the participants. Some believed that their classmates increase their level of anxiety if they are performing better than them in the listening comprehension tasks. Indeed, these learners try to adjust the level of their understanding with the peers, and strive to be better than them.

The finding is in line with what Bailey's (1983) concluded through analysing the diaries of 11 learners that competitiveness can cause anxiety in learners. He found that learners have the tendency to outperform their peers to gain positive feedback from their instructor regarding their performance and competence. For other learners if they find themselves deficient in getting benefit out of such competitive setting, this negative cognitions might make serious blockage in their listening progress which leads to heightened awareness of their incapability and consequently to reticence when are required to perform their competence in listening comprehension.

### **Instructors**

The role of language instructor is another factor influencing the level of listening anxiety according to the interview respondents in this study. The respondents unanimously declare the fact that their instructor is a key figure that can make them feel more comfortable in doing listening tasks and decrease the level of their listening anxiety.

According to many participants one of the most stressful aspect of the listening class, directly is related to the instructors themselves. Participants believe that it is difficult to meet their teacher's expectation to comprehend difficult listening tasks. This is in line with Vogely (1998) that reported, students experience listening comprehension anxiety when teachers have unrealistic expectation and are critical when students do not respond correctly.

As Arnold (2000) suggested, FL instructors are advised not to use only those type of listening production methods that rely on correct answers that can distract learner's attention and increase the levels of anxiety. Instead of expecting only correct answers FL instructors should encourage learners to take risks and consider it as an essential learning process. This can help learners to reduce the anxiety over "losing face" which is a common concern in FL classrooms (Yan and Horwitz, 2008). Moreover, FL teachers by providing learners with encouragement and comfort can help them to build up confidence (Atasheneh and Izadi, 2012).

### **Lack of Practice**

One more influential factor worth noting is the amount of listening practice learners have in language classrooms. Most of the interview respondents attribute their listening anxiety to their lack of listening practice in language classroom, which is resultant from the lack of exposure to the authentic listening materials and instruction.

Previous research (Vogley, 1998 and graham, 2006) acknowledges lack of practice as a contributing factor to difficulties in listening comprehension for language learners. Several respondents stated that they are not guided in being prepared for listening tasks and enough attention is not paid in teaching listening comprehension skill. As Lee and Vanpatten (1995) suggested providing structured input exercise consists of steps to guide and focus learners' attention is beneficial for the learners. These type of activities decrease listening anxiety since the listeners are provided with reason and direction (Vogely, 1998).

## V. CONCLUSION

Findings of the study revealed factors that influence listening anxiety. The factors that were identified as having influence on listening anxiety are divided into three categories, i.e. individual factors, input factors and environmental factors as illustrated in the figure above. The individual factors include factors that refer to the individuals' characteristics and situation of learners and include nerves and emotionality, using inappropriate strategies and lack of practice. The environmental factors, on the other hand, include factors that exist in the classroom atmosphere and influence the learners' level of listening anxiety. These include instructors, peers and class environment. Input factors refer to characteristic of listening input including lack of time to process, lack of visual support, nature of speech and level of difficulty. It was shown that these factors have impact on learners' listening anxiety. Finally, when a higher level of listening anxiety is observed among language learners, students tend to have lower performance in listening tasks.

## Appendix A

### Listening Comprehension Anxiety and Factors Affecting it

- To what extent do you feel anxious and stressed while you are doing listening comprehension activities?
- Can you give me some examples of the situations in which you are most anxious/least anxious in listening comprehension tasks?
- In your opinion, why do some students experience anxiety in doing listening tasks? What factors do you think are at work?
- What is the role of the teacher in this issue? What can your teacher do to make students less anxious in listening tasks?
- How about the topic you are listening to? What kind of topics are you more comfortable to listen to?
- Who/What do you usually prefer to listen to?
- In which environment you feel less anxious for doing listening tasks?
- What makes listening tasks difficult for you?
- In which situations you are less anxious and perform better listening comprehension?

## Appendix B

### Sample Interview Coding

The codes are mentioned in parentheses.

"I get a lot of stress when I know I have to answer the follow up questions right away after listening to a text and my teacher doesn't give me enough time to me think about what I heard."(Lack of time to process)

"I always feel more comfortable with those listening materials which have British pronunciation. I guess it is more understandable for me...listening to the other accent make me confused cause sometimes the same word I already know sounds completely different. "(Nature of speech)

"I know, I am familiar with a lot of spoken vocabulary, but when they are mixed together in long sentences, then I can't easily separate the vocabulary from each other and I lose track of listening. "(Level of difficulty)

"Imagining myself listening over the phone to English make me anxious and I feel I am not able to understand what is said and then I cannot answer to it properly, I guess it is really difficult."(Lack of visual support)

"The most important factor to increase my anxiety is my teacher. Some teacher just wants to see you making mistakes and I feel silly when she says you should have listened more carefully."(Instructor)

" Most of the time my classmates refer to me to check the answer of listening comprehension question with me. It makes me feel good about myself and I try to be prepared and alert for the tasks." (Peers)

"I believe in our classes most of attention is into teaching grammar and listening is not that much practiced. That's why I feel uncomfortable and anxious encountering listening exercises."(Lack of practice)

"If the room is too hot I get nervous and sweaty I guess I don't want to think about how hot it is when I am already try to listen to something and understand it, and it makes me uncomfortable."(Environment)

"Most of the time when my teacher is talking I have this feeling that I hear the wrong thing and think she is talking about something different and I don't get her right properly."(Inappropriate strategies)

"I don't think my listening level is as high as other skills. Normally I get lower scores and by default when I am doing a listening task I do not expect to perform very well. I have no confidence in doing well in listening, sometimes I feel very bad when I realize the input meant nothing to me but a string of unrecognizable sounds."(Nerves and emotionality)

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#### AUTHORS

**First Author** – Samaneh Serraj, PhD in TESL,  
Sama.oct@yahoo.com

# Protest and the Media in Iraq: Introduction, the progress, the protest

Ahmed J. Bahiya

De Montfort Univeristy.UK

**Abstract-** The Iraqi media industry has witnessed a significant change after the American led invasion in 2003. This period is considered to be a major period of transformation in Iraq media history, as it moved from a completely restricted form of media coverage to one of the most open media sectors in the Middle East. After the fall of Saddam Hussein regime Iraqi media sector witnessed the emergence of 'free-for-all media' and a significant number of media productions released as a mouthpieces of various 'political, religious, or ethnic groups'. This new form of media played an important role in serving as a communication tool of the Iraqi population as a whole. However, that role has been affected by sectarian agendas and the domination of media ownership. The new media landscape has developed in an era of domination, based on the presence of new controlling forms, including ethno-sectarian, political, Islamic, and independent factions, as well as the appearance of media personas. The emergence of this new media affected significantly the way that issues were dealt with in the country, especially the wave of protests that spread across Iraq. The aim of this paper is to shed light on the media role in covering and dealing with the protests happened in the country. Additionally, it shows the role that social media sites played sustaining such protests.

**Index Terms-** Media industry in Iraq, changes, traditional media, Social media, protests.

## I. INTRODUCTION

In recent years, Iraqi media landscape witnessed a significant development since the end of the draconian control by the Ba'ath party in 2003. Media components start to serve as an Iraqi population voice to deliver their own social, economic and political problems. Media sector has been considered as a mirror to reflect the view of the real situations that Iraqi people face in their daily life. A number of Iraqi media channels have played a challenging role particularly in facing the shortcomings of the Iraqi government by addressing various issues such as corruption, services shortcomings, poverty, and unemployment as well as calling for governmental reform. At the same time, several channels have broadcasted entertainment programs as an outlet for many Iraqi people. Indeed, it is important to state that such media diversity has impacted positively since 2003. In spite of the fact that the Iraqi media landscape has currently reached an era of incredible evolution, unfortunately a new domination form has been emerged. This kind of domination was directed by an ethno-sectarian, political, Islamic, and independent factions, as well as media characters. All means of communication have been owned either by Arab Sunni, Arab Shi'a parties, Iraqi

Kurdish or Turkmen groups. Such groups dominate the most media outlet such as TV channels, radio stations and prints. The main stream of such media production is mainly used to disseminate its owner's agendas and ideologies. This form of manipulated media has massively participated in the crisis of sectarianism and fragmentation of the Iraqi population. Serving particular agendas and reflecting certain ideologies might be the clear objective in recent Iraq's media outlet. It seems that the new controlling process of the media sector in Iraq consist of certain implications which have imposed new restrictions on media activities. Nevertheless, the neutral independent media also has been presented in the Iraqi media industry. Such type of mass media form could be described as non-affiliated ones. The main characteristic of this type of media is the lack of the governmental funds and physical protection provided by political factions. Hence, it might be worth to declare that the new Iraqi media has shaped for the Iraqi population their own type of media.

## II. IRAQI MEDIA PRE AND POST 2003

### A-Iraqi media Scene before 2003: brief overview

Until 2003, the media state in Iraq was tightly controlled by the Ba'ath Party and Saddam Hussein's Iron government. In 1968, the Ba'ath Party detained power in Iraq and Saddam Hussein seized the presidency through it in 1979 (Ewad and Eton, 2013). Since that period and over 35 years Sadam's rule the flow of information was controlled and the media in Iraq constructed to serve the government agendas. Iraqi media agencies were all owned by the government and run through the Ministry of Information who allowed the Ba'ath party to direct media production in Iraq by directing and supervising daily press releases and broadcasting programs. There was only one main TV channel named Iraqi TV, which was mainly directed to broadcast patriotic songs and government news (mastersofmedia, 2012). Another TV channel called "Al-shabab TV" was owned by Sadam Hussein eldest son Uday Saddam (mastersofmedia, 2012). Also the oppressive domination of media sector extended when the Uday Saddam has been chosen to lead the Iraqi Journalists Union In the early 1990s (Isakhan 2009; Bengio 2004: 111; Daragahi 2003: 47; Bengio 1998: 8).. In addition, radio operation and daily newspapers production were also censored by Ba'ath faction. There was only five newspapers and four radio stations (Amos, 2010). According to the International Alliance for Justice (as cited in: Daragahi, 2003; 46) Ba'th rule executed and detained more than 500 Iraqi journalists and writers. Ofra Bengio has described the mediascape as 'an omnipotent propaganda machine (which) played the role of the

Ba'ath regime watchdog, thus contributing to its survival and longevity' (Bengio 2004:109-110). Iraq witnessed several wars and being under sanctions for thirteen years which negatively impacted people's life and Iraq became a completely isolated from the outside world. The key objective of media production at that time was nothing than serving government interests. The Media policy and information release process adopted by Baathist regime was vindictive and psychologically influenced life in Iraq (Ewad and Eton, 2013). Iraqis concluded that the media system was nothing more than being as a mouthpiece of Saddam Hussein government. President speeches, wars' scenes and patriotic songs were the key production of the media establishments during his rule. At the time people around the world were enjoying the advent of the internet as a new vehicle of communication, Iraqis were prevented from using that new technology. The information access was limited and very few people were able to use internet. Furthermore, Saddam Hussein's government banned the use of Satellite receivers. The Population as well as elite personas was even not allowed to install or use it. However few people were challenging such restrictions and taking the risk by installing satellite receivers and dishes. It's worth saying that the restrictions of media sector at that era was extensive and the Laws legislated were widely controlled free expression. The Media environment was neither independent nor isolated from the government rules. At The end of the Ba'ath's regime the media framework in Iraq bloomed and new era of communication emerged.

### III. B-IRAQI MEDIA SCENE AFTER 2003: BRIEF OVERVIEW

The toppling of Saddam Hussein at the hand of the coalition forces in 2003 war, aided the Iraqi media environment to transform completely from being a tightly censored media environment by Saddam's regime into one of the most uncontrolled media landscapes in the Middle East (Amos, 2010). Iraqis are exposed to national TV media and Iraqi TV channels were an important source of information than any other means including radio, newspapers and the internet. Furthermore, the use of satellite receivers and dishes has been allowed and the people flocked to the local markets to purchase Satellite receivers and dishes despite of its high cost. They were eager to be connected to the outside world through more than 300 channel satellite channels (Isakhan 2009; Cochrane 2006; Price 2003). Hence, the restriction imposed by the Ba'ath regime on media productions vanished and new bloom era of Iraqi media emerged. On 21st April 2003, the Coalition Provisional Authority (CPA) substituted Saddam Hussein's Ministry of Information by the Iraqi Media Network (IMN) which was responsible for censoring new media productions (Rugh 2004: 116, cited in Isakhan 2009). Iraqi media network (IMN) has been considered as one of the significant stages in the development of media environment in Iraq. The CPA or Iraqi government did not fund the whole Iraq's TV channels, radio stations and printed media. A new media landscape had been placed in Iraq in which many Radio stations, printed media and TV channels existed in the country as well as the public debates and criticisms of nation issues had started. By mid-2003, media production in Iraq changed in which More than 20 radio stations, nearly 200 newspaper and 15-17 TV channel Aired. Additionally, it can be

noted that even smaller regions' centers like Najaf center released more than 30 newspapers (Isakhan 2009; Radio Netherland 2003f; Finer 2005; BBC News 2005d; Whitaker 2003; Gerth 2005; Zanger 2005:107). In spite the fact that Iraq turned to be an open country and the new media communication and free expression became available and Iraqi media platforms have been expanded significantly, after extensive control of Saddam's regime, which marked as a positive change in media sector. However, a new era of manipulation appeared and media outlets have been controlled by powerful political, religious and ethnic factions as well as business figures, which have employed the new Iraqi media platforms such as TV channels, radio stations and newspaper to promote their own agendas and ideologies (Price et al, 2007). The vast majority of media establishments have been funded by those factions. Actually, the variety of ethno – religious and class positions in Iraqi population have established a complex political and social situation in the country, which in turn extensively affected the media outlets.

### IV. OWNERSHIP OF IRAQI MEDIA BROADCAST AFTER 2003

The media in Iraq was governed by new indirect controllers under the process of ownership and funding. Such new controllers varied between ethnic and religious groups as Rugh stated "Nearly half identified themselves as official organs of political or religious groups" (Rugh, 2006). This has enlarged the sectarian diversity among the Iraqi community and became obvious through the different types of media outlets. Price et al.,(2007), mentioned that 'Ethnic factions among the Arabs, Kurds and Turkmens, and religious-sectarian factions among the Sunni, Shi'a and Christians all have their own means of communication to their ethno-sectarian constituencies in Iraq and abroad in the Iraqi diaspora'. There are no neutral outlets and "Iraq's media landscape had become a mirror of Iraq's political-sectarian divisions" (Amos, 2010). Therefore, it might classify the new Iraq's media into the following groups as AL-Marashi identify it : (1) Iraqi state media (2) Political Islamist groups (religious/sectarian factions) media, (3) Ethnic political parties' media (4) Anti-state media, and finally (5) Independent Media (AL-Marashi, 2006). Certain channels might be identified in order to represent each of the above mentioned categories, for instance:

1. Iraqi state media (AL Iraqi a TV channel terrestrial TV channel, two radio stations, and the Al-Sabah newspaper)
2. Political Islamist groups (religious/sectarian factions) media
  - A- Arab Shi'a Media (Al-Furat satellite channel)
  - B- Arab Sunni Media (Rafidayn Channel and the Baghdad Satellite Channel)
3. Ethnic political parties' media ((PUK) satellite channel KurdSat)
4. Anti-state media (Al Zawraa Satellite Channel)
5. Independent Media (Al-Baghdadiyya, Al-Diyar, Al-Fayha, Al-Sharqiyya and Al-Sumariyya).



## V. TRADITIONAL IRAQI MEDIA PRACTICE AND PROTESTS

The Categorization of the Iraqi media industry have played an important role in effecting the way that media outlets dealt with the events and protests occurred in different parts of Iraq. Iraq's media failed to offer neutral media. Traditional media platforms such as TV channels, radio stations, and newspapers mainly linked to the Ethnic factions, religious-sectarian factions, and the Iraqi government as well as political parties in Iraq. Price reported that "Ethno-sectarian 'media empires' have formed in Iraq and are quite a pervasive element in the Iraq's Fourth Estate" (Price et al, 2007). This variation of the Iraqi media can be clearly noted through the way that the Iraqi media tackled protests happened in the country after the Arab spring events in 2011. In that period, the Anti-Maliki government protests, launched in 2011, classified the media actions in accordance with the way they reported such demonstrations. On February 12-2011 many Iraqi people from different positions grouped in Tahrir Square, shouted "No, no to corruption," "The government are thieves" and "Baghdad, Baghdad, spark a revolution"(Sly, 2011). Another one has been scheduled on Feb. 25 in the same square and it titled "Revolution of Iraqi Rage" (Sly, 2011). Iraqi people continued their demonstrations all over the country; calling on the government to address their needs. The non-neutral position that media outlets shows regarding the news of the protests revealed its own belonging and ownership. Beehner stated that "The majority of Iraqi newspapers are funded by governmental advertisements." (Beehner.2006). The State media tried to downplay the effect of such demonstrations by controlling media outlets. Journalists and live media coverage were prevented by Iraqi government from covering the event of protests in an attempt to tone down their importance (AL-Rawi, 2014). Additionally the independent satellite channels prohibited from acting freely. So that, the emphasis or amount of coverage given to protests could show clearly the biased position of media outlets at that time. In spite of the fact that the Iraqi media has been revolutionized since the American invasion in 2003, the traditional media outlets in Iraq is highly directed and if you need to have a full picture of the daily events it might be advisable to watch different Media productions and news channels.

## VI. INTERNET AND SOCIAL MEDIA USE IN IRAQ

Recently, Internet platforms are considered to be as one of the most important ways of interactions and free expression. The number of internet and social media sites as a means of communication, have raised significantly (Abedalla et al. 2014). Iraq was not isolated from using this new communication technology which was also presented during Saddam Hussein's regime, but it was limited and controlled. Rashid (2012) indicated that, although the existence of the Internet was found in Iraq before the American invasion in 2003, it was hardly accessible by the public and very limited as it was considered as a threat for the state. After the American invasion in 2003 and the overthrow of Saddam Hussein's rule, internet witnessed a significant change and expanded dramatically as the number of the internet users increased noticeably (Arab IP Centre, 2014). This was due to the improvement in the economic situation in Iraq. According to the global scale, Iraq has been ranked as 126th

in home Internet access among other countries (CIA, 2014). Iraqi people started enjoying the use of this facility and connect to the virtual world, interacting and reflecting different views including: political, social, economic and ethical views.

Iraqi people have been mainly using internet as means of communication, basically through its various applications such as yahoo Messenger and Skype. Viper and Skype are considered among the most popular apps used in Iraqis nowadays (Rashid, 2012). The number of computer mediated communication (CMC) users risen dramatically especially with the arrival of social media networks such as Facebook, twitter and YouTube. According to (Alexa, 2013), Facebook and YouTube are considered among the most popular social media sites in Iraq respectively. Iraqi citizens were eager to use open and transparent means of communications to discuss various issues as they remain suspicious of owned and sponsored media. Recently, Social media has witnessed a substantial improvement with increased rate of internet hosts which reached 26 (CIA, 2014). In spite of Iraqis internet using is ranked low, the Facebook users reached to 2.3 million users (Rashid, 2012). The use of Internet and social media played a vital role in Iraq, as it participated greatly in developing the media environment. However, there are still some fears that the social media in Iraq might follow Iraq's traditional media footsteps.

## VII. THE ROLE OF SOCIAL MEDIA IN PROMOTING PROTESTS AND DISSENTS

The Information technology has positively impacted Iraq and people have joined the global trends by interacting positively through this new technology. Social network sites were among the most important venues which attracted many Iraqis who were aware of the events that happened in the Arab world. During the Arab Spring, Iraqis were not isolated from the events happened in most of other Arab countries such as Yemen, Egypt, Libya, Morocco, Jordan, Syria, Bahrain, Oman, and Saudi Arabia. Events accrued there had prepared for and launched by using social media sites such as Facebook and Twitter. The effect of Arab world events mainly impacted the Iraqi people who they started voice their dissatisfaction with the government and calling on it to address their needs and daily difficulties faced by the average citizens. Iraqis decided to publicly display their disagreements with their governments by leading dozens of protests that began on February 12, 2011 (AL-Rawi, 2014). During the protests, Iraqi Government adopted several tactics to blackout the news of the protests in an attempt to control the situation and downplaying the importance of these protests. Government banned live media coverage and prevented journalists from covering the events. Despite the measures used by the government, thousands of Iraqis from all over the country protested against the state, and many of them used social media sites. A group of educated people from different positions and unemployed youth started to gather on Facebook and post their opinions and views as well as showing their concern regarding different issues. They started to use social media to disseminate the idea of revolution, plan and organize the protests against the government. Many protests swept in different parts of the country and activists used social media platforms as an alternative media channels to promote and post their views and

share the events despite the governments' pressure and threats. Indeed, Social media played pivotal role in mobilizing protests, protesters relied heavily on the use of new media platform as they considered it a free and less control venues to express their opinions and share their ideas. Activist employed social media sites to unify public opinion, and enhance the public sphere by offering a virtual environment for the exchange of views and sharing ideas. Many Facebook pages invented such as "Iraqi revolution" and "The Revolution of Rage" which carried different banners written in Arabic like "We don't ask for skyscrapers . . . We want you to fix the sewage," or "Congratulations! Prize for World Class Corruption" (AL-Rawi 2014). It's important to state that the Iraq's spring lacked the attention of Western media due to the effect of ongoing ethno-sectarian violence in the country, which in turn overshadowed the calls which demanded for social and political reforms.

### VIII. CONCLUSION

The Iraqi media environment has changed radically after the US-led invasion of Iraq in 2003. Iraqis have various outlets in which hundreds of newspapers and tens of radio stations and TV channels were produced. These outlets have enabled them to express their views, requirements, complaints and frustrations. Number of new media productions in Iraq particularly the ones that characterized of being independent have played their fourth estate role by challenging the government for its shortcomings. All of these changes and developments are considered as positive indications for the future of Iraq's media. However, one emergent problem that happened following these initiatives and developments was that new media domination and ownership. The new media landscape has developed in an era of domination, based on the evolving of this new controlling form. The existence of different ethno, religious factions and groups has widely impacted the media sphere in Iraq. Those factions and groups own various media outlets such as newspapers, radio stations and satellite TV stations, which represent the most widely consumed media in Iraq. Thus, Iraq's media are increasingly divided along ethno-sectarian lines. The emergence of this new ethno-sectarian media affected significantly the way that issues were dealt with in the country, especially the wave of protests that spread across Iraq. In order to have the best practices for the Iraqi media, the researcher recommend that the Iraqi government should encourage finding independent media. Media outlets have not to be biased and Iraqi media establishments should have well-organized strategies to improve the quality of their work. This in fact will enable them to find more powerful and effective media production.

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AUTHORS

**First Author** – Bahiya .A – DeMontfort University-  
LEICESTER - Ahmed.albahiya@gmail.com

**Correspondence Author** – Bahiya.A,  
Ahmed.albahiya@gmail.com

# Water Pollution Sources for Hand-Dug Wells (HDW) in the Ancient City of Bauchi Metropolis, Nigeria

Muhammad Adamu Isah<sup>1</sup>, Muhammad Ali Chiroma<sup>2</sup>, Adamu Isa Harir<sup>3</sup> Bala Ishiyaku<sup>4</sup>

<sup>2,3,4</sup>Faculty of Environmental Technology  
<sup>1</sup>Faculty of Engineering and Engineering Technology

**Abstract-** This study pursued a recommendation to search for the sources of water pollution in the hand dug wells (HDW) from Hardo ward a high density residential area in the ancient traditional city of Bauchi metropolis, Nigeria. Secondary data on pollution by Coli form concentration in water from HDW in Hardo ward was used as the dependent variable (Y) while primary data was collected on four parameters as potential sources of water pollution: the depth of the well; type of well; setback distances between HDW and pit latrines, setback distances between HDW and unlined water drainage channels served as independent variables (IV) = X1, X2, X3 and X4 respectively. The data were subjected to both standard and hierarchical/sequential multiple regression analysis (MRA) using the SPSS 20.0 software to determine the significant sources of water pollution in the study area. The results were presented in coefficients tables, and figures. The standard multiple regression showed a highly significant positive correlation at  $R^2 = 0.758$  (adjusted  $R^2 0.693$ ) implying that the level of pollution in the HDW is directly affected by the combined effect of the four independent variables. However, when each independent variable was controlled, in the hierarchical multiple regressions, the model indicated only distance from pit latrine (X2) had a significant impact on water pollution by Coliform and with the highest correlation. The study recommended the use of community boreholes for water supply in the area and educating the residents on the need for proper treatment of water before drinking, as well as measures to achieve standards of construction and the setback standards of locations of HDWs from all the pollution sources in general.

**Index Terms-** sources of water pollution; Hand dug wells; Coli form pollution; Ancient Traditional city

## I. INTRODUCTION

The study area is Hardo Ward, a high density, low income residential area located within the ancient traditional city of Bauchi Metropolis in the north east Nigeria. Hardo Ward has about 42.47 hectares of land occupied by about 15,736 populations (NPC, 2006 in [1]). The area is mostly inhabited by the native people and hand dug wells (HDW) are the most common sources of water for drinking and domestic purposes and most of the houses use a pit latrine for sewage disposal. The area is an organic settlement where the layout is unplanned and the houses are not built to modern design standards. Furthermore, the area is lacking in adequate portable water supply, paved/lined surface water drainage channels and solid waste disposal facilities. In the study area most of the HDW are poorly constructed (Figure 1) and many are very shallow in depth and also are located close to pit latrines (Table 1).

The quality of water for drinking or any domestic use is of a great concern to public health. Poor water quality can cause a disease outbreak, which contributes to the rates of ill health conditions of any community. However, water quality in a HDW is both a factor of natural and human interaction. Adediji & Ajibade [2] showed the effect on refuse dump sites, toilets and soak away with the water quality of HDW. Many studies [3; 4; 5] have also cited the need to monitor groundwater quality including water from HDW. Furthermore, a study by [6] concluded that water from HDW in Hardo ward, is unsafe for drinking due to pollution and recommended a further research to determine the sources of the pollution. This study therefore is to determine the sources of water pollution in Hardo ward the study area.



**Figure 1: Hand dug wells in Hardo ward.  
Sources of water pollution in hand dug wells (HDW)**

The quality of groundwater is a function of either natural or human factors or an interaction of both. These factors can determine the groundwater quality [7]. Although, groundwater

aquifers are sources of quality water due to the purifying effect of the soil layers [7], however, water from an HDW is very liable to several sources of pollution due to human activities. In

Nigeria, many studies [8; 9; 10 11 and 12] have revealed the pollution of water wells by the sources of human activities such as poor management of waste; location of water wells near pit latrines and soak-away system, or near unlined drainage channels. Amadi et al., [13] concluded from a study that human activities are the most possible source of water contamination by heavy metals properties in the water from hand dug wells near Kaduna refinery and petrochemical company in Kaduna town, Nigeria. In many developing countries the disposal of solid wastes into open dump sites creates pollution of groundwater by contamination through leachate [14]; and in the southwest Nigeria, [15] has established the contamination of wells sited close to solid wastes dump sites. Similarly, [16; 17 and 18] have also observed the pollution effects of refuse dump sites, pit latrines and soak away systems on the water quality from HDW. Ariziki [19] and [20] variously observed from their studies in Samaru village of Zaria metropolis, Nigeria that polluted water from HDW were due to poor standards of distance, separation between the location of such wells and land uses and also poor construction standards of the wells. Iguisi et al. (2001) in [21] have routed the sources of water pollutants to the high decomposing solid wastes dump sites in various locations of human activities within the catchment area of the Kubanni river dam in Zaria, Nigeria.

Surface runoff is another factor of water pollution in shallow wells. According to Strahler & Strahler [22], storm water from rainfall can transport contaminants from the atmosphere and from the land surfaces into groundwater aquifers. Similarly, [23; 24; 25] have observed water pollution incidences from surface runoff. Pollutants are also transported through surface runoff into hand-dug wells through percolation, where water wells have no concrete wall casing, especially where the mouth of the well is not sufficiently raised above the ground surface as in Figure 1c.

Studies have also shown that the depth of HDW is another important factor of groundwater pollution because of the natural filtration process of water by the soil layers and its purifying effects on groundwater quality. However, the depth has minimal pollution reduction effect on hand dug wells when water table or flood plains are at shallow aquifer. A study by [26] found that the longer polluted water passes through the soil layers the cleaner it becomes. Iserman [27] and [28] observed that shallow wells at depths less than 15 meters are very liable to contamination. Similarly, [29] studied faecal contamination from 24 wells in Abeokuta Town Nigeria and discovered an increasing water quality as the depth of the wells increases. Agbede & Akpen [30] studied water quality from 10 wells in Makurdi Town, Nigeria and found that the flood plains were shallow between 1.82 and 7.43 meters deep and all the water samples were polluted either with faecal bacteria or non-faecal bacteria. In other studies, [31] and [32] revealed in Ilorin city, Nigeria that effluents from slaughtering slab houses increases groundwater pollution within the immediate vicinity, but the level of concentrations in the parameters of water pollution decrease with depth of water table and depth of the wells.

The type of construction standard is also a factor of water quality from HDW. A standard constructed water well should have a concrete side wall from the bottom extending above the ground surface to a height 0.5-1.0 meter and also have a good

cover, as shown in Figure 1a. These are necessary protections to prevent ground water leachate into the wells and also to prevent any contaminant being deposited into the water wells by agents such as the surface water runoff or wind erosion and any human activities. Therefore, based on the construction standard [34] has classified water wells into three categories: Protected (P) and Unprotected (UP) as wells with the complete presence of protection and wells with the total absence of protection respectively, while Semi-Protected (SP) as wells with incomplete protection (Figure 1).

The standard of location and distance separation setback of a well and possible sources of pollution also affects water quality in HDW. A water well is to be located at the highest elevation possible on the site to achieve optimum surface drainage. Generally, a well located downhill of pollution source has a greater risk of contamination than a well located uphill of pollution sources. In addition, it is required that hand dug wells should be located away from drainage systems, surface water ponds, a pit latrine, a septic tank and soak away systems to prevent pollution. A minimum of 15 to 30 meters distance setback between an HDW and all potential sources of contamination is the benchmark standard set by the Nigerian Standard of Drinking Water Quality [35]. Similarly, [36] recommends that a well should be at least 15.24m and 30.5m away from a septic tank and a septic system drain field. The major purpose of the setback isolation distances is to protect water wells from pathogen contamination by ensuring sufficient time for the pathogen attenuation. Therefore, hand dug wells should be located on the highest gradient while maintaining the setback standard isolation distance from any sources of contamination. This implies that both the location and the setback standards will normally act collectively to maintain the safety of water from HDW for drinking and other domestic purposes.

## II. METHODOLOGY OF THE STUDY

Previous data on the Coli form concentrations in water from HDW in Hardo ward by [6] were used as the dependent variable (DV), while the primary data collected on four parameters, namely: the depth of the well; construction standard of HDW i.e. Type of well or construction category (protected, semi-protected and unprotected); setback distances between HDW and pit latrines, setback distances between HDW and unlined waste water drainage channels were used as the independent variables (IV), represented by X1, X2, X3, and X4, respectively. The data were subjected to both standard and hierarchical multiple regression analysis (HMRA) model using SPSS 20.0 software. The MRA model was used to determine the interrelationships between the IV as sources of pollution and pollution by coil form in HDW as the DV.

Data on conditions of Hand dug wells (HDW) in Hardo ward

The data collected through field survey on the conditions of hand dug wells in hardo ward are presented below:

(i) Construction standards of HDW: The data on construction standards of HDW in the study area revealed that the majority (70%) of HDW is semi-protected while another (25%) are unprotected and only 1 well (5%) is protected (Table 1 and Figure 1).

(ii) Setback distances: The data on the setback distance between the locations of HDW from pit latrines (in Table 1) show a range of 4.20 to 8.50 meters with a mean of 6.05 meters. The setback distances between HDW and unpaved surface water drainages also range from 0.50 to 8 meters with a mean 3.65 meters. The setback in the study area is all well below 15 meters, the minimum separation distance to protect water wells from pathogens of coli form contamination from pit latrines and also

polluted waste water runoff from unpaved drainages in the study area.

(iii) Depth of HDW: The depth of HDW in the study area (in Table 1) showed a range from 3.05 to 5.33 meters with a mean of 3.62 meters. This also showed that all the sampled HDW in the study is below the 15 meters, minimum recommended depth of quality water.

**Table 1: Parameters of water pollution sources from Hand Dug Wells in the study area.**

Samples HDW	*Pollution Level [DV=Y]	Depth of HWD (m) [IV=X1]	Type of HDW [IV=X2]	Distance from Pit Latrine [IV=X3]	Distance from Drainage [IV=X4]	Position Longitude °E	Position Latitude °N
HDW1	35	3.810	SP	4.4	2	9.84111	10.31510
HDW2	17	3.048	SP	6.2	3	9.84122	10.31536
HDW3	95	4.572	SP	4.2	2	9.84148	10.31348
HDW4	21	3.048	SP	5.0	0.5	9.84275	10.31316
HDW5	82	3.810	SP	4.2	1	9.84219	10.31541
HDW6	22	3.810	SP	7.1	5.5	9.84117	10.31533
HDW7	71	3.048	SP	4.4	6	9.84165	10.31536
HDW8	42	3.048	UP	6.2	8	9.84129	10.31532
HDW9	18	3.048	SP	7.6	4.5	9.83861	10.31644
HDW10	65	5.334	SP	4.6	5	9.83629	10.31701
HDW11	42	3.048	SP	5.4	2	9.83904	10.31644
HDW12	61	3.810	SP	5.1	3	9.84102	10.31549
HDW13	4	4.572	P	8.4	5	9.84121	10.31721
HDW14	56	3.048	UP	5.3	3.5	9.84128	10.31655
HDW15	9	3.048	UP	8.5	6	9.84114	10.31642
HDW16	12	3.810	SP	8.1	7	9.84100	10.31527
HDW17	34	3.048	UP	6.5	3	9.84108	10.31551
HDW18	7	3.810	SP	7.1	3	9.84123	10.31541
HDW19	28	3.048	UP	6.7	2	9.83970	10.31810
HDW20	16	4.572	SP	6.1	1	9.84155	10.31642
MEAN	36.85	3.6195		6.05	3.65		

Source: \*Isah, et al. (2015) and Field survey, (2014)

III. DATA ANALYSIS AND RESULTS

1. Standard multiple regression analysis (SMRA) was carried out based on the four characteristics of each of the twenty (20) HDW in Hardo ward. The depth of the well; type of well; distance from pit latrine; and the distance from the unlined drainage channel were analysed as the independent variables labelled X1, X2, X3, and X4, respectively. This is to establish their relationship with the level of pollution in the well (dependent variable labelled Y). Tables 2a and 2b give the results of the correlation between the level of pollution (Y) and the four independent variables (X1- X4) simultaneously expressed as:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 \quad *$$

[Equation 1]

Where: Y = level of pollution, a= constant, b= regression coefficients,

X1 = the depth of well, X2=type of well (protected, semi-protected and unprotected), X3 =distance from pit latrine, and X4 = distance from unlined drainage channel [37 and 38].

Results for standard multiple regression analysis (SMRA):

In the model summary (Table 2a) the coefficient of determination or R<sup>2</sup> of 0.758 is high, however the adjusted R<sup>2</sup> = is 0.693, is used due to small samples of N<50 [39]. This means that 69.3% of the level of pollution in the HDW is explained by these four independent variables (depth of, well, the type of well, distance from Pit latrine and distance from the unlined drainage channel.

**Table 2a: Standard Multiple Regression Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.871a	0.758	0.693	14.756	0.758	11.739	4a	15	0.000

- a. Predictors: (Constant), Depth of Well, Type of Well, Distance from Pit latrine, Distance from unlined Drainage
- b. Dependent Variable: Pollution

The R<sup>2</sup> value is positive, indicating a direct relationship where an increase in variable X, leads to an increase in variable Y. The strength of the relationship is further indicated by the significance, F Change (4,15) = 11.739 in Table 2b where the p value is 0.000, which is less than 0.5 (therefore: p < 0.5). Thus the model has given a strong positive relationship between the level of pollution and the combination of the four independent variables.

**Table 2b: ANOVAa**

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	10224.319	4	2556.080	11.739	.000b
Residual	3266.231	15	217.749		
Total	13490.550	19			

- a. Dependent Variable: Pollution. . Predictors: (Constant), DistDrain, Depth, DistPit, Type of well

2. Hierarchical or Sequential Multiple Regression Analysis (HMRA):

The data were further subjected to hierarchical/sequential multiple regression analysis (HMRA) in order to determine the interrelationship between each of the independent variable with the dependent variable. Therefore, there were four iterations of the model, in each round one of the independent variable (Xn) was controlled. The analyses were conducted to ensure that there was no violation of the three prerequisite assumptions of normality, linearity, multicollinearity and homoscedasticity.

- a. Results of HMRA 1:

Table 3a is the result of the analysis of the HWD level of pollution (Y) as it relates to three other independent variables, while controlling the depth of the well (X1). The depth of the well (X1) was entered at Step 1, explaining 1.4% of the variance in pollution (Y). After entry of the type of well [X2], distance from pit latrine [X3], and distance from drainage [X4] at Step 2, the total variance explained by the model as a whole was 69.3% (adjusted R<sup>2</sup>), F (4, 15) = 11.739, p < 0.001. The three control measures explained an additional 72% of the variance in pollution, after controlling for the depth of the wells, R<sup>2</sup> change = 0.719, F change (3, 15) = 14.842, p < 0.001. In the final model the depth of well measures was statistically not significant with a beta value (beta =0.198, p > 0.05).

**Table 3a: HMRA Model Summary 1**

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.198a	0.039	-0.014	26.835	0.039	0.734	1a	18	0.403
2	0.871b	0.758	0.693	14.756	0.719	14.842	3b	15	0.000

b. Results of HMRA 2: Table 4a presents the result of the analysis of the HWD level of pollution (Y) as it relates to three other independent variables, while controlling the type of well (X2). Hierarchical multiple regression was carried out to assess the ability of the type of well variables to predict the level of pollution in the wells after controlling for the influences of the other independent variables. The type of well (X2) was entered at Step 1, explaining 5.1% of the variance in pollution (Y). After entry of the depth [X1], distance from pit latrine [X3], and

distance from drainage [X4] at Step 2, the total variance explained by the model as a whole was 69.3% (adjusted R<sup>2</sup>), F (4, 15) 11.739, p < 0.001. The three control measures explained an additional 75.3% of the variance in pollution, after controlling for the type of well, R<sup>2</sup> change = 0.753, F change (3, 15) = 15.560, p < 0.001. In the final model the type of well measures were statistically not significant with beta value (beta = 0.66, p > 0.05).

**Table 4a: HMRA Model Summary 2**

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.066a	0.004	-0.051	27.316	0.004	0.080	1a	18	0.781
2	0.871b	0.758	0.693	14.756	0.753	15.560	3a	15	0.000

c. Results of HMRA 3: Table 5a presents the result of the analysis of the HWD level of pollution (Y) as it relates to three other independent variables, while controlling the distance from pit latrine (X3). Hierarchical multiple regression was carried out to assess the ability of distance from pit latrine variable to predict the level of pollution in the wells after controlling for the influences of the other independent variables. The distance from pit (X3) was entered at Step 1, explaining 65% of the variance in pollution (Y). After entry of the depth [X1], type of well [X2],

and distance from drainage channel [X4] at Step 2, the total variance explained by the model as a whole was 69.3% (adjusted R2),  $F(4, 15) = 11.739, p < 0.001$ . The three control measures explained an additional 89% of the variance in pollution, after controlling for the distance from pit latrine, R2 change = 0.089,  $F(3, 15) = 1.841, p > 0.05$ . In the final model the distance from pit were statistically significant with beta value (beta = -0.818,  $p < 0.001$ ).

**Table 5a: HMRA Model Summary 3**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.818a	0.669	0.650	15.757	0.669	36.336	1a	18	0.000
2	0.871b	0.758	0.693	14.756	0.089	1.841	3b	15	0.183

d. HMRA 4: Table 6a shows the result of the analysis of the HWD level of pollution (Y) as it relates to three other independent variables, while controlling the distance from drainage channel (X4). Hierarchical multiple regression was carried out to assess the ability of distance from drainage variable to predict the level of pollution in the wells after controlling for the influences of the other independent variables. The analysis was conducted ensuring that there was no violation of the three prerequisite assumptions as discussed earlier. The Distance from drainage (X4) was entered at Step 1, explaining 2.5% of the

variance in pollution (Y). After entry of the depth [X1], type of well [X2] and distance from pit latrine [X3] at Step 2, the total variance explained by the model as a whole was 69.3% (adjusted R2),  $F(4, 15) = 11.739, p < 0.001$ . The three control measures explained an additional 72.9% of the variance in pollution, after controlling for the Distance from drainage channel, R2 change = 0.729,  $F(3, 15) = 15.062, p < 0.001$ . In the final model the distance from drainage channel measures were statistically not significant with a beta value (beta = -0.169,  $p > 0.05$ ).

**Table 6a: Table 3a: HMRA Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R. Square Change	F Change	df1	df2	Sig. F Change
1	0.169a	0.029	-0.025	26.983	0.029	0.529	1a	18	0.476
2	0.871b	0.758	0.693	14.756	0.729	15.062	3b	15	0.000

**IV. DISCUSSIONS OF RESULTS**

Results of the standard multiple linear regression analysis imply that all the independent variables acting collectively as the sources of water pollution contribute up to 69.3% of the Coli form contamination in the hand dug wells. The results of the hierarchical multiple regression have asserted that the independent variable of distance from pit latrine [X3] is the

major source (about 65%) of the Coli form pollution of water in the wells and it also showed a statistical significant at  $P=0.001$  while the other 3 independent variables: depth [X1], type of well [X2], and distance from the drainage channel [X4] are statistically insignificant.



## V. CONCLUSION

Based on the findings of the study, it is concluded that pit latrines are the major source of water pollution in HDW from Hardo ward. This stressed the need of upholding the minimum 15 meter setbacks distance between HDWs and pit latrines. This is however difficult to achieve because of both the high population density and smaller plot sizes in the study area [6]. However, portable water supply can be achieved through the provision of either bore holes or the construction of standard wells in the study area and public education on the potential hazards of drinking polluted water from the HDWs.

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#### AUTHORS

**First Author** – Muhammad Adamu Isah obtained a Bachelor of Technology (Hons) degree in Civil Engineering from the Department of Civil Engineering, Faculty of Engineering and Engineering Technology, Abubakar Tafawa Balewa University Bauchi, Nigeria.

**Second Author** – Muhammad Ali Chiroma is a holder of BA (Hons) Geography/Urban Development, from the University of Western Ontario, Canada; and MSc in Urban & Regional Planning from Ahmadu Bello University, Zaria, Nigeria. He is a lecturer at Abubakar Tafawa Balewa University, Bauchi, Nigeria, and currently, a PhD student in Transportation Planning at UTM, Malaysia.

**Third Author** – Adamu Isa Harir holds a Bachelor of Science (Hons) in Geography from the University of Jos, Nigeria and Masters degree in Urban and Regional Planning from Ahmadu Bello University Zaria, Nigeria. He is a lecturer at Abubakar Tafawa Balewa University, Bauchi, Nigeria and currently a PhD Fellow of Facilities management in UTHM, Malaysia.

**Fourth Author** –Bala Ishiyaku obtained his Bachelor of Technology (Hons) degree in Estate Management from Abubakar Tafawa Balewa University, Bauchi, Nigeria and Master of Technology degree in Estate Management from Federal University of Technology Minna, Nigeria. He is presently a PhD Fellow of Facilities management in UTHM, Malaysia.

**Correspondence Author** – Adamu Isa Harir:  
adamuharir@gmail.com  
Muhammad A. Chiroma: machiroma@gmail.com

# Stochastic Petri net modeling of $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsions

Swati Dubey\*, Neena Shrivastava\*, Shweta Joshi\*, Ranjana Choudhary\*, P.L. Gupta\*\* and R. Prasad\*

\*School of Chemical Sciences, D A University, Khandwa Road, Indore.

\*\*Department of Chemistry, IPS Academy, Indore, India.

**Abstract-** We consider chemical reactions taking place in micro emulsions, where the mean number of reactant molecules present is small and countable because of small volume of micelles. We describe time evolution of such stochastic reactions and compare the results with traditional chemical kinetics. Petri net modeling and stochastic simulation of  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsion has been performed for the first time. The net has been verified using invariant properties of Petri net. A stochastic simulation of the reaction has been carried out using Gillespie hypothesis. The model concludes the nature of a typical enzymatic reaction. The study suggests the concept that enzyme catalyzed reactions in micro emulsions can mimic in vivo enzymatic reactions.

**Index Terms-**  $\alpha$ -chymotrypsin, Microemulsion, p-nitrophenyl acetate, Stochastic Petri nets

## I. INTRODUCTION

Recent advances in genetic and molecular biology has created large amount of genomic data. Analysis of this data to understand the functioning of genes and proteins necessitates use of computers both for modeling and data interpretation. Exponential increase in the use of computers in system biology reflects the widespread belief that computers and programming together could effectively solve the complexity of living cells. Attempts have therefore been made to produce sophisticated computer algorithm to simulate bio-molecules and bio-reactions which can help better understanding of biological phenomenon.

Traditionally reactions are modeled by monochromatic graphs and time evolution is considered to be continuous and deterministic. In monochromatic representation of reactions, there is only one type of player, i.e. chemical species and there is no representation of reaction. The representation does not provide enough detail of the reaction and can not be treated mathematically. The present study aims to model  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsions by Petri nets which are directed bipartite graphs used for modeling, concurrent (several interactions happening independently and in parallel) processes. Petri net is invented in 1962 by Adam Petri.[1] There have been many advances in the subject and different types of Petri nets developed, e.g. simple Petri nets [2,3], hybrid Petri net [4] and stochastic Petri nets [5]. Since biochemical reactions are inherently bipartite, concurrent and stochastic (timing behaviors

of the interactions governed by stochastic laws), stochastic Petri nets offer a suitable tool for modeling biochemical reactions. In this model reactant and product molecules are represented by circles, Number of reactant/ product molecules are modeled by dots inside the circles. Reactions are represented by rectangles and stoichiometry is represented by weights on the directed edges. A formal definition of Petri nets is described in section 2. Since number of reactants and products are countable for reactions occurring in micro reactors (bio-cells), the problem of reactions in emulsions micro reactors can be handled by stochastic Petri nets. The concept has been applied to many biological reactions [6-17] Although there are reports on the studies on enzymatic reaction in emulsion micro reactors [18-22], to the best of our knowledge, there is no report on the stochastic Petri net modeling of enzymatic reactions in emulsion micro reactors. Therefore we have undertaken the stochastic Petri net modeling of  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsion to confirm whether this model satisfactory reproduces the nature of enzymatic reactions in emulsion microreactors.

## II. FORMAL DEFINITION AND PROPERTIES OF STOCHASTIC PETRI NETS

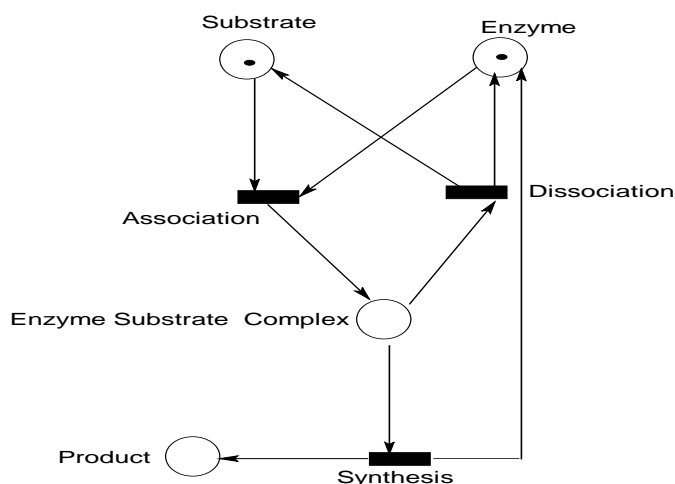
A stochastic Petri Nets can be defined as a quintuple  $N = (P, T, f, \lambda, M_0)$  where  $P$  is the set of places,  $T$  is the set of transitions and  $N_0$  is the set of natural numbers.

$f: ((P \times T) \cup (T \times P)) \rightarrow N_0$  defines the set of directed edges containing nonnegative weights and  $M_0: P \rightarrow N_0$  gives the initial marking.

$\lambda: T \rightarrow H$  is a function, which assigns a stochastic hazard function  $h_t$  to each transition  $t$ .  $H$  is the set of stochastic hazard functions and  $v(t) = h_t$  for all transitions  $t \in T$ .

In stochastic Petri Net function is returning, for every possible pair the multiplicity of the arc; and that, if this is zero the arc does not exist.

Petri nets possess structural as well as behavioral properties. While structural properties depend upon the topology of the Petri net and are independent of initial marking, the behavioral properties reflect the chemical properties of the reaction and depend upon the initial markings. Details of the properties can be found elsewhere [23]. Petri net model of a typical enzymatic reaction is shown in Figure 1:



**Figure 1. Petri net model for a typical enzymatic reaction**

In-vitro enzymatic reactions in nanometer sized water pockets are important as they can mimic models for intracellular enzymatic reactions. Such pockets are formed in water-in-oil type microemulsions [18] (reverse micelles) due to dispersion of water droplets in low polarity bulk solvent and stabilized by a surfactant like AOT. Hydrophilic enzymes such as  $\alpha$ -chymotrypsin remain active in water pockets of such microemulsions. Reverse micelles find applications in the fields of synthesis of nanomaterials [24], drug transport, catalysis, and liquid-liquid extraction.  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsions have been reported [21].

Conventional modeling of chemical reactions is based on the assumption that time evolution of a chemically reacting system is continuous and deterministic and are modeled by reaction rate equation (RRE) which is a ordinary differential equation (ODE), one for each reactant.

$$\frac{dX_i}{dt} = f_i(X_1, \dots, X_N) \quad (i=1, \dots, N) \quad (1)$$

Where  $f_i$  are specific rate constants of the reactions. It is usually expressed in terms of the concentration variables  $Z_i = X_i/V$ , where  $V$  = volume of the system.

The first assumption of reaction being continuous can be ruled out because molecular population levels can change, only by discrete integer amounts. The second assumption of population being deterministic can also be ruled out because it is impossible, either by quantum mechanics or classical mechanics to predict the exact molecular population levels at a future time. Because of large population in test tube size or bigger reactors RRE seems to work quite well. However, for nano-reactors, micelles and bio-cells where molecular population of at least some of the reactant species are not too many orders of magnitude large than one, discreteness and stochasticity may play important roles. In the present work an attempt have been made to model such reactions employing theory of Petri nets [3] and exact stochastic theory of chemical reactions proposed by Gillespie [25, 26, 27]. Although, there are reports on the stochastic modeling of few bio-reactions, there seems to be no report on the modeling of enzymatic reactions in microemulsions employing stochastic Petri nets. The present problem of the

Stochastic Petri net modeling of  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsions [21] was therefore under taken to study the structural properties of the net, validation of the net by its behavioral properties and to simulate the reaction employing stochastic simulation algorithm.

### III. THEORETICAL BACKGROUND

Let us consider  $N$  reactants  $S_1, S_2 \dots S_n$  with their population  $X(t_0) = X_1(t_0), X_2(t_0) \dots X_n(t_0)$  at time  $t_0$ , contained in a well stirred reactor of volume  $V$  in thermal equilibrium at a constant temperature. Assume further that these reactants undergo  $M$  reactions producing a change in the reactant populations. Our objective is to calculate the state of the system  $X(t) = X_1(t), X_2(t) \dots X_n(t)$  at time  $t$  [26].

Each reaction channel  $R_j$  is associated with a state change vector  $v_j \equiv (v_{1j}, v_{2j} \dots v_{Nj})$ , where  $v_{ij}$  is the change in the  $S_i$  reactant population due to  $R_j$  reaction and a propensity function which gives the probability  $a_j$  of  $R_j$  in  $V$  in the time interval  $(t, t+dt)$ , The state change vector  $v_j$  can be calculated with the help of stoichiometric matrix  $U$  of Petri net, which is defined as  $U = u_{ij} = U^+ - U^-$  (2)

Here  $U^+$  is the matrix of weights on outgoing arcs (reactions to places) and  $U^-$  is the matrix of weights of incoming arcs (places to reactions). All three matrices are  $P \times T$ . The population change after one reaction is :

$$X_{t_1} = X_{t_0} + U^{(j)} \quad (3)$$

Where  $U^{(j)}$  is the  $j^{\text{th}}$  column of  $U$ . The stoichiometric matrix  $U$  for the Reaction under consideration is:

$$U = U^+ - U^- = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} -1 & 1 & 1 \\ -1 & 1 & 0 \\ 1 & -1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

The propensity function  $a_j$  is the probability that  $j^{\text{th}}$  reaction will occurring in time interval  $(t, t+dt)$  and is related to the constant  $c_j dt$ , which defines the probability of reaction between a pair of molecules of  $j^{\text{th}}$  reaction in time  $dt$  [26].  $a_j dt = h_j c_j dt$  (4)

Here  $h_j$  is number of all possible combinations of reactant molecule pairs involved in the  $j^{\text{th}}$  reaction. If reaction is unimolecular of the type  $S_1 \rightarrow$  product and  $x_1$  is the population of  $S_1$  reactants undergoing the reaction, then  $h_j = x_1$ . If reaction is of the type  $S_1 + S_2 \rightarrow$  Product then  $h_j = X_1 \cdot X_2$  where  $X_1$  and  $X_2$  are the populations of  $S_1$  and  $S_2$ . If reaction is of the type  $S_1 + S_1 \rightarrow$  Product, the  $h_j = \frac{1}{2} x_1(x_1-1) \cdot c_j$

can be accurately computed from the physical parameters of the molecules such as mass, relative velocity and diameter of the molecules.

The first stochastic formulation of chemical reactions is popularly known as chemical master equation (CME) [26] which is time derivative of the grand probability function  $P(X; t)$  = the probability that there are  $X_i$  molecules of reactant  $S_i$  in volume  $V$  at time  $t$  and  $X = (X_1, X_2, \dots, X_n)$  is a vector of molecular species populations. Knowledge of this function can lead to the complete understanding of the probability distribution of all the states at any time. The CME is given by the relation:

$$\frac{\partial P(X;t)}{\partial t} = \sum_{j=1}^M [a_j(X - v_j)P(X - v_j, t) - a_j(X)P(X, t)] \quad (5)$$

Where  $v_j$  is the stoichiometric vector defining the change in the state vector  $X$  due to occurrence of  $j$ th reaction, i.e.  $X = X + v_j$ . CME is a linear ordinary differential equation, one ODE for each state. The number of ODE's will increase with increase in the number of states. It is not easy to solve CME except for simplest of the chemical reaction.

Stochastic simulation algorithm is another rigorous method for study of stochastic chemical reactions. Given  $X(t) = X$ , SSA is based on the definition of joint probability function  $P(\tau, j)$  defined by

$P(\tau, j) d\tau$  = The probability that (A) the next reaction will be  $j$ th reaction and (B) will occur in the time interval  $(t + \tau, t + \tau + d\tau)$ . (6)

= probability of no occurrence of any reaction in the time interval  $(t, t + \tau)$  multiplied by Probability of occurrence of  $j$ th reaction in the time interval  $(t + \tau, t + \tau + d\tau)$

=  $P'(t) \cdot a_j(x)dt$ ; where  $P'(t)$  is the probability of (A) (7)

$P'(t)$  can be proved [26] to be =  $e^{-a_{sum}(x)t}$

$$\begin{aligned} \text{Therefore } P(\tau, j) &= a_j(x) e^{-a_{sum}(x)\tau} \\ &= \frac{a_j(x)}{a_0(x)} a_0(x) e^{-a_0(x)\tau} \end{aligned}$$

Here from eq.(4)  $a_j = h_j c_j$  ( $j=1, \dots, M$ )

$$\text{And } a_0 = \sum_{j=1}^M a_j = \sum_{j=1}^M c_j h_j$$

The pair  $(\tau, j)$  can be obtained by applying standard Monte Carlo inversion generation rule for random numbers. The method generates two independent samples  $r_1$  and  $r_2$  from the unit interval uniform distribution  $U(0,1)$  and then  $\tau = 1/a_0(x) \cdot \ln(1/r_1)$  and

$j =$  the smallest integer such that  $\sum_{j=1}^j a_j(x) > r_2 a_0(x)$

Bartholomay [29] was one of the first biochemist to examine enzyme catalyzed reaction within the framework of statistical kinetics. Since then a large number of reactions have been investigated including the Michaelis-Menten mechanism. In recent years, the SSA has been successfully applied to  $\lambda$ - phase [30] and circadian rhythms [31]

#### IV. PETRI NET MODELING AND STOCHASTIC SIMULATION OF $\alpha$ -CHYMOTRYPSIN CATALYZED HYDROLYSIS OF $p$ -NITROPHENYL ACETATE IN CATIONIC MICROEMULSIONS.

The Petri net model for the reaction is shown in Figure 2. The resulting incident matrix is presented in Table 1. The model possesses the basic structural properties of Petri net like PUR, ORD, HOM and SC which are necessary for preliminary consistency of the net and its correctness. The net is pure (PUR) as there are no place and transition connected in both directions. So the net structure is fully represented by the incidence matrix, which is used for the calculation of the P- and T-invariants. If all arc weights are one the net is ordinary (ORD). The net is homogenous as the outgoing arcs for each place have the same multiplicity (HOM). The net possesses directed paths between all pairs of nodes which prove it to be strongly connected (SC). This net is without source places and sink transitions. Invariant properties were computed with the help of free download software "Platform independent Petri net Editor" (Pipe) [28]. The two P-invariant vectors corresponding to four places were found to be:

P-Invariants 1:  $x = (1010)$ ; P-Invariants 2:  $x = (0111)$ ; Support of the P-invariants (non zero elements) were as follows. P-Invariants 1:  $\{\alpha$ -chymotrypsin,  $\alpha$ -chymotrypsin- $p$ -nitrophenyl acetate complex}; P-Invariants 2:  $\{p$ -nitrophenyl acetate,  $p$ -nitrophenol,  $\alpha$ -chymotrypsin- $p$ -nitrophenyl acetate complex}.

According to the definition of p-invariant, the weighted sum of tokens over invariant places should remain constant and should be independent of any firing. It is worth noting that according to P-1, the sum of molecules of  $\alpha$ -chymotrypsin and  $\alpha$ -chymotrypsin- $p$ -nitrophenol complex should always remain constant and is a characteristic of an enzymatic reaction. Similarly, according to P-2, the sum ( $p$ -nitrophenyl acetate,  $p$ -nitrophenol,  $\alpha$ -chymotrypsin- $p$ -nitrophenyl acetate complex) should remain constant. The support of p invariants 1 is not a subset of P-invariant 2, and vice versa. The greatest divisor of the non zero elements in both p invariants is 1. Thus, both P-invariants are minimal. Each place contains in at least one of the two P-invariants. Thus the Petri net of our example is covered by p-invariants.

The only T-invariant vectors corresponding to three transitions was found to be:

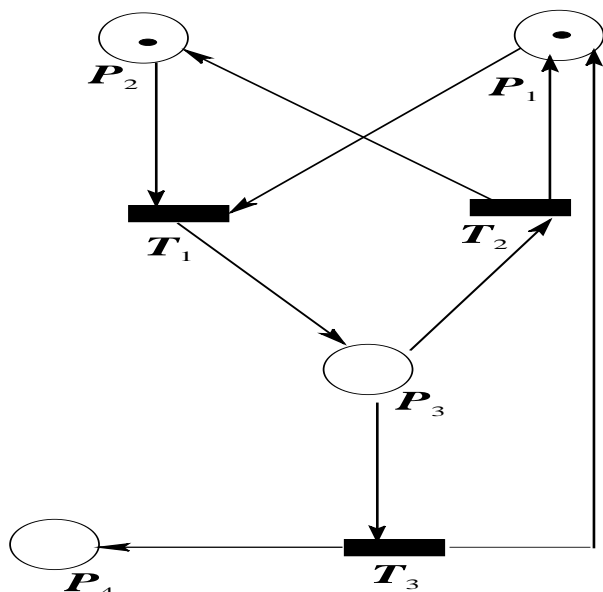
T-invariants 1:  $x = (110)$

The support of the T-invariants (non zero elements) are: T-invariants 1 (Association, Dissociation).

The greatest divisor of non zero elements in T-invariants is equal to one. Thus, the T-invariants is minimal. Transitions synthesis is not contained in the T-invariants. The Petri net of our example is not covered by T-invariants. The Reachability graph shown in Figure 3 is the graph when the initial marking of the net only includes a single molecule of the substrate.

**Table-1. Incident matrix for Petri net model of  $\alpha$ -chymotrypsin Catalyzed hydrolysis of p- nitrophenyl acetate in cationic microemulsion**

	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
P <sub>1</sub>	-1	1	1
P <sub>2</sub>	-1	1	0
P <sub>3</sub>	1	-1	-1
P <sub>4</sub>	0	0	1

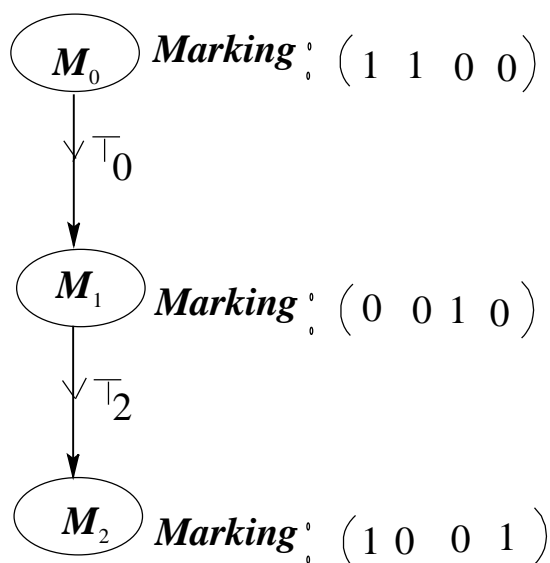


**Figure 2. Petri net model for  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in Cationic microemulsion. P<sub>1</sub>=  $\alpha$ -chymotrypsin, P<sub>2</sub> = p- nitrophenyl acetate P<sub>3</sub> = $\alpha$ -chymotrypsin-p-nitrophenyl acetate complex, P<sub>4</sub> = p-nitrophenol, T<sub>1</sub>= association, T<sub>2</sub>= dissociation, T<sub>3</sub>= synthesis**

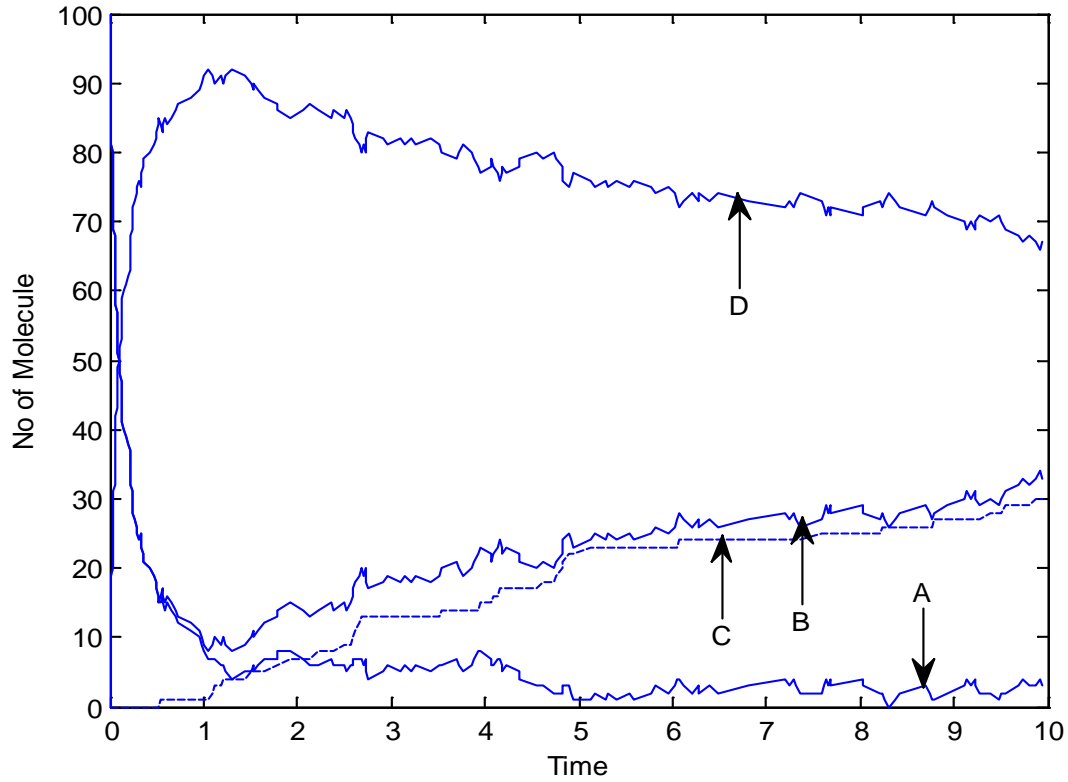
The stochastic simulation using Gillespie SSA algorithm were performed employing a Matlab computer program written by Feres [5]. Input to the program were number of tokens for  $\alpha$ -chymotrypsin, p-nitrophenyl acetate, rate constants for three reactions, total number of steps and pre- and post matrices for the reactions. The constants were transferred from [21] and [22].

The results for reaction between  $\alpha$ -chymotrypsin, p-nitrophenyl acetate is shown in Figure 4 for 100 molecules of substrate and 100 molecules of enzyme. Figure 5 represents the same simulation results with 500 molecules of substrate and the enzyme. Curves in Figure 5 are smoother compared to Figure 4. This can be attributed to the increase in population level of reactant.

The Effect of head group of cationic surfactants on the  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate with  $\alpha$ -chymotrypsin = 100 and p-nitrophenyl acetate = 100 is shown in Figure 6. Similar simulation with  $\alpha$ -chymotrypsin = 500, p-nitrophenyl acetate = 500, Total number of molecules = 1000.  $c_1 = 3.1$ ,  $c_2 = 2.08$  and  $c_3 = 3.03$  is shown in Figure 7. In this case also the smoothness of the curves increases with increasing population.



**Figure 3. Reachability graph for  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsion. In the initial marking only 1 molecule of reactants are present.**



**Figure 4. stochastic simulation results of  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate.  $\alpha$ -chymotrypsin = 100, p-nitrophenyl acetate= 100 Total number of steps = 230,  $c_1 = 0.1$ ,  $c_2 = 0.06$  and  $c_3 = 0.04$ . A= P-nitrophenyl acetate, B =  $\alpha$ -Chymotrypsin, C= p-nitrophenyl acetate-  $\alpha$ -Chymotrypsin complex, D = p-nitrophenol.**

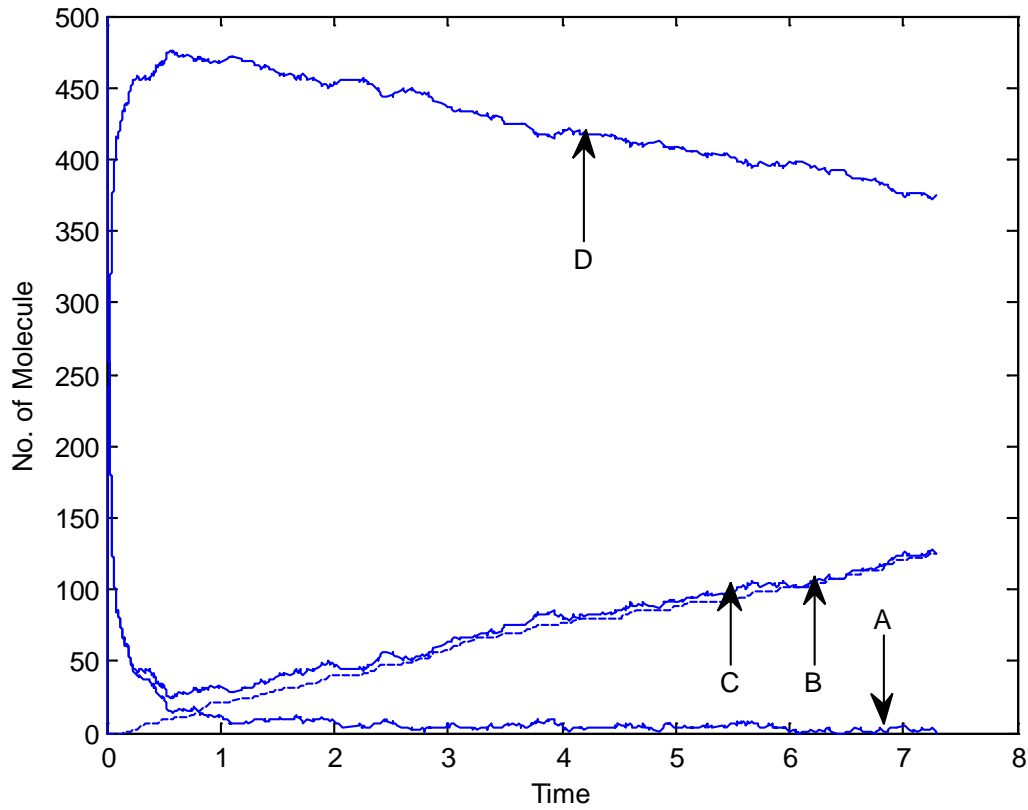


Figure 5. Stochastic simulation results of  $\alpha$ -chymotrypsin catalyzed hydrolysis of P-nitrophenyl acetate.  $\alpha$ -chymotrypsin = 500. p-nitrophenyl acetate= 500 Total number of molecules = 1000.  $c_1 = 0.1$ ,  $c_2 = 0.06$  and  $c_3 = 0.04$ . A= p-nitrophenyl acetate, B=  $\alpha$ -Chymotrypsin, C= p-nitrophenyl acetate-  $\alpha$ -Chymotrypsin complex, D = p-nitrophenol



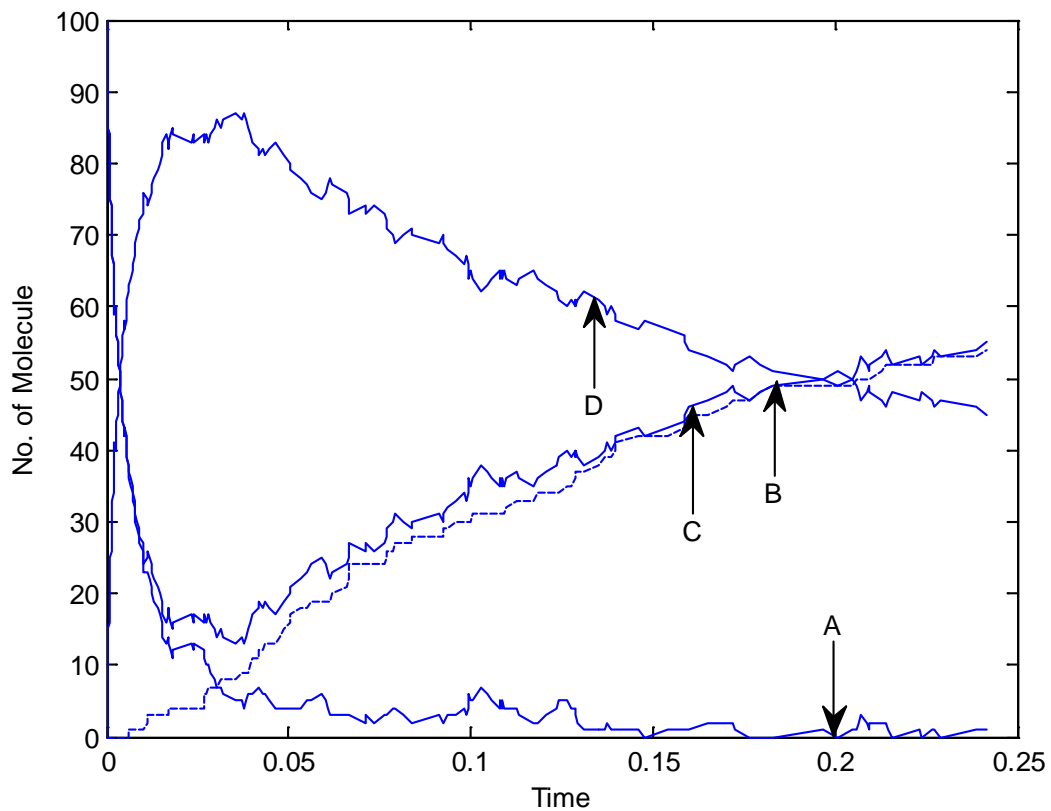
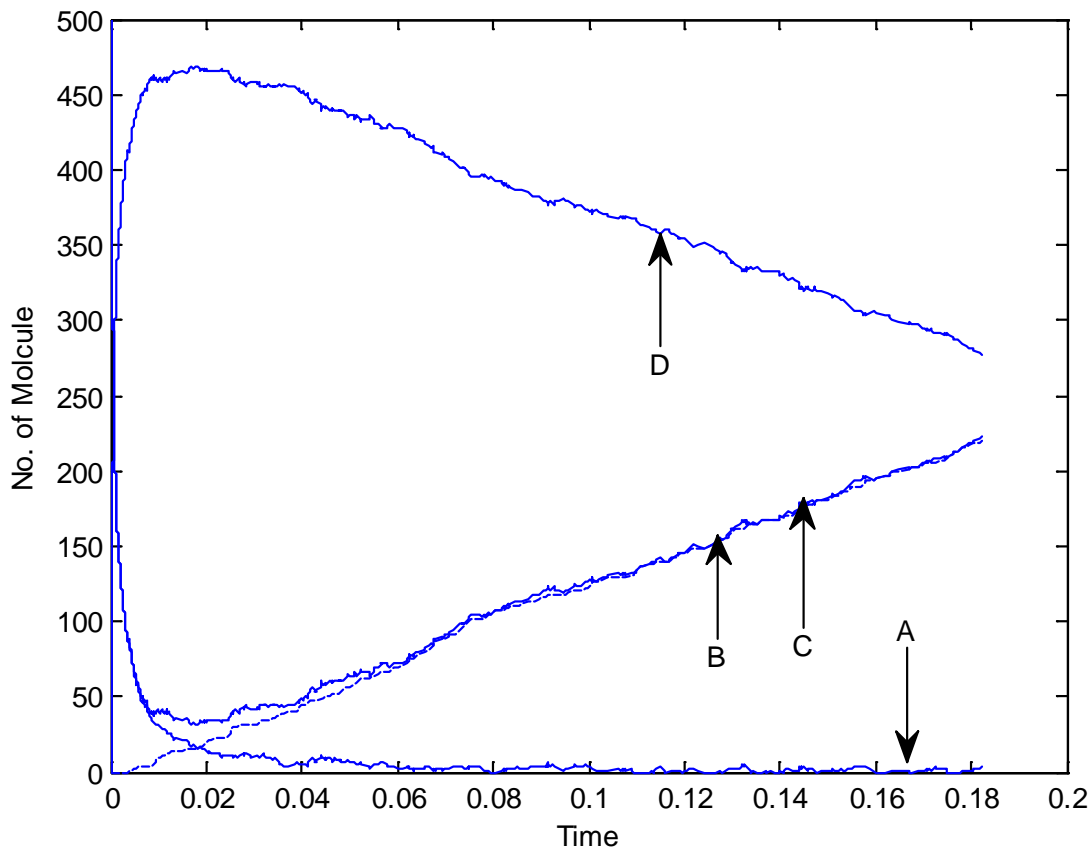


Figure 6. Effect of head group of cationic surfactants on the  $\alpha$ -chymotrypsin catalyzed hydrolysis of P-nitrophenyl acetate.  $\alpha$ -chymotrypsin = 100, p-nitrophenyl acetate= 100, Total number of molecules = 230.  $c_1 = 3.1$ ,  $c_2 = 2.08$  and  $c_3 = 3.03$ . A= p-nitrophenyl acetate, B=  $\alpha$ -Chymotrypsin, C= p-nitrophenyl acetate-  $\alpha$ -Chymotrypsin complex, D = p-nitrophenol.



**Figure 7. Effect of head group of cationic surfactants on  $\alpha$ -chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate.  $\alpha$ -chymotrypsin = 500, p-nitrophenyl acetate= 500, Total number of molecules = 1000.  $c_1 = 3.1$ ,  $c_2 = 2.08$  and  $c_3 = 3.03$ . A= p-nitrophenyl acetate, B=  $\alpha$ -Chymotrypsin, C= p-nitrophenyl acetate-  $\alpha$ -Chymotrypsin complex, D = p-nitrophenol**

### V. CONCLUSION

A stochastic modeling of  $\alpha$ -Chymotrypsin catalyzed hydrolysis of p-nitrophenyl acetate in cationic microemulsion has been performed. Structural as well as behavioral properties of the net have been verified. This Petri net modeling shows the nature of the reaction satisfactory.

The reaction was simulated employing Gillespie SSA algorithm. These simulations confirm the reaction to follow a typical deterministic enzymatic reaction. This is the result for a typical enzymatic reaction.

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#### AUTHORS

**First Author** – Swati Dubey, M.Sc Applied Chemistry, MCA, School of Chemical Sciences, DAVV and

[swatidubey8@gmail.com](mailto:swatidubey8@gmail.com)

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**Second Author** – Neena Shrivastava, MSc, Ph.D, School of Chemical Sciences, DAVV and [mailneena@ymail.com](mailto:mailneena@ymail.com)

**Third Author** – P.L. Gupta, MSc, PhD, Department of Chemistry, IPS Academy, Indore. [premlatagupta03@yahoo.co.in](mailto:premlatagupta03@yahoo.co.in)

**Fourth Author**- Shweta Joshi, MSc, School of Chemical Sciences, DAVV and [shwetakanungojoshi@gmail.com](mailto:shwetakanungojoshi@gmail.com)

**Fifth Author**- Ranjana Choudhary, MSc. School of Chemical Sciences, DAVV and [ranjna.rajesh@gmail.com](mailto:ranjna.rajesh@gmail.com)

**Correspondence Author** – Dr. R. Prasad ,

[rjndr.prds3@gmail.com](mailto:rjndr.prds3@gmail.com); [swatidubey8@gmail.com](mailto:swatidubey8@gmail.com),

Mob# 09575010982, School of Chemical Sciences, D A University, Khandwa Road, Indore.

# A Hybrid Genetic and Cuckoo Search Algorithm for Job Scheduling

Satyendra Singh\*, Jitendra Kurmi\*\*, Sudanshu Prakash Tiwari\*\*\*

\*M.Tech Scholar, Lovely Professional University, Jalandhar (Punjab), India

\*\*M.Tech Scholar, Lovely Professional University, Jalandhar (Punjab), India

\*\*\*Assistant Professor, Lovely Professional University, Jalandhar (Punjab), India

**Abstract:** Job scheduling is a NP –hard problem in which we have to minimize the makespan time. Scheduling is the algorithm of assigning resources to the jobs in such a way that all jobs get required resource in fairly manner without affecting one another. In this paper we have proposed a hybrid algorithm for job scheduling using genetic and cuckoo search algorithm. This proposed algorithm combines the advantages of both genetic algorithm and cuckoo search algorithm. Genetic algorithm is an evolutionary algorithm that provides optimal solution for optimization problem but the disadvantage of the genetic algorithm is that it can be easily trapped in local optima to overcome this difficulty we are using cuckoo search algorithm.

**Index Terms:** job scheduling, cuckoo search algorithm, genetic algorithm, hybrid algorithm

## I. INTRODUCTION

Job scheduling problem has a combinatorial optimization problem. Job scheduling is the algorithm of assigning tasks to the machines in such a fairly manner that all task should get resource at time and complete their execution without affecting other tasks. The major problem in job scheduling is that many scheduling do not fit into a common description model. Hence for scheduling problems it is too difficult to define a common frame work. In this paper, we have proposed a Hybrid algorithm which combines the advantage of genetic and Cuckoo Search algorithm so as to solve the job scheduling problems. Job Scheduling can be used in scientific computing and high power computing for solving all the combinatorial optimizations problems. Our approach is based on heuristic principles which have the advantage of minimizing the make span. The proposal of a Hybrid algorithm which combines the advantage of genetic algorithm and Cuckoo Search. The performance comparison of the Hybrid algorithm and genetic algorithm is compared by makespan time.

## II. RELATED WORK

All the algorithms to complete its execution. Assumptions and constraints are as follows:

Some of the assumptions for job scheduling are as follows:

Maryam Rabiee and Hedieh Sajedi [13] used a cuckoo search algorithm for job scheduling in grid computing. In this paper author compared the result of cuckoo optimization algorithm with genetic algorithm and PSO and result show that cuckoo optimization algorithm can complete tasks in minimum time as compare to other genetic algorithm and PSO. R.G. Babukartik and P. Dhavachelvan [5] proposed a hybrid algorithm for solving job scheduling problem using advantage of both genetic and cuckoo search algorithm. Result show that as the size of the problem increases task creation time and result retrieval time also increases. Jun-qing Li, Quan-ke Pan [16] proposed a hybrid algorithm using Tabu search and PSO for job shop scheduling problem. In the sequencing stage, Author use PSO to discover the best solution, and for the allocation of machine, author use tabu search algorithm to find the optimize solution near the given particle. Result show that this hybrid algorithm perform better than genetic algorithm. P. Mathiyalagan [15] proposed an enhanced hybrid algorithm using PSO and ACO algorithm for job scheduling. Author compared the performance of enhanced hybrid algorithm with hybrid algorithm using PSO and ACO. And it was found that performance of enhanced hybrid algorithm using PSO and ACO algorithm was better than hybrid algorithm using PSO and ACO algorithm. Khaled mesghouni, slim hammadi [17] proposed a genetic algorithm for job shop scheduling. In this paper author used parallel encoding for suitable representation of chromosome. Result show that parallel encoding is suitable for job shop scheduling problem.

## III. PROBLEM DEFINITION

Job scheduling is a combinatorial problem. To solve a combinatorial problem we need to design an efficient algorithm. In this paper we have proposed an efficient hybrid algorithm that combines the advantage of both genetic and cuckoo search algorithm .This designed algorithm solve problem of job scheduling very effectively.

We have N number of jobs and M number of machines .Each machine has its own order of execution. Our main objective of proposed hybrid algorithm is to minimize the make span time. Make span time is the total time taken by

1. Job should be a finite set.
2. Machines should be a finite set.
3. Every job must contain a series of operation that

Should be performed by machine.

4. All jobs should be able to handle only one Operation at a time.

Some of the constraints for job scheduling are as follows:

1. No job should visit the same machine the twice.
2. No condition among various operation jobs.
3. Preemption type of jobs are not allowed.
4. A single machine is able to handle only a single job At a time.

#### IV. PROPOSED SYSTEM

Our proposed algorithm combines the advantage of both genetic and cuckoo search algorithm. Disadvantage of genetic algorithm is that it can be easily trapped in local optima. Local optima means it provides different results for Same parameters on different runs. To overcome this difficulty of genetic algorithm we are using cuckoo search algorithm which is very fast and efficient algorithm. This is very fast, efficient and simple because it uses only a single parameter for searching.

Scheduling algorithm for job scheduling are as follows:

1. Initialization of parameters.
2. Enter the number of tasks and resources
3. Plans the tasks using hybrid algorithm(genetic + cuckoo)
4. Initialize current generation
5. While(maximum no of generations)
6. Apply local search using cuckoo search algorithm. Go to step 7
7. Initialize the population of n host birds nest;
8. While (no of domains)
9. Get a cuckoo randomly i and replace its solution by performing Mantegna algorithm;
10. Calculate fitness value  $F_i$ .
11. v Choose another nest among all nests randomly say it j;
12. Evaluate its quality value called as  $F_j$ .
13. Compare fitness value of both cuckoos.
14. if fitness value of cuckoo i is greater than fitness value of cuckoo j.
15. Replace cuckoo j by the new solution;
16. Some proportion of nest having low fitness value will be abandoned and some new nest will be.
17. Keep the fittest solution.
18. Forward the current best solution to the future generation.
19. End while. (end of cuckoo search)
20. Go to step 6
21. Apply selection operator for selecting fittest solution every time.
22. Apply crossover operator to produce new child
23. Apply mutation operator is used to maintain genetic diversity.

24. End while (end of Genetic algorithm)
25. Calculate completion time of tasks
26. All task allocated if yes go to stage 6 else go to step 3
27. Stop (end of scheduling algorithm)

#### Description of Algorithms:

##### a) Hybrid algorithm-

This proposed hybrid algorithm combines advantage of both genetic and cuckoo search algorithm. Hybrid algorithm starts with number of jobs and number of machines. Scheduling is done with the help of hybrid algorithm.

##### b) Genetic algorithm-

Genetic algorithm is a metaheuristic algorithm which is used for optimization. Genetic algorithm starts with number of solutions .Firstly genetic algorithm uses selection operator to select fittest individual from a set of population. Genetic algorithm selects a number of individuals until a desired condition met. After applying selection operator genetic algorithm uses crossover operator to produce anew offspring. After applying crossover operator genetic algorithm apply mutation operator. Mutation operator is used to maintain genetic diversity. Genetic algorithm provides better result as compare to existing algorithms but problem with genetic algorithm is that it can be easily trapped in local optima.

##### c) Cuckoo search algorithm-

Cuckoo search algorithm is simple, fast and efficient algorithm. Cuckoo search algorithm uses only a single parameter for search. We are using cuckoo search algorithm to remove difficulty of genetic algorithm. Cuckoo search algorithm provides global result and it does not trapped in local optima.

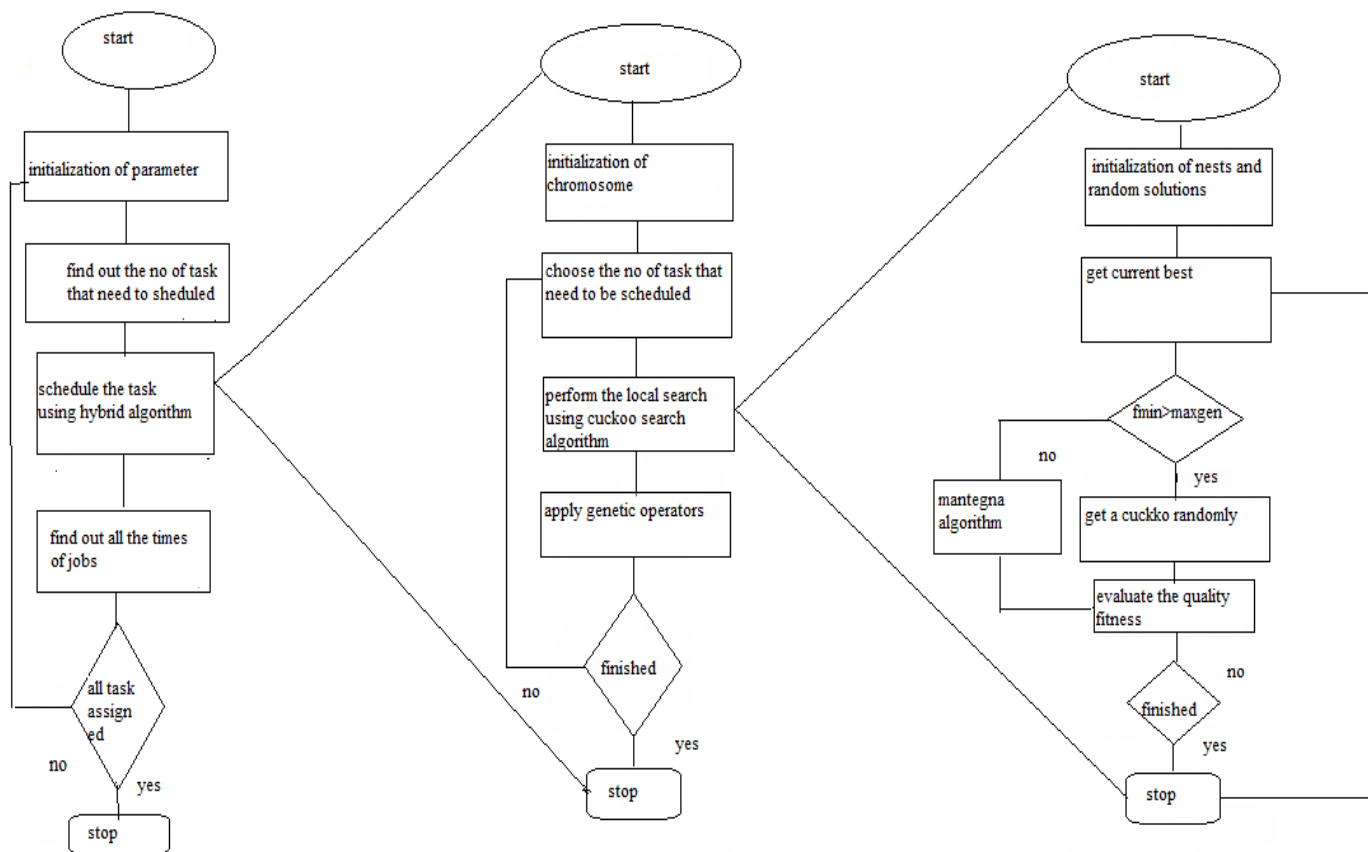


Fig (1): Flow chart of proposed system

**IV. EXPERIMENT AND RESULT**

We have taken different number of jobs and machines where number of jobs is greater than number of machines. Result analysis show that performance of proposed algorithm is better than genetic algorithm. Following table shows the performance of hybrid algorithm

No of machines	No of jobs	Time taken by genetic algorithm	Time taken by hybrid algorithm
3	6	5.3191	0.3954
6	16	1.4609	0.5137
5	17	1.7534	0.5586

Input parameters for above table are taken as:  
 Number of machines= [3, 6, 5]  
 Number of jobs = [6, 16, 17]  
 Maximum no of generations=5  
 No of domains = 15

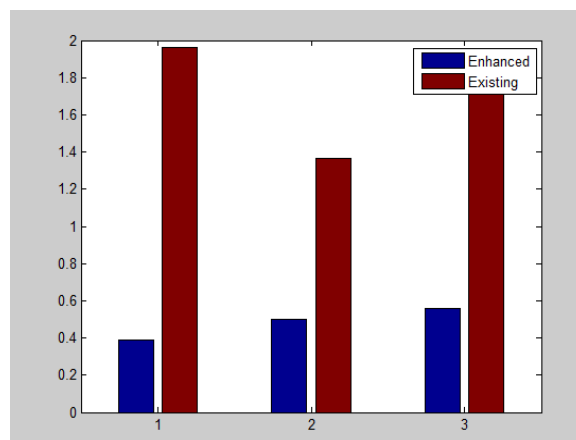


Fig (2).performance of proposed and genetic algorithm

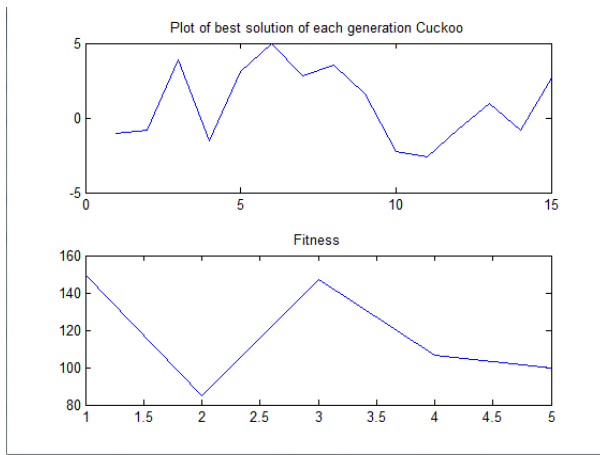


Fig (3): best solution for each generation of cuckoo search

## V. CONCLUSION

In this paper we have developed a hybrid algorithm that combines the advantage of both algorithm genetic and cuckoo search algorithm. Disadvantage of genetic algorithm is that it can be easily trapped in local optima to remove this difficulty we are using cuckoo search algorithm along with genetic algorithm. Performance of hybrid algorithm should be better than genetic algorithm. In future we are planning to add more parameters to proposed algorithm to make more robust and flexible.

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## AUTHORS

**First Author-** Satyendra Singh, M.Tech scholar, Lovely Professional University, satyendra.gla@gmail.com

**Second Author-** Jitendra Kurmi, M.Tech scholar, Lovely Professional University, jitendrakurmi458@gmail.com

**Third Author-** Sudanshu Prakash Tiwari, Assistant Professor, Lovely Professional University, [sudhanshu.15813@lpu.co.in](mailto:sudhanshu.15813@lpu.co.in)

# Apply the fusion of Watermarking techniques on coloured image using layered approach

Saurabh Verma<sup>1</sup>, Indresh Yadav<sup>2</sup>

\* Student of M. Tech Computer Technology and Application (CSE deptt.), Gyan Ganga College of Technology Jabalpur (R.G.P.V University BHOPAL), India

\*\* Faculty member in Gyan Ganga College of Technology, Jabalpur, India

**Abstract-** Watermarking technique is used to solve the issue related to security of data and copyright degradation. This issue has to be determined by keeping a steady prove on the imperceptibility and robustness or strength which incur to be its major goal. In order to achieve these objectives the usage of a mixed (hybrid) transformation is adopted in this paper, the main idea behind applying a hybrid transform is that the cover image is modified in its singular values rather than on the DWT sub-bands, therefore the watermark makes it vulnerable to vivid attacks and maintains its original state. Some simulation results are available to support the methods and relative study.

**Index Terms-** Authentication, copyright protection, robustness, Hybrid, Singular Value Decomposition (SVD), Discrete Wavelet Transform (DWT)

## I. INTRODUCTION

The enhancing usage of digitization has given a great lead to the digital society; the digital mode of communication is building its grip tight on the broadcasting of images, text videos, and audio. But with the improvisation of the digital communication media its degradation has also got amenable, thus to deprecate the copyright defiance digital watermarking implies to its best [1], [2].

Digital watermark insertion is in the definite domain, i.e. either in the spatial domain or the transform domain. The diversity in these domains is that, in case of spatial domain the embedding of the watermark is a straightforward method. The spatial-domain components of the original image are embedded with the digital watermark; due to the straightforward acting behaviour the spatial domain has a low complexity and easy implementation as its plus points. But on the contrary, spatial domain method is not immune to image-processing operations and other attacks.

Whereas, the transform domain (frequency domain) carries the embedding of the watermark by modulating the magnitude of the coefficients of the image in the desired transform domain, for instance: DCT (discrete cosine transform), DWT (discrete wavelet transform), and SVD (singular value decomposition) [3]. The positives of a transform domain is its ability to yield maximum information after embedding the watermark and improved robustness against various attacks, but it has a flaw of increased computational cost in comparison to spatial-domain [4].

On taking into account the DWT, it has its spatial-frequency localization property which sectors the entire image into different frequency coefficients and the areas where the watermark can be embedded imperceptibly are easily accessible. SVD has a mathematical property where minute amendments in the singular values do not cause much havoc on the visual perception of the cover image, thereby improving the robustness and transparency [5].

## II. BACKGROUND REVIEW

### a. DWT

Discrete Wavelet Transform can be defined as any wavelet transform for which waves are discretely sampled. DWT in mathematical terms fit well to be a hierarchical tool for decomposing an image. The advantage of DWT over Fourier Transform is its ability of generating temporal resolution and that it captures both frequency and location information. The translations and dilations of the wavelet are caused by the mother wavelet.

DWT enumerates the high and the low frequency components by splitting the image into its respective frequency components. The high frequency components bequeath for the edge detection whereas the low frequency components are again bifurcated into high and low frequency components. The purpose of watermarking is served by the high frequency components as the human eye is sensitive on the edge variations [6].

The levels of DWT implementation can be on a multistage level transformation. For the first stage decomposition by DWT the image is divided into its LL, LH, HL, and HH plane. The LH, HL, and HH plane represent the finest scale wavelet coefficient whereas the LL plane represents the coarse-level coefficient. Therefore for edge detection purposes the LL plane can undergo the desired number of DWT levels [7].

### b. SVD

The Singular Value decomposition yields the purpose of reduction of complexity by dividing the non-negative image matrix into  $U * S * V^T$ , where U and V are the orthogonal matrices and S is the diagonal matrix of singular values of the original matrix arranged in decreasing order [8].

The usage of singular values volumes to the robustness of the image, i.e. when any perturbation is added on the image large variations in the singular values do not occur. Additively singular values represent intrinsic algebraic properties [9].



c. Proposed DWT-SVD Scheme

The proposed DWT-SVD scheme is formulated as given under steps:

- 1) Extract the red component of the given image with (:, :, 1)
- 2) One level 'Haar' Discrete Wavelet Transform to decompose cover image into 4 subbands.

$$[ca1, ch1, cv1, cd1]=dwt2(image,'haar')$$

- 3) Apply Singular Value Decomposition to the vertical (cv1) and horizontal (ch1) coefficients.

$$[U1, S1, V1]=svd(ch1)$$

$$[U2, S2, V2]=svd(cv1)$$

- 4) Divide the watermark into two parts W1, W2.

$$W=W1+W2$$

- 5) Extract the red component of the watermark as well similar to for the image, with (:, :, 1).
- 6) Modify the particular singular values of vertical and horizontal plane in step 2. Along with the inputted scale factor ( $\alpha$ ).

$$S1 + \alpha W1 = Uw *Sw *Vw^T$$

$$S2 + \alpha W2 = Uw *Sw *Vw^T$$

- 7) Two sets of modified DWT coefficients are complete available by 4.

$$Mod\_c\_h = U1 *Sw *V1^i$$

$$Mod\_c\_v = U2 *Sw *V2^i$$

- 8) Apply the inverse Discrete Wavelet Transform, i.e. idwt on the two sets of modified coefficients in step 5 (cv1 and ch1) and non-modified coefficients in 1 (ca1 and cd1).

$$WI=idwt2(ca1, Mod\_c\_h, Mod\_c\_v, cd1,'haar')$$

- 9) Replace the 1<sup>st</sup> component of the image that is processed with the original image's first component.

- 10) Extraction of the watermark:

For the Extraction of the watermark: (in the red component). Apply one level Haar DWT to the watermarked image obtained in step6.

$$[ca2, ch2, cv2, cd2] = dwt2(WI,'haar')$$

- 11) Apply SVD to the horizontal and vertical coefficients, where U and V are of original image and S is of the watermarked image from step 2 and step 4 respectively.

$$[U1, Sw, V1] = svd(ch2)$$

$$[U2, Sw, V2] = svd(cv2)$$

- 12) Compute the replaced coefficients by placing the V and U of the original watermark along with the singular value S used in 8.

$$M\_c\_h = Uw *Sw *Vw'$$

$$M\_c\_v = Uw *Sw *Vw'$$

- 13) Extract half of the watermark by

$$W1* = (M\_c\_h - S1) / \alpha$$

$$W2* = (M\_c\_h - S2) / \alpha$$

- 14) Combine the results of step 4 to obtain the new original watermark.[10]

$$W* = W*1 + W*2$$

divide the colour image into three layers and then the watermark image fuse into it. After fusing the image we can combine and construct the watermarked colour image (layer 1) and send to the receiver.

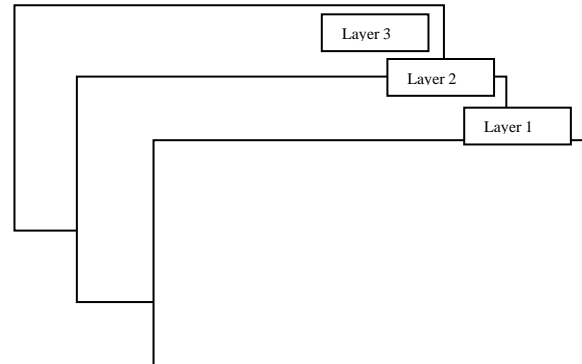


Figure 1 Colour image m x n x 3

Red Layer (m x n of first layer pixel Values from 0 to 255)

Green Layer (m x n of second layer pixel values from 0 to 255)

Blue Layer (m x n of third layer pixel values from 0 to 255)

As we know that every colour image consists of three layers and each layer having the combination of pixel values of the RGB colour components. The very first layer is belongs to red layer, the second layer is Green layer and the third layer is blue layer.

Experiments are conducted to demonstrate the proposed approach. The coloured image "chrysanthemum" of size 256 x 256 is used as the cover image and the colour image "sunset" of size 128 x 128 is used as the watermark image. These images are shown in Fig. 1(a) and 1(b) which are of the cover and watermark respectively. Fig. 1(c) illustrates the Grey cover image (of layer 1) and Fig. 1(d) is the Grey watermark image. Fig. 1(e) illustrates the Grey watermarked cover image and Fig. 1(f) is the Grey extracted watermark image.

The observation of the proposed approach yields the preserved high perpetual quality of the watermarked image.

As a parameter of quality, peak signal-to-noise ratio (PSNR) has been used. The PSNR illustrates the maximum fluctuation of pixels with the mean square error of the images and helps in easy analysis of the variations and degradations being caused on the image by comparing the peaking pixel values.

$$PSNR = 10 \log_{10} (R^2 / MSE)$$

$$MSE = \sum [(I1(m, n) - I2(m, n))^2] / m*n$$

Where, R is the maximum fluctuation of pixels and m, n are the row and column matrix of the images.

### III. EXPERIMENTAL RESULTS

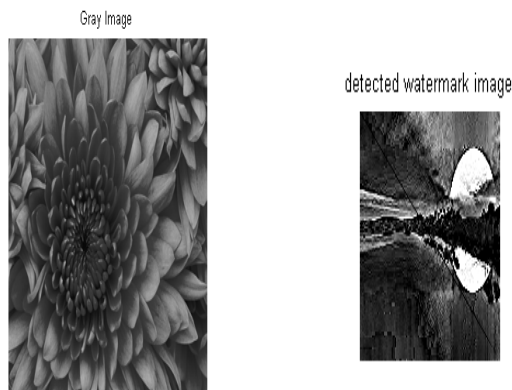
Colour Image Consist of three layers Red, Green and Blue (RGB), we can easily retrieve each layer. Each layer consists of 0 to 255 pixel values and it behaves as Gray image. So first we



**Fig. 2 (a) Cover Image (b) Watermark image**



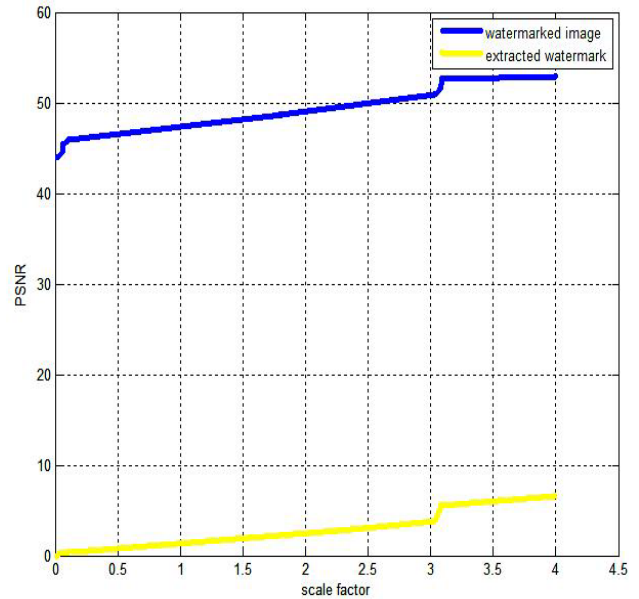
**Fig. 2 (c) Grey Cover Image (d) Grey Watermark Image**



**Fig. 2 (e) watermarked Image (f) Extracted Watermark Image**

In the experiment the values of the scale factor has been carried out from 0.01 to 4 with a random interval. The graph presented in the Figure 3 illustrates the PSNR of the extracted image, and of the watermarked image. It is clear from the

presented graph that the robustness of the watermark is maintained at a perpetually high level.



**Figure 3- PSNR of the Watermarked Image and Extracted Watermark**

The varying range of the PSNR of the images used in order to draw the comparison has been presented in the Table 1 below:

Scale Factor	0.05	0.1	0.2	0.5	1.5
Watermarked Image	50.002	44.064	38.222	30.936	18.123
Extracted Watermark	12.456	14.483	17.244	22.236	31.203

**Table I. Comparative analysis of PSNR at different scale factor values for resultant images**

On changing the value of the scale factor the PSNR fluctuates indicating the status of the robustness of the watermark in the image and after extraction. This experimental result is mainly applied on first layer; similarly we can apply the algorithms in rest of two layers. After applying the concept in all three layers we can combine and construct the watermarked image.

To contemplate the robustness of the presented approach the watermarked image is tested against various attacks. Attack can be applied on individual layers image as well as combine layer image. The PSNR values indicate the quality of watermark image and the watermarked images.

**IV. CONCLUSION**

In this paper a hybrid watermarking scheme using SVD and DWT has been introduced, where the watermark is embedded in the singular values of the red component of the cover image's DWT sub bands and then combined with the other two i.e. green and blue components to yield the watermarked image. The

methods adopted fully exploit the features of the SVD and DWT transform. The intrinsic algebraic properties of the image represented by SVD and the spatial-frequency localization of DWT are well utilized. Experimental results are made available which depict the improved imperceptibility and robustness under attacks and preserve copyrights by using this technique. In this present approach for robustness we can apply various attacks on the images and check the correspondent PSNR values. Further work of integrating human visual system (HVS) characteristics into our approach is in progress for robustness and more secure application.

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#### AUTHORS

**First Author** – Saurabh Verma, Student of M. Tech Computer Technology and Application (CSE deptt.), Gyan Ganga College of Technology Jabalpur (R.G.P.V University BHOPAL), India sverma260383@gmail.com  
**Second Author** – Indresh Yadav, Faculty member in Gyan Ganga College of Technology, Jabalpur, India indresh99@yahoo.com

# The main effective parameters on wireless sensor network performance

Samar Fakher\*, Mona Shokair\*\*, M.I. Moawad\*\*, and Karam Sharshar\*

\*Radiation Eng. Department, in NCRRT, Atomic Energy, Egypt.

\*\* Electronics and Electrical Communications dept. Faculty of Electronic Engineering, Menoufia University, Menouf, Egypt.

**Abstract-** Wireless Sensor Network (WSN) consists of a large number of sensor nodes to detect some physical phenomena. To design a WSN it is necessary to identify the major issues or the main metric parameters of WSN, which are network lifetime, data gathering, and security. These parameters effect on the overall performance of WSN. To enhance the performance of that network in this paper, we present a survey study of the methods and proposed algorithms that were used to overcome those issues. A number of challenges and research issues emerging from this survey study have been reported for further investigations.

**Index Terms-** WSN- network lifetime- data gathering- security

## I. INTRODUCTION

WSN has come forth as an important new field in wireless communication. Due to recent advances in Micro-Electronic-Mechanical System (MEMS) and wireless communication technologies, sensors are deployed in a physical environment and communication through wireless links and thus provide new opportunities for variety of civilian and military applications, for example, environmental monitoring, battle field surveillance, and industry process control [1]. Sensor nodes monitor physical parameters such as temperature, pressure, motion and vibration. The sensor node performs three primary functions which are sensing, communication and data processing [2]. Sensor node consists of microcontroller, small energy and limited battery capacity. Due to more traffic load on sensor node its energy will be depleted that is required to increase network lifetime. In WSN, the security of data is a great issue. Security and privacy issues must be seriously taken into account in order to exploit the full benefits of WSN. Security deal with the cryptographic technic that is used to secure communication channels by ensuring message integrity, confidentiality, and authentication. While privacy issue involves studying the trust and risk associated with collection, storing, and associated with personal data [3]. Data gathering is an important issue that is used for solving the overlap problem. In this paper, some routing protocols will be explained to gather/ route the data [4]. Fading and interference represent the main channel impairments that prevent transmitted message from arriving to transmitter correctly. Therefore, channel impairments, will be investigated. This paper is organized as follows: related works will be made in Section 2. Section 3 represents network lifetime. The security of data will be made in Section 4. Data gathering and some routing

protocols will be investigated in Section 5. Finally, conclusions will be made in Section 6.

## II. RELATED WORK

Solutions on privacy support for data centric sensor networks (PDCS). The proposed schemes offer different levels of location privacy and allow a tradeoff between privacy and query efficiency. PDCS also includes several query optimization techniques that are based on Euclidean Steiner Tree and Bloom Filter to minimize the query message overhead and increase the query privacy. Simulation results verified that the KBF scheme can significantly reduce the message overhead with the same level of query delay. More importantly, the KBF scheme can achieve these benefits without losing any query privacy in [5]. An overview on security moreover, reliability challenges for WSNs was described in details in [6]. and introduces a toolbox concept to support such a framework and classification of hierarchy routing protocols were discussed. Development for malicious nodes discovery in wireless sensor network security was discussed in [7,8]. Sensed data are continuously collected at all or some of the sensor nodes and forwarded through wireless communications to a central base station for further processing. This makes it different from other applications of WSNs as well as traditional sensor data collection using wired networks. A survey on recent advances in networked wireless sensor data collection was presented. Specifically, a feature of sensor data collection in WSNs, by comparing it with both wired sensor data collection networks and other applications using WSNs was discussed. Issues on using WSNs for sensor data collection, which in general can be broken into the deployment stage, the control message dissemination stage and the data delivery stage were obtained in [9]. The performance comparison of the routing protocols Destination-Sequenced Distance Vector (DSDV) routing protocol, Ad-hoc On Demand Distance Vector (AODV) and Dynamic Source Routing (DSR) using NS-2 Simulator were described in [10]. The comparison of these routing protocols is based on the basis of Average End-to-End delay, Normalized Routing Load, and packet delivery fraction by varying number of nodes, pause time and maximum speed. Through the analysis and comparison of network simulation results, when number of nodes are varied, AODV delivers the highest Packet Delivery Ratio (PDR) and Normalized Routing Load (NRL) due to on-demand nature of this protocol, while Average End to- End delay is maximum for DSR due to caching mechanism of DSR. When pause time is varied, AODV delivers the highest PDR and NRL while average End-to-End delay is

maximum for DSR. When maximum speed is varied, AODV delivers the highest PDF and NRL and Average End-to-End delay is maximum for DSR. In all of the three cases, AODV has the highest PDF and NRL. And DSR has the highest Average End-to-End delay, while DSDV because of its proactive nature provides the minimum delay. In [11] presents a comprehensive review of the existing distributed mobile sink routing protocols was presented. The unique challenges associated with mobile sinks and the design requirements of a mobile sink routing protocol were discussed in detail to provide an insight into the motivations and the inherent mechanisms. An accurate classification of the protocols was given and the advantages and drawbacks of the protocols were individually determined with respect to the performance requirements. The determined classes of protocols have different benefits which may provide motivations for new solutions. The hierarchical approaches exploit a virtual structure which serves as a rendezvous region for the sink advertisement and data packets. The virtual structure reduces the overhead of the sink advertisement by confining it to a subset of the network; however, the high-tier nodes constituting the structure are susceptible to becoming hotspots since they are likely to carry and process more traffic.

### III. NETWORK LIFETIME

Sensor nodes have limited energy battery. These are deployed in several areas. They are used for monitoring and

$$p(x) = \begin{cases} e^{-ax} & D_{max} \geq x \geq 0, \\ 0 & x > D_{max} . \end{cases} \quad (1)$$

Where  $a$  is a constant and depends upon the sensor node and  $D_{max}$  is the maximum range of the sensor node.

Discrete radio model was used to determine which link should be used between two nodes for transmission that depends on achieving the lowest cost and low power for transmission. Discrete radio model follows the some steps for calculating the Received Signal Strength Indicator (RSSI). Depending on the RSSI, it can choose the best link for transmission discrete number of bower level that is based on standard CC240. That power is used to calculate RSSI then it can choose the best link for transmission. That model was applied on single hope and multi hope network [13].

### IV. SECURITY AND PRIVACY

WSNs are composed of wireless sensors which are often deployed in public or untrusted environment which prompts a number of security and privacy issues that must be studied. Many advanced researches have been made and reported on recent years.

In [14] the author based on using a secret key between transmitter and receiver. Authentication broadcast requires asymmetry key. Otherwise any compromised receiver could forge the message from the sender. Asymmetric cryptography requires a high computation and storage overhead, which makes their usage is impractical. Moreover, security requirements are achieved using Secure Network Encryption Protocol (SNEP) and

transmitting their data to the sink node. The area around the sink node is known as bottleneck zone, and the nodes near to the sink node its energy will be wasted easily due to high traffic on it and more over load. That leads to decrease network lifetime and then that node will die. Network lifetime depends on number of survive node after a certain period of time . To increase network lifetime two proposed algorithms that were made will be investigated in the following,

#### a. Using Relay Nodes

Depends on using relay nodes to forward the received data that leads to decrease the traffic on the nodes that is near to the sink. That technique depends on using different number of relay nodes and makes the transmission power of relay nodes varied. It was found that when using relay nodes with different transmission powers to forward the data It will lead to increase network lifetime and decrease average end to end delay. Moreover average jitter will be decreased [12] .

#### b- Using Realistic Sensing and Traffic Generation Model

The system depends on using realistic sensing and radio model to increase network lifetime. That system depends on using Elfes sensing model and event generation model which are described in [14]. In Elfes sensing model the probability of an event occurs depending on distance ( $x$ ) from the sensor node being sensed and can be expressed by the following equation

Micro Version of Timed, Efficient, Streaming, Loss-tolerant Authentication protocol ( $\mu$ TESLA). SNEP provides data confidentiality, two parties data authentication, integrity and freshness.  $\mu$ TESLA provides authentication for data broadcasting [15]. Actually some spread spectrum technique for security at physical layer communication using frequency hopping spread spectrum and direct sequence spread spectrum (DSSS) were discussed in [16].

Using cryptography for encryption, there are two types of cryptography are used which are symmetry and asymmetric cryptography. At symmetric cryptography, the shared key between transmitter and receiver is the same. This is means that the decryption key is the same as encryption key. In Asymmetric key, cryptography encryption key is different from decryption key. The main idea of this is to convert plain text to cipher text based on the key which is known to the transmitter and receiver [17]. On the following, some parameters which are affected on the security will be discussed

#### 4.1 Type of attackers

Data privacy related to preventing data from internal and external attacker. Type of security protocols depends on type of attacker. Therefore some type of attackers will be explained as follow:

- a. Internal attack where a node in the network is reprogrammed to be used as attacker. That type of attacker can be overcome by end to end encryption.

- b. Malicious attacker where attacker node attracts packet by inserting false routing protocol. Security in that case depends on using different shared keys between each node and base station.

Data privacy also related to time and location of sensor node. That depends on using fake packet that allow establishing different routing paths. Attacker cannot identify the original traffic. While steganography depends on modifying the carrier to hide the message and allow the data to be loaded on image, sound and videos [18].

#### 4.2 Security on Collected and Aggregated Data

The system depends on using a number of aggregator nodes to aggregate the data to overcome the problem of energy consumption. The aggregator nodes not include the security key but the security depends on end to end encryption between sensor nodes and sink node. Encryption key depends on holomorphic encryption in which the system is known as concealed data aggregation security [19].

#### 4.3 Multiple Security Levels

Multiple securities were concluded to provide uniform secure access at the network allowing using different security levels for different information. Two proposed algorithms were made for multiple security levels which will be explained in the following :

##### 4.3.1 Multiple Level Security (MLS)

- In MLS algorithm, every group of nodes has symmetry shared key for encryption. Each node receives data decrypt it with the shared key used for encryption. Guard node was used when transmitted data from high security level to low security level of transmission.
- Guard node that contains information about nodes and also about the keys of different security levels.
- When transmitting the data from high security to low security level. First, the data was received by the guard node which decrypts the data with its transmission key then re- encrypt it with its required key for transmission to the other node at lower security level. That system depends on using collator and down grader. That depends on guard node to identify the source node and the destination node and allow identifying the key for encryption and decryption. That organizes the transmission level as collator allows transmission from low level security to high level security.
- Down grader allows transmission from high level security to low level security. The algorithm depends on using tiny key man algorithm for construction asymmetry key between each two node [20].

##### 4.3.2 WSN Cluster Multilevel Security Model (WSN – CMLSM)

In which all sensor nodes and cluster heads have different security clearances. WSN is modeled as a tree, in which the base station is the root, and each cluster is the sub tree. In each cluster, the security clearances of all nodes are lower than the clearance

of the cluster head, and the clearances of nodes are decreased from the root to leaf. That system depends on election to cluster head node. Each group of nodes belongs to one cluster head. That cluster head collects the data and transmits it to base station. That model aims to organize the security levels. The security clearance of cluster head must be higher than the sensor node. That model was organized only for transmission of data from low level communication to high level communication [21].

## V. DATA GATHERING

WSN consists of sensor nodes which are capable of collecting information from the environment and communication with each other via transceiver. The collected data will be delivered to one or more sink. The sensor nodes are typically expected to operate with batteries and are often deployed to not easily accessible or hostile environment. Sometimes in large quantities, it can be difficult or impossible to replace the batteries of sensor nodes. The main goal is to aggregate the data with maximizing the network lifetime.

Data gathering represents one of the main issues in WSN, which means aggregation / collecting the data to be transmitted to base station. Many researches have been proposed routing solutions to enable such networks. That routing protocols are broken down into four groups are data centric, hierarchical, location based and quality of services (QOS) routing protocols.

### 3.1 Data Centric Routing Protocol

Data centric routing protocol requires attribute based on naming. That system is more interested in querying an attribute of the phenomenon, rather than querying an individual node. The Base Station (BS) sends queries to a certain area for information and waits for replying from the nodes of that particular region. Since data is requested through queries, attribute based naming is required to specify the properties of the data. Depending on the query, sensor collects a particular data from the area of interest and this particular information is only required to transmit to BS [22,23]. Some of those protocols are sensor protocols for information via negotiation (SPIN), direct diffusion and energy aware routing protocol which are explained in the following,

#### 3.1.1 SPIN

That routing protocol based on two basic ideas which are first sensor nodes that operate more efficiently by sending the data that describes the sensor data instead of sending the whole data.

Second sensor nodes must monitor the change in their energy resources. SPIN has three types of messages (ADV, REQ and data). The sensor broadcasts an advertisement message contains a descriptor of data. If the sensor interested in the data, it sends a request message for the data, then it is sent. That process is repeated until finishing the process [24, 25].

#### 3.1.2 Direct Diffusion

At direct diffusion routing protocol, the sink sends out interest which represents a task description to other sensor nodes based on diffusion. Each sensor node stores the interest in its cache. As the interest is propagated through the network, the gradient from the source back to the sink are setup When the

source has a data for the interest. It sends the data along the interest gradient path that achieves minimum energy [26]. As shown in Fig .1

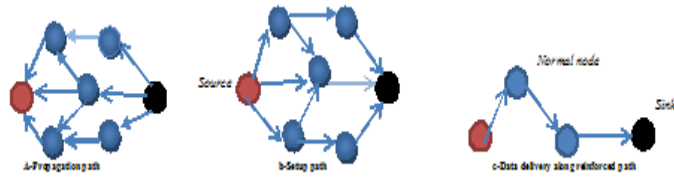


Fig. 1 Direct diffusion routing protocol .

**5.1.3 Energy Aware Routing Protocol**

The paths between the source and sink are determined by some of probability function. The aim is to increase network lifetime. The probability function in choosing the path is based on energy consumption of each path [27].

$$P_i(t) = \begin{cases} \frac{k}{N - k * (r \bmod N / k)} & C_i(t) \neq 0 \\ 0 & C_i(t) = 0 \end{cases} \quad (3)$$

Where:

$K$ : is the expected number of cluster head.  
 $N$ : is the total number of nodes in the network.  
 $r$ : is the current round and the expected number of nodes that have not been a cluster head in the round  $r$  which is given by  $(N - K * r)$ . When  $c_i(t) = 0$ , the node will be chosen to be cluster head. In setup phase, once the nodes have elected themselves to be a cluster head. The cluster head nodes must tell all the other nodes in the network that they have chosen to be cluster head for current round. Cluster head broadcasts an advertisement message. Each non cluster head node determines to which it belongs by choosing the cluster head that requires the minimum communication energy based on received signal strength of the advertisement from each cluster head. . In steady state phase, the nodes send their data to the cluster head that was chosen by the nodes. The data is transmitted at frames using TDMA. Each node has slot to transmit data in it. Once cluster receives data, it can operate on the data and transmit it to BS [28]. As shown in Fig.2

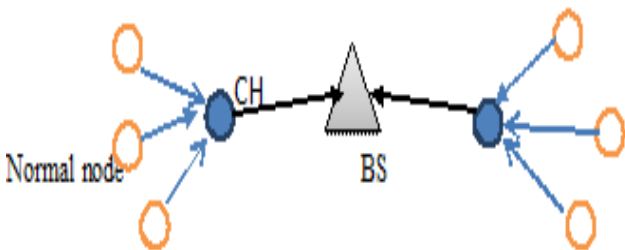


Fig. 2 LEACH routing protocol

**5.2 Hierarchical Routing Protocol**

Hierarchy protocols are proposed for energy consumption. Sensor nodes form clusters where the cluster heads aggregate the data to transmit it to sink node. The cluster head form another layer of clusters among themselves before reaching the sink. Some of hierarchy protocol were proposed for sensor network are LEACH, PEGASIS, TEEN and APTEEN [27].

**5.2.1 Low Energy Adaptive Clustering Hierarchy (LEACH)**

The operation of LEACH is divided into two phases which are setup phase and steady state phase. At setup phase, the node chosen them to be cluster head based on a random number when the random number is less than threshold, the sensor node is chosen to be cluster head as shown in equation(2) . The probability for each sensor node (i) to be a cluster head at time (t) is given by [28],

**5.2.3 PEGASIS**

- PEGASIS requires the nodes in the network to form chains. Each node at the chain aggregates the data and only one node through a chain is allowed to communicate with base station.
- PEGASIS stands for Power Efficient Gathering in Sensor Information System. This chain based protocol that provides improvement over LEACH algorithms. Therefore PEGASIS is an extension of the LEACH protocol. PEGASIS protocol requires information of chain which is achieved in two steps that are chain construction and gathering data.
- Chain construction that forms a chain from sensor nodes so that each chain transmits and receives from a neighbor and only one chain is elected to transmit to the base station. The chain construction is performed in a greedy way, starting from the node farthest to the sink. The nearest node to this node is put as the next node in the chain. A node can be in the chain at only one position. During each round, a leader node is randomly selected. The construction phase assumes that all the sensors have a global knowledge about the network. When a sensor fails or dies due to low battery power, the chain is constructed using the same greedy approach by passing the failed sensor.
- Gathering data where the data is aggregated and moves from node to node, and sent to base station. PEGASIS avoids cluster formation and uses only one a chain to transmit to its local neighbors in the data fusion phase instead of



sending directly to its cluster head as in the case of LEACH. As shown in Fig.3 node A passes its data to node B. node B aggregates data of node A with its own and then transmits to the leader. After node C passes the token to node E, node E transmits its data to node D. Node D aggregates the data of node E with its

own data and the transmit to the leader C. Node C waits to receive data from both neighbors data. Finally, node C transmits one message to the base station [29].

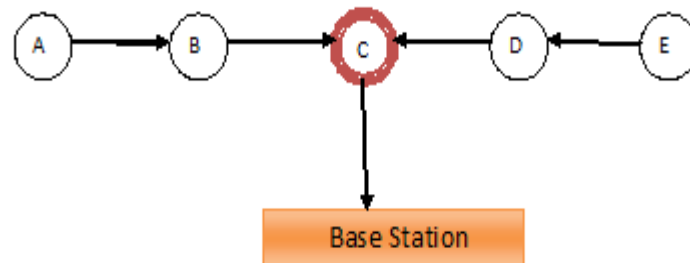


Fig. 3 Data gathering and chain construction in PEGASIS.

#### 5.2.4 Hybrid Energy Efficient Distributed Clustering (HEED)

Excellent cluster based protocol. It elect cluster heads based on residual energy and node degree or density of nodes as a metric for cluster selection to achieve power balancing, which is a rational improvement compared with LEACH. Cluster heads are selected according to a combination of two clustering parameters. The primary parameter is a function of cluster density. The primary parameter is their residual energy of each sensor node and the secondary parameter is the intra – cluster communication cost as a function of cluster density. The primary parameter is used to probabilistically select an initial set of cluster heads while the secondary parameter is used for breaking ties. Sensor node sets the probability  $CH_{prob}$  of becoming a cluster head as obtained in (3)

$$CH_{prob} = C_{prob} * E_{residual} / E_{max} \quad (4)$$

Where  $E_{residual}$  is the estimated current residual energy in this sensor node and  $E_{max}$  is the maximum energy corresponding to a fully charged battery, which is typically identical for homogeneous sensor nodes. The parameter  $C_{prob}$  is only used to limit the initial cluster head announcements and has on direct impact on the final cluster structure.

In HEED the clustering process at each sensor node require several rounds. Every round is long enough to receive messages from any neighbor within the cluster range. The  $CH_{prob}$  value must be greater than a minimum threshold. If a sensor node is selected to become a cluster head, it broadcasts an announcement message as a tentative cluster head or a final cluster head. A sensor node hearing the cluster head list selects the cluster head with the lowest cost from this set of cluster heads. A sensor hearing the cluster head list selects the cluster head with the lowest cost from this set of cluster heads [30,31].

#### 5.2.5 Threshold sensitive Energy Efficient sensor Network (TEEN)

Is a hierarchical clustering protocol, which groups sensors into clusters with each led by cluster head. The sensors within a

cluster report their sensed data to their cluster head. The cluster head sends aggregated data to higher level cluster head until the data reach the sink. The cluster head broadcasts to its member by the following:

- Hard threshold: This is a threshold value for the sensed attribute. It is the absolute value of the attribute beyond which, the node sensing this value must switch on its transmitter and report to its cluster head.
- Soft threshold: This is a small change in the value of the sensed attribute which triggers the node to switch on its transmitter and then transmit it.

The nodes sense their environment continuously, the first time parameter from the attribute set reach its hard threshold value, the node switch on its transmitter and send the sensed data.

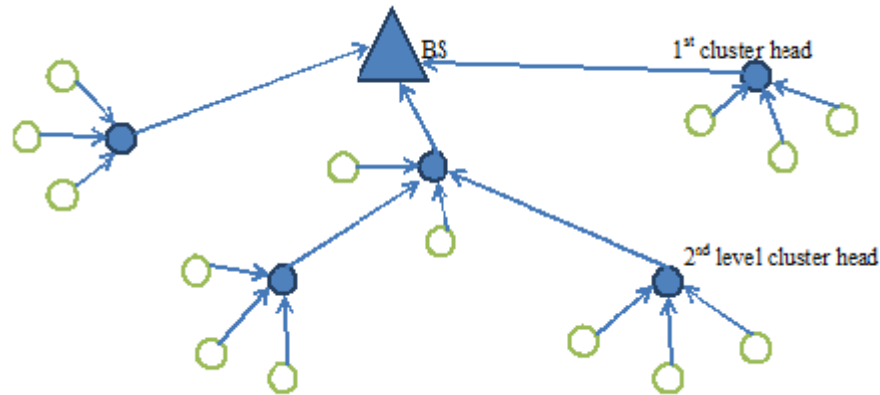
The sensed value is stored in an internal variable in the node, called sensed value. The nodes will next transmit data in the current cluster period, only when both the following conditions are true:

- a. The current value of the sensed attribute is greater than the hard threshold.
- b. The current value of the sensed attribute differs from sensed value by an amount equal to or greater than soft threshold.

Whenever a node transmits data, sensed value is set equal to the current value of the sensed attribute. Thus, the hard threshold tries to reduce the number of transmission by allowing the nodes to transmit only when the sensed attribute is in the range of interest. The soft threshold further reduces the number of transmissions by eliminating all the transmissions which might have otherwise occurred when there is little or no change in the sensed attribute once the hard threshold. TEEN is not suitable for sensing applications where periodic reports are needed since the user may not get any data at all if the threshold is not reached [32].



As shown in Fig. 4



**Fig. 4 TEEN routing protocol.**

### 5.2.6 Adaptive Periodic Threshold sensitive Energy Sensor Network Protocol (APTEEN)

In APTEEN once the cluster heads are decided, in each cluster period, the cluster head first broadcasts the following parameters:

- Attributes: This is a set of physical parameters which the user is interested in obtaining data about
- Threshold: This parameter consists of a hard threshold and soft threshold. Hard threshold is a particular of an attribute beyond which a node can be triggered to transmit data. Soft threshold is a small change in the value of an attribute which can trigger a node to transmit data again.
- Schedule: This is a TDMA schedule assigning a slot to each node.
- Count time: It is the maximum time period between two successive reports sent by a node. It can be a multiple of the time division multiple access schedule length and it account for the proactive component.

The main features of APTEEN are by sending periodic data, it gives the user a complete picture of the network. Energy consumption can be controlled by the count time and the threshold value.

The main drawback of this scheme is the additional complexity required to implement the threshold functions and the count time [33].

### 5.3 Energy Efficient Clustering Scheme (EECS)

It is clustering based LEACH protocol that is operated in single hop mode between cluster head and base station. Sensor nodes compete for the ability to become cluster head for a given round. It involves sensor nodes into competition by broadcasting their residual energy to neighboring candidates. If a given node doesn't find a node with more residual energy, it becomes a cluster head. The main distinguishing features from LEACH are the dynamic sizing that is used in clustering in which cluster distance from base station is computed. In despite of these features EECS have some limitations as it uses single hop networks and can consume more energy for longer distance between cluster heads and base station, as all nodes compete for

elevating to cluster head will add more complexity overhead. This overhead becomes due to more global knowledge about distance between base station and cluster heads.

### 5.4 Energy Efficient Protocol with Static Clustering (EEPSC)

It is also based on LEACH and comprise of three phases are setup phase, responsible node selection phase and steady state phase. It is based on dynamic clustering and taking temporary cluster heads in responsible node selection phase which are going to help in choosing the best cluster head within a cluster which will increase the network lifetime. It is hierarchical based on static routing protocol in which cluster formation is initially predetermined by base station thus removing the complexity overhead due to dynamic clustering. In setup phase, it is assumed that base station knows the locations of all the sensor nodes. In this scheme, the base station sends  $k-1$  messages where  $k$  is the desired number of clusters set initially with different transmission powers. The sensor nodes who listen to the messages will respond by sending the join request message. The sensor nodes which are not joined to any cluster will set  $k$  as their cluster ID and will inform base station. It uses Carrier Sense Multiple Access (CSMA) for sending join request messages to base station in order to reduce collision so that energy can be reserved which will enhance network lifetime. base station selects one temporary cluster head randomly for each cluster and forward it to clusters in whole network. It is also send TDMA for all nodes in each cluster and allow nodes to transmit its data at its time slot. In next phase the round for selection cluster head begin all the nodes will send energy levels to the temporary cluster head, it then compare residual energy level of all the nodes and the node with highest energy level is selected as the cluster head during current round. The node with the lowest energy level is selected as temporary cluster head for next round. In steady state phase the nodes will send the data to cluster head at their allocated time slot. The cluster head will aggregate data and send it to base station. The major limitation of EEPSC is that the nodes located at the boundary of the cluster will consume more energy that lead to early dead nodes.

### 5.5 Enhanced energy Efficient Protocol with Static Clustering (EEEPSC)

It is based on existing scheme EEPSC by modifying it in order to remove the limitation of EEPSC. Cluster head is chosen not only on the basis of the highest residual energy as well as the relative location of the node in cluster. The objective of the scheme is to select the high residual node which is approximately central in the cluster. Base station compute the mean position of node distribution of every cluster. And distance from mean position to every node in every corresponding cluster. And node with highest residual energy and smallest mean distance will be selected as cluster head. The node with second highest residual energy is selected as temporary cluster head for next round in each cluster [34, 35 and 36].

### 5.5 Energy Efficient Data Gathering Mechanism Using Mobile Collector

M- Collector is responsible for gathering data from local sensors in the subarea. M collectors forwards the sensed data to one of the other nearby M- collector, and finally all the data are forward to the sink node. That protocol based on the following steps:

- first some of sensor nodes will be selected as polling point, these polling point will temporarily cache the data and upload them to the mobile collector when it arrives.
- The polling point can simply be a subset of sensors in the network or some other special devices such as storage nodes with a large memory and more battery power.
- Second, mobile collector has the freedom to move to any location. In the sensing field when the mobile collector arrives, it polls each polling point to request data then upload data to mobile collectors. Finally mobile collector handover the data to sink node then to base station [37].

#### Research issues and challenges

- 1- WSN used for many applications as military application, environmental monitoring. WSN consists of a number of sensor nodes that may be static or mobile sensor node. The following design issues of the sensor network must be taken into consideration.
- 2- To achieve security that is represent a great challenges as it is necessary to use an algorithm that not effect on energy resources as there is a tradeoff between security and network lifetime (sensor's energy ). As sensor node has a limited energy, limited processing power and limited storage. So it is necessary to use security algorithm that secure the data with less energy consumption. Multiple security level must be applied on data aggregation system.
- 3- Privacy also represents an important issue that related to protection of private sphere bodily characteristics data as body temperature. Encryption key to protect data must be strong enough but with feasible computational to be used by sensor with limited energy.
- 4- Sensor nodes must be reliable as some sensor nodes may fail or be blocked due to lack of power or due to environmental interference. The failure of nodes shouldn't affect the overall performance of the network.

This the reliability or fault tolerance issue of which is the ability to sustain sensor network functionalities without any interruption due to sensor node failure.

- 5- Scalability is one of the main issues in wireless sensor network as wireless sensor network consist of a large number of sensor nodes in order of hundreds or thousands and routing scheme must be scalable enough to respond to events.
- 6- Since the sensor network consists of a large number of sensor nodes. The cost of single node is very important to justify the overall cost of the networks so production costs must be taken into consideration.
- 7- Operating environment must be taken into consideration as sensor nodes are deployed in different area in the environment as in biologically or chemically contamination field or in a home or large building.
- 8- Network lifetime is related to power consumption as the transmission power is proportional to distance square. So multi hop routing protocol will consume less energy than direct communication. However, multi hop produce more routing overhead but direct communication would perform well if all nodes were close to each other.
- 9- Data delivery must be taken into consideration as it related to when the data was delivered. That depend on the application of the sensor network, the data delivery to the sink node can be divided in to continuous, event driven, query driven and hybrid. In the continuous delivery model, sensor node sends data periodically. In event driven the transmission of data triggered when an event occurs. In query driven when the query is generated by the sink by the sink, the sensor node transmits its data. A hybrid model uses a combination of continuous, event driven and query driven.
- 10- The routing protocol must have high quality of services which is related to long lifetime, energy efficiency, packet delivery ratio and throughput.
- 11- Overhead and data latency which are the most important factors that must be taken into consideration in designing wireless sensor network. As data aggregation and multi-hop relay cause data latency. Moreover, some routing protocols create excessive overhead to implement their algorithms, which are not suitable as it effects on energy of sensor nodes.
- 12- Provably secure routing: Routing is one of the most basic networking functions in multi-hop sensor networks. The presence of malicious nodes must be considered and precautions taken. Routing has two main functions: finding routes to the sink nodes, and forwarding data packets via these routes. Security approaches for routing protocols have mainly been analyzed by informal means only. What is needed is a mathematical framework in which security can be precisely defined.

## VI. CONCLUSIONS

In this paper, we made an attempt to provide a survey on the issues and metric parameters that effect on the overall

performance of wireless sensor network. We have discussed several security problems, privacy issues, network lifetime increment, data gathering and channel impairments solutions. A number of existing standard solutions have been studied along with their mechanism. Also there are still interesting problems for future investigations, also traditional complex cryptography for security that require more processing and effects on the lifetime of network is not necessary to be used. Routing protocols must be investigated to identify the most one that have more network lifetime, less delay, less routing overhead. From the above it is necessary to design A WSN that has the following metric parameters that have studied above.

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AUTHORS

**First Author** – Samar Fakher, Radiation Eng. Department, in NCRRT, Atomic Energy, Egypt, Email: samarfaker@yahoo.com

**Second Author** – Mona Shokair, Electronics and Electrical Communications dept. Faculty of Electronic Engineering, Menufia University, Menouf, Egypt, Email: mona.sabry@el-eng.menofia.edu.eg

**Third Author** – M.I. Moawad, Electronics and Electrical Communications dept. Faculty of Electronic Engineering, Menufia University, Menouf, Egypt

**Fourth Author** – Karam Sharshar, Radiation Eng. Department, in NCRRT, Atomic Energy, Egypt

# The Effects of Anxiety on Achievement and Performance: A College Study

Dr. Naveed Shibli, Naila Nawaz, Nazima Ameen, Sehrish Fatima, Hafiza Sadia Khan, Qurat ul Ain

**Abstract-** During an interview 150 students 75 male and 75 female selected on the bases of low performance and high performance during the current year and were asked to express their personal experiences during the recent examinations for the assess the relationship of anxiety with the academic achievements. The responses reveal no significant relationship between anxiety and academic achievements

**Index Terms-** Academic achievement, anxiety, performance

## I. INTRODUCTION

Anxiety is a known psychological term that is directly influencing human race. Social scientists have successfully evaluated that how anxiety does is related with and influences human life (Dowbiggin 2009) although there exist various controversies about the defining of the construct (Cox, Parker, Swinson 1996). The importance of the construct anxiety in human life is so important that in some cases it intervention have been reported in the lingual domain of human being: a differentiation and edge that human being possesses as compared with the other living species (Małgorzata 2014).

Anxiety is a symptom or group of symptoms that is capable of inducing 'worries' and tension and sometimes physiological symptoms like blood pressure increase or in some cases decrease (Kazdin 2000). People subject to the symptom of anxiety in some cases may avoid situations due to allied experiences those accompany anxiety like sweating trembling or heartbeat. Since the likelihood of such states in various academic situations like examinations cannot be excluded so the relationship of anxiety with academic achievements have been an area of interest for social science research specially behavioral and psychological sciences.

Researchers focused the assumed relationship between academic matters and anxiety with various angles (Saket 2014) and tried to find out that how do gender habitat and different types of schools may play role in generating anxiety among students? In another study Mohd & Atieq (2014) tried to find out that how socio- economic status does contributes to cause anxiety among students. However in both these studies researchers did not look into the possibility that how do anxiety they reported in school settings was there due to 'facilitating' effects or 'debilitating' effects (Alpert& Harber 1960)?

Many studies conducted in that context found noticeable relationship between the construct anxiety and academic achievements. In one such study it was found that the anxiety can be considered as major predictor so far as academic success is concerned (Prima et al 2010). Another such study found a marked impact of anxiety on academic achievements (Muhammad et al 2012). 'Under achievement' and 'Low

performance' of students were also related with the construct anxiety (Rizwan & Nasir 2010) the findings of Sing & Thukra (2009) were also similar who found that negative and significant relationship exists between anxiety and academic achievements. Some researchers explored further analytical aspects related with the relationship of anxiety and academic achievements in one such study it was found that subject those were in senior terms and were familiar with the academic tests were less exposed to anxiety as compared with the ones those were less familiar (Farhan et al 2011). Another study explored and found the difference between the personality anxiety level and test anxiety level (Sr. Kaula et al 2014). A few studies in that context have been reported with reference to comparison between races (Sabrina 2004). A researcher has discussed some strategies those could help to handle the relationship between anxiety and academic achievements in a positive way (Cassie 2012).

## II. METHOD AND PROCEDURE

The present study was conducted to find that how anxiety does relate with academic achievements. A sample of 150 students including 75 male and 75 female studying in various colleges of Faisalabad selected on the bases on 'high achievers' and 'low achievers' so far as their academic achievement of the current year was concerned. After selection, low achievers and high achievers were interviewed and 5 structured questions were asked from them during the interview. These questions were about their experiences of anxiety before and during the examination. During the interview all the subjects were informed that interview contains nothing personal and it is just for the research purpose so all of them can frankly narrate what they exactly felt during recent examinations.

## III. RESULTS

The analysis of responses revealed no significant relationship with anxiety and achievement.

## IV. CONCLUSIONS

More researches with more sophisticated designs and equipment with larger samples are recommended in order to generalize assumptions.

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#### AUTHORS

**First Author** – Dr. Naveed Shibli  
**Second Author** – Naila Nawaz  
**Third Author** – Nazima Ameen  
**Fourth Author** – Sehrish Fatima  
**Fifth Author** – Hafiza Sadia Khan  
**Sixth Author** – Qurat ul Ain

# Exploring The Impact Lean Performance Management ( LPM) Towards Superior Sustainable Value-Based(SSVB) Organization As A Competitive Intelligence

Mahmoud A. Ramadan

Arab Academy for Science, Technology & Maritime Transport, Marketing Department

**Abstract-** The Purpose of this paper is aimed to clarify the superior value of applying the lean performance management on the organization and being a lean centric oriented that will enhancing and the capability the core- competency of it in competing journey with any organization in the global industry.

Adopting lean principles is influence the Performance measurement which is of critical importance in a company's strategic actions towards minimizing the gap between the company strategic planning track and the actual performance track and starting lean efforts as a real and deeply understanding of the lean principles involved and, therefore, focus on the deeper changes necessary this will be a value creation not just improving the operation performance

Therefore Value-based management provide to all managerial and non-managerial level with tools and techniques supporting the development and implementation of value-creating strategies and fully encourage them to realize their role in developing a superior sustainable value-based which leads to having a strong well -known brand name.

**Index Terms-** Value-Based Management, superior performance, sustainable value, Lean Performance Management- competitive intelligence, Mobilizing assets.

## I. INTRODUCTION

In recent decades, massive changes in the competitive landscape have increased stakeholder power in nearly every industry, driven by information and communications technology, low cost transportation, globalization, and a tighter interface between business and civil society. Consumers, employees, investor groups, and Non-Governmental Organizations (NGOs) to name just a few stakeholders, are now able to instantly access data about a company just a few stakeholders, are now able to instantly access data about a company. (Laszlo et al., 2003)

And most companies, even many sorts of Lean companies, lack formal strategic visions and ways to translate those visions into actionable goals throughout their organizations INFOR, 2009. In addition, a growing influence of institutional investors in particular has triggered the growing popularity of value-based management concepts (Bausch et al, 2009).

In effect, all managers and employees work from the same script, although each plays a different role and is critiqued based on their own performance. This is important as the effort to

cascade objectives through your company begins, enabling you to embed the scientific method—techniques for investigating problems and acquiring knowledge, such as the PDCA (plan-do-check-act) cycle—into your improvement efforts and the culture of the company (INFOR, 2009 )

So Laszlo et al., (2003) state that Companies can use the sustainable value framework to think in strategic terms about their existing portfolio of products and services. Most managers are able to assess the overall value created for a business or product in both shareholder and stakeholder terms. Therefore, the idea of value-based management can be traced back to the end of the 19th century (e.g., Marshall, 1890). However, this concept did not become widely recognized and popular until Alfred Rappaport published his seminal book “Creating Shareholder Value” in 1986. Since then, numerous consulting firms have developed different value-based measures to enable corporations to make strategic and operational decisions in line with the goal of value creation.

That will lead to as (Laszlo et al., 2003) explain, Capitalizing on the opportunity to create additional business value from improved economic, environmental, and social performance requires companies to apply the same systematic discipline in managing stakeholder value as they do in managing other aspects of business performance. This kind of approach is still the exception in most companies. And they add that creating value for stakeholders are cultivating sources of extra value that can fuel competitive advantage for years to come. Sustainable value occurs only when a company creates value that is positive for its shareholders and its stakeholders.

And according to ,( INFOR, 2009), that besides, Employees need to be supported by visible processes and systems that engage, motivate, and guide them, reassuring them that someone has an idea where the ship is headed even as it makes a few quick turns in order to avoid the reef

Altogether, the differences in value creation between different companies, between different years, and between different countries indicate that within the utility industry there was value destruction and value creation at the same time (Bausch et al, 2009).

## II. LITERATURE REVIEW

According to An Oracle White Paper, (2009) the use of business intelligence techniques to analyze complex data and

thus Journal make better decisions requires organizational alignment, a clear value proposition and an executable path to value. Each of these items plays an integral role in the concept of Lean Performance Management. And organizations are also faced with many continued challenges such as the internet, globalization technology, which has increased the speed of the competition and through the advent of social media which has changed the way business is done. And INFOR (2009) inquire, what separates your company from others? What are your competitive advantages? How does your company define success, both internally (safety, employee satisfaction, Green), externally (customer satisfaction) and for stakeholders and supply-chain partners (profitability, productivity)? Without a unique path for the company, there can be no clear goals for employees and suppliers.

And The key to success is identifying, defining, and communicating what success means at the outset of the initiative. In other words, how does one interpret the value of proposed efforts? (Bhatia and Drew, 2000) And developing Integrated value-based management systems influence the strategy, structure, processes, analytical techniques, and performance measures of a firm ,(Arnold, 1998).

According to Bhatia and Drew( 2000), this As a result of implementing a Lean Performance Management, the organization not only addressed its key issues, but also established a highly sustainable operational platform.

### **1.The lean and Performance management perspective:**

Lean is about removing waste. How much non-value effort does your company regularly exhaust pulling together budgets and forecasts? (INFOR, 2009). According to Bhatia and Drew (2006 )the impact of a Lean approach in such cases could be substantial. “A Lean approach breaks with the prevailing view that there has to be a trade-off between the quality of services and the cost of providing them.”

Real Lean requires that improvements occur constantly, spurred by the needs of customers and encouraged by a culture in which improvement is natural, discussion of problems is a positive workforce characteristic, and firefighting and workarounds are unacceptable. For this to occur, real Lean organizations look to both strategy deployment (the process of defining and cascading goals and objectives throughout a company. (INFOR, 2009), and continuous improvement—At the core of Lean thinking is the scientific method of the PDCA cycle (plan-do-check-act), essential for achieving Lean improvements. Organizations must be as rigorous in tracking their overall Lean implementations as they are in measuring specific Lean actions and performances:

Are Lean improvement events occurring on-time and delivering expected results?

Are employees receiving the training and skills necessary to participate in Lean improvements (e.g., problem solving, root-cause analysis)?

Are scheduled gemba (translated, in Lean speak, as where the work is done) walkthroughs and “checking” rituals for supervisors and managers occurring in order to support Lean changes? Are these checks captured in the performance management system? (INFOR, 2009).

### *1.1. Introduction about Lean performance management :*

A good performance management system, in addition to executing strategy deployment and PDCA cycle—, also allows you to easily incorporate financial planning (prepare realistic financial and operational plans), budgeting (allocate resources), consolidation (rolling up and closing the books), and forecasting (predict future performance ) moves into your improvement efforts and the culture of the company,(INFOR, 2009).

An Oracle White Paper, (2009) agree on it that When offering insights into business performance, executives frequently speak of doing things “faster” or “cheaper” or “doing more with less.” This passes, in their minds, as successful performance management. Yet true performance management is so much richer than simply executing tasks more quickly or with fewer headcount.

Thus, Performance management should influence and inform outcome management by continuously optimizing costs, quality, and customer service. This is Lean Performance Management definition according to (An Oracle White Paper, 2009) .Performance management (the methods, systems, and personnel that enable an organization to set goals and to assess progress toward those goals on an individual, department, and companywide basis (INFOR, 2009).

Thus ,A lean performance management dashboard pushing the right information in front of the right managers at the right moment can mean the difference between operations having opportunities to solve problems at an early stage and the escalation of those problems into issues which ultimately cause missed deliveries, poor quality, equipment failures—and lost revenue. (INFOR, 2009).

According to DLPI ( 2009) defining, its approach to performance management deserves to be called “lean” because it drastically reduces the time and complexity of top-management performance appraisal. The practices it brings together are helping progressive companies simplify performance management, sense change, and cut the noise out of their results.

Lean Performance Management is not simply about KPIs, but how an organization defines, tracks, manages those KPIs; how the KPIs inform us of what changes must be made; how those changes are actually embedded back into the business; and how the business creates value based upon the data. (An Oracle White Paper, 2009)

### *1.2. The four concepts for a Lean Performance Management approach.*

It is not enough to think about costs — the true path to value is through a combination of cost, quality, and customer service. (See Figure 1) So how do the four concepts provide a foundation for a Lean Performance Management approach?

#### 1- Lean processes

Embracing “Lean” is the first step. Lean is a simple concept. Just as Mr. Dracker points out, enhancing efficiency in the face of effectiveness can be worthless. Lean forces organizations to examine cost, quality, and constituent service collectively and continuously .Costs equal efficiency , Quality equals effectiveness and Constituent service equals service. It can be challenging for highly static and devolved organizations to adopt Lean processing



2- Shared Services

Shared Services provide a great foundation and transition to Lean as Shared Services foster the concepts of sustainability, transparency, and enhanced operational performance. For Lean focused organization-wide efforts, Shared Services may well be the hammer and Lean the nail.

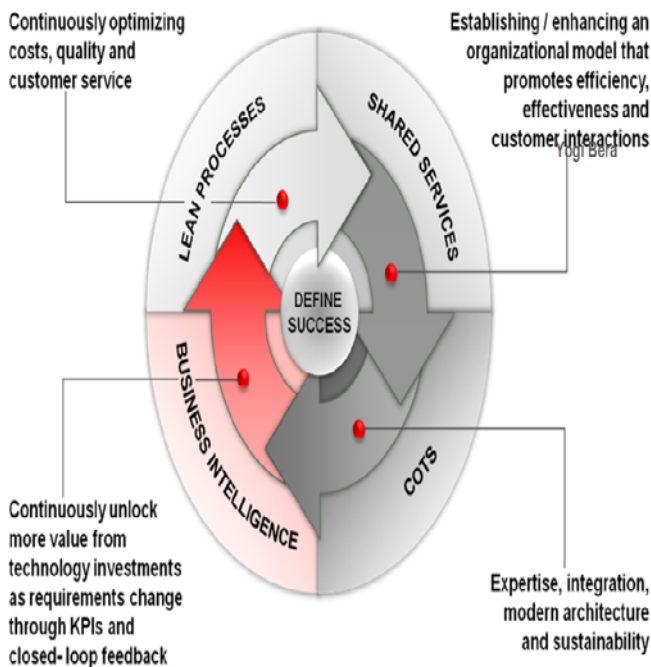
3- Commercial Off-the-Shelf (COTS) Application

COTS is a software enables a departure from the traditional scenario of high cost with low return for information technology .An effective Shared Services model, in turn, is predicated on a standardized approach to technology. As a result, COTS is generally a key enabling component to healthy and sustainable Shared Services.

4-Business Intelligence (BI)

In addition to these operational models, a fourth important trend — the use of analytics, or BI. Therefore the BI represents the latest wave in enabling Lean Performance Management. Once the organization has embraced Lean, has an operational model such as Shared Services which can support Lean, and has adopted r other comprehensive technology solution that can enable Shared Services, BI can be used to evaluate performance, link to KPIs and establish a continuous improvement, closed-loop model

**Figure ( 1): FOUNDATION FOR A LEAN PERFORMANCE MANAGEMENT APPROACH**



1.3. The strategic perceptive of the lean performance management:

■ Corporate performance management—as expected, the first priority for performance management is to ensure just that: that performance is managed. With that come

monitoring, measuring, and distribution of information out of the performance management function to set strategy and to plan, budget, and forecast (Pulakos, 2004).

And he adds that:

■ Workforce management:

Many organizations don't address this complete set of workforce management issues or even have solid support systems in place to see how their workforce management is performing (INFOR, 2009).

It's trite but true: What is your company without its people? Lean companies recognize that they must develop people in order to develop better products and processes ask the following critical questions (INFOR, 2009). Does your organization:

- Manage talent from hire to retirement, providing the necessary learning and growth opportunities for all employees, from frontline workers to senior staff?
- Evaluate and solve workforce needs, skillfully staffing the company while optimizing payroll expenses?
- Foster the right amount of intellectual pressure and urgency so that the workforce is motivated and challenged but not overwhelmed?
- Strive to continuously improve productivity while maintaining good safety?
- And, of course, apply sound Lean principles and performance tracking systems to workforce administration functions (e.g., many Lean companies have found great success in administrative settings with the technique of value-stream mapping, which helps to make invisible service and paperwork flows more apparent)? (Pulakos,2004)

■ Operations management—at the heart of performance management lies the answer to “How are operations performing, day-in, day-out, hour-by-hour?” Performance management can bring the gemba (translated, in Lean speak, as where the work is done) to senior executives, managers, and shop floor operators in all corners of a global company (Pulakos, 2004).

At a tactical level, performance management of operations also can offer computer-based customized dashboards that track key performance indicators (KPIs) for specific roles, and incorporate the means to act on those numbers: KPI histories, links to reports, day-to-day tasks, standardized work instructions, etc. (INFOR, 2009). Measurement through KPIs can provide an important and necessary calibration of performance assuming that alignment exists between the organization's mission, structure, supporting processes and performance tool / measures. Without this alignment, it's unclear that the “right” KPIs are being measured (An Oracle White Paper, 2009)

Further, this alignment is ultimately what ensures that the appropriate KPIs are not only defined and measured but also that a closed loop process exists to incorporate analyses back into the organization (An Oracle White Paper, 2009)

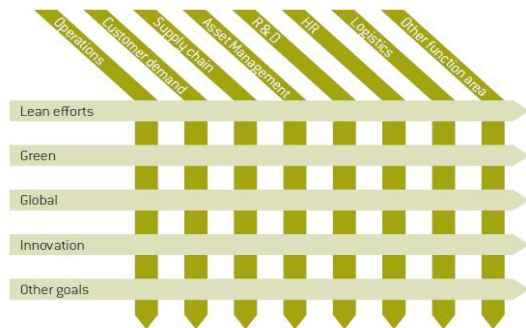
1.4. Lean performance management Process/function perspectives:

According to INFOR (2009), Proactive planning and lean performance management occurs within all functions in a real Lean organization, in addition to touching all the programs and issues that run horizontally throughout a company and across functions. What follows are two perspectives of performance management in action:

- Vertical by process/function**, managing goals important to the executives and workforce in that process or function
- Horizontal by objectives across the organization**, managing goals in which all processes/functions contribute to achievement of an overall objective

Figure (2) integrated performance management :

Performance management vertical and horizontal monitoring



According to Maszta (2010) develop a Performance Management process that will work best for your organization. The process includes focused planning to define desired components, followed by a thorough review of current tools and process in place (interviews, focus groups, and process reviews). Next steps include the development of a new or enhanced performance management process (tools or process or both), and the introduction of supporting tools and documentation. The final steps of the process are to develop the communications and training plans, and then to create an implementation plan to achieve maximum benefit and ensure program success.

Thus INFOR (2009) confirm, Often the group managing the performance management process does not exist as a standalone team, but instead consists of executives and senior management who are expected to lead this effort in addition to their functional roles. Because of this, it's even more important to ensure that the management of performance management has both structure and accountability

1.5. The challenges of lean performance management

According to Collins et al., (2012) there are a lot of challenges as follow:

1. Firefighting.—Reactive program execution
2. Unstable, unclear, and incomplete requirement
3. Insufficient alignment and coordination of the extended enterprise
4. Processes are locally optimized and not integrated for the entire enterprise

5. Unclear roles, responsibilities, and accountability
6. Mis-management of program culture team competency, and knowledge
7. Insufficient program planning.
8. Improper metrics, metric systems, and KPIs
9. Lack of proactive program risk management
10. Poor program acquisition and contracting practices

According to Robinson and Schroeder,(2009) High-performing idea systems—which the authors define as those that implement 12 or more ideas per employee per year—were found to be a major factor in successful lean initiatives, for following reasons.

First -Creating a Lean Improvement Culture by Engaging the Work Force

Robinson and Schroeder(2009) stats that a common reason lean initiatives perform poorly is that they fail to engage the work force in creating a culture of lean improvement Almost all the company leaders the authors interviewed stressed the importance of employee engagement, and the amount of training they provided to their employees was not a differentiator. But clear differences emerged the nature and extent of employee involvement. These differences are summarized in Table (1).

And Pulakos (2004) adds that , In spite of the difficulties, performance management is an essential tool for high performing organizations, and it is one of a manager’s most important responsibilities, if not the most important responsibility. Furthermore, done correctly, performance management can result in numerous important outcomes for an organization, its managers and employees.

Table (1): The differences of lean initiatives

Less successful lean initiatives	Successful lean initiatives
Improvement is management driven	Improvement is front-line driven
Improvement is done primarily through larger-scale events or projects	Small improvements are made on a daily basis
There are limited opportunities for front-line involvement	Front-line involvement is primary to improvement activity
Improvement activity is results focused	Improvement activity is process focused

Second -Improvement Opportunities That Are Hard for Managers to See:

Robinson and Schroeder(2009) say Managers deal primarily with information that has been aggregated—such as “profits are down,” “market share is dropping,” or “labor as a percentage of costs is up” (Hayek 1945). Information in this form is helpful in identifying issues, but not so helpful in dealing with them. But, as Hayek also observed, front-line workers are the ones who have specific and detailed knowledge of how their organization’s work actually gets done. As such, they are in much better positions than their managers to see many problems and opportunities. They also are in the best positions to develop ideas that will work to deal with these problems and opportunities

## 2. The value based organization perspective:

Value-based management can be defined as an “approach to management that aligns a company’s overall aspirations, analytical techniques and management processes to focus management decision making on the key drivers of value” (Koller, 1994). Consequently, implementing a comprehensive value-based management system helps a company to attain the goal of value maximization.

Or can be define Edvardsson and Enquist (2008) as a values-based business is a combination of core company values and foundation values, which guide the company in creating customer value

On other hand, Value-based management is a solution for both challenges mentioned. Not only does value-based management provide managers with metrics and analytical techniques for identifying value-creating strategies; it also aligns managers’ and shareholders’ interests by linking managers’ compensation and promotions directly to value creation (Ryan & Trahan, 2007; Martin & Petty, 2000).

### 2.1. The need for a modern approach of doing business:

From the customer’s perspective, ‘value’ is an overall personal assessment of the quality attributes of the market offering in relation to the price and other sacrifices. It is a subjective assessment of the positive and negative consequences associated with the purchase, including values linked to the provider (Edvardsson and Enquist, 2008).

The values of a company guide the attitudes and behaviors of the firm’s leaders, employees, and customers, as well as determining the business strategy and vision of the company (Edvardsson and Enquist, 2008). And they add Values can be understood as the principles, standards, ethics, and ideals that companies and people live by. A distinction can be made between two main categories of values: (i) a company’s core values (which form the basis of the company culture); and (ii) foundation values which reflect the norms of society in general.

### 2.2. The value based- and the strategy development perspective:

Today companies across a range of industries are finding that they can achieve high quality, fast speed to market, high customer service and low cost all at the same time (Laszlo et al., 2003).

In addition, creating value requires investments on which returns exceed the capital cost of investment. This implies, first of all, that managers must be able to identify and implement value-creating strategies (Bausch et al., 2009). Strategy development can be regarded as one of the most important areas in which to apply value-based management tools, as strategy has a very substantial and long-lasting effect on the value-creating potential of a company (Morin & Jarrell, 2001). Distinguishing between the two levels of corporate strategy and business unit strategy, a firm’s strategy development process is aimed at either creating a parenting advantage or at gaining and sustaining a competitive advantage (Johnson et al., 2008).

On the level of corporate strategy, choosing to do business in attractive industries is crucial. Industry attractiveness greatly depends on growth potential. This implies that establishing business units in fast-growing industries or creating growth

through internationalization or with new, innovative products and services is desirable.

### 2.3. Sustainable value -based organization:

The first—and most critical—step in building organizational sustainability is to explore the organization from the assets perspective. This means that a new way of thinking must be adopted, one that moves away from evaluating the needs and deficiencies of the organization and toward viewing it in terms of its assets, (Puntenney, 2000). And he adds that focus on organizational assets in ways that will reveal how many there really are, and show how to understand them in ways that can lead to increased sustainability.

#### 2.3.1 Five principles for developing a sustainable values-based service business:

Five principles for a sustainable values-based service business have been developed by (Edvardsson and Enquist, 2008)

#### Principle 1: Strong values drive customer value

Strong values form the basis for a company culture. In tandem with customers’ values and the values of the wider society, strong corporate values provide energy and direction to business development. Innovative service businesses are often created by entrepreneurs who are imbued with a clear vision and a strong sense of mission. Such vision and mission are usually based on a firm set of personal values. . The values create bonds with customers and thus represent a significant loyalty driver. Thus, in developing a sustainable values-based company, values are pre-eminently important in the company’s relationships with its staff, partners, suppliers, shareholders, and the media but most important its customers.

#### Principle 2: CSR as a strategy for sustainable service business:

Sustainable values-based service businesses have a strong commitment to corporate social responsibility (CSR), which leads to quality-assurance systems, appropriate performance indicators, By using CSR in a proactive way, companies think ‘laterally’ in searching for ‘smart’ solutions. The logic of values thus drives the logic of value creation.

#### Principle 3: Values-based service experience for co-creating value

Many services are experience-based and companies should therefore create and offer ‘test-drives’ of services for customers to enable them to experience the service, before purchase and consumption. Customers’ experiences are formed during use or consumption of a service. When a customer’s basic requirements are met, other issues make a difference.

#### Principle 4: Values-based service brand and communication for values resonance:

Brands are living expressions of what a company stands for. They communicate what its products or services can do for people. However, if a company overstates what its products can do, and subsequently fails to deliver (as perceived by customers), this creates adverse reactions—both in the market and among the company’s employees. These brands then enable values-based

companies to reach out and connect with customers, staff, and other stakeholders.

**Principle 5: Values-based service leadership for living the values**

To secure sustainability, a values-based company needs a strong, values-based leadership. A company built on an entrepreneurial business model often has the original entrepreneur’s values and leadership style as a model for future generations of leaders. Success in capturing these opportunities requires new leadership and the courage to understand and engage a diverse set of constituencies, including those previously considered adversarial or Marginal to the business (Laszlo et al., 2003).

**1.3. The value based- and the strategy development perspective:**

Strategy development can be regarded as one of the most important areas in which to apply value-based management tools, as strategy has a very substantial and long-lasting effect on the value-creating potential of a company, (Morin & Jarrell, 2001).

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On the level of corporate strategy, choosing to do business in attractive industries is crucial. Industry attractiveness greatly depends on growth potential. This implies that establishing business units in fast-growing industries or creating growth through internationalization or with new, innovative products and services is desirable. The top four levels in Figure 3 represent opportunities that are significantly larger than those represented by eco-efficiencies. They are opportunities for innovation and topline growth based on business solutions that integrate financial and societal performance, (Laszlo et al., 2003).

**Figure 3. Levels of strategic focus**

Levels of Focus	Sources of Value
Business Context	Changing the “rules of the game” to provide competitive advantage for sustainability strategies
Reputation/ Brand	Gaining stakeholder recognition and preference including attracting and retaining talent and employee productivity
Market	Entering new markets driven by customer and societal needs (sanitation, health, clean air, water,...)
Product	Creating product differentiation based on technical and sustainability features
Process	Reducing energy, waste or other process costs. Security of supply of raw materials
Risk	Compliance-oriented management of risks and protecting license to operate

**2.4. The value- base for Shareholders and Stakeholders**

Stakeholder value, based on a company’s economic, environmental, and social performance, is anew and largely untapped source of competitive advantage that is likely to grow in the years ahead. (Laszlo et al., 2003).And he adds

**2.4.1 A stakeholder value approach:**

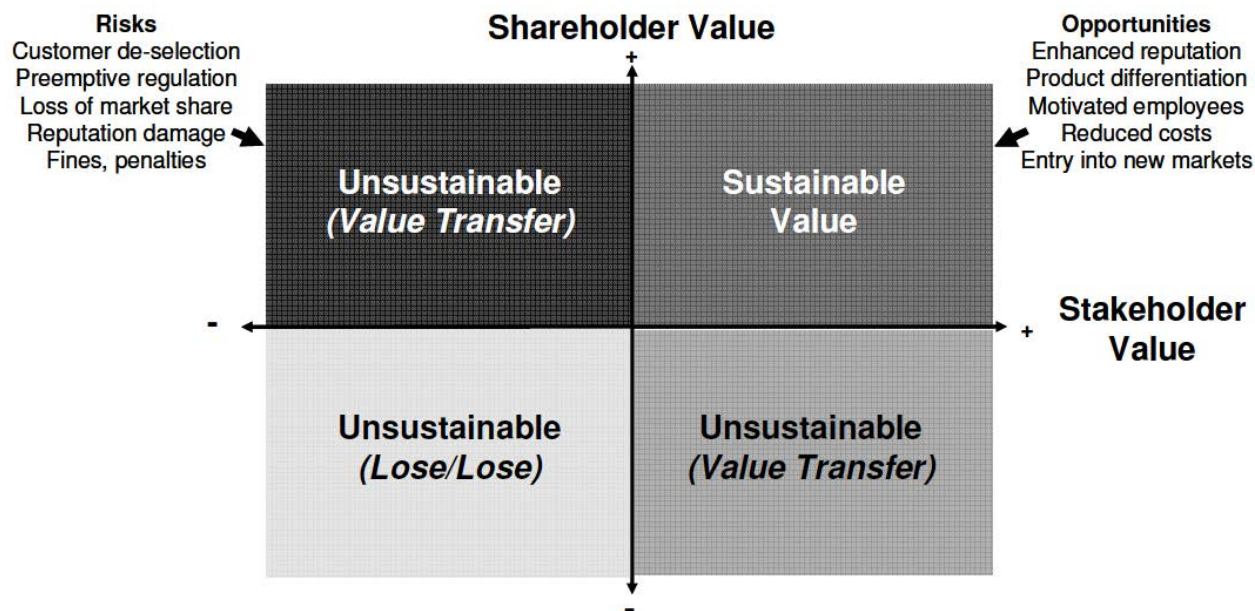
It requires managers to think “outside-in” about how their companies create and sustain competitive advantage. Outside-in thinking, which sees the world from the perspective of stakeholders, is a powerful new lens through which managers can discover new business opportunities and risks (Laszlo et al., 2003)

(Laszlo et al., 2003)To succeed in a stakeholder-driven business environment, business leaders must think and operate in new ways, shaping strategies and actions with full awareness of their impacts on and implications for key stakeholders.

Figure five describes company performance along two axes: shareholder value and stakeholder value. Managing in two dimensions represents a fundamental shift in how managers must think about business performance. In this framework, companies that deliver value to shareholders while destroying value for other stakeholders have a fundamentally flawed business model.



Figure (5): The Sustainable Value Framework



Starting in the upper left of Figure 5 and moving counter-clockwise, consider the following four Cases of value creation and destruction

**1-Upper left quadrant:**

When value is transferred from stakeholders to shareholders, the stakeholders represent a risk to the future of the business. Companies that avoid environmental regulations in their home markets through exporting production to countries with lower regulatory standards create similar risks. Also in this quadrant are firms that create shareholder value through a low cost strategy that tolerates management actions to cut costs through avoiding overtime pay, undertraining on employee safety or discriminating on the basis of gender and ethnic background. Shareholder value in these cases is created “on the backs” of one or more stakeholder groups, thereby representing a value transfer rather than true value creation.

**2. Bottom left quadrant:**

When value is destroyed for both shareholders and stakeholders, this represents a “lose/lose” situation of little interest to either.

**3. Bottom right quadrant:**

When value is transferred from shareholders to stakeholders, the company incurs a fiduciary liability to its shareholders. Actions intended to create stakeholder value that destroy shareholder value put into question the company’s viability. Environmentalists often unintentionally pressure companies to take actions in this quadrant without realizing that the pursuit of loss-making activities is not sustainable either. Avoiding offshore sourcing to protect American jobs is an example of creating stakeholder value (employee job security) while destroying shareholder value (higher operating costs).

**4. Upper right quadrant:**

When value is created for stakeholders as well as shareholders, stakeholders represent a potential source of hidden value. Sustainable value is created only in this case.

*2.3.2 A disciplined approach:*

Laszlo et al .,(2003) add “A disciplined process” to create sustainable value requires three phases:

1. Diagnosis:

Understand where and how the company is creating or destroying value for Stakeholders. Anticipate future stakeholder expectations and identify key emerging issues. Assess the business risks and opportunities associated with current stakeholder impacts.

2. Value creation:

Choose specific actions that create shareholder and stakeholder value, or Reduce stakeholder value destruction while increasing shareholder value. Leverage strategic Partnerships with key stakeholders build a compelling business case for action and obtain the needed resources.

3. Value capture:

Determine the requirements for execution, including stakeholder alignment. Carry out the activities to implement the actions. Measure progress on shareholder value and stakeholder value, validate results, and capture learning.

So disciplined approach that integrates stakeholder considerations into core business strategy and operations can help senior executives and line managers create above average returns.

### 3.The benefits of applying the Lean Performance Management(LPM):

New ways that the organization's unique access to Ongoing participatory decision making , evaluation, assessment, leadership development among staff, board its constituents represents a potentially powerful tool that can be utilized in organizational planning, evaluation, and promotion ,(Puntenney, 2000).

Consequently, value-based management may help any utility firm to take the right actions that will allow to create value and to be among the leading firms in its industry ,( Bausch et al , 2009).

So ,It's important that the "system" aspects of performance management ensure the ability to build, incorporate, and update goals and objective (INFOR, 2009). And he add functionally, performance management systems also must provide real-time visibility into what's happening throughout other corporate systems and applications

And Bhatia and Drew, 2006 mention the benefits of applying LPM as follows:

- Enabled Shared Services Model :
  - By centralizing processes the organization is able to reduce the resources required to handle the same or greater number of activities this enabled the organization to eliminate waste while improving flexibility.
  - Improved Processes :

By adopting Lean principles, the organization is able to improve the efficiency and effectiveness of organizational processes. . And as part of its closed-loop system, the organization streamlined the processes to its final resolution.

- Improved Workflow
  - In addition to streamlining its ability to improve service request workflow by decreasing the processing time required to respond to and complete work orders. It achieved this by minimizing the number of manual transactions required — minimizing manual documentation to instantly create action-oriented workflows.
  - Improved Field Service Performance

The organization can increase its efficiency in providing service. Moving forward, integrated between the opportunities and the process to optimize the performance level

- Enhanced Citizen Services

As a result of the enhanced operational model, the organization also enabled it to dramatically improve the quality of the services it delivered to its citizens, primarily by re-inventing the partnership between the citizens and the organization

- Improved Knowledge Management

By capturing institutional knowledge in a database documents current processes and improves the ability of

customer service representatives to resolve common constituent issues.

And according to An Oracle White Paper (2009):

- Enhance Reporting:

Also improved accountability and planning. Because of the sophisticated

Reporting capabilities citizen services solution, and provided more transparency into operations, new and improved processes, and greater responsiveness to citizens, and improved internal supply chain management. This enabled them to more effectively plan how to allocate resources among various initiatives, support and state-wide best practices.

- Enhanced Transparency:

By developing flexible reporting capabilities for both internal and external uses, the organization has visibility into the entire citizen-call-response lifecycle. It routinely documents call metrics, including time, purpose, geographic distribution, and time-to-resolution.

- Improved Analytical Capabilities:

By analyzing call data, service requests, and work order requests, City executives can identify emerging trends and program needs. When aggregated, this data provides insights into current and future citizen demands as well as potential solutions. And because these analyses are accessible by department managers.

- Improved Decision-Making

Managers will be able to better plan programs, train employees, and allocate budgets based on evolving needs.

- Enhanced Performance Management:

By tracking and sharing metrics on how well services are being delivered by employees, contractors, and partners, the organization is able to boost accountability across all departments. This facilitates and directly drives operational excellence which allows for better management and service-level.

- Improved Planning

Management will access to sufficient data to make better decisions, ranging from more accurate budget forecasting to strategic planning to ensure the organization is on track to realize its vision.

- Improve Revenue Generation and Capture

The organization increases their ability to generate and capture revenue. -routed from individual departments to a centralized location for more efficient collection of fees.

In addition Maszta (2010), The following extra benefits Implementing a lean Performance Management Process:

- Individual performance expectations are established
- Individual goals align with department and company goals
- Performance levels are enhanced

- Stronger performance is recognized and weaker performance is addressed
- Opportunities for development and growth are identified and pursued
- Employees are held accountable for their performance
- Managers are held accountable for managing the process within their group/department
- Employee engagement, satisfaction and retention improves

### III. CONCLUSION

The bottom line is that conducting lean Performance Management systems effectively helping organizations to better influence their human capital and optimize workforce and organizational performance towards the competitive intelligence the cut off and the un-visionary strategic scope between strategy and action, unfocusing on value for the external customer and integrating the work and tasks of all employees to financial and business needs will unsuccessful process and that is good enough for making the company not only suffering ,having very hard time but also for sure will on the long run will lose customers very easily

Therefore, shifting as a start to thinking “outside the box” of usual day-to-day actions on a lean culture base during restructure or reengineering their processes or mobilizing their assets .This will be effectively useful for each organization to explore internal and external opportunities .

Finally, Without such not only applying lean performance management ( LPM) but to be fully convenience about it , especially when horizontally across an organization as well, monitoring performance of specific goals and objectives , may have a difficult time creating a lean improvement culture eliminating deeply the unsuccessful process.

### IV. FUTURE ACTIONS

I do highly recommend breaking out the company standard ,culture, values in a very smooth way of re-thinking and re-engineering about organizational development, eliminate unnecessary constraints on their creativity and identify innovative ways of exceeding the challenges and opportunities limitations toward having a superior sustainable value-based organization as a competitive intelligence

- Only the bridging over the Lean performance gap by supporting strategic goals and targets to all processes, functions, and objectives, along with the means to review and adjust based on real-time and updated information
- Better understanding , empowering, rewarding leaders and co-workers to and well-designed updated the company training plan specially of how conducting the lean performance management the way of integrated it to all company processes

- Having a highly strategic visionary that maximizing the value of your company and provides to its customers and its competitive advantages in the marketplace
- More focusing on the developing and conducting the innovation and entrepreneurship management which are considered as a critical success factor for the conducting the lean performance management
- Develop effective ,well-structured communication matrix among executives and employees, especially at the manager-to-supervisor and supervisor-to-operator levels to enhancing the ability to check on progress toward the company strategic goals.
- More keening on applying the quality continues improvement techniques keeping the organization to “test” itself against a multi-dimensional definitions of organizational sustainability and by systematically assessment and deeper understanding the various components of the organization and the relationships between and among them and present in its relationship network.
- Design an effective tracking system and fully sharing metrics on monitoring and controlling progress of bridging the lean performance gap on a transparency base of how the updating feed backs are being batched by ,through and to the employees, in other word across all the departments. This will for sure facilitate and directly drives operational excellence which allows for better strategic management .

### ABBREVIATIONS

- Business Intelligence (BI)
- Commercial Off-the-Shelf (COTS)
- corporate social responsibility (CSR)
- Key Performance Indicators (KPIs)
- lean performance management ( LPM)
- Non-Governmental Organizations (NGOs)
- Plan-Do-Check-Act (PDCA)
- Superior Sustainable Value-Based(SSVB)

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#### AUTHORS

**First Author** – Mahmoud A. Ramadan, Arab Academy for Science, Technology & Maritime Transport  
Marketing Department, Mahmoud.Ahmady@aast.edu



# Rural Development in Haryana

Kanu Raheja

Assistant Professor, Satpriya Group of Institutions, Rohtak

**Abstract-** Rural development is conceived as strategy aimed at finding ways to improve the rural lives with participation of the rural people themselves so as to meet the required need of the rural area. According to World Bank (2005), rural development is the process of rural modernization and the monetization of the rural society leading to its transition from traditional isolation to integration with the national economy. Also, rural development is perceived as a process of not only increasing the level of per capital income in the rural areas but also the standard of living of the rural population measured by food and nutrition level, health education, housing, recreation and security. Haryana is a leading contributor to the country's production of food grain and milk.. Greening rural development can stimulate rural economies, create jobs and help maintain critical ecosystem services and strengthen climate resilience of the rural people. Conversely, environmental challenges can limit the attainment of development goal. The basic objective of this paper is to upgrade the living standard of the rural people by providing ways to develop rural parts of Haryana and improving food security including those below poverty line (BPL) by restricting the rural-urban migration. However, to provide optimum benefit to the grass-root level, there is a need for coordination among various Government agencies and other institutions engaged in rural development. This will also assist in minimizing the rural-urban gap in terms of basic infrastructure facilities essential for 'Sustainable Development' of a settlement.

**Index Terms-** Rural Development, Growth Rate, Literacy Rate.

## I. INTRODUCTION

Rural development is the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas. Rural development has traditionally centered on the exploitation of land-intensive natural resources such as agriculture and forestry. However, changes in global production networks and increased urbanization have changed the character of rural areas. Rural development as a concept suggests the overall development of the areas and sustaining improvement in the quality of life of rural people. It results in creating an environment conducive to improve people's capacity and to utilize it fully, without exploitation, on a sustainable basis. It is both the means and end of economic development of a country like India. Today, apart from governments, rural development has become a matter of interest to industrialists, financiers, bankers and philanthropists as well. In India, a country of villages, it means making the life of the majority, worth to live and thus paying back them the dividend of India's economic growth. Four decades of regulations and two decades of liberalisation, has made India the

ninth largest economy in the world (World Bank, 2011), which could grow, second after China, at an average rate of 8.46 per cent, for the last five years, even in the aftermath of global economic slowdown (Economic Survey, 2010-11). There are predictions that if the current high growth continues, India will overtake Japan (pre-quake) by 2030 (Economic Outlook – India 2008 to 2010). Today India hosts 11 per cent of the world's richest (Forbes India Magazine 2010) and it is looking forward the fortunes to trickle down to the rural people. India has 6.4 lakhs villages with a population of 83.3 crores which is 68.84% of the whole India (Census India, 2011). Providing timely and adequate cheap credit to farmers, rural artisans, petty shop keepers, and micro and small entrepreneurs is of paramount importance. It is reported that rural India suffers from a more serious lack of finance than urban Indian (Bose, 2004, Shah et al., 2007, Mishra, 2008, Remesha, 2003). Rural development strategies are a critical component of an inclusive growth strategy for Haryana

## II. REVIEW OF LITERATURE

J. Dean Jansma and Frank M. Goode, Rural Development Research: "Conceptualizing and Measuring Key Concepts" In this research paper the researcher explain the conceptual basis for rural economic development. He said rural economic development is assumed to be reflected by increase in employment and/or income. The major determinants of income and employment in a given economic space (a rural community) are the quantity of the goods and services sold to and inputs purchased from outside the community and the extent to which dollars entering the local area are "recirculated" within the local economy.

Kenneth L. Deavers," Social Science Contributions to Rural Development Policy in the 1980s". In this research paper author said, rural development policy involves deliberate action by federal, state, and local governments and private institutions and individuals to achieve three goals: (a) improved rural income levels and employment opportunities; (b) improved access by rural residents to adequate housing and essential community facilities and services; and (c) responsible use of rural resources and the rural environment to preserve the quality of rural life. In attempting to achieve these rural development goals, federal policy needs to be guide.

Clark Edwards," The Political Economy of Rural Development: Theoretical Perspectives". In this paper the author said that the rural and urban sectors of the economy are strongly interlinked. Growth in one sector impacts on the other. The growth process does not appear to be an equilibrium one in which marginal adjustments to opportunity costs eliminates disparities. This rural-urban imbalance is of national concern. It

appears to have resulted in relatively densely populated cities and sparsely populated countryside. Rural development can increase economic efficiency, add to the nation's goods and services, and enhance the social and economic well-being of both the rural and the urban sectors.

### III. OBJECTIVES OF THE STUDY

1. To upgrade the living standard of the rural people by providing ways to develop rural parts of Haryana.
2. To know various schemes made by government of Haryana for developing its rural areas.
3. To provide optimum measures for restricting rural-urban migration.

### IV. RURAL DEVELOPMENT

In the last thirty years Asia has experienced dynamic growth and structural transformation, and has achieved substantial poverty reduction. The incidence of people living in poverty fell from more than 50 percent in the mid-1970s to 18 percent in 2004, and the incidence of hunger fell to 16 percent. However, Asia is still home to more than half of the world's poor, the majority of whom live in rural areas. Agricultural and rural development thus remains a critical component of an inclusive growth strategy for the region. Haryana is a leading contributor to the country's production of food grain and milk. Agriculture is the leading occupation for the residents of the state; the flat arable land is irrigated by submersible pumps and an extensive canal system. Haryana contributed heavily to the Green Revolution in the 1960's, that made India self-sufficient in food production. According to census, 1991-2001 about 71.07% of Haryana's population was living in rural area and the agricultural sector contributed 31.19% (Rs. 16625.71 crores) to the Net State Domestic Product. For the year 2006-07 this figure dropped to 21.45% (Rs. 24795.16 crores) which shows decline in the agriculture and animal husbandry sectors. Land, the main asset in rural area, is concentrated amongst a few. The Population of Haryana according to the 2011 census stands at about 25 million, making it the 17th most populated state in India. The state lies in the northern part of the country and is well connected to the capital of India. There is a huge influx of population into Gurgaon, which is a part of Haryana from Delhi. The state is

spread over an area of about 44000sq. km. making it the 20th largest state in the country in terms of area. The density of population per sq. Km. is about 570 which is above the national average. The state has a growth rate of about 19% which slightly exceeds the national growth rate of about 17%. The population of the state is rising considerably due to rapid efforts towards development and progress. The literacy rate in the state is about 76% a figure that has improved tremendously in the last few years due to the consistent efforts of the government. The sex ratio in Haryana leaves a lot to be desired as it lags behind the national average by 70 points. The statistics in the Haryana Census 2011 reveal facts that can be instrumental in planning for a better development plan for the state.

#### Haryana Population 2011

As per details from Census 2011, Haryana has population of 2.54 Crores, an increase from figure of 2.11 Crore in 2001 census. Total population of Haryana as per 2011 census is 25,351,462 of which male and female are 13,494,734 and 11,856,728 respectively. In 2001, total population was 21,144,564 in which males were 11,363,953 while females were 9,780,611.

##### (a) Haryana Population Growth Rate

The total population growth in this decade was 19.90 percent while in previous decade it was 28.06 percent. The population of Haryana forms 2.09 percent of India in 2011. In 2001, the figure was 2.06 percent.

##### (b) Haryana Literacy Rate 2011

Literacy rate in Haryana has seen upward trend and is 75.55 percent as per 2011 population census. Of that, male literacy stands at 84.06 percent while female literacy is at 56.91 percent. In 2001, literacy rate in Haryana stood at 67.91 percent of which male and female were 76.10 percent and 59.61 percent literate respectively.

##### (c) Haryana Density 2011

Total area of Haryana is 44,212 sq. km. Density of Haryana is 573 per sq km which is higher than national average 382 per sq km. In 2001, density of Haryana was 478 per sq km, while nation average in 2001 was 324 per sq km.

#### Haryana Sex Ratio

Sex Ratio in Haryana is 879 i.e. for each 1000 male, which is below national average of 940 as per census 2011. In 2001, the sex ratio of female was 861 per 1000 males in Haryana.

State	Total Population	Rural Population	Urban Population	Rural Pop Percentage	Urban Pop Percentage
Haryana	2,53,53,081	1,65,31,493	88,21,588	65.21	34.79

#### Rural Development Department, Haryana

The Department of Rural Development through the District Rural Development Agencies is implementing Special Beneficiary Oriented Schemes, Wage Employment Programmes and Area Development Programmes. The Government of India from the year 1999-2000 has restructured/modified most of the Rural Development Schemes. Besides this, the Government of India has also

changed the funding pattern of all the schemes from 50:50, 80:20 and 100% and most of the schemes are now being implemented on 75:25 and 90:10 sharing basis between the Central and State Governments respectively. The Special Beneficiary Oriented Schemes, Wage Employment Programmes and Area Development Programmes being implemented by the department of Rural Development are given as under.

RURAL DEVELOPMENT DEPARTMENT, HARYANA		
STATEMENT SHOWING THE SCHEME-WISE OUTLAY FOR THE FINANCIAL YEAR 2015-16.		
Sr. No.	Major Heads/ Minor Heads of Development (Scheme-wise)	Proposed Outlay for the year 2015-16. (Rs. in Lacs)
A	State share	
1	Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)	1800.00
2	Indira Awaas Yojana (IAY)	6000.00
3	DRDA Admn.	650.00
4	Integrated Wasteland Management Programme (IWMP)	550.00
5	NRLM/SGSY	1200.00
6	Monitoring Cell	40.00
7	Pay to JGSY Staff (At State Headquarter)	55.00
8	Pay to Gram Sevikas	300.00
9	Information Technology (IT)	5.00
	Sub Total	10600.00
B	Centre Share	
1	MGNREGS	25000.00
2	IAY	18000.00
3	IWMP	5000.00
4	BRGF	3300.00
5	MPLADS	7500.00
6	NRLM/SGSY (including DRDA Admn.)	3500.00

	Sub Total	62300.00
	GRAND TOTAL	72900.00

### Rural development schemes:

Some of the major schemes implemented by the Rural Development Department are as follows:

- Swarnjayanti Gram Swarozgar Yojana (SGSY)
- Indira Awaas Yojana (IAY)
- Sampooran Grameen Rozgar Yojana (SGRY)
- Watershed Development Projects/Hariyali Scheme
- Desert Development Programme(DDP)
- Members of Parliament Local Area Development Scheme (MPLADS)
- Rashtriya Sam Vikas Yojana (RSVY)
- Total Sanitation Campaign (TSC)
- Swarnjayanti Shahari Rozgar Yojna (SJSRY)
- Employment Assurance Scheme (EAS)
- National Rural Employment Guarantee Scheme (NREGS)
- Integrated Wasteland Development Projects (IWDP)
- Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)
- Bharat Nirman Rajiv Gandhi Sewa Kendra (BNRGSK)
- National Rural Livelihoods Mission (NRLM)/Aajeevika
- Backward Region Grant Fund
- Intergrated Watershed Management Programme (IWMP)

### District Rural Development Agency

The District Rural Development Agency (DRDA) has traditionally been the principal organ at the District level to oversee the implementation of different anti poverty programmes. The primary objective of DRDA Schemes is to professionalize the DRDAs so that they are able to effectively manage the anti poverty programmes of the Ministry of Rural Development and interact effectively with other agencies. The Department of Rural Development is implementing a number of programmes in rural areas through the state Governments for poverty reduction, employment generation, rural infrastructure habitant development, provision of basic minimum services etc.

Programmes implemented by the DRDA

- Panchayati Raj
- Pradhan Mantri Gram Sadak Yojana (PMGSY)
- Swarnjayanti Gram Swarozgar Yojana (SGSY)
- Sampoorna Gramin Rozgar Yojana (SGRY)
- Rural Housing (Indira Awaas Yojana)
- DRDA Administration
- Training Schemes
- Promotion of Voluntary Schemes and Social Action Programme, organization of beneficiaries, advancement and dissemination of rural technology through CAPART.
- Monitoring mechanism.

### Comilla Model

The Comilla Model was a rural development programme launched in 1959[1] by the [Pakistan Academy](#) for Rural Development (renamed in 1971 the [Bangladesh Academy for Rural Development](#)). The Academy, which is located on the outskirts of [Comilla](#) town, was founded by [Akhter Hameed Khan](#), the [cooperative](#) pioneer who was responsible for developing and launching the programme

The main features of the Comilla Model were:

The promotion of development and of refining of various [institutions](#), both public and private, and establishing a system of interrelationships between them;

- Involvement of both [public](#) and [private sectors](#) in the process of rural development;
- Development of leadership in every village, including [managers](#), [model farmers](#), [women organizers](#), [youth leaders](#), and village [accountants](#), to manage and sustain the development efforts;
- Development of three basic infrastructures (administrative, physical and organisational);
- Priority on [decentralized](#) and coordinated rural administration in coordination with officials of various government departments and the representatives of public organisations.
- Integration and coordination of the various developing services, institutions and projects;
- Education, organisation and discipline;
- Economic planning and [technology](#);
- Development of a stable and progressive [agriculture](#) to improve the conditions of the farmers, and provide employment to rural labour force

### RIGA Project

The Rural Income Generating Activities (RIGA) Project is a collaboration between the [Food and Agriculture Organization](#), the [World Bank](#), and [American University](#) (Washington, DC) that seeks to contribute to the understanding of the income generating activities, both agricultural and non-agricultural, of rural households in developing countries. The RIGA project achieves this by two means. First, through the development of an innovative database of income sources from various developing countries, which is available free of charge to researchers via the project's website. Second, by producing studies and publications that use the database to analyze pressing economic and policy issues.

### Purpose

The RIGA Project's purpose is to create an income measure that is comparable within and between countries.

According to the RIGA Project website, the key questions addressed by the RIGA Project include:

- What are the relationships between the various Rural Income Generating Activities (RIGAs)?
- What types of RIGAs are associated with poverty reduction?
- What is the relationship between various Rural Non-Farm activities and agriculture?
- What is the link between RIGAs and food security?

In order to answer these questions, the RIGA Project developed a standardized income calculation method that is applied only to country surveys that meet strict criteria of data requirements. The definition of income utilized closely adheres to the one set out by the [International Labour Organization](#). The "Resolution Concerning Household Income and Expenditure Statistics" passed by ILO outlines that household income includes all monetary and in-kind receipts that a household receives, which should include income from wage employment, self-employment, property, own consumption of household goods, and both public and private transfers.<sup>[3]</sup> Since agriculture remains the principal activity for rural households, the RIGA Project also considers income generated from on-farm activities, both those sold and consumed by the household.

## Measures for Rural Development

### 1. Agricultural output

The most important factor affecting agriculture output is the availability of water. The length of main canals increased only by 42 miles between 1981-1991 and this increase was just 24 miles between 1991-2001. Each additional irrigated hectare of land gives employment to eight additional labourers. If the State gets its due share of water, one lakh hectares of additional area can be brought under irrigation. Thus, State may be able to produce additional grain worth Rs. 1000 crore.

a) Encouraging cultivation under green house sheds:

A number of vegetables, flowers and fruits can be grown under greenhouse shed to get high yield. Some private companies provide consultancy, know-how, seeds and marketing facilities with purchase contract. This is known as high capital-low land-low labour-low input high yield strategy.

b) Farming can also generate quality employment of 12 lakh persons in supervision, packing and transport of farm output

c) The indirect subsidies should be given to promote agriculture

e) All direct subsidies should be converted in the indirect ones such as agricultural research and irrigation or water harvesting or water shed management infrastructure or soil conservation or environmental protection or biofertilisers to be in the "Green Box".

2. Panchayats need to be strongly encouraged by subsidies to build and maintain water-harvesting structures, especially in view of the continuing deterioration in the condition of ponds/water tables

3. The quality of electricity supply is very poor in the rural area and farm sector. This is the main reason that farmers are not willing to pay the power bills. There has been a number of hidden costs in the form of more farm supervision, damage to the water pumps, burning of transformers and increased uncertainty. Since most of the farmers have a flat rate system, thus there is no chance of overuse of the electricity by the farmers. However, this

leads to the cultivation of water intensive crops. The SEBs impute all power losses and thefts of all sectors including their own corruption and inefficiencies on the farmers which is not the reality.

4. It is recommended that the State should use the distributed power production model. The electricity farming by solar power not by photovoltaic method but by focusing of sun rays by a concave mirror, wind-mills, bio-mass energy (using dung), biodiesel or solid plastic wastes generated from urban areas should be the new methods of power generation. The people i.e. farmers, co-operatives, municipal bodies, private parties and shopkeepers should be allowed to produce electricity by any method

5. The Haryana Government should plan all the cities in such a way that they are connected to a hub of villages by circular ring roads with fast transport and connectivity system. The existing 97 urban areas can be connected to the villages by an average peripheral road of 60 kilometres so that even the farthest villager can reach to the city and come back within one hour. This will require building good quality roads of 6500 kilometres. With this kind of strategy, the industrial manufacturers will be induced to start their production units in the rural areas; and the congestion, pollution and rise in property prices and slum areas in the cities will be controlled. The production process will shift from urban to rural areas which can absorb more pollution.

6. The investment in agriculture with new technologies can reduce not only the variable costs of farm outputs in short-run but also the risks of farming

7. A serious policy intervention is required to promote the use of organic, bio/compost fertilisers, organic sprays and integrated pest management practices

8. In the suburban areas or some big villages, where people have the ability to pay, the water supply systems can be handed over to private parties with strict conditions that if they do not invest certain percentage in rain water harvesting, water purification or do not provide good service to the people, the State has the right to change the service provider

9. There is a serious problem of shortage of latrines in Haryana villages. In every village, the government should make best quality latrines and hand over them freely to people who can run them and can recover variable costs

10. There is a great opportunity of generating employment in the rural areas by production of electricity. People should be allowed to produce electricity using bio-mass (dung), biodiesel, solar energy or wind mill. A small bio-mass plant does not cost more than Rs. 40 thousand and can give employment to four unskilled persons. The State can provide training, and the banks can give loans through micro-finance institutions<sup>15</sup>. All the schemes of providing incentives to own private assets for self-employment can be connected with family planning schemes. Those who are unemployed and unmarried should be given the asset with the condition that if they have more than two children in future the State can take the asset back

11. The protection of environment can also generate a lot of employment opportunities. The investment in rainwater harvesting structures, community based ponds/johars, etc. should be enhanced.

## Rural Infrastructure

### a) Rural Roads

Amongst the various components of the infrastructure, the roads in the rural areas have assumed great importance. The development of roads in rural areas would not only provide the basic facility to the villagers but also help in reaching the rural India in its true sense. The rural economy which in other sense is agro economy and the construction of rural roads would provide a major incentive for the development of rural sector, that is, both farm and non-farm sectors. The recent programme of PURA (provision of urban amenities in rural areas) is also an important initiative by the Government of India, in this direction

### b) Rural Communication (Telecom)

The second most important component of rural infrastructure is the Rural Telecommunication. After the rural roads, the telecom connectivity forms the most crucial part of the rural connectivity. It connects rural (agro) economy with the rest of the economic development of the country. Irrigation With the limited and scarce irrigation facility, the irrigation potential has not been realised so far. There is enormous potential to be explored in this sector. The wide gap between potential and actual realisation of irrigation is prevailing across the entire rural areas.

### c) Shelter-Rural Infrastructure (Rural Housing)

The basic requirement of the rural masses is shelter. For the survival of the human beings, housing is most needed. The housing for the poor in rural areas is most crucial. It provides a dignified living standard and ensures the security to the rural masses.

### d) Rural Energy (Rural Electrification)

Power (energy) is the most crucial component of the infrastructure in the rural area. The adequate supply of energy attracts investments, which in turn help in the establishments of various industries in the rural areas. For the up gradation of this component of rural infrastructure, the Government of India has introduced 'Rajiv Gandhi Grameen Vidhyuttikaran Yojana' in the fiscal year of 2005. Under this programme it is planned to provide electricity in all the villages and the habitants in the rural areas, in the coming four years Rural Energy (Bio-Gas Plants)

For the provision of clean and unpolluted energy to the rural masses, the programme of biogas plant has been introduced in the State. The programme was initiated with the two folds objectives. One was to provide energy for the domestic purposes and the second important objective was to generate enriched manure for the use in the agricultural activities.

### e) Renewable Energy

The State has also implemented various programmes and policies for the exploration of energy through nonconventional and renewable sources. There are many programmes and schemes related to solar energy, biogas, micro hydel and biomass, the State has initiated measures to explore the energy through these sources.

### Rural Infrastructure and the Panchayati Raj Institution

The role of Panchayati Raj system has also assumed significant importance in the rural infrastructure development in the State. The financial and administrative powers assigned to PRIs would ensure social security, equality and social justice for the people in the rural areas. The concept of Gram Vikas Samities has been implemented in the States. These bodies are

assigned responsibilities of execution of development works in the rural areas

### Haryana Rural Development Fund

Administration Board has been constituted in the State. For the efficient execution of the development works in rural areas.

### Nirmal Gram Puraskar

Launched by the GOI for full sanitization and open defecation- free Gram Panchayats in the State. Under the Restructured Rural Sanitation Scheme the government has provided individual toilets and sanitary complex facilities for the women in the rural areas.

### Rural Infrastructure and the Institutional Finance

For any development programme, the provision of finances through the mechanism of institutional finance is very essential. In the State of Haryana, the Government has been persuading to the banking institutions to give importance to the Agricultural and Allied Sector, particularly to poverty alleviation programmes.

## V. CONCLUSION

Rural development strategies are a critical component of an inclusive growth strategy for Haryana. Developing a modern rural development strategy for poverty reduction in Haryana in the coming decades requires recognition of institutional and technological changes, as well as of the growing role of a broadly defined and diversified agricultural system Furthermore, the rural poor need to participate in the development and implementation of the relevant policies and programs, which need to ensure

- gender equity
- inclusion of minorities
- participation of the poorest in markets and in the provision of services

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## AUTHORS

**First Author** – Kanu Raheja, Assistant Professor, Satpriya Group of Institutions, Rohtak., Qualifications: MBA & NET Qualified, Email Id: kanuraheja23@gmail.com





# Current Scenario of Child Labour in Haryana

Kanu Raheja

Assistant Professor, Satpriya Group of Institutions, Rohtak

**Abstract-** Child Labour is one of the major concern of India. A large number of Schemes, Projects and laws have been introduced by the Government of India to overcome the problem but the problem has not been solved yet rather the number is increasing day by day. The union Budget Gives least importance to the problem, also the amount which is allocated every year is not being spent as per plans. Presence of child labour is the violation of the child labour laws as well as the lack of implementation of primary education or Sarva Shiksha Abhiyan. Present paper deals with the of Current Scenario Child labour in Haryana state. Paper also finds out some major problems regarding implementation of the law. Suggestions to eradicate the problem have been given at the end of the paper.

**Index Terms-** Child Labour Laws, Budget for children, Employment, Child Labour schemes.

## I. INTRODUCTION

Child labour refers to the employment of children in any work that deprives children of their childhood, interferes with their ability to attend regular school, and that is mentally, physically, socially or morally dangerous and harmful. Child labour was employed to varying extents through most of history. Before 1940, numerous children aged 5–14 worked in Europe, the United States and various colonies of European powers. These children worked in agriculture, home-based assembly operations, factories, mining and in services such as [newsies](#). Some worked night shifts lasting 12 hours. With the rise of household income, availability of schools and passage of child labour laws, the incidence rates of child labour fell. In developing countries, with high poverty and poor schooling opportunities, child labour is still prevalent. [Child labour](#) is the practices of having children engage in economic activity, on part or full-time basis. The practice deprives children of their childhood, and is harmful to their physical and mental development. Poverty, lack of good schools and growth of informal economy are considered as the important causes of child labour in [India](#). The 1998 national census of India estimated the total number of child labour, aged 5–14, to be at 12.6 million, out of a total child population of 253 million in 5-14 age group. A 2009-2010 nationwide survey found child labour prevalence had reduced to 4.98 million children (or less than 2% of children in 5-14 age group). The 2011 national census of India found the total number of child labour, aged 5–14, to be at 4.35 million, and the total child population to be 259.64 million in that age group. The child labour problem is not unique to India; worldwide, about 217 million children work, many full-time. India has largest number of children employed than any other country in the world. Around 90 million out of 179 million

children in the age group of 6-14 year do not go to school and are engaged in some occupation or other so around 50 percent of children of our country are involved in child labour. A large numbers of children are engaged in cottage industries: carpet, matches, firecrackers, bidis, brassware, diamond, glass, and hosiery, hand loomed cloth, leather goods, plastic, bangles, sporting goods, at shops as helpers.

## II. OBJECTIVES OF STUDY

- To study the socio-economic background and working conditions of child labour
- To find out the factors responsible for child labour and consequences there after
- To suggest remedial strategy based on the information gathered

## III. REASONS FOR CHILD LABOUR

- Insufficient family income
- Family occupation
- Encouragement from parents
- Lack of interest in studies
- Large family size

## IV. CHILD LABOUR LAWS IN INDIA

1. Children (Pledging of labour) Act 1933.
2. Employment of child Act 1938.
3. The Bombay shop and establishment Act 1948.
4. The Indian factories Act 1948.
5. Plantation labour Act 1951.
6. The mines Act 1952.
7. Merchant shipping Act 1958
8. The apprentice Act 1961
9. The motor transport workers Act 1961
10. The atomic energy Act 1962
11. Bidi and cigar workers (condition of employment) Act 1966.
12. State shops and establishment Act
13. The child labour (Prohibition and Regulation) Act 1986.
14. The juvenile justice (care and protection) of children Act, 2000.
15. Article 24 of our constitution and section 67 of the factories Act, explicitly direct that children below the age of 14 years are not allowed to work in factories.
16. Article 21A (added by the 86th amendment Act 2002) provides that state shall provide free and compulsory education to children of age group 6-14 years.
17. Article 45 provides for free and compulsory education for all children up to the age of 14 years.



## V. LABOUR WELFARE BOARD HARYANA

The Haryana Labour Welfare Board was constituted in the year 1970 under section-4 of the Punjab Labour Welfare Fund Act, 1965 for the Welfare of Industrial Workers. The following schemes for the welfare of workers and their children are running by the Board:

### 1. Scholarship to the Children of industrial workers

Under this scheme financial help is provided to the children of industrial workers by way of scholarship of Rs. 4000/- to 15000/- if they have secured 60% marks in 9th to Graduate, Diploma and Degree exams.

### 2. Cash awards to the children of industrial workers

A cash award of Rs. 1000/- & 2000/- is given to those children of workers, who have secured 75% and 60% marks upto pre-university & post-graduation level respectively.

## CHILD LABOUR (PROHIBITION & REGULATION) ACT 1986

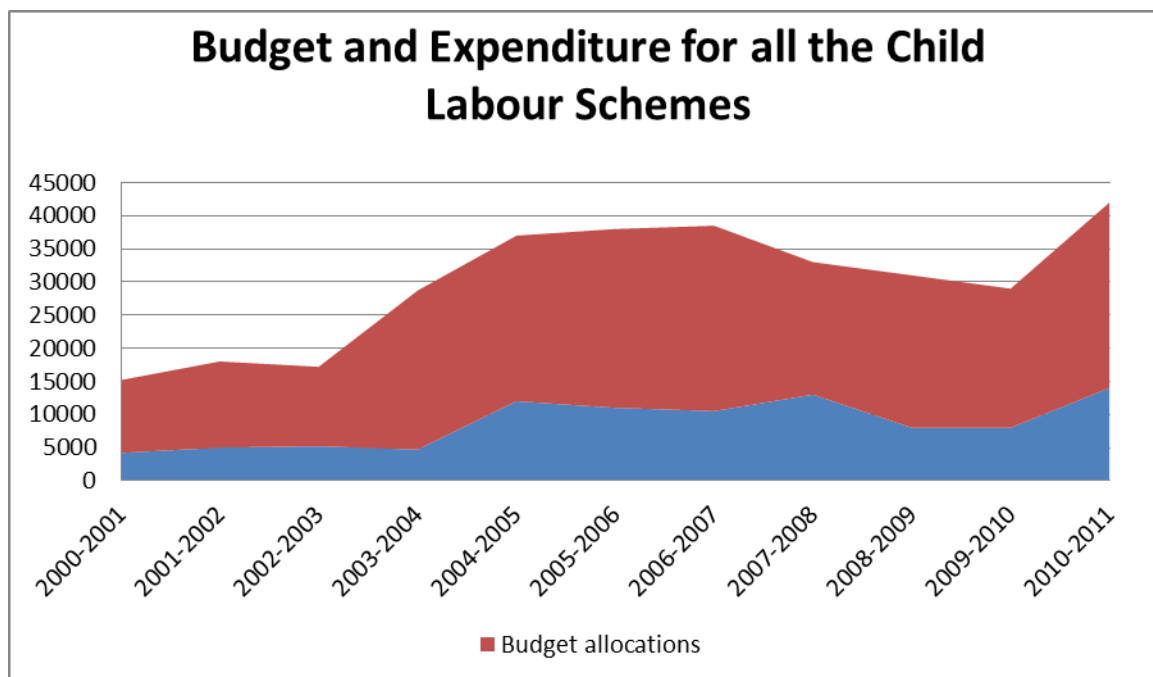
The act defines a child as any person who has not completed his fourteenth year of age. . It outlines where and how children can work and where they cannot. The basic objective of the Child Labour (Prohibition & Regulation) Act 1986, is to ban employment of children below the age of 14 years in factories, mines and hazardous employment's and to regulate the working conditions of children in other employment's.

## National Child Labour Project (NCLP) Scheme

Government had initiated the National Child Labour Project (NCLP) Scheme in 1988 to rehabilitate working children in 12 child labour endemic districts of the country.

### Objectives of the Scheme:

- This is the major Central Sector Scheme for the rehabilitation of child labour.
- The Scheme seeks to adopt a sequential approach with focus on rehabilitation of children working in hazardous occupations & processes in the first instance.
- Under the Scheme, survey of child labour engaged in hazardous occupations & processes has been conducted.
- The identified children are to be withdrawn from these occupations & processes and then put into special schools in order to enable them to be mainstreamed into formal schooling system.
- Project Societies at the district level are fully funded for opening up of special schools/Rehabilitation Centres for the rehabilitation of child labour.
- The special schools/Rehabilitation Centers provide:
  1. Non-formal/bridge education
  2. Skilled/vocational training
  3. Mid Day Meal
  4. Stipend @ Rs.150/- per child per month.
  5. Health care facilities through a doctor appointed for a group of 20 schools.



## Child labour in Haryana

Child labour in Haryana is one of the major concerns of most developing nations. In a country with a mammoth population such as India, the concern is highlighted by the acute poverty of the masses. In 2001, about 12.6 million child labourers were employed in India of which about 2,53,491 were from Haryana (a massive rise from 1,09,691 in 1991). According

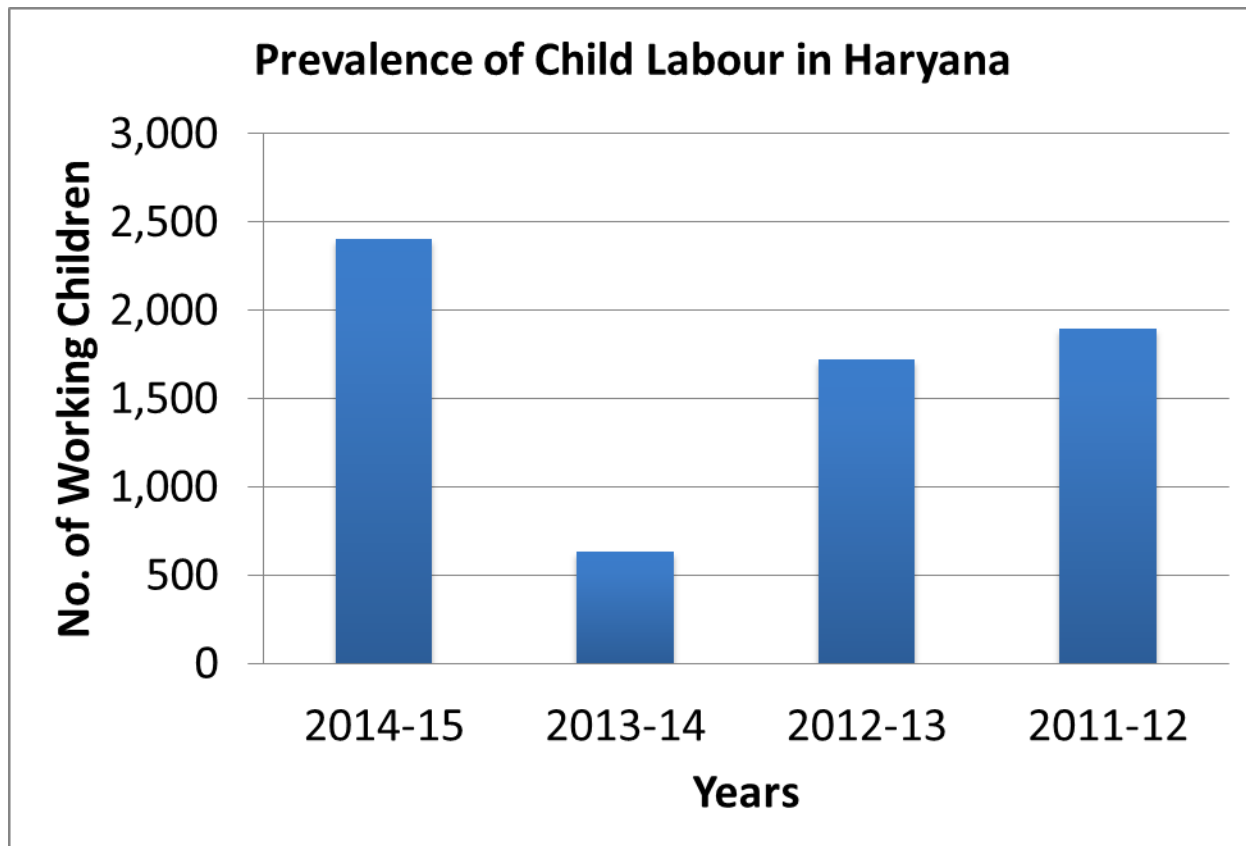
to the Child Labour (Prohibition and Regulation) Act of 1986, children under the age of 14 may not be employed in hazardous occupations. In Haryana, the employment of children, however, in non-hazardous areas is rampant. Not only does child labour take away from children the opportunity to study and play, it gives rise to incidences of inequality, abuse of children, and health issues due to exertion and maltreatment. Children are one

of the most vulnerable sections of society; by allowing child labour to flourish, the state administration has failed to protect this defenseless section. There are about 3.58 lakh children employed in cotton farms across the state.

**Cities in Haryana having major share of child labour**

- Fatehabad,
- Hissar

- Jhajjar
- Rohtak
- Sirsa



**According to [IKEA Foundation](#)**

- Haryana has a large number of children working in the agriculture sector with an estimated 16% of them in cotton picking. The NGO-Save the Children, Pratham and Breakthrough will work with panchayat leaders, farmers, teachers, families and Indian state officials in Punjab, Haryana and Rajasthan, to provide children with access to quality education, improve teacher training, develop local child protection committees and school management committees and tackle issues like gender based discrimination.
- In the states of Punjab and Haryana, Save the Children will work directly at community level to form community groups and increase the reporting of child labour, linking them with the Government's Child Protection Services. Pratham will work at primary & upper middle school level to improve the learning levels across grades 3.
- Breakthrough will generate communication material & provide information on gender discrimination at school & national level in two pilot districts, Jhajjar and

Rohtak, and will train Save the Children to scale it up in all 7 project districts, which include Bathinda, Muksar Sahib, Mansa and Fazilka (earlier part of Ferozepur) in Punjab and Hisar, Sirsa and Fatehabad in Haryana.

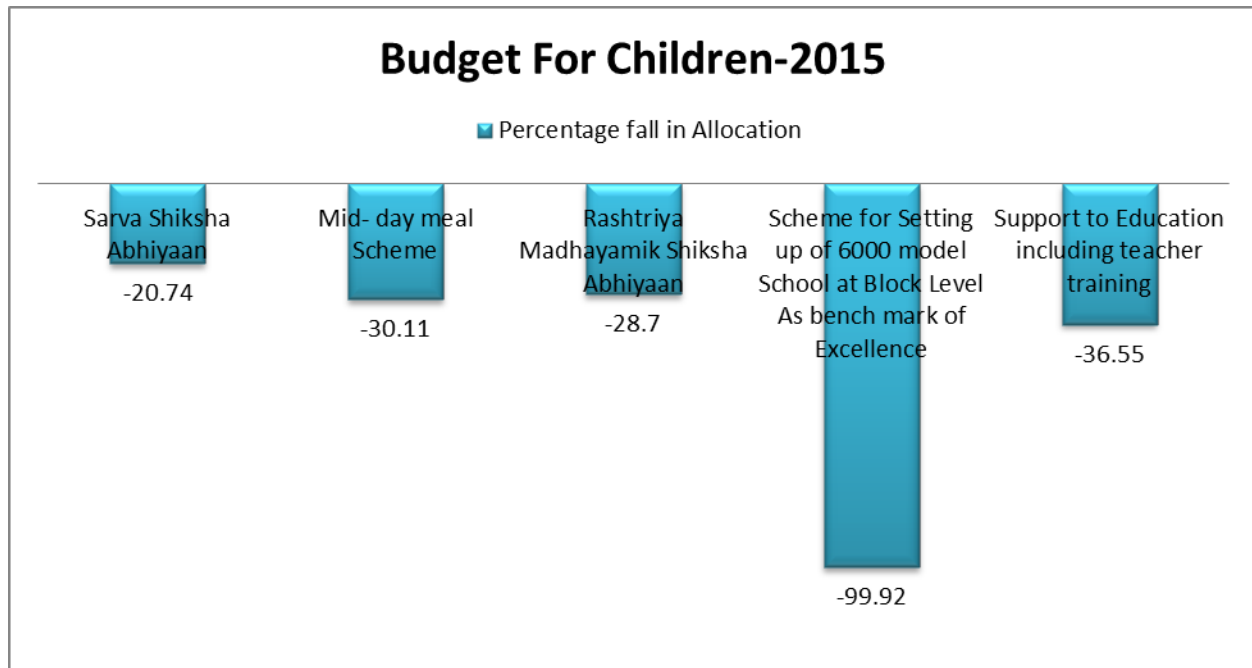
Notably, Haryana's three-point crusade to fight child labour includes 'strict enforcement' of Child Labour (Prohibition and Regulation) Act 1986, 'awareness' about the same and 'rehabilitation' of children rescued during the raids. According to the officials of State Labour Department, a large number of child labourers were reported from districts like Hisar, Sirsa, Fatehabad, Ambala in the past. While there is more than 90 per cent compliance to the Child Labour (Prohibition and Regulations) Act in the industrial units, the unorganised sector including the construction sites, roadside dhabas etc continues to flout the child labour laws in Haryana. As the problem of child labour persists at many places, it appears that little impact has been made so far in the State, where children's rights are reportedly violated every day. During census 2001, child workers in Haryana were 2,53,491. During a previous survey for identification of child labour, 5,876 working children were

identified in Panipat and out of the total 3,112 children were found working in hazardous industries or occupations.

#### Statistics

- Children constitute 39 % of India's population
- BfC analysis for the last 15 years shows that children have never received more than 5 % of the total Union Budget allocation.

- In 2014-15, out of every 100 Rupees allocated in the Union Budget, the share of children was only Rs 4.52.
- children have received a little over 3% of the total budget in 2015-16 compared to 4.52% in the 2014-15 budget
- Budget for children reduced by 29 %
- 22% reduction in health related schemes for children
- 25% reduction in overall education schemes for children



#### VI. FINDINGS

- Underutilization of allocations the little that is allocated for schemes under child labour often remains unspent
- Lack of attention to budget allocations and spending for children
- Largest number of children suffering from malnutrition
- Falling sex ratio
- Increasing violence against children
- Retention of children in schools

#### Prevention and Rehabilitation

- Controlled system for compensation of families for the loss of income
- Maintenance of homes where destitute children may be provided, food, clothing, shelter, and allowed to study without resorting to work.
- Educating village leaders and parents
- Implement legislation supporting the Indian child labour act
- Effective schemes to complement the national child labour project.
- Massive awareness drives, in partnership with media and NGOs to instill the
- Schemes that have failed need to be immediately rethought and replaced

#### VII. SUGGESTIONS TO OVERCOME CHILD LABOUR

- Give child protection concerns top priority
- Step-up investments under Restructured ICDS for addressing the rights of the young under-served children
- convert all Anganwadi Centres into Day Care Centres
- Initiate measures to check under-spending in schemes for children
- Restriction to Job Market
- Poverty Elimination Programmes
- Increase in Income
- Adult Education
- Strengthening of Inspection
- Increase the Age limit
- Need of a Comprehensive Legislation
- Recreational Facilities
- Removal of income disparity
- Families must be provided some incentives
- Evening schools should be started
- Free books and other stationary items must be provided
- Vocational training centers must be started
- Minimum wages of children should be increased and free nutrition mean may be provided at their workplace.

### VIII. CONCLUSION

The existing child labour concern is not a change that can be effected in a short while. Policy making is the key. The Government of Haryana needs to implement legislation supporting the Indian Child Labour Act. Implementation of legislation requires effective schemes to complement the National Child Labour Project. Creation of awareness at a grass roots level by educating village leaders and parents is important, especially about the necessity of sending girl children to school. The state is in need of massive awareness drives, in partnership with media and NGOs to instill the sanctity of childhood development and healthy growth of children. Schemes that have failed to curb child labour need to be immediately rethought and replaced with effective measures.

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### AUTHORS

**First Author** – Kanu Raheja, Assistant Professor, Satpriya Group of Institutions, Rohtak., Qualifications: MBA & NET Qualified, Email Id: kanuraheja23@gmail.com

# Management of Non-Performing Assets in Thoothukudi Pandyan Grama Bank in Thoothukudi District

Dr. D.Rathi

Assistant Professor of Economics, St.Mary's College (Autonomous), Thoothukudi

**Abstract-** Banks are financial entities whose prime concern is the well functioning of the economy represented by price stability and effective transmission of monetary policies through the financial markets. Regional Rural Banks are the youngest members in the family of rural banking in India. RRBs are mandated to purvey credit in rural areas, especially to the weaker sections of society. This innovation in rural credit institutions has a unique role in the enormous rural development. Thus, the RRBs in India normally depend on the internal guidance and functioning support in devising an effective policy and strategies for NPAs management. The present study is confined from 2006 – 2007 to 2010 – 2011 further the study depends mainly on secondary data obtained from the bank both published and unpublished. The NPA details of the Pandyan Grama bank were collected from the higher officials of the bank. This study is mainly analyses the three categories ( $D_1$ ,  $D_2$  &  $D_3$ ) of Doubtful Assets. The simple statistical tools like percentage and trend line techniques have been adopted for the study. It may be concluded from the analysis that the recovery performance better in Education Loans, Small Scale loans to the industries, Crop loan and Kisan Credit. But the recovery performance is very poor in Loans given to the Self Help Groups.

**Index Terms-** Banking, NPA, Types, Loans, Trend value.

and finance development of business and trade. Thus banks act as an intermediary in the flow of funds from savers to users.

They serve as intermediaries between borrowers and lenders and assist in the smooth flow of the monetary funds. The soundness of the bank system is of great importance for the economic development of a nation. Having no wealth on their own banks are responsible for the right utilization of the national resources. Money is one of the important resources for living and survival. There is a general concept commonly accepted "A Man or Woman with no money is equal to dead body". The basic functions of banks are accepting all kinds of deposits and supply money"- The life blood of business concerns by lending process. In general there are several challenges to the banks, particularly to the regional rural banks. The main challenge confronting the regional rural banks is the disbursement of funds in quality assets like advances which may lead to non-performing assets to the banks. This paper attempts to study the management of NPAs in a Regional Rural Bank located in Thoothukudi district, Thoothukudi.

The main objectives of the present study may be summarized as follows the performance of loan portfolios and procedures of decision making in the area of management of NPAs in Pandyan Grama Bank, Bazaar Branch, Thoothukudi. This study is mainly analyses the three categories ( $D_1$ ,  $D_2$  &  $D_3$ ) of Doubtful Assets.

## I. INTRODUCTION

A bank is an institution, which deals with money and credit for a common man, a bank means a storehouse of money for a business man it is an institution of finance and for a day to day customer it is a depository for his savings. Actually, banks are business organizations selling bank services. They play a vital role in the economy of any country banks hold the savings of the public; provide a means of payment for goods and services

## II. PERFORMANCE OF REGIONAL RURAL BANKS IN INDIA

The first Regional Rural Bank was set up in October 1975. Subsequently, the Regional Rural Banks Act 1976 was passed in February 1976. There are 196 Regional Rural Banks in India covering 370 districts in 2008. Agriculture and agro based activities in rural areas play straight role in promoting balanced, equitable and self sustained pattern of development.

**Table – 1**  
**Performance Indicators of Regional Rural Banks in India (As on 31<sup>st</sup> March 2010)**  
(Rupees in Crores)

Particulars	2009	2010	Growth (%)
No of RRB	86	82	-9.89
Branch network(No.)	15181	15444	4.63
Share capital	197.00	197.000	-
Share capital Deposit	3959.30	3959.77	39.80

Reserves	6753.99	7912.39	38.74
Deposits	120189.90	142980.48	44.29
Borrowings	12734.65	18555.84	61.44
Investment	65909.92	76167.29	56.85
Loans & Advances(outstanding)	67802.10	82221.59	39.40
Loans issued	43367.13	55727.75	44.44
RRB incurring loans(No.)	80	70	-4.88
Amount of losses (B)	35.91	8.44	-84.33
Net profit (A-B)	1787.64	2541.07	91.41
Accumulated losses	2299.98	1813.03	-30.91
RRB with accumulated losses(No.)	31	30	16.67
Recovery (%)	77.85	79.12	-2.13
NPAs to loans outstanding (%)	4.14	3.66	-39.50
Net worth	8610.31	10256.13	67.93

**Source:** Compile from Annual report of NABARD.

### III. NON-PERFORMING ASSETS: CONCEPTS AND TYPES

Basically the assets of the banks are classified as performing and non-performing assets which generate income to the bank. A non-performing asset is an asset which fails to generate income of the bank. As per the regulation, an asset is considered to have gone due, the past due amount remaining uncovered where the borrower has defaulted as principal and interest repayment for more than 90 days is called as non-performing assets. According to the guidelines of Reserve Bank of India NPAs consists of sub-standard, doubtful and loss assets.

**Standard Assets:** The Regional Rural Banks have been advised to make a general provision for standard assets at the following rates (a) Direct advances to agricultural and small and marginal entrepreneurial sectors at 0.25%; (b) All other advances at 0.40%.

**Sub- Standard Assets:** A general provision of 10% of net outstanding should be made without making any allowances for Export Credit Guarantee Corporation cover and securities available. The unsecured exposures which are identified as sub-standard would attract additional provision of 10% , i.e. a total of 20% on the outstanding balance.

**Doubtful Assets:** The portion of 'gross loans' which has remained NPA for a period exceeding two years from the date of becoming NPA.

Doubtful assets again are classified in three sub categories:

- a. D1 i.e. up to 1 year: 20% provision is made by the banks.
- b. D2 i.e. up to 2 year: 30% provision is made by the bank.

- c. D3 i.e. up to 3 year: 100% provision is made by the bank.

**Loss Assets:** It is advised by Reserve Bank of India to the banks that in cases where loss assets are more than two years old in the books of a bank without legal action being initiated, the banks should submit a review note to their management committee/ boards of directors giving specific reasons as to why steps have not been taken for recovery. These assets should be written off. If they are permitted to remain in the books for any reason 100% should be provided.

### IV. METHODOLOGY

The study was under taken to analyse the non-performing assets of the Pandyan Grama Bank, Thoothukudi. The analysis purely depends on both primary and secondary data. It was collected from the annual reports of Pandyan Grama Bank, Thoothukudi, the facts published in the annual reports and bulletin of Reserve Bank of India, Referred Books, Journals, Newspaper and Magazines. Information was collected partly through personal investigations and questionnaire schedule techniques have been followed in support of it. This collected data were classified and analysed, the simple statistical tools like percentage and trend line are used in this study.

### V. ORIGIN OF THE BANK

Pandyan Grama Bank is one of the popular rural banks in Tamilnadu. The Pandyan Grama Bank was established on 9<sup>th</sup> March 1977 and it is a listed public sector bank in India. The

bank works under the Regional Rural Banks Act 1976. The Pandyan Grama bank is functioning in seven districts in south Tamil Nadu. The bank has its Administrative Office (Head Quarters) at Sattur and now the bank has shifted to Virudhunagar in Tamilnadu on 16<sup>th</sup> July 1993. The Administrative Office has started functioning in its own building from 31<sup>st</sup> October 2000 onwards. The Thoothukudi Pandyan Grama Bank (Bazaar Branch) was established in 1999.

**VI. LOANS PROVIDING IN THE BANK**

The bank was started in the country to remove rural poverty. It was adopted as the most powerful weapon for ending stagnation of the poor masses. Banking operations are becoming complex and difficult for supervisors to monitor and control. The timely recovery of loans is a prerequisite for any credit institution, particularly for Pandyan Grama Bank with their limited funds for sustained growth and existence. The banks grants loans to its members for the following purposes, on surety basis, loans to Small Scale Industries, Cash Credit, Staff Loan, Purchase of Vehicles, Crop loan and Kisan credit, Education loan

for self – Help Groups, and like in accordance with the instructions given by Regional Rural Bank. At present, the Pandyan Grama Bank provides short term, medium and long term loans to the rural people.

**VII. ANALYSIS AND RESULTS**

The Banking Commission (1972) recommended establish an alternative institution for rural credit in the rural areas, particularly among the economically and socially marginalized sections. The RRBs have more reached to the rural area of India, through their huge network. The success of rural credit in India is largely depends on their financial strength. Avoidance of losses due to loan is one of the preoccupations of the management of all banks. Complete elimination of such losses is not possible. The bank’s management aims to keep the losses at low level.

The Pandyan Grama Bank is doing tired less works in the management of Doubtful Assets. However, the present study will try to reduce the NPAs.

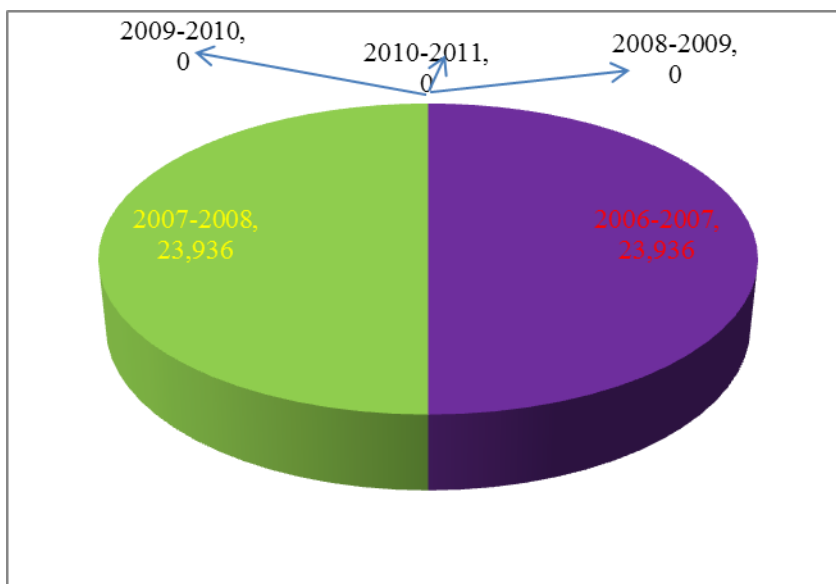
**Table: 2. Crop loan and Kisan Credit of the Bank (Rs. In Lakhs)**

Year	Doubtful Assets						Total NPA	
	D1		D2		D3		No. of a/c	Amount
	No. of a/c	Amount	No. of a/c	Amount	No. of a/c	Amount		
2006-2007	-	-	-	-	2	23,936	2	23,936
2007-2008	-	-	-	-	2	23,936	2	23,936
2008-2009	0	0	0	0	0	0	0	0
2009-2010	0	0	0	0	0	0	0	0
2010-2011	0	0	0	0	0	0	0	0

Source: Annual Reports and Balance sheet of the Bank from 2006-2007 to 2010-2011.

It is observed from Table 2, during the year 2006-2007, the total doubtful asset is in the category of D3. That is the stage of sleep age. The NPA of crop loan and kisan credit is Rs.23, 936

lakhs in both 2006-2007 and 2007-2008 years. During the study period, the crop loan and kisan loan credit NPA is zero.



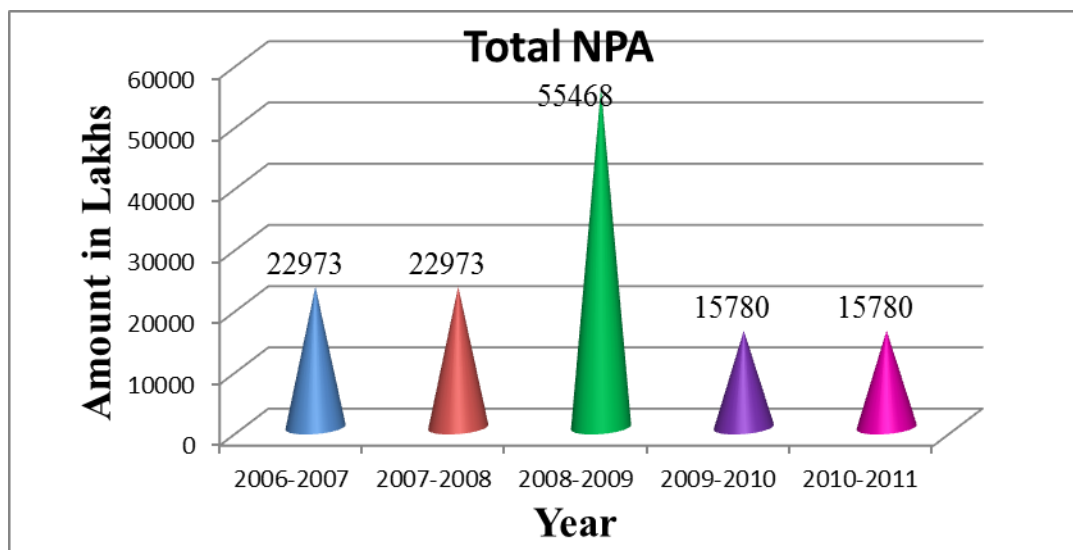
**Small loans to Small Scale Industries:** A small scale industries loan is one which is engaged in the manufacture processing of goods or is a servicing and repair workshop undertaking repairs of machinery used for production.

**Table: 3 Small Loans to Small Scale Industries (Rs. In Lakhs)**

Year	Doubtful Assets								
	D1		D2		D3		Total NPA		Total NPA
	No. of a/c	Amount	No. of a/c s	Amount	No. of a/c s	Amount	No. of a/c s	Amount	Increase (or) Decrease
2006-2007	1	4380	4	12400	1	6193	3	22973	-
2007-2008	-	-	-1	16780	1	6193	3	22973	0
2008-2009	-	-	0	43068	1	12400	2	55468	32495
2009-2010	-	-	1	-	2	15780	2	15780	-39688
2010-2011	-	-	4	-	2	15780	2	15780	0

**Source: Annual Reports and Balance sheet of the Bank from 2006-2007 to 2010-2011.**

The table 3 indicated that the small loans to small scale industries. In the year 2006-2007 the amount to NPA is in the categories of D1, D2 and D3 is Rs.22,973 lakhs. In the year 2007-2008 the NPA is in 2009-2010 the small loans to small scale industries NPA is Rs. 15, 780 lakhs.



**Loans to Self Help Groups:** Bank has found in SHGs a reliable credit delivery mechanism which is cost-effective. Today the concept of self help groups in catching as the most viable means to empower of grass root level.



**Table: 4 Loans to Self Help Groups (Rs. In Lakhs)**

Year	Doubtful Assets							
	D1		D2		D3		Total NPA	
	No. of a/c	Amount	No. of a/c s	Amount	No. of a/c s	Amount	No. of a/c s	Amount
2006-2007	0	0	0	0	0	0	0	0
2007-2008	0	0	10	274356	2	14521	12	228877
2008-2009	18	500015	4	93665	8	198113	30	791793
2009-2010	4	206151	14	338692	11	263606	29	808449
2010-2011	3	156326	12	474181	11	243371	29	873878

Source: Annual Reports and Balance sheet of the Bank from 2006-2007 to 2010-2011.

From the table 4, it is observed that during the year 2006-2007, the total doubtful asset is in the categories of D1, D2 and D3. The NPA of doubtful assets is Rs. 808449 in the year 2009-2010. The amount of NPA is Rs. 873878 in 2010-2011.

With the help of linear trend equation, the trend values for Loan to Self Help Groups are computed. The trend analysis reveals that the NPA of Self- Help Groups for the future year 2020 will be Rs.3046660 lakhs.

**Table: 5 Term loan to Education (Rs. In Lakhs)**

Year	Doubtful Assets								
	D1		D2		D3		Total NPA		Total NPA
	No. of a/c	Amount	No. of a/c s	Amount	No. of a/c s	Amount	No. of a/c s	Amount	Increase (or) Decrease
2006-2007	0	0	2	31735	0	0	2	31735	-
2007-2008	0	0	1	14000	0	0	1	14000	17735
2008-2009	0	0	0	0	1	3000	1	3000	11000
2009-2010	0	0	0	0	0	0	0	0	0
2010-2011	0	0	0	0	0	0	0	0	0

Source: Annual Reports and Balance sheet of the Bank from 2006-2007 to 2010-2011.

The above table 5 indicate that the year wise NPA of the education loan. In the year 2006-2007 the bank NPA of education loan amount is Rs.31, 735 lakhs. In the year 2007-2008 it reduced to Rs.14, 000 lakhs. The year 2008-2009 the banks education loan NPA stood zero.

**Findings:** The key to any bank's success is the collection of its Non Performing Assets and use of funds. Crop higher yield could reduce the NPA level in the bank. The lower percentage of agriculture NPA is alarming given the fact that yield has been laying favourable environment to register respectable growth. NPA movement of SHGs has been found to be weak. Lack of basic

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knowledge about banking and overall financial illiteracy is the two striking features of the defaulted of SHGs. In the same way, post- lending supervision and approaching the borrower at the right time for repayment may prove effective in the recovery of overdues early.

**Conclusion:** Thus it may be concluded from the analysis overdues have been identified as a major hurdle in the creation of an efficient and viable credit system at Pandyan Grama Bank. Poor recovery implies distorted recycling of funds. From this analysis the recovery performance better in Education Loans, Small Scale loans to the industries, Crop loan and Kisan Credit. But the recovery performance is very poor in Loans given to the Self Help Groups. To overcome these problems, the credit

management of bank is required to develop mechanisms for the proper selection of appropriate borrowers, constant monitoring for proper utilization of the loans, time- bound repayment, cost effectiveness, reduction of overdues and non-performing assets and motivational improvement.

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#### AUTHORS

**First Author** – Dr. D.Rathi, Assistant Professor of Economics,  
St.Mary's College (Autonomous), Thoothukudi

# Believe it or not, hybrid technology is the only way to enhance pigeonpea yields

K. B. Saxena\* and A. N. Tikle\*\*

\*Principal Scientist (ICRISAT, Retd.) 17, NMC Housing Complex, Al Ain, Abu Dhabi, UAE

\*\*RAK College, Sehore (M.P.)

**Abstract-** Pigeonpea yields have remained unacceptably low over the past five decades and efforts to break this plateau through breeding pure line cultivars did not succeed in its mission. Key successes in breeding stable cytoplasmic nuclear male-sterility (CMS) system, its fertility restorers, and development of an efficient hybrid seed production technology have led to the release of the world's first commercial hybrid in pigeonpea [*Cajanus cajan* (L.) Millsp.]. This hybrid has demonstrated 40-50% yield advantage over the best locally adapted varieties in different agro-ecological environments, giving a strong indication towards a breakthrough in the stagnant productivity of the crop. This paper discusses various issues related to genetic enhancement of productivity in pigeonpea.

**Index Terms-** Hybrids, Pigeonpea, Yield plateau

## I. INTRODUCTION

Pigeonpea or red gram [*Cajanus cajan* (L.) Millsp.] constitute a major protein-rich food supplement for most Indians. The crop is cultivated on 4.04 m ha (IIPR, 2013) mainly at subsistence level as rainfed intercrop since hundreds of years; but its formal genetic improvement began in 1931 with pure line selections within available landraces for simply inherited traits such as plant type, maturity, and wilt resistance. It was in 1965 when Indian Council of Agricultural Research (ICAR) launched a massive crop improvement programme and opened a number of research centres in different agro-ecological regions of the country (Ramanujam and Singh, 1981). However, in spite of serious breeding efforts, the productivity increase did not meet

the expectations. This paper summarizes the efforts of a non-conventional breeding approach in enhancing productivity of this pulse crop.

## II. THE CHRONIC PROBLEM OF YIELD STAGNATION

Among pulses, pigeonpea *dal* is a staple food across the country and plays an important role in national economic and nutritional security. The annual production of this pulse in India is about three million tonnes; but this quantity is insufficient to meet the domestic needs; and hence a considerable amount (about 100,000 t) of pigeonpea is imported each year (<http://www.ipga>). To breed high yielding cultivars pigeonpea breeders deployed various methods primarily recommended for self-pollinated crops (Green et al., 1981) and released dozens of varieties but without any marked improvement in its productivity, that remained unchanged over the decades at around 600-800 kg/ha (Fig 1). In the near future also, the issue of yield stagnation is likely to remain more or less the same, until a path breaking technology with exceptionally high yield potential is developed. In this context, the recent success in developing hybrid breeding technology in pigeonpea (Saxena et al., 2013), the first in the world in any grain legume, has generated a lot of optimism and enthusiasm among pigeonpea breeders to break the decades-old productivity barrier. This paper besides giving a brief overview of hybrid technology, discusses the potential role of hybrids in smashing the decades old yield plateau.

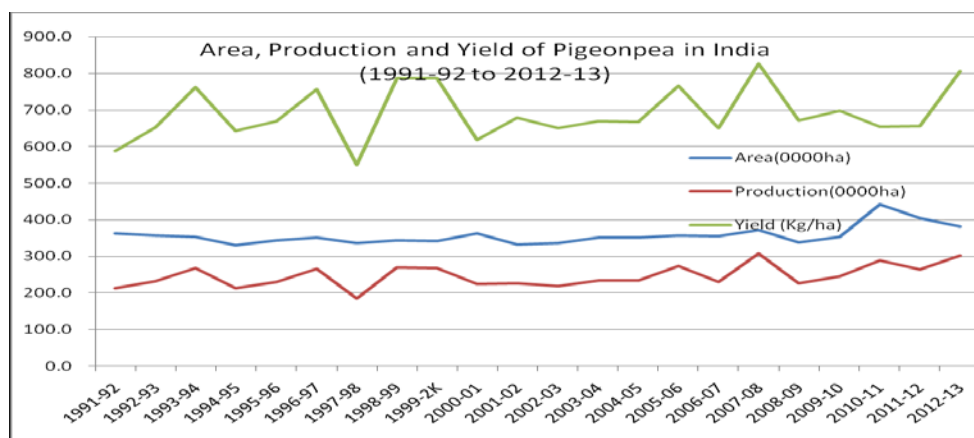


Fig 1: Area, production and productivity of pigeonpea in India

### III. THE BIRTH OF HYBRID TECHNOLOGY IN PIGEONPEA

Pigeonpea is known to attract a number of nectar-hunting insects and during the process of foraging cross-pollination takes place (Saxena et al., 1990). Pigeonpea breeders, however never took this phenomenon seriously while breeding cultivars and considered pigeonpea at par with other pulses and followed methods traditionally used in breeding self-pollinated crops. In the mid-seventies ICRISAT planned to convert the constraint of natural out-crossing into an opportunity by using it as a tool for genetic enhancement of yield through hybrids. In this context breeding of a commercially viable cytoplasmic nuclear male sterility (CMS) system using the cytoplasm of *Cajanus cajanifolius* (Fig 2) - a wild relative of pigeonpea, is considered a major breakthrough (Saxena et al., 2005) in achieving the goal of developing world's first legume hybrid.



Fig 2: *C.cajanifolius*, a wild relative of pigeonpea (source: ICRISAT)

### IV. ADVANTAGES OF HYBRIDS

It is believed that the hybrid plants are naturally programmed at genetic level to produce vigorous plants, greater yields and stability. This is attributed to the interactions among various

favourable alleles. It was noted that pigeonpea hybrid plants start showing hybrid vigour right from the early seedling stage. In comparison to pure lines, the hybrids have 18 % longer radical and 15 % greater seedling growth indices (Bharathi and Saxena, 2012; Thakre et al., 2013). According to Saxena et al. (1992) this vigour of the hybrid plants is carried forward throughout its growth period and in comparison to pure lines they produce about 30% more shoot and root mass. The trials conducted at ICRISAT also showed that besides high yields, the hybrids also demonstrated greater tolerance to common root and foliar diseases and drought. The greater biomass of individual plants also allows about 25-30% saving in the seeding rates of the commercial hybrid crops. Saxena and Raina (2001) showed that pigeonpea hybrids were better than pure line cultivars with respect to their stability across environments. The deep root system and dry leaf fall in hybrid plants also help in recycling of valuable soil nutrients lying unused in the deeper soil zones and make them available to the crops with shallow root system.

### Evidences of Breakthrough in Productivity

**The first commercial hybrid:** The first commercial pigeonpea hybrid ICPH 2671 (Fig 3), produced by crossing ICPA 2043 with ICPR 2671, was released in 2010 (Saxena et al., 2013). In 21 multi-location trials it recorded 47% superiority over the check (Table 1a). In All India Coordinated Trials, the hybrid (2564 kg/ha) was 31% superior to the control (Table 1b). In 1829 on-farm trials (Table 2) conducted in states of Maharashtra (782 trials), Andhra Pradesh (399 trials), Madhya Pradesh(360 trials), and Jharkhand (288 trials), ICPH 2671 recorded 30-60% superiority over the best local cultivar. Overall all the five states, ICPH 2671 was 51% better than the control in its productivity. The performance data of the hybrid have shown that in pigeonpea significantly high productivity levels can be achieved by farmers and the persistent yield plateau can be smashed.



Fig 3: ICPH 2671, the world's first commercial pigeonpea hybrid (source: ICRISAT)

**Table 1: Yield (kg/ha) of hybrid ICPH 2671 and control cultivar in multi-location trials organized by ICRISAT.**

Year	Locations	Hybrid Yield	Control yield	Standard heterosis (%)
2005	5	3183	1855	72
2006	4	2410	1589	52
2007	7	2986	2209	35
2008	5	3085	1889	63
Total/Mean	21	2736	1862	47

Source: Saxena et al. (2013)

**Table 1b: Grain yield (kg ha<sup>-1</sup>) of pigeonpea hybrid ICPH 2671 in Central Zone in All India Coordinated trials in 2007 (Mean of Initial & Advanced Hybrid Trial)**

Genotype	SDAU, Nagar	SK MPKV Rahuri	ZARS, Khargon	Mean	% Superiority over
ICPH 2671	2936	2479	2278	2564	-
Marurti (C)	1831	2766	1267	1955	31
Asha (C)	1882	2551	1855	1996	28
BSMR 736 (C)	2147	2608	1649	2135	20
CO 6 (C)	2745	2777	1603	2375	8

**Table 2. Performance (yield kg/ha) of hybrid ICPH 2671 in the on-farm trials.**

State	Farmers (no.)	Hybrid yield	Control yield	Standard heterosis (%)
Maharashtra	782	969	717	35
Andhra Pradesh	399	1411	907	55
Jharkhand	288	1460	864	69
Madhya Pradesh	360	1940	1326	46
Total/mean	1829	1445	954	51

Source: Saxena et al. (2013)

**New hybrids:** After the success of hybrid ICPH 2671 in Madhya Pradesh, two more medium duration hybrids with high yield potential were released in India. In 2012, ICPH 2740 was released for cultivation in Andhra Pradesh (Saxena et al., 2015); while the third hybrid ICPH 3762 was released in Odisha in 2014 (Saxena et al., 2014). Like ICPH 2671, the hybrids ICPH 2740 and ICPH 3762 also out-yielded the control by a big (40-50%) margin.

Besides the three releases, a number of new hybrids were also bred to cater the needs of different agronomic niches and

cropping systems. This programme began with the development of new male sterile and fertility restoring lines. In the early maturity group, the performance of hybrids was very good (Table 3). In 25 multi-location trials conducted over four years hybrids ICPH 2433, ICPH 2438 and ICPH 2363 respectively produced 54%, 42%, and 36% more yield as compared to the national check (1502 kg/ha). The highest yield of 2722 kg/ha was produced by ICPH2433 in only 115 days and

**Table 3: Performance of early maturing hybrids in multi-location trials organized by ICRISAT**

Hybrid (ICPH)	Maturity (days)	2007 (n=7)	2008 (n=4)	2009 (n=8)	2010 (n=6)	Mean (n=25)	Gain (%)	Yield (kg/ha/day)
2433	114	2538	1864	2331	2489	2306	54	22.22
2438	115	2722	1570	2238	1979	2127	42	18.50
2363	115	2292	1763	2131	2005	2048	36	17.81

2429	114	1825	1907	2015	2037	1946	30	17.07
2431	117	2186	1400	1925	2165	1919	28	16.40
Check	120	1502	1204	1545	1758	1502	-	12.52

Source: ICRISAT

recorded unbelievable daily yield accumulation of 22.22 kg/ha/day, as compared to 12.52 kg/ha/day for the control. This demonstrated 77.5% greater production efficiency in the hybrids as compared to the pure line control cultivar. Among medium maturing hybrids (Table 4), ICPH 3371(3013 kg/ha) and ICPH

3762 (3000 kg/ha) were found as most promising with 62% superiority over the national check Asha (1864 kg /ha). These hybrids were also found to be highly resistant to fusarium wilt and sterility mosaic diseases when evaluated in sick nursery

**Table 4. Some promising medium duration pigeonpea hybrids developed at ICRISAT**

Hybrid (ICPH)	Yield (kg/ha)	Standard heterosis (%)	100- seed weight (g)	*Wilt (%)	*Sterility mosaic (%)
3371	3013	62	11.50	0	0
3491	2919	57	13.40	0	0
2740	2900	57	12.30	0	0
3762	3000	62	11.90	0	0
Check	1864	-	11.10	0	0
SEm	± 205.7	-	±0.33	-	-
CV (%)	11.9	-	3.98	-	-

\*Disease data recorded in sick nursery. Source: ICRISAT

**Hybrid records exceptionally high yields:** Pigeonpea is notoriously tagged as low yielding pulse but hybrids have shown the way (as described above) with 2500-3000 kg/ha productivity. Some of the farmers in Maharashtra grew the hybrid crop under good management (fertilizer, timely sowing, insect control, weed control, irrigation) and produced about 4000 kg/ha of grains in

their fields (Table 5). This data set was encouraging and showed the real yield potential of hybrids. With high market prices and high yields, the pigeonpea hybrid crop can compete with cereals in profitability with added advantage of improving the nutrition and texture of soils.

**Table 5: Demonstration of exceptionally high yields (kg/ha) of pigeonpea Hybrid by some farmers in Vidharba (Maharashtra)**

Location	Area (m <sup>2</sup> )	Hybrid yield	Control yield	Standard heterosis (%)
Salod	450	3956	2044	94
Nimgaon	1012	3951	2469	60
Kothoda	450	4667	3556	31
Tamoli	450	3889	2278	71
Mean	-	4116	2587	59

Source:ICRISAT

**Hybrid Seed Production – No More an Issue**

In order to get maximum benefits from hybrid vigour, only a single use of true hybrid (A x R) seed is recommended for cultivation. Hence, the large-scale production of hybrid seed is the core activity of any seed business. This will fetch good returns to both the producers as well as farmers. Initially, the hybrid seed production programme faced rounds of ups and downs due to various reasons. However, learning from the

failures the hybrid seed production technology was modified over time and it has now been perfected by ICRISAT and their partners. The hybrid yields recorded at many places in the states of Andhra Pradesh, Madhya Pradesh, Gujarat, and Maharashtra has demonstrated that reasonably high yields can be harvested from well managed seed production plots. The on-farm validation at 94 locations, on an average produced 1019 kg/ha of hybrid seed (Table 6); and confirmed that large scale hybrid seed

production is not a difficult task but needs careful selection of sites.

For a successful seed programme the key factors identified were the presence of sufficient number of pollinating insects at flowering and availability of the male flowers for extended periods in the seed production plot. Attempts should be made to select the isolation plots in the areas which are infested with wild bushes, fruit or other trees that generally harbour the insects. It is also observed that if the seed production plots are located near small or large water bodies, it attracts the pollinating insects and helps in enhancing natural out-crossing in the seed production plots to produce good hybrid seed yields (RV Kumar, personal

communication). Such seed production 'hot spots' can be identified by organizing a number of small-sized 'pilot seed production plots (Table 7). The pod set under natural conditions will indirectly indicate the presence of pollinating vectors at a particular site; and this will help in identifying suitable locations for large-scale hybrid seed production. A record of such locations and productivity should be maintained and the seed producing agencies should be guided in choosing the favorable production sites. Now it can be said with confidence that hybrid seed production in pigeonpea is not an issue any more.

**Table 6. Hybrid seed production (kg/ha) record in six states.**

State	Locations	Mean yield	Highest yield
Andhra Pradesh	34 (6)	998	1750
Madhya Pradesh	9 (3)	1674	3040
Gujarat	4 (2)	1179	1669
Maharashtra	5 (2)	603	1017
Odisha	40 (1)	523	1040
Karnataka	2 (2)	1138	1900
Total/Mean	94	1019	3040

( ) number of years. Source: ICRISAT

**Table 7. Some hot spots identified for hybrid seed production**

Location	Area (ha)	Yield (kg/ha)
<u>Madhya Pradesh</u>		
Tikamgarh	5.0	3040
Seoni	1.0	2500
Indore	1.5	2267
Rewa	1.0	1740
Katni	3.0	1450
<u>Andhra Pradesh</u>		
Nizamabad	1.0	1750
Medak	1.0	1250
Medchal	1.4	1214
Warangal	1.2	1063
Nalgonda	2.0	1000

Source: ICRISAT

#### V. PROMOTION OF HYBRIDS-STILL A CHALLENGE

The expansion of pigeonpea area under hybrids is important keeping in view the national interest. Since this is a multi-facet issue, several agencies dealing with production, marketing, distribution, and extension need to work together. Hence a strong coordinating unit is a must to develop links with different disciplines. For the promotion of any technology, involvement of experts can help a lot in technology transfer. Since hybrid pigeonpea involves special attention in various seed production

activities, a thorough training of seed producers is essential. For increasing the adoption of hybrids the basic requirement is to make available high quality seed at reasonable rates. To achieve this, an efficient seed chain should be developed to cater the needs of breeder, foundation, and certified seeds. Fortunately, the seed-to-seed ratio for pigeonpea hybrids is high (1: 200 to 1: 300) and this will ensure large area coverage. However, a good planning would be required for quality control and timely supply of seed to seed distributors and growers. Initially, it is also important that seed distributors should be given enough information about the product. A set of hand-outs, dealing with



important features of the hybrid and its cultural practices will be helpful.

## VI. GENERAL DISCUSSION

FAO define food security as “the situation when each group of the population in a country get sufficient calories and essential nutrients in sufficient quantities necessary for a healthy life”. With these standards most of the developing countries can be classified as “nutritionally insecure”. The scenario of nutritional security in India is quite interesting, as it is self-sufficient in calorie production but lacks in protein and other vital nutrients. In the last half-century the per capita protein availability in India has witnessed a sharp decline from 27.3 kg/year in 1950 to 10 kg/year in 2000 ([www.commodityonline.com](http://www.commodityonline.com), 2009). The escalating prices of pulses and other nutrient-filled vegetables, fruits, and milk products have further added to this misery. The adverse adverse effects of nutrient deficiency is visible in the mal-nutrition of a major proportion of rural and urban masses, especially children and women. According to National Institute of Nutrition, India (NIN,2010) this is an important national issue and require immediate attention of policy makers. To alleviate this problem perhaps a paradigm shift in the genetic improvement and extension strategies of the nutritive food crops is warranted. In this context the breakthrough in pigeonpea breeding technology has shown a great promise with 30-50% yield advantages in farmers’ fields. The promotion of hybrid technology will not only raise the national pigeonpea production but also provide easily digestible quality protein.

The extensive on-farm testing of the hybrids in states of Madhya Pradesh, Maharashtra, Karnataka, Gujarat, Telangana, Andhra, and Jharkhand have given very positive signals to the farmers about the high yields of hybrids. Now the issues related to seed availability need attention from all the corners. Since the hybrid technology in pigeonpea is new, it is essential to convince the public and private seed companies about the financial viability of the hybrid technology.

Pigeonpea hybrids are capable of meeting the challenge of imports by replacing only 10% area of traditional pigeonpea. With hybrid (A x R) seed yields of 1000-1500 kg/ha and seed rate of 5 kg/ha, the seed-to-seed ratio for hybrid pigeonpea is reasonably high (1:200 to 1: 300). This means that to replace the targeted 10% (=400,000 ha) of the national pigeonpea area with hybrids, only 2000 ha of certified seed production programme would be required (Table 8); but it will add about 200,000 tonnes of additional grain to country’s production with an estimate of 30 -40% hybrid advantage. It was observed that harvesting 3000 kg/ha of pigeonpea from commercial hybrids was not uncommon in Maharashtra and some farmers even touched the magic yield mark of 4000 kg/ha. With the yield advantage of 1000-1500 kg/ha and price @ Rs 50/kg, the farmers can fetch additional profit of Rs 50,000-75,000 from one hectare. This level of profitability can easily be compared with any high value field crop; and therefore, pigeonpea can make a grade into “cash crops”.

**Table 8. Calculations of grain production by replacing 10% pigeonpea area with hybrids**

Contents Units	
Estimated annual imports	= 100,000 tons
Total area under pigeonpea	= 40 lakh ha
Area that can be brought under hybrids (10%)	= 400,000 ha
Extra production due to hybrids @ 0.5 t/ha	= 200,000 tons
Certified seed to replace 400,000 ha @ 5 kg/ha	= 2000 tons
Area for producing certified seed @ 1000kg/ha	= 2000 ha.
Breeder Seed needed for 2000 ha @ 5kg/ha	= 10, 000 kg
Area for producing Breeder Seed @ 1000kg/ha	= 10-15 ha

## VII. CONCLUSIONS

- Yield stagnation in pigeonpea has been a long standing issue
- Pure line cultivars could not enhance yield to desired levels
- Breakthrough in productivity is possible only through hybrids
- On-farm demonstration of hybrids showed a great promise
- Hybrid seed production is no more an issue
- Hybrid seed production is easy and economical
- Seed-to-seed ratio in pigeonpea is high (1: 200 - 1: 300)

- A good hybrid seed chain can now be developed
- Hybrid pigeonpea technology is now established
- To achieve a sustainable breakthrough, a high level of commitment on the part of researchers, research managers, and policy makers is essential.

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#### AUTHORS

**First Author** – Dr. K.B. Saxena, Qualification: Ph.D.,  
Affiliation : Principal Scientist (Rtd.) International Crops  
Research Institute for the Semi-Arid Tropics, Patancheru, India,  
E mail: kbsaxena1949@gmail.com  
**Second Author** – Dr. A.N. Tikle (Corresponding author),  
Senior Pigeonpea Breeder, RVS Krishi Vishwa Vidyalaya, RAK  
College of Agriculture, Sehore 466001, Madhya Pradesh, India,  
E mail: antiklepb@gmail.com

# Angle Based-Unicast Routing Protocol

Mehvish Minhaj\*, Vandana Dubey\*\*

Amity School of Engineering & Technology  
Amity University, Lucknow Campus, U. P., India  
\* mehvishminhaj022@gmail.com, \*\* vdubey@lko.amity.edu

**Abstract-** A Mobile Ad-hoc Network (MANET) is self-configuring network made out of portable nodes with no altered foundation. In a MANETs, there are no distinction between a host node and a router so that all nodes can be source and forwarders of movement. Among all the different protocols unicast will be a standout amongst the most critical application in MANETs which manage the exchange of message from single source to single destination hence this sorts of protocol are extremely powerful and mainstream these days. We have proposed a unicast Routing Protocol for MANETs which consolidate the directional forwarding along largest distance from the single source to single destination, named as AB-URP. The fundamental point of this protocol is low system postponement, accomplishing lessened packet overhead and high adaptability in the system.

**Index Terms-** MANETs, Angle based protocol, Unicasting routing protocol, Directional Routing

## I. INTRODUCTION

Mobile Ad-Hoc Networks (MANETs) are included mobile nodes (MNs) that are self-arranging and agreeable to guarantee proficient and exact packet routing in the middle of nodes (conceivably, base stations). There are no particular routers, servers, access focuses for MANETs. On account of its quick and simple of organization, power, and minimal effort, Typical MANETs applications could be find in the accompanying territories like Military applications (i.e. a transitory system in the front line), Search and salvage operations, Temporary networks inside of meeting rooms, air terminals, Vehicle-to-vehicle correspondence in brilliant transportation, Personal Area Networks joining portable gadgets like cellular telephones, portable workstations, shrew watches, and other adaptable PCs and so on. Configuration issue for creating a routing protocol for remote environment with portability is altogether different and more unpredictable than those for wired network with static nodes [1].

Primary issues in mobile ad hoc network are Limited transmission capacity and oftentimes change in the topology. Even Though there are plenty of routing protocols that can be utilized for unicast correspondence inside of the Mobile Ad hoc systems, it watches that any one protocol can't fit in all the diverse situations, diverse topologies and activity examples of Mobile Ad-Hoc Networks applications.

For example, proactive routing protocols are exceptionally helpful for a small scale MANETs with high versatility, while reactive routing protocols are extremely helpful for an extensive

scale, MANETs with moderate or less topology changes. Hybrid routing protocol endeavors to strike harmony between the two, for example proactive for neighborhood, responsive for far away [2].

Most applications in the MANET are based upon unicast correspondence. Hence, the most essential operation in the IP layer of the MANET is to effectively transmit information packets from one source to one destination. The sending system is exceptionally basic in itself: with the routing table, the rely node just uses the destination address in the information packet to find it in the routing table. In the unicast routing protocol one different duplicate sends to every collector from the source node. Information packet is repeated at the sender node and afterward conveyed to each destination node. By this procedure we can undoubtedly see that transmission capacity is devoured by the excess information packets. The off chance that the longest coordinating destination location is found in the table, the packet is sent to the relating next hop. The issue that emerges is the way the steering table is constructed in the nodes in the MANET.

Unicast routing protocol are divided into three part i.e. Proactive, Reactive and Hybrid unicast routing protocol. Which can be better understood by the diagram.

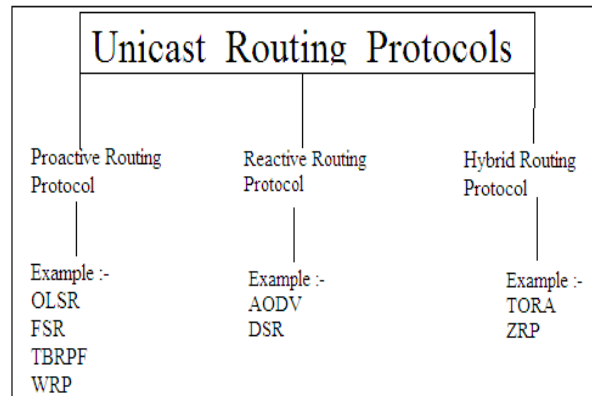


Fig1: Classification of Unicast Routing Protocol

By making use of geographical information available at each node routing is optimized in position based protocol. Position based protocols are broadly classified into two categories:-  
1. Greedy forwarding  
2. Restricted flooding.

In Greedy Forwarding source node selects the node with the best progress towards the destination based on the location

information of the destination node. The location information of the destination is further inserted in their data packets and unicast to the selected node. After receiving the unicast data packet, the selected node selects the finest node among its neighbor and this process continues until the data packet reaches its specific destination. Greedy Forwarding works specifically in topology as stated in and several work proposed recovery techniques to run-over voids [3, 4, and 5].

Restricted Flooding can be implemented where by limited nodes participate in the flooding and not network-wide participation, with location information. In Restricted Flooding the packet is broadcasted by the nodes that are located nearer to the destination or in a forwarding zone. The operation towards the destination is determined by the distance and forwarding zone information that are computed at the respective nodes. These nodes in-turn broadcast the packet and the process is repeated at each intermitted node until it reaches the destination.

Complex mathematical computation is required by the routing protocol so far. These computation accrued further processing downtime in the current node .besides this position based protocol needs local topology updates via periodic beaconing among the neighbor [5, 6].

## II. BACKGROUND

Routing is one of the important issues which are having a significant impact on network performance. Different measures which are matters with the Quality of Service are like pause time end to end delay, control overhead, packet delivery ratio, routing overhead, and distance in between source and destination pair.

Different optimization techniques can be used to find out an available optimal path from source to destination. Generally, there are two different stages in routing;

- Route discovery
- Data forwarding.

In route discovery, route to a destination will be discovered by broadcasting the query. Then, once the route has been established, data forwarding will be initiated and sent via the routes that have been resolved. Through broadcasting, all nodes that receive the query will broadcast to all neighbors and hence, large number of control messages is transmitted.

### A. Proactive Unicast Routing Protocols:

Traditional routing protocols, for example, Optimized connection state (OLSR), The Fisheye State Routing (FSR), And Topology Broadcast Based on Reverse-Path forwarding Routing Protocol (TBRPF) are proactive unicast routing protocol. Periodic broadcast of network topology update (e.g., distance vector or link state data) is important to register the shortest path from the source to each destination, which devours a considerable measure of bandwidth. Despite the fact that they are generally utilized as part of the Internet backbone. They can't be utilized as

a part of the MANET straightforwardly due to the contrasts between the hardwired network furthermore, the MANET. In Table 1 gives the Characteristic examination of proactive Unicast Routing Protocol.

### 1. Optimized Link State Routing Protocol (OLSR):

Optimized link state routing protocol (OLSR) is a proactive (table-driven) routing protocol for MANETs. A route of routing protocol between sources to destination is accessible quickly when required. OLSR is taking into account link-state algorithm. Generally, every single remote nodes flood neighbor data in a network, yet not in OLSR node. It is publicizing data just about links with neighbor who is in its multipoint hand-off selector set. Its decrease size of control packets diminishes flooding by utilizing just multipoint hand-off nodes to send data in the network and decrease number of control packets by diminishing duplicate transmission. This protocol does not anticipate dependable exchange, since upgrades are sent intermittently. OLSR utilized hop by hop routing. Routes are in light of element table passages kept up at moderate nodes. The protocol is outline to work in disseminated way and consequently does not depend up on the focal substance. The conventions therefore bolster a nodal versatility that can be followed through its nearby control message, which depends up on the recurrence of these messages. Point of preference of OLSR is having the routes accessible inside of the standard routing table can be helpful for a few frameworks and network applications as there is no route revelation deferral connected with discovering another route. Greater overhead and need more power are primary hindrance of this convention [7].

### 2. Fisheye State Routing Protocol (FSR):

The Fisheye State Routing (FSR) is a table driven unicast routing protocol for Mobile Ad hoc Networks taking into account Link State routing calculation in actuality with lessened overhead to keep network topology data. As demonstrated in its name, FSR uses a function like a fish eye. The eyes of fishes catch the pixels close to the central with high detail, and the subtle element diminishes as the separation from the point of convergence increments. Like fish eyes, FSR keeps up the precise distance and way quality information about the quick neighboring nodes, and dynamically lessens detail as the distance increments. Point of preference of this convention is that it has possibility to bolster various way directing and QoS routing yet detriment of FSR is that it has high storage complexity [8].

### 3. Topology Broadcast Based on Reverse-Path Forwarding Routing Protocol (TBRPF):

Topology Broadcast Based on Reverse-Path Forwarding routing Protocol (TBRPF) was proposed in. TBRPF goes for the Mobile Ad hoc Network with at generally a few several mobility nodes or high portability of nodes. Each node in the remote system keeps halfway worldwide topology data. At the point when a node needs the briefest way to each other node, a minimum spanning rooted established at itself is processed utilizing adjusted Dijkstra's calculation. TBRPF transmits just the

contrasts between the past network state and the present system state. Correspondingly, routing messages are littler, and can therefore be sent all the more oftentimes. This implies that nodes routing Tables are all the more breakthrough [9].

**TABLE 1: Attributes of Proactive Unicast Routing Protocol**

	OLSR	FSR	TBRPF
Scope	Large and dense MANETs	Large scale MANETs with high mobility	MANETs with hundreds of nodes and high mobility
Organization Of the Network	Flat	Hierarchical	Flat
Neighbor Detection Method	Periodical HELLO messages	Periodical link state updates	Differential HELLO messages
Optimized Broadcast	Multipoint relaying	Combined with neighbor Detection	Combined with HELLO Messages
Broadcast Information	MPR selector list	Link state update	(Partial) Spanning tree
Route Freshness	Up-to-date	Maybe not up-to-date	Up-to-date

**B. Reactive Unicast Routing Protocols:**

Because of the as often as possible changing topology of the Mobile Ad hoc Network, the worldwide topology data put away at every node needs to be upgraded often, this expends heaps of bandwidth. Notwithstanding, this utilization now and again is a misuse of bandwidth, in light of the fact that the link state upgrades gotten lapse before the route in the middle of itself and another node is required. To minimizing the wastage of transfer speed, the idea of On Demand or reactive routing protocol is proposed. In On Demand protocols; the routing is isolated into the accompanying two stages: initial one is route disclosure and second one is route maintenance. The most unmistakable On Demand unicast routing protocols are Dynamic Source Routing protocol (DSR), Ad Hoc On demand distance Vector Routing routing(AODV) and Temporally Ordered Routing Algorithm and so forth. In Table 2 gives the Characteristic examination of Reactive Unicast routing Protocols [10].

**1. Dynamic Source Routing Protocol (DSR):**

Dynamic Source Routing (DSR) is an On Demand unicast routing protocol that uses source routing algorithm. In source routing algorithm, every data packet contains complete routing information to achieve its dispersal. Moreover, in DSR every node employments caching technology to keep up route information that it has found. Case in point, the intermediate nodes cache the route towards the destination and backward to the source. Moreover, in light of the fact that the information

packet contains the source route in the header, the catching nodes are capable to cache the route in its steering store [11].

**2 .The Ad Hoc On-demand Distance Vector Routing Protocol (AODV):**

The Ad Hoc On-demand Distance Vector Routing (AODV) protocol is a reactive unicast routing protocol for mobile ad hoc networks. In a reactive routing protocol, AODV just needs to keep up the routing information about the dynamic ways. In AODV route information is kept up in routing tables at nodes. Each mobile node keeps a next-hop routing table, which includes the destinations to which it as of now has a route. In a routing table, sections lapses in the event that it has not been utilized or reactivated for a prespecified ending time. Also, AODV hold the destination sequence number procedure utilized by DSDV in an on-demand way [12].

**3. Temporally Ordered Routing Algorithm:**

Temporally Ordered Routing Algorithm (TORA) is an On Demand routing algorithm taking into account the idea of joins inversion. This Routing protocol enhances the fractional join inversion technique by identifying partitions and ceasing non-gainful connection transposition. TORA can be utilized for exceedingly progressive mobile ad hoc networks. TORA has three fundamental steps: route construction, route preservation and route deletion. In TORA the DAG gives the capacity that numerous nodes can send packets to a given destination and ensures that all routes are without circle. On account of node portability the DAG in TORA may be separated. In this way, route maintenance step is an imperative part of TORA. This routing protocol has the distinctive attribute that control messages are localized into a small set of nodes near the topology changes occurred [13, 14].

**TABLE II: Characteristic of Reactive Unicast Routing Protocol**

	DSR	AODV	TORA
Updating of Destination at	Source	Source	Neighbors
Multicast Capability	No	Yes	No
Control Hello Message Requirement	No	No	Yes
Design Structure	Flat	Flat	Flat
Unidirectional link	Yes	No	Yes
Multiple Route	Yes	Yes	Yes

**C .Hybrid Unicast Routing Protocols:**

Hybrid routing protocol endeavors to find equalization between the two, for example, proactive for neighborhood, reactive for far away. In light of proactive and reactive routing protocols, some

hybrid routing protocols are suggest to join their favorable circumstances. The most unmistakable hybrid routing protocol is Zone Routing Protocol.

**1. Zone Routing Protocol (ZRP):**

Zone Routing Protocol (ZRP) [4] is a hybrid routing protocol for mobile ad hoc networks. The hybrid protocols are proposed to diminish the control overhead of proactive routing methodologies and decline the inertness brought on by route look operations in reactive routing methodologies.

Zone Routing Protocol (ZRP) is a structure of hybrid routing protocol suites, which is made up the accompanying modules: First one is Intra-zone Routing Protocol, second one is Inter-zone Routing Protocol, and last one is Broadcast Resolution Protocol [15].

ZRP alludes to the mainly proactive routing segment as the Intra-zone Routing Protocol (IARP). The invariably reactive routing segment is named Inter-zone Routing Protocol (IERP). IERP and IARP are not particular routing protocols. Rather, IARP is a group of limited depth, proactive link-state routing protocol. IARP keeps up routing information for nodes that are inside of the routing zone of the node. Correspondingly, IERP is a group of reactive routing protocol that offer upgraded route discovery and maintenance support administrations in view of nearby integration observed by IARP [16] [17].

**III. PROPOSED UNICAST ROUTING PROTOCOL**

**A. Basic Strategy:**

AB-URP is a proficient unicast routing protocol which incorporates the choice of angle for mobile nodes to forward packet in two unique headings in light of the biggest distance in the middle of sender and recipient nodes. The establishment of route having biggest separation from source serves taking after focal points:

- It brings down the quantity of Hop Counts.
- Decreases the dormancy in the system.
- Decreases the aggregate number of packets in the system.
- Control the congestion in the system.

Routes in the network are manufactured and kept up utilizing reply and request messages. At the point when an intermediate node gets a message from a source node, the node first confirmed that the message that was send by other node is received for the first time or not. In the event that it was received for the first time, the node angle forward that message utilizing the same rakish methodology, else it drops the message. Every sending message is stamped by the source with a special sequence number. The duplication can be identified by putting away a record of source and sequence number for beforehand got messages. Source +Sequence number in the route demand message characterizes the character of the message.

**B. Methodology :**

Above all else, source distinguishes its neighboring nodes with the assistance of an echo packet. In the wake of getting the reply from every one of its neighbors, source sends route ask for RREQ message in two distinct bearings in angle of points and biggest distance to diverse neighboring nodes for the foundation of routes. The message is sent and the source and sequence number is put away so as to filter the future copies and structures the unicast gathering utilizing the reply along opposite path. It is not important to have Location information on all nodes.

The far nodes in the network cover more new network space than closer nodes, accordingly hold latencies down for far-away nodes. This makes our protocol more powerful than others.

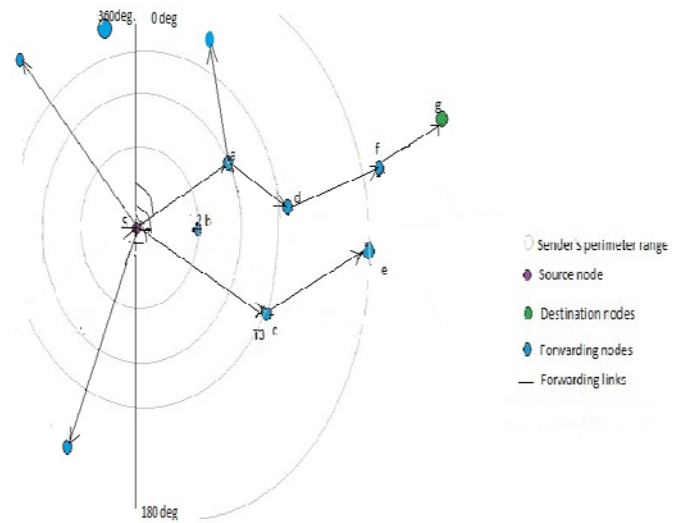


Fig1. Description of protocol

The request packet is redirected in two directions by calculating the angle as follows:

$$1. \quad Y = X_2 - X_1, X = Y_2 - Y_1$$

$$ANGLE = 180 - \text{atan}(y/x) * 180/\pi$$

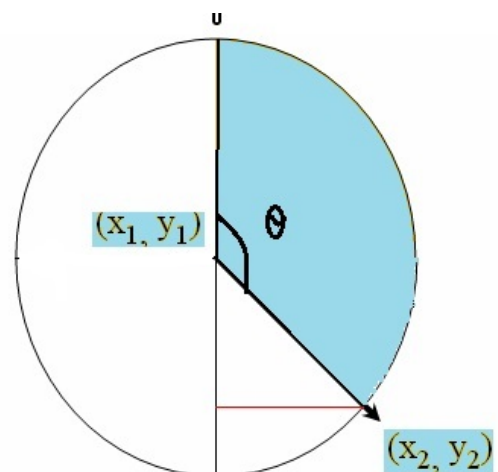


Fig2: Calculation of angle <math> <180^0 </math>

2.  $Y=X1-X2, X=Y1-Y2$   
 $ANGLE=360-atan(y/x)*180/pi$

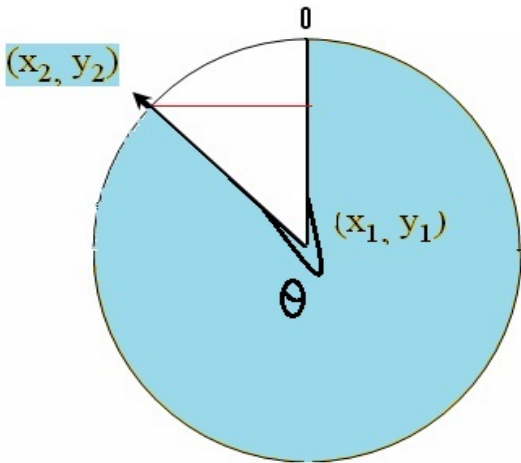


Fig3: Calculation of angle >math> >180^0 </math>

Here,

- For knowing the location coordinates all the nodes should be equipped with GPS.
- $atan(y/x)$  is the inverse tangent or arc tangent function, which is used to compute the angle between positive y-axis of a plane and a point  $(x, y)$  on it.

**C. Route Creation:**

For each Unicast transmission of packets in the ad hoc network, a route from the source is made. The unicast route is framed utilizing the replies along reverse path. Location information is not completely needed on all nodes. The source sends a REQUEST to neighbouring nodes in two directions. After one-hop, request is further sent to node in just one bearing, leaving the course from which the request came. A REQUEST packet is remarkably distinguished by the comparing (source, sequence) match that is put away in the forwarding cache. As the REQUEST packet is spread to other node, reverse route passages are made at every intermediate node. Subsequent to getting the REQUEST message from source nodes, the comparing nodes reply with the REPLY messages to build up the route.

Each node in the network maintains a Forwarding Table which is updated after sending or receiving request and reply messages. The format of the Forwarding Table is as follows:

Table III: Forwarding Table Format

Sequence No.	Previous Hop	Next Hop	Node coordinate	Request id
--------------	--------------	----------	-----------------	------------

1	S	a, b, c	(x1, y1)	S
---	---	---------	----------	---

**IV. ALGORITHM**

Calculation for route foundation: AB-URP  
 Start  
 At the point when a source node S sends a route request packet RREQ to a unicast destination UD  
 1. Find the neighboring nodes which act as Forwarders FG utilizing echo packet  
 2. Maintain the Forwarding Table (FTI) at every node  
 3. Compute the ANGLE with every member node  
 4. Append the Sequence no., Source Address, Destination location and FTI to RREQ  
 5. Select the route having largest distance  
 6. Broadcast RREQ to every neighboring node N in two directions  
 At the point when an Intermediate node Ii gets RREQ,  
 7. If Ii is a member of UD, then  
 a. Get UD and show warning of stop to different nodes  
 8. Else If Ii is an individual from N, then  
 a. identify new arrangement of neighboring nodes N'  
 b. Broadcast RREQ to all new neighboring nodes N'  
 9. End if  
 10. End if  
 11. Send RREP along chose route utilizing information as a part of FTI

**V. CONCLUSION**

AB-URP is a productive technique utilized for unicast directing as a part of mobile ad hoc networks. It impressively decreases the packet overhead when density of nodes is higher. Due to its directional forwarding methodology, the protocol has the capacity safeguard the potential timing of sending packets under sensible limits and viably diminishes packet overhead. ED-URP gives various advantages due to its single destination, geographic area consideration of nodes, controlled directional sending of packets towards group individuals in the network. The protocol utilizes directional forwarding of the data packets outside the zone towards the objective. These outcomes in impressive reduction in packet preparing accordingly minimize the utilization of energy and transmission capacity.

Toward the end, we got to the meaningful part from my reenactment consider that the execution of our directing convention shifts with the density of nodes.

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## AUTHORS

**First Author** – Ms. Mehvish Minhaj is currently pursuing M.Tech in the field of Computer Science and Engineering from Amity University, Lucknow, (U.P.), India. Her area of interest is Computer Networks and the dissertation work complied by her includes improving the efficiency of Unicast Routing Protocol. Email id: mehvishminhaj022@gmail.com

**Second Author** – Ms. Vandana Dubey is pursuing Ph.D. in the field of Reversible Circuit Designing. Her area of interest is Computer Architecture and Organisation. She is currently working as Assistant Professor at Amity University, Lucknow (U.P.), India. Email id: vdubey@lko.amity.edu



# Evaluation Water Consumptive in Western Asia by Mathematical Model

Ibraheem M.A.Naser

Lecturer in Technical Institute of Mosul, Iraq

**Abstract-** Significant problems of water shortage and deteriorating water quality are contributing to a growing water crisis in many countries such as western Asia. This situation requires creative solutions to achieve sustainable resources management. In the Western Asia irrigation (agricultural sector) extraction have had major impact on the water resources environment. Finding ways to meet agricultural demands and also achieve positive environmental and economic outcomes requires the aid of modeling tools to analyze the impact of alternative policy scenarios. These scenarios seek to assess the impact of options for allocation of limited water resources between agricultural production and the environment. This study presents a novel approach for optimizing these objectives by combining system dynamics and constrained linear objective optimization approaches. The network simulation optimization model NSOM has been coupled with a linear programming mathematical algorithm model. This paper concludes that system dynamic optimization approaches is a useful tool for agricultural water use. NSOM has the capability to compare the simulation and optimization dynamic results synchronized in time for each variable involved in the model. The comparison shows that VENSIM optimizer does achieve the same results. Rationalization water consumptive require a lot of researches to achieve objectives by using scientific means.

**Index Terms-** Mathematical model, Evaluation, Water, Western Asia, Consumptive.

## I. INTRODUCTION

Integrated water management in sectional level using is the best strategy to improve water benefit and optimize the use of the available water resources. The chief limiting factors for increased water production are the availability of suitable water. Water problems are rapidly increasing in many parts of the world such as in western Asia (ESCWA) region, the real crisis in water uses is a creeping crisis which needs a sustainable response at present [1].

Increasingly, researcher and policy makers are advocating sustainable development as the best approach to day's and future water problems [2]. The consumptive sector to water in ESCWA region were: agricultural; industrial and domestic; the agricultural sector consumes about 80%; industrial 8%; domestic 10% such as in table 1 of total available water resources in region, agricultural water consumptive requirement depend on many factors such as temperature, humidity rain fall and evaporation. Typically agricultural patterns and agriculture decisions are affected by several factors such as climatic

forecasted growing condition and water allocation. Taking in to consideration this approach, the agricultural pattern of the different cultivated crops under a given allocation is a variable that can be used to improve the productivity of consumed water. The overall goal of this study is to evaluation consumptive sectors in such manner that the optimal pattern is achieved by minimizing the water deficit (difference between available water and total water requirement) in an agriculture area while maximizing the economic return. The current study is carried out on regional scale at an sectors consume water. The model determines the optimal water use in sectors with maximize the net return and minimize use. The study has been performed using the system dynamics programming tool VENSIM with an optimizer algorithm.

The network simulation optimization model NSOM are developed to determine the amount of water demand for each case. Development mathematical model to generate optimal water uses has been performed by researchers since 1970. Most of the optimization models have adopted linear programming (LP), Quadratic programming (QP) and Dynamic programming (DP) approaches.

## II. PROBLEM FORMING

A water resources were bio factor to life stability in nature, water form 75% of earth surface, the percentage of potable water in the world was 2% that require rationalization scientific care from pollution, depletion and activation the water circulation in nature by decreasing atmospheric pollution which increasing average of rain water, that consider first renewed source.

The environmental situation in world was connecting circle. Which any defect in ecological balance on local, territorial and international levels will be invert to other resources and on sustainable development, life stability. Finally, appearance great environmental problems in by the reason of demography increasing, technological development, non rationalization natural resources such as a water, and human activities increasing, where water exposed to great crisis. Western Asia include 13 Arabic countries in ESCWA organization which intending on territorial ecology for organs countries.

This region characterize with hard ecological conditions, consider the great region in water depletion by reason of high temperature and its average variation between winter and summer seasons which reaches 40 C°, lowest rain water in the most countries less than 155 mm yearly, evaporation increasing and fastness wind blowing. This leaved negative elicit such as: drying, desertification increasing. This require researchers attention to study water depletion in the region by laying



capability scientific strategy plans to solving water problems and protect water from pollution and depletion further to diagnosis exhaustive sector, also how to find solving to ensure sustainable development and balance achievement to water in this region by evaluation traditional, nontraditional water resources, with harvesting rain water. The current study include analysis water consumptive due to sector using of water such as, agricultural, industrial and domestic using. Agricultural sector was great consumptive of water but was non capability in economic production by comparing with water consumptive which reaching 80% from total available water. The aim of study how calculate the amount of consumptive water by using mathematical formulation to reach optimization water using.

### III. SYSTEM DYNAMIC

Sector water demand managements is a difficult variable to impact due to the pressure of uncontrolled variable factors such as climatic conditions. Difficulties increase further when economic and environmental perspectives are integrated with realities of biophysical processes. The dynamic character of contributing variables and how they affect water use in the future is not captured through traditional modeling approaches. Although the application of optimization techniques has been a major field of research in water resources planning for many years, their successful adaptation to practical water allocation problems has not been validated in practice, partly due to the fact that most applications dealt with oversimplified systems [3,4].

Total water resources (T) =traditional water (tr) + non traditional water (nt)

$$T = \sum_{i=1}^n tr + \sum_{j=1}^m nt$$

Where  $i, j=1, 2, 3, \dots, n, m$

Traditional water (tr)=surface water (S)+ground water (G)

$$tr = \sum_{i=1}^n S_i + \sum_{j=1}^m G_j$$

Where  $i, j=1, 2, 3, \dots, n, m$

.Non traditional water (nt)=treating waste water (w)+desalinated water (D)

$$nt = \sum_{i=1}^n W_i + \sum_{j=1}^m D_j$$

Where  $i, j=1, 2, 3, \dots, n, m$

Total consumptive water(c) = agricultural consume. (A) +industrial consume. (I) + domestic consume (D)

$$C = \sum_{i=1}^n A_i + \sum_{j=1}^m I_j + \sum_{k=1}^q D_k$$

Where  $i, j, k=1, 2, 3, \dots, n, m, q$

Agricultural consumptive water = Area of crop(a) × quantity of water use (q)

Therefore; there is a need to explore new tools to represent the complex relationship found in water system. One promising option in system dynamics (SD), a feedback-based, object-oriented approach. Although not a novel approach, system dynamic offers a new way of modeling the future dynamics of complex system [4]. System dynamics is based on a theory of system structure and a set of tools for representing complex system and analyzing their dynamic behavior. A network simulation optimization model (NSOM) problem of effectively has been developed to test the feasibility and issues in applying system dynamics to the purpose of model is to analyses the historical water allocation for an agricultural use with un the constraints of environmental flow rules based on economic rationale . The model uses VENSIM™ as a software development tool to configure the water balance network model. The outputs of NSM model are total cost, total yield, total return, irrigation demand, gross margin, losses, surface water use, ground water Fundamentally, a water balance must be determined which can best match the demand and environmental flows within system constraints [5].

### IV. NSOM MODEL FORMULATION AND APPLICATION

The objective function of the NSOM model is formulated to know the relation between several water resources, sector consumptive, ecological water resources, renewed water, minimize the amount of water with maximize advantages (maximize net return), which were as the followings:

$$ACW = \sum_{i=1}^n a_i + \sum_{j=1}^m q_j$$

Where  $i, j=1, 2, 3, \dots, n, m$

Industrial consumptive water=number of factories (N) ×quantity of water use (q)

$$ICW = \sum_{i=1}^n (F_i \times \sum_{j=1}^m q_j)$$

Where  $i, j=1, 2, 3, \dots, n, m$

Domestic consumptive water=number of domestic (d) × quantity of water use (q)

$$DCW = \sum_{i=1}^n (d_i \times \sum_{j=1}^m q_j)$$

Where  $i, j=1, 2, 3, \dots, n, m$

Total consumptive water

Where  $i, j=1, 2, 3, \dots, n, m,$

$$= \frac{\text{type of sector consumptive water}}{\text{total consumptive}}$$

Sector consumptive percentage of water

$$a - \% \text{ Agricultural consumptive water} = \frac{A}{T} \times 100$$

$$b - \% \text{ Industrial} = \frac{I}{T} \times 100$$

$$c - \% \text{ domestic} = \frac{d}{T} \times 100$$

Ecological water resources = Available water (Aw) – loosing water (Lw)

$$= EWR = \sum_{i=1}^n \sum_{j=1}^m (AW) - \sum_{j=1}^m (LW)$$

Where  $i=1, 2, 3, \dots, n, j=1, 2, 3, \dots, m$

Optimization irrigation = Evaporation + Exhaustive(Ex)

$$OI = F(N)$$

$$\text{Year capita share of water} = \frac{\text{Available water}}{\text{Number population}}$$

a – water pressure =F(population growth)

$$wp = F(p)$$

$$\text{Percentage rain water to renewed water} = \frac{\text{Rain water}}{\text{Total water}} \times 100$$

$$\text{Percentage traditional water resources} = \frac{\text{traditional water}}{\text{available water}} \times 100$$

$$\text{Percentage nontraditional water} = \frac{\text{nontraditional water}}{\text{available water}} \times 100$$

Water deficit = available water  $\geq$  Consumptive water

$$\text{Density of water consumptive} = \frac{\text{yearly capita share of total consumptive water}}{\text{yearly capita share of renewed water}} \times 100$$

Arid factor (A)=F(Environmental factors)

A=F(E)

Desertification (D) =F (arid) =F (A)

Pollution (P) =F (human activities)

P=F (H)

$$\text{Maximum net benefit (MNB)} = \sum_{c=1}^n y_c \times p_c \times A_c - \sum_{c=1}^n c_1 w_x \times Q \times A$$

Where  $y_c$ =yield of crop

$p_c$ =crop price

$A_c$ =crop area

$c_1 w_x$ = cost of water

Q=quantity of water (MWN)

$$= \sum_{c=1}^n I_c \times A_c \sum_{c=1}^n I_c \times A_c$$

Minimizes water neck =

$I_c$  = crop irrigation water demand need

$A_c$  = crop area

MR (maximizes ratio) =MNB/MWN

Where: MNB – maximum net benefit

MWN – minimizes water need

Area Availability to total area

$$= \sum_{C=1}^n A \leq TA$$

The sum of all crop area is equal or less the total farm area, where TA is the total area.

Water demand to water Availability

$$= \sum_{C=1}^n i_c \times A_c \leq WA$$

Where  $i_c$  water need of chop total irrigation water needed should not exceed total water available for the irrigation area.

Hydrological sustainable development= F (pollution + depletion)

= F (p + D)

The effecting factors in water resources were pollution and depletion

V. DISCUSSION AND RESULTS

Clear from this study the water resources suffers from two problems, pollution and depletion, which requires to find suitable solving by researchers to protect water resources. Western Asia characterize great arid region in world, that must be laying strategy plans and integrated water management in sector using. Figure 1 shows consumptive water resources in many sectors such as agricultural industrial and domestic consumptive water. On territorial level the consumptive of agricultural was 80%, industrial was 8%, domestic was 10%, other 2% [6]. From figure 1 possible doing analysis to knowing consumptive water in ESCWA region which were 13 countries, this shows in figure 2 which clear watery consumptive percentage in 13 countries, the great consumptive country in potable water was Kuwait 90% and

the lowest country Syria 8% , possible obtaining agricultural using water , the great consumptive country was Yemen 89% and the lowest in Kuwait 4%, possible calculate industrial water consumptive , which shows, the great consumptive industrial water in Egypt 15%, the lowest was in Oman 1.2% .

The conclusion of this study, a system dynamic optimization programming model has been developed to determine the optimal water use against two objectives: to maximize the net profit and minimize the amount of water used. The agricultural sector was a chief consumptive, this require to be less by rationalization and using scientific means in agricultural production such as sprinkler and drip irrigation which irrigated crops due to water necessity with optimization water using.

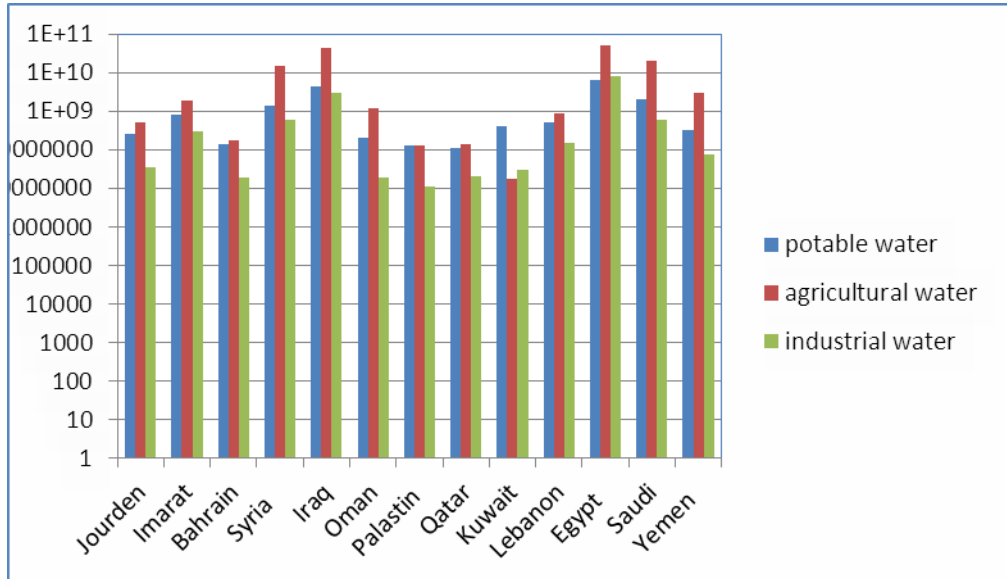
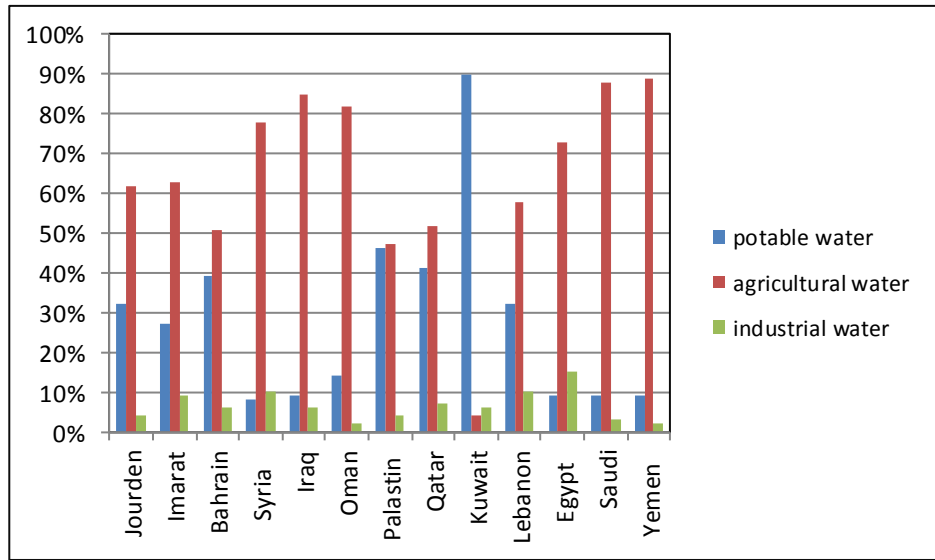


Figure 1 The water sector consumptive in ESCWA region(million M³/year in 2003 y



**Figure 2 Percentage of water consumptive in ESCWA region**

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**AUTHORS**

**First Author** – Ibraheem M.A.Naser, lecturer in Technical Institute of Mosul, Iraq

# Prevalence of Bow legs and Knock Knee Deformity in School going children

Mr. Qureshi haroon Rasheed \*, Dr. Sachin.B.Pagare \*\*

\* Research Scholar, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, (MS) India

\*\* Director & Head, Dept of Physical Education, R.B Attal College, Georai, Dist Beed (MS) India

**Abstract-** Child health has prime importance in all societies. School curriculum always emphasis on child proper health for all round development of the pupil. Lack of correct posture and negligence of good postural habits indulge postural deformity which indeed effect the body either structurally or functional. The purpose of this study was to find the prevalence of knock knee and bow legs deformity in school children. For this task a total of 25 subjects were selected randomly from different school ranged from 9 to 14 years of age. **Methodology** – to identify the deformities the inter - condylar distance for bow legs and inter - malleolar distance for knock knee was measured. Data was collected individually by performing the clinical test of orthopaedics. Mean score, standard deviation were applied for data analysis and interpretation. **Conclusion** – the mean score for bow legs was 3.38 and for knock knee 4.48 was reported. In the examined subject it was found that 32% of the subjects were having bow legs and knock knee deformity.

**Index Terms-** bow legs, inter malleolar, inter condylar, knock knee

## I. INTRODUCTION

Children represent the future and ensuring their healthy growth and development ought to be a prime concern of all societies (WHO). Your child spends more time at school than anywhere else except home. Schools can have a major effect on children's health. Schools can teach children about health, and promote healthy behaviors. Physical education classes give children a chance to get exercise. Child's health includes physical, mental and social well-being. Most parents know the basics of keeping children healthy, like offering them healthy foods, making sure they get enough sleep and exercise and insuring their safety. Children's bones grow continually and reshape (remodel) themselves extensively. Growth proceeds from a vulnerable part of the bone called the growth plate. In remodeling, old bone tissue is gradually replaced by new bone tissue (see Bones). Many bone disorders come from the changes that occur in a growing child's musculoskeletal system. These disorders may get better or worse as the child grows. Other bone disorders may be inherited or occur in childhood from known reason.

## II. OBJECTIVES OF THE STUDY

- To find the prevalence of knock knee deformity in school going children
- To find the prevalence of bow legs deformity in school going children

## III. HYPOTHESIS

- It was hypothesized that there will be no knock knee deformity in school going children
- It was hypothesized that there will be no bow leg deformity in school going children

## IV. PROCEDURE AND METHODOLOGY

- To achieve the purpose of the study 25 (N=25) school children were randomly selected from different government and private schools of Aurangabad city of Maharashtra (India). They were ranged from 9 to 14 years of age. The orthopaedics variables selected for the study were bow legs and knock knee to detect the prevalence of variables clinical examination of orthopaedics was applied in which knock knee and bow leg deformity was diagnosed by measuring inter condylar and inter malleolar distance in standing position.
- The subject was asked to stand in normal standing posture with feet apart by using the steel Tape the distance between inter malleolar and inter condylar were measured according to the clinical examination of orthopaedics method for Knock knee – if the distance is 6 to 8 cm between the two malleolar than mild knock knee deformity is found. And if the distance is 10 cm then the deformity is severe for Bow legs – if the distance is 6 to 8 cm than mild deformity is found and if the distance is 10cm or more than the deformity is severe. The data was collected individually by performing the test on the subject in the described manner. The distance is measured in cm.

## V. RESULTS AND DISCUSSION

The collected data were applied with statistical measures like mean, standard deviation. The level of significance

was considered when  $p > 0.05$ . The results of the study is shown in the following table

**Table - 1**

Significance of mean, standard deviation, range of selected variables bow legs and knock knee is presented.

Table – 1 illustrates the statistical values of bow legs and knock knee. With regards to bow legs and knock knee deformity the obtained mean value was 3.38 and 4.28 respectively which reveals that bow legs deformity and knock knee deformity is prevalent in school going children

Variables	Distances	Number	Mean	S.D	Range	Level of confidence
Bow Legs	inter - Condylar	25	3.38	1.85	0-8	0.76
Knock Knee	inter - Malleolar	25	4.28	2.04	0- 8.5	0.84

\*significant at 0.05 level

**Figure -1**  
 In our study we found four cases of abnormal inter - condylar distance, bow legs deformity.

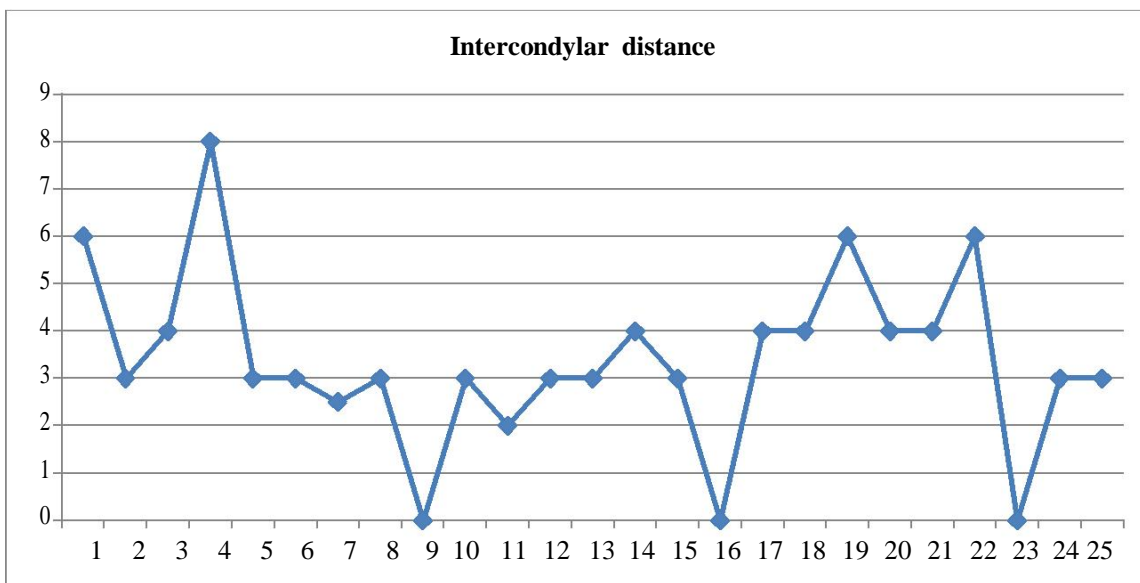


Figure – 2

In our study we found four cases of abnormal inter – malleolar distance, knock knee deformity  
Inter malleolar distance

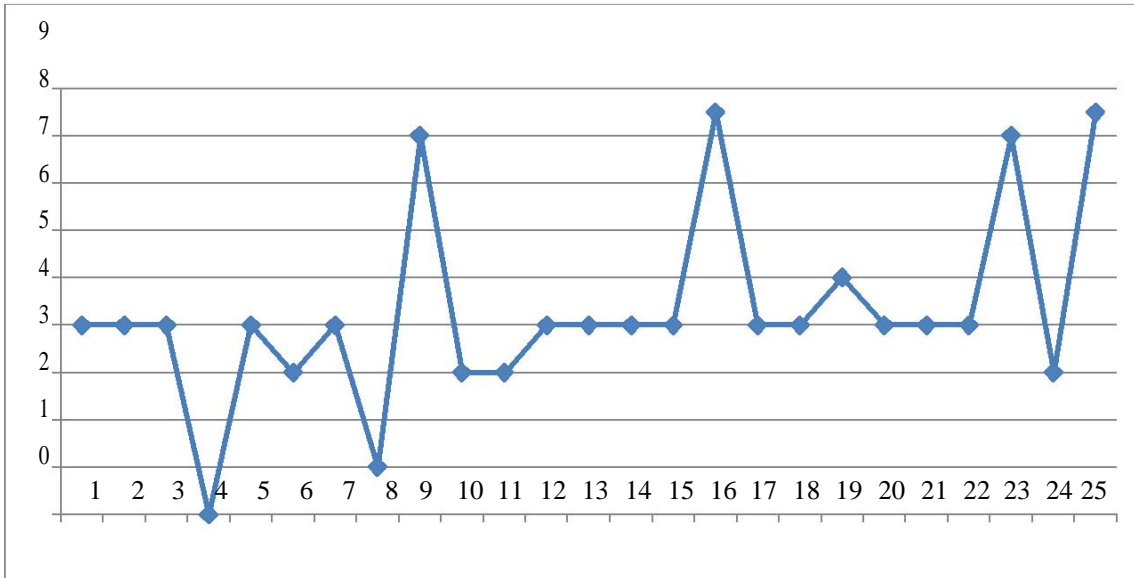
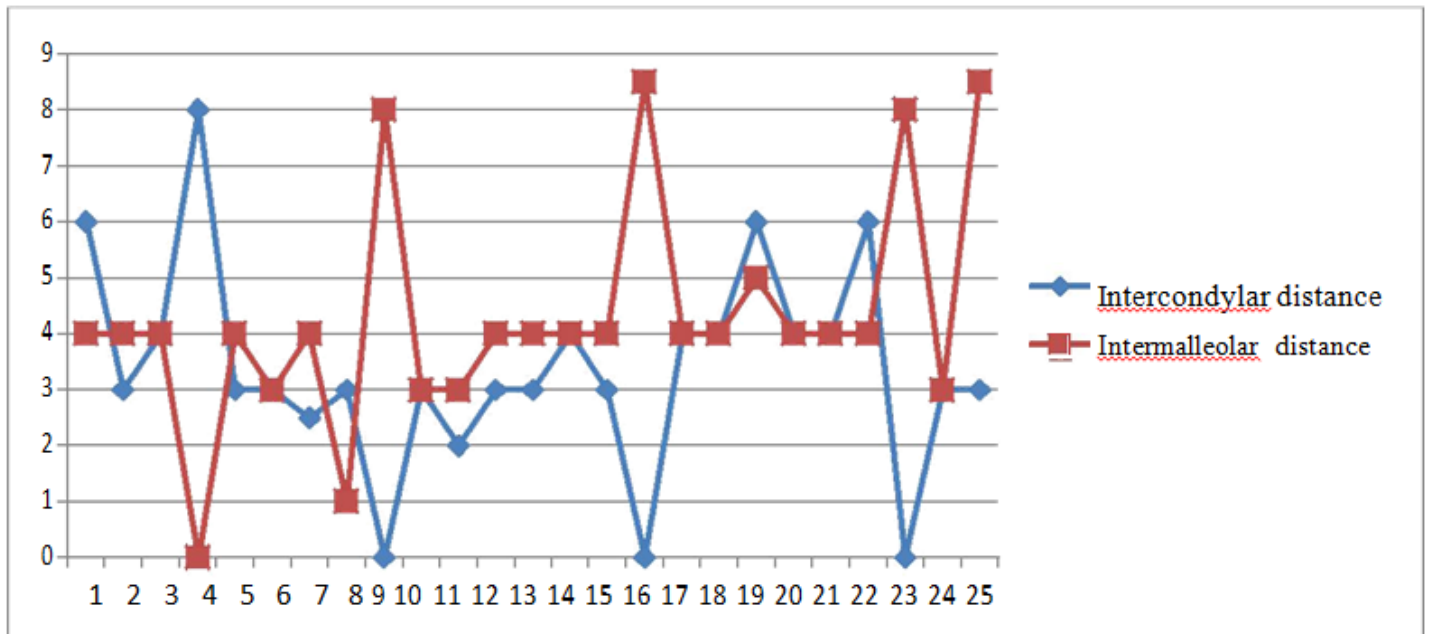


Figure 3. Showing the intercondylar and inter malleolar distance of samples





## VI. CONCLUSION

- Knock knee deformity is found in school going children hence H1 is accepted.
- Bow leg deformity is found in school going children hence H2 is accepted

## ACKNOWLEDGEMENT

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## AUTHORS

**First Author** – Qureshi Haroon Rasheed, Research Scholar, M.P.Ed, M.Phil, Sportiveharoon@gmail.com

**Second Author** – Dr. Sachin.B. Pagare, Ph.D, Head and Director Dept of Physical Education, R.B. Attal College, Georai dist Beed (MS) India [spagare@gmail.com](mailto:spagare@gmail.com).

**Correspondence address:** Qureshi Haroon Rasheed, Sportiveharoon@gmail.com

# Effect of Flat Foot Deformity on Selected Physical Fitness Components in school going children

Mr. Qureshi Haroon Rasheed \*, Dr. Sachin.B.Pagare \*\*

\* Research Scholar, Dr.Babasaheb Ambedkar Marathwada University, Aurangabad, (MS) India

\*\* Director & Head, Dept of Physical Education, R.B Attal College, Georai, Dist, Beed (MS) India

**Abstract-** The moment you discover which foot is your right foot, you don't have many hesitations about which of them is the left foot. And then the problem left is which of them to start walking with them (A.A.Milne). Flatfoot impairs the body's shock absorption mechanism and creates motor difficulties in functions or activities requiring balance and stability. The purpose of this study was to find the effect of flat foot deformity on selected physical fitness components in school going child. For this task a total of 20 subjects (10 flat footer and 10 normal feet) subject were selected purposively from different school, ranged from 9 to 14 years of age. Methodology –to identify the flat foot deformities wet test was measured. Data was collected individually by performing the wet test. Mean score, standard deviation were applied for data analysis and interpretation. Conclusion – the mean score for bow legs was 3.6 and for knock knee 4.4 was reported. In the examined subject it was found that 20% of the subjects were having postural deformity.

## I. INTRODUCTION

**M**ovement and postural pattern are important components in a Child's physical and emotional development (Dr.Gill Soberg) health is of prime importance with respect to all walks of life. Childhood is a crucial stage of life in terms of Child's physical, intellectual, emotional and social development. Growth of mental and physical abilities progress at an outstanding rate and a very high proportion of learning take place from birth to age six. Child development experts agree that play is very important in the learning and emotional development of all children. Flat feet or foot is a deformity where the foot have medial arch completely present. Children between 3 and 13 percent of kids have flat foot (Dr.Angela Evan) and the condition is more common in young children. In fact some degree of flat footedness that reduces with age is considered normal up until around the age of eight or nine. According to research flat foot might have a detrimental effect on various components of human physique. So here a study is been carried out to find the effect of flat foot deformity on selected physical fitness components in school going child.

In **flat feet** (pes planus), the middle of the feet, which are normally arched, appear sunken. Before 3 years of age, all children have flat feet. The arch in the foot begins to develop around age 3. Persistent flat feet may result when the arch of the foot is unusually flexible (called **flexible flat feet**). Another cause of flat feet is stiffening of the foot joints, which fixes the foot in a position with a flattened arch (called **tarsal coalition**).

Tarsal coalition may be a birth defect or result from conditions such as injuries or prolonged swelling.

## II. OBJECTIVES OF THE STUDY

- To find the effect of flat foot deformity on agility of school children.
- To find the effect of flat foot deformity on explosive leg strength of school children.

## III. HYPOTHESIS

- It was hypothesized that there will be no significant difference between flat footer and non flat footer with respect to agility.
- It was hypothesized that there will be no significant difference between flat footer and non flat footer with respect to explosive leg strength

## IV. PROCEDURE AND METHODOLOGY

To achieve the purpose of the study 40 (N=40) school children were purposively selected, 20 subject which have flat foot deformity and 20 sample which have normal feet were selected from different government and private schools of Aurangabad city of Maharashtra . The subjects were ranged from 9 to 14 years. The variables selected for the study flat foot (orthopaedics) agility, explosive leg strength (physical fitness) to detect the flat foot deformity clinical examination methodology of orthopaedics was used. Foot print wet test was used to detect flat foot deformity. A visual observation of the foot print was observed by using the wet test.

To measure agility 10 yards shuttle run was used. To measure explosive leg strength standing broad jump was used .for wet test the subject was asked to sit on a chair normally by applying black color to their soul and then asking them to give their foot impression by standing properly on the white paper sheet, ultimately Recording the foot impression. Flat foot detection – subject have almost entire footprint, if the medial foot Arch is present than they have a flat foot and if the medial arch is missing than the feet is normal. Standing Broad jump (explosive leg strength) Pupil stands with the feet several inches apart and the toes just behind the take off line. Preparatory to jumping, the pupil swings the arm backwards and bends the knees. The Jump is accomplished by simultaneously extending the knees and swinging forward the arms.

**Scoring** – Record the best of the three trials in feet and inches to the nearest inch. **Shuttle run. (Agility)** Two Parallel lines are marked on the floor 30 feet apart. The width of a regulation volleyball court serves as a suitable area. Place the blocks of wood behind one of the lines as indicated. The pupil starts from behind the other line. On the signal ready? **Go” the pupil runs to the blocks; pick one up, Scoring** - record the time of the better of the two trials to the nearest tenth of a second. The data was collected individually by performing the test on the subject and two groups were made one with flat foot deformity and other with normal feet in the described manner.

V. RESULTS AND DISCUSSION

The collected data were statistical measure like mean; standard deviation, fisher’s exact test were applied. The level significance was  $p>0.05$ . The following table shows the result of the study.

Table – 1

Table no –1 illustrates the statistical values of agility level of normal foot and flat footer. With regards to Agility (shuttle run) the obtained mean value of normal footer is 11.89 and 12.32 of flat footer respectively which reveals that there was no significant effect of flat foot deformity on agility.

**Agility (Shuttle Run)**

Samples	Number	Mean	S.D	Range	level of confidence	significance value
Normal foot	10	11.89	1.44	10.00– 15.09	1.03	<b>p&gt;0.05 level</b>
Flat foot	10	12.32	0.72	11.41 -13.41	0.51	

\*significant at 0.05 level.

**Table- 2**

**Table no – 2 illustrates the statistical values of explosive leg strength of normal foot and flat foot samples With regards to explosive leg strength (standing broad jump ) the obtained mean value of normal footer is 4.406 and 4.621 of flat footer respectively which reveals that there was no significant effect of flat foot deformity on explosive leg strength**

**Explosive leg strength (standing broad jump)**

Samples	Number	Mean	S.D	Range	level of confidence	significance value
normal foot	10	4.406	0.82	2.08 - 5.11	0.58	<b>p&gt;0.05 level</b>
flat foot	10	4.621	0.69	2 .00 - 6.00	0.50	

\*significant at 0.05 level.

Figure- 1

Figure -1 illustrates the comparison of flat footer and normal foot with respect to agility

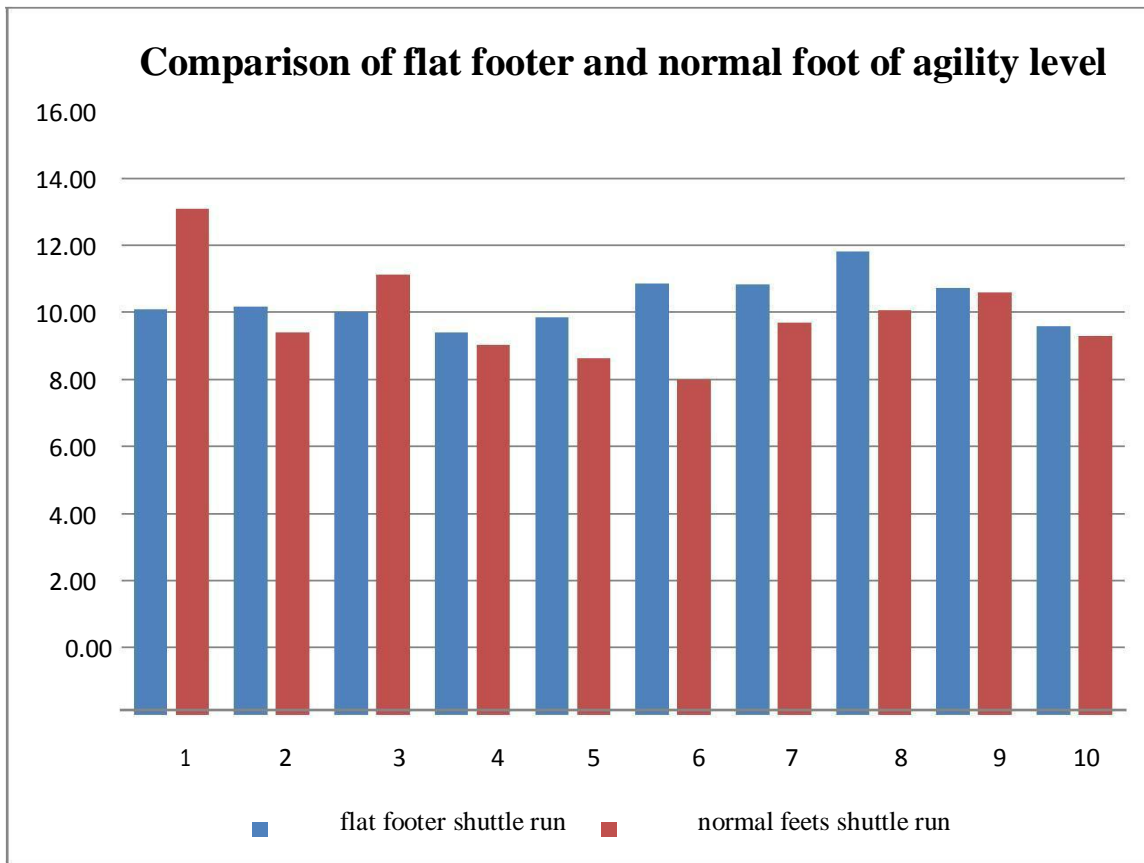
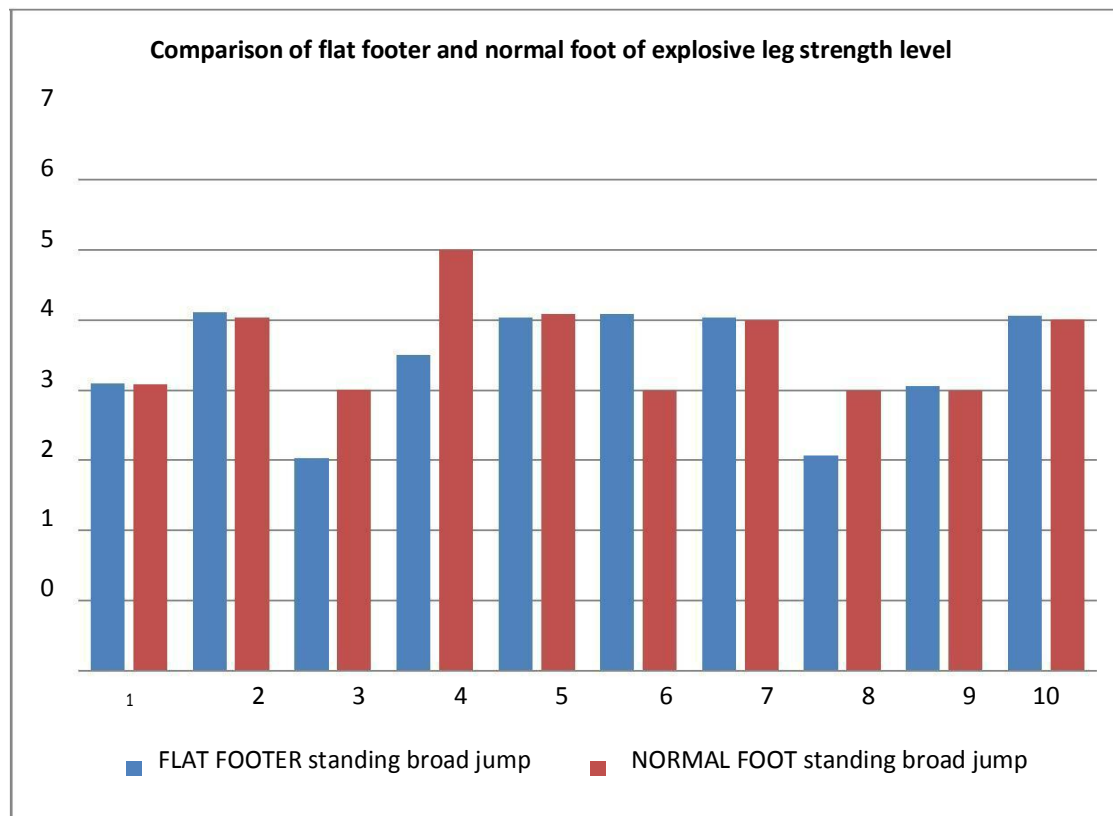


Figure - 2

Figure -2 illustrates the comparison of flat footer and normal foot with Respect to explosive leg strength.



## VI. CONCLUSION

On the basis of data interpretation and analysis the following conclusion is drawn

- There is no significant difference between flat footer and non flat footer with respect to agility hence H1 is rejected
- There is no significant difference between flat footer and non flat footer with respect to explosive leg strength. Hence H2 rejected.

## ACKNOWLEDGEMENT

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## AUTHORS

**First Author** – Qureshi Haroon Rasheed, Research Scholar, M.P.Ed, M.Phil, Sportiveharoon@gmail.com

**Second Author** – Dr. Sachin.B. Pagare , Ph.D, Head and  
Director Dept of Physical Education ,R.B.Attal College, Georai  
dist Beed (MS) India spagare@gmail.com

**Correspondence address:** Qureshi Haroon Rasheed,  
Sportiveharoon@gmail.com Mob – 9975848903, H.no 1-13 37  
near Nehru bhavan buddi lane Aurangabad , Maharashtra.India. -  
431001

# Significance of Strata Monitoring Instruments in Roof Fall Risk Assessment of an Underground Coal Mine

Deepak V. Walke, Research fellow and Dr R.R. Yerpude, Assistant Professor

Department of Mining Engineering,  
Visvesvaraya National Institute of Technology, Nagpur (M.S.), India.

**Abstract:** This paper refers to the role of strata monitoring instruments in risk assessment of roof falls in an underground coal mine. Detailed investigation in to the factors responsible for roof fall was carried out in an underground coal mine situated in Central India. The investigation was supplemented by In-situ stress assessment by drilling yield measurements and convergence recording by strata monitoring instruments. It was observed that strata monitoring instruments gives early indications about initiation of strata movement and potential roof fall. The proper analysis and interpretation of the readings from strata monitoring instruments is very much helpful in updating the risk assessment and preventing the roof fall by risk management.

**Index Terms-** Risk Assessment, Strata monitoring instruments, Roof Fall, underground, coal mine.

## I. INTRODUCTION

Roof fall is the major contributor towards fatal and serious accidents in underground mines. A risk assessment technique is frequently used worldwide to manage and reduce the consequences of roof fall. The mining conditions changes with time after the initial exposure of roof and sides. The risk assessment of roof fall, done before or immediately after the drivage of gallery must also be updated from time to time with changing mining conditions. Close monitoring of the strata monitoring instruments enables to update the Risk Rankings and act accordingly in time to manage the risk.

The analysis in to the causes of fatal accidents in Indian coal mines during the period 1998 to 2010 revealed that, roof fall is the major cause of fatal accidents. In spite of all the precautions taken in this regards, trend of accidents due to fall of roof and sides is not arrested. (D.G.M.S, 2011) [1] Fig.1 shows the cause-wise classification of fatal accidents in India for the period 1998 to 2010 and it can be seen that 32% of the total fatal accidents were occurred due to roof falls. (D.G.M.S, 2011) [1]. According to D.M. Pappas & C. Mark, 2009 [2] from 1999 through 2008, ground fall events resulted in 75 fatalities, 5,941 injuries and 13,774 non injury roof falls in U.S. underground coal mines, according to the U.S. Mine Safety and Health Administration (MSHA).

The main consequences of these accidents can be in the form of human disabilities, fatalities, production downtimes and deterioration in industrial relations which ultimately results in economic loss to the industry. Shahriar, Oraee & Bakhtavar, 2005 [3] used the decision analysis tree for comparison between estimated costs of accidents & the cost of preventive measures to

arrest them and shown that the application of later is economically feasible. Employing proper education system, accurate supervision on safety considerations and support improvements are the Risk Management tools applied to reduce the severity of consequences.

As per the recommendations of 11th conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi, India.[4] - In every Coal mining company, strata control cell shall be established at corporate and area levels within a period of one year, to assist mine managers, for formulation of Systematic Support Rules, monitoring strata control measure in a scientific way to ensure efficacy of support system and for procurement/supply of quality supporting materials. Risk assessment exercise shall be carried out in the mines for assessing for risk from the hazards of roof and sides falls and identifying the control mechanism with specific responsibility for implementation. This exercise shall be reviewed at regular intervals not exceeding a year. Every mine should employ a sound risk analysis process, should conduct a risk assessment, and should develop a safety management plan to address the significant hazards identified by the analysis / assessment.

Mustanir Ali (2014), [5] described Strata monitoring Instruments, which typically measure the strata movement. They are low cost and installed at frequent intervals. They are commonly installed to monitor the roof near working faces, along travelling roadways and at other places frequented by workmen. They are there to warn mine workers about the danger. As such they are designed to show strata movement on a clear and easy to interpret scale of measurement, accurate to at least 1 mm. Analyzed collectively they can provide data for design verification. Safety and design of monitoring equipment forms an important part of efficient, cost-effective rock bolted roof-support systems in underground coal mines.

David Conover, Tim Ross and David Bigby (2010) [6] compared the results of strata monitoring by manual and automated instruments. Extensive arrays of tell-tale roof monitoring instruments were installed in a Mexican copper mine and a large underground mined storage facility in the eastern U.S. The data were used to evaluate roof stability during development and retreat mining and after installation of supplemental supports. The response of tell-tale in relation to known events affecting roof stability, including nearby pillar extraction, roof caving, and installation of supplemental cable bolts and separation of the immediate roof layer was studied. The strategy for processing the large quantity of data, presenting the data for review, monitoring the system remotely, and identifying and reporting critical events was described.

Anthony T. Iannacchione, T.S. Bajpayee and John L. Edwards (2006) [7], examined the potential for monitoring

microseismic emissions activity as a means of forecasting roof falls. There has been a persistent need to forecast roof falls, so that miner's exposure to hazardous underground environments can be minimized. Several monitoring techniques have been developed and are used today with varying levels of acceptance in the mining industry. The microseismic activity collected from Moonee Colliery demonstrates that techniques to forecast roof rock instabilities in underground mines are possible.

T. S. Bajpayee, A. T. Iannacchione, NIOSH and S. R. Schilling (2008) [8] described a case study where a surface-based microseismic system, using triaxial geophones in boreholes drilled from the surface, was deployed at a large limestone mine for detecting strata fracturing and roof failures. It detected the first rock fracture event 17 minutes before the rock fall event. The geophone array was sensitive enough to identify all large rock fracture, impact, and blast events as well as medium-size rock fracture events occurring close to the geophone array.

Razani, Chamzini and Yakhchali (2013) [9] applied Fuzzy inference system (FIS) to predict roof fall rate more in accurate, precise, and sure way for controlling, mitigating, and/or even eliminating the risk of roof fall. A technical report by McDonnell and Haramy (1988) [10] states that, if mine operators can locate high-stress and potentially burst-prone zones, they can then use stress-relief methods to control the burst condition. One method of locating the high-stress zone is the probe-hole-drilling or drilling-yield method. Singh Rajendra, Singh A. K., Mandal, Singh M.K. and Sinha, 2004 [11] done assessment of stress level by instrumentation and monitoring of strata movement during underground coal mining. They concluded that the hostile impact of these stresses can be managed effectively by instrumentation and monitoring of strata control parameters. Mark K. Larson, Douglas R. Tesarik, J. Brad Seymour and Richard Rains (2000) [13] described different types of geotechnical instruments in underground mines to study ground control problems and develop means of reducing accidents and fatalities caused by ground falls. The advantages and disadvantages of various sensor technologies, various instruments, sensors, and data acquisition equipment that have been used for studies were explained. The practical recommendations regarding the use of specific instruments and data acquisition systems were provided. The general approach to the design and implementation of a successful instrumentation plan was also outlined.

R. R. Yerpude and Deepak V. Walke (2014) [14] investigated in to the factors affecting roof fall risk in an underground coal mine. During investigation, the real time developments in roof instability before actual occurrence of roof fall was assessed with the day to day observations of strata monitoring instruments like tell-tale, glass bearing plate and rigid convergence recorders. Aweek Mangal (2013) [15] described Support resistance as the most promising and effective scientific tool to predict various aspects related to strata mechanics of Longwall mechanized workings. The characterization and understanding of geo-mechanics of longwall strata is very important for determining support requirement and planning and design of panel layout so as to ensure safety, stability and higher productivity. To understand actual fracture zones, fracture propagations and failure mechanisms of the longwall face, the geo-technical field investigation with various forms of field measurements techniques have been carried out using

instruments like stress capsules, extensometers, convergence measurement devices, subsidence surveys, borehole camera, observation of water loss in experimental boreholes etc. He used observations of the strata monitoring instruments as one of the inputs for development of software to estimate the required support resistance.

## II. MATERIAL AND METHODS:

**Risk assessment** is a methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. The Standards defines Risk as 'the chance of something to happen that will have an impact upon objectives. It is measured in terms of consequences and probability.

### **Risk = Consequences x Likelihood**

The term **Consequence** can be defined as the outcome of an event or situation, such as a loss, injury or even as a gain. The loss events could include: Death, Serious injury, First aid treatments, Acute or chronic disease, Loss of production, Equipment damage, Environmental damage, Loss of reputation etc.

**Likelihood:** Is used as a qualitative description of probability and frequency.

### **Likelihood = Probability x Frequency**

**Probability:** Is the likelihood of a specific outcome, measured by the ratio of specific outcomes to the total number of possible outcomes.

**Frequency:** Is a measure of likelihood expressed as the number of occurrences of an event in a given time.

### **Investigation:**

The mine selected for the study is situated in central India near Nagpur. There are four workable seams having thickness ranging from 1.8m.to 5.5m.and the Rock Mass Rating (RMR) from 32 to 57. The method of work adopted is Board & Pillar. The uppermost seam is having RMR of 32. It is overlain by clay band of about 1m.thickness and water charged sandstone - Kamptee Series. There is history of roof falls in that seam, total 73 number of recorded & un-recorded, small & large roof falls were occurred in this seam during last 10 years. Almost all the roof falls occurred either in the vicinity of major angular discontinuity, at roadway junctions or near active working faces. Therefore, these areas were considered as vulnerable locations for roof fall. The various phases of investigation include -

- Study the history of Roof-falls in mine.
- Selecting the locations of monitoring stations.
- Recording the initial roof condition by physical observations.
- Recording the initial status of fixed and variable factors affecting roof fall and their sub-categorization.
- Installation of strata monitoring instruments.
- Assessment of In-situ stress level by Drilling Yield measurements.
- Observing the changes in strata behavior and roof movement with time.



- Observing changes in selected variable factors with time.
- Recording the read data of strata monitoring instruments on daily basis.
- Recording the data of physical observations and measurements just before or at the time of roof fall.
- Analysis of the observed data.

The various factors considered for the Risk assessment of roof fall were:

**Geological Factors:** Large angular discontinuities, Joint frequency, Roof layer thickness and bedding contact Strength.

**Mining Induced Factors:** Shear rupture surface, Joint separation, Lateral strata shifting, vertical strata separation, Roof rock debris on floor and Roof shape.

**Moisture factors** were also taken into account for risk assessment.

**Strata monitoring:** Observations of Strata monitoring instruments were considered as a important factor. The roof to floor Convergence records by- Tell-tale, Glass bearing plate, and telescopic gauge/Steel tape measuring were used as inputs for Risk assessment and its updating from time to time.

In order to make the Risk assessment realistic and practical, the attempts were done to convert the roof fall probability in quantitative terms. The Spirit of Fault Mode Effect analysis (FMEA) method is used and two measures have been considered for the purpose. The first one is to assign the probability factor (Pf) for each sub-category of risk factors ranging from 0 to 4. This indicates different levels of roof fall risk and the increasing values represent higher potential for failure. The probability factor is an index which represents the probability of roof fall for each sub-category. The second one is to give a weight (W) to each parameter which ranges from 1 to 3. Since the effects of different parameters on roof fall are not the same, it is necessary to give a weight to each parameters based on its importance on roof fall occurrence. Sum of the weighted probability factor is then used to derive the predictor equation as an indicator of roof fall. Once the RPRI for a particular station is calculated it was then converted in to the standard scale of Likelihood - 1 to 5, for fitting in to the established method of risk ranking.

#### **Risk Probability Ranking Index:**

$$\text{RPRI} = \frac{[\sum (\text{Pf}_1 * \text{W}_1 + \text{Pf}_2 * \text{W}_2 + \dots + \text{Pf}_{13} * \text{W}_{13}) \div \sum (\text{MPf}_1 * \text{MW}_1 + \text{MPf}_2 * \text{MW}_2 + \dots + \text{MPf}_{13} * \text{MW}_{13})] \times 100}{1}$$

Where, Pf<sub>1</sub> = Probability factor for each factor,

W<sub>1</sub> = Weightage number for each factor

MPf = Maximum Probability factor for each risk factor

MW = Maximum Weightage number for each risk factor.

The Consequences level of 1 to 5 is then assigned to all the situations. The levels of consequences is then multiplied by the Likelihood levels to derive the final Risk Ranking Index. Thus the RPRI and Risk Ranking Index for every monitoring station were calculated.

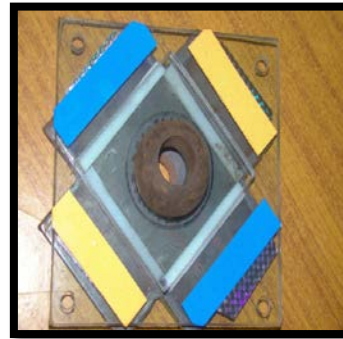
#### **Strata Monitoring:**

**Strata Monitoring Instruments:** Optimization of safety and recovery during coal mining involves a number of measurements through instrumentation and monitoring. Rajendra

Singh, A.K. Singh, P.K. Mandal, M.K. Singh & Amalendu Sinha (2004) [11] stated that the hostile impact of highly active nature of mining induced stress development over the natural support under a hard and massive rock can be tackled through effective underground instrumentation and monitoring strata control parameters. Prediction of strata behavior by theoretical analysis becomes unreliable due to almost impossibility of simulation of the real field conditions in mathematical, physical or numerical models. Thus, S Jayanthu (2011) [13] stated that the empirical formulation, based on in-situ measurements of strata behavior parameters, is an accepted way to estimate the strata behavior. There is a need to be more innovative in application of the existing instrumentation with proper planning by experienced strata control engineers which may lead to possibility of modification in existing practices for better safety and economy of mining venture. Convergence of advance workings in depillaring panels has been widely believed to be a reliable indicator for warning of goaf falls.

The real time developments in roof instability before actual occurrence of roof fall was assessed with the day to day observations of strata monitoring instruments. The convergence recording at selected sights was done with the following instruments:-

**Tell-tale:** It is the simplest mechanical device consisting of strata movement indicator positioned in the mouth of a drilled hole and attached to an anchor installed up to the hole. It provides pre-emptive warning of roof-falling by detecting any unstable trends in the strata by estimation of bed separation in the roof so that timely remedial action can be taken. The Dual Height Tell Tale is used in the present investigation with highest anchoring 0.15m below the clay band.

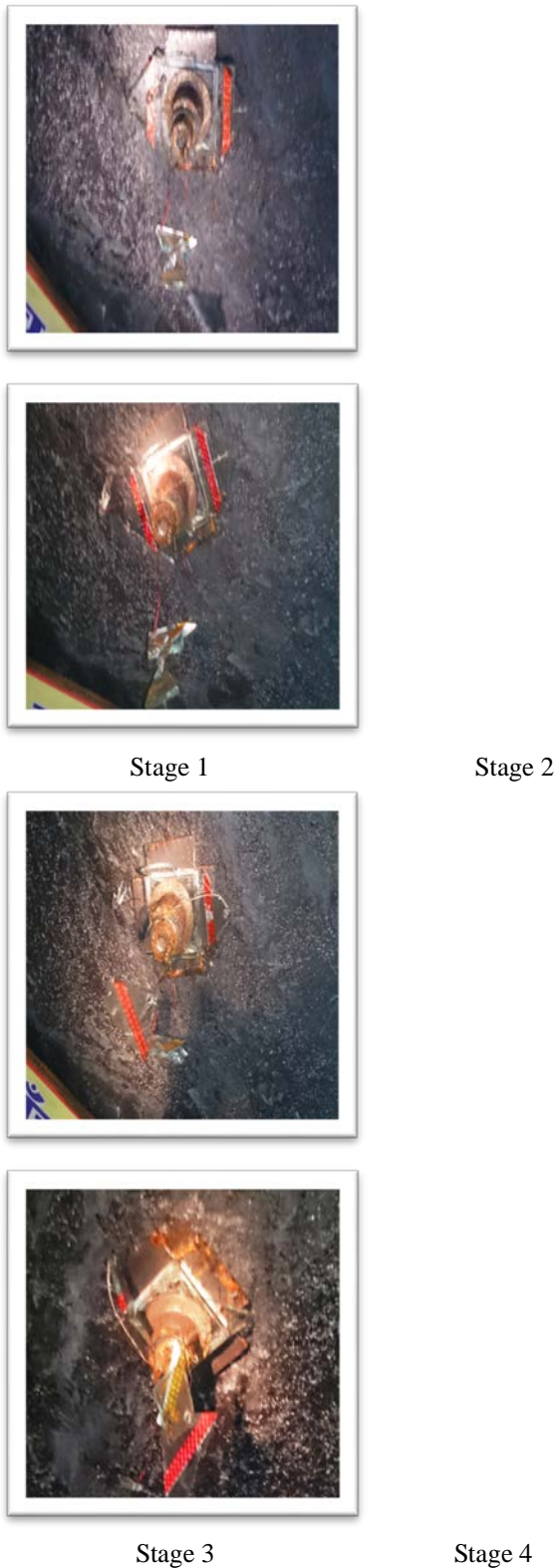


**Figure 3: Assembled Glass Bearing plate**

**Figure 4: Glass bearing plate installed underground**

**Figure 1: Convergence - 12mm      Figure 2: Convergence – 14m**  
**Glass bearing plate:** Figure 3 shows the assembled glass bearing plate placed on steel bearing plate and a dome washer. It consists of a square type bearing plate made of glass and having cuts at its corners. This plate placed diagonally over the steel bearing plate fitted with acrylic sheets having 3mm and 6mm thickness just at inner side of the cuts at glass plate. The roof bolt is point anchored at roof and this complete assembly is just tightened on it by dome washer and nut.

The principle behind this is that when the roof layers separates, the converged roof exerts pressure on the glass bearing plates which is indicated by breaking the pre-cut corners of the glass bearing plate. Initially the corner placed on 6mm acrylic sheet breaks and then on the 3mm sheet, indicating the convergence of 3mm and 6mm respectively. When the roof convergence above 6mm occurs the plate breaks completely.



**Figure 5: Broken Glass bearing pates Showing Convergence**

**Roof-to-Floor Convergence recording:** Convergence points were installed at suitable locations for recording roof to floor movements at different stages. The steel rods with pointer arrow welded to it were grouted on roof and floor. The telescopic rod

convergence meter was used to measure the distance between these two pointers, one in the roof and the other on the floor vertically below it. The monitoring was done on 8 hourly basis and readings were noted on day to day basis. One or the other of above three monitoring instruments was installed at selected sites. The various instruments installed at various stations are given in table 1.



**Figure 6: Rigid convergence Recorders installed underground**

### III. OBSERVATIONS

Total 57 nos. of monitoring stations were installed & readings were recorded during the period of investigation. All the 57 vulnerable zones selected for investigation were closely monitored on day to day basis during the period of investigation. In totality 7 numbers of roof falls occurred during this period. It is observed that all the factors identified for investigation were present with almost highest severity at all the sites of roof fall. On the other hand there were number of cases where roof falls did not occur even after presence of one or more of these factors with moderate or high severity. On the other hand strata monitoring the instruments recorded convergence at every site of the roof fall.

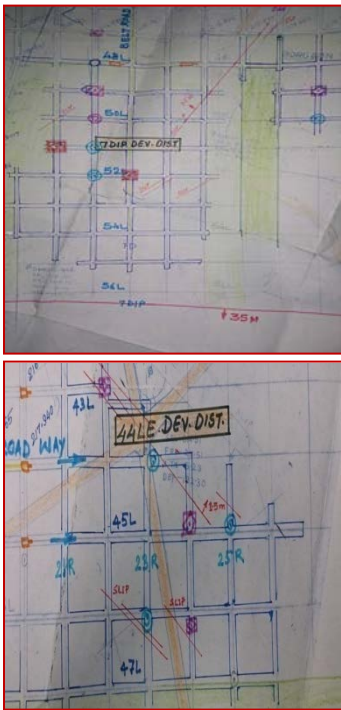


Figure7: Typical Strata Monitoring Plans of the workings

The Strata monitoring plans showing locations of various instruments were maintained and updated as and when required

Table-1 Details of strata monitoring instruments installed at various stations

Region	R M R	Type of instrument	No. of stations	Not Considered	Monitored	Remark
Seam "A"	62	Tell-tale	3	-	3	Some Stations were damaged due to mining or human activities at initial stage therefore not considered.
		Glass Bearing Plate	2	-	2	
		Convergence recorders	3	-	3	
Seam "B"	43	Tell-tale	3	3	Nil	
		Glass Bearing Plate	3	3	Nil	
Seam "C"	32	Tell-tale	10	-	10	
		Glass Bearing Plate	12	-	12	
		Convergence	21	-	21	

	recorders			
<b>Total</b>		<b>57</b>	<b>6</b>	<b>51</b>

Table 2 - The summary of strata monitoring instruments used during the investigation

Type of instrument	No. of stations	Not Considered (No.)	Monitored (No.)
Tell-tale	16	3	13
Glass Bearing Plate	17	3	14
Convergence recorders	24	0	24
<b>Total</b>	<b>57</b>	<b>6</b>	<b>51</b>

Some of the important observations were:

- 1) Total 7 no. of roof falls occurred during the period of investigation. The strata monitoring instruments shown early indications of the convergence at all such sites.
- 2) All the roof falls occurred at places after the convergence recorded by Glass Bearing plate is more than 6mm.
- 3) Roof fall occurred after the convergence of 16 to 20 mm was recorded by tell- tale.
- 4) Most of the roof falls occurred with the gap of 3 to 4 days after initial convergence recorded by the instrument.
- 5) At five no. of sites risk assessment was updated after recording the convergence by strata monitoring instruments. The further deterioration of roof was arrested by additional support and roof falls were saved.
- 6) Roof movement near discontinuity, running across the roadway was controlled by positive support even after recording the convergence.

Table-3 Observations of strata monitoring instruments and comparison with RFRI and RRI

Station	RFRI	Risk Ranking	Instrumentation Results	Remarks
(GBP-1)	43	6	No crack	No physical indications
(GBP-2)	41	8	No crack	No physical indications
(GBP-3)	42	10	No crack	No physical indications
(GBP-4)	52	9	Damaged	Indicator prop erected
(GBP-5)	88	10	12.5.13 - 3mm	<b>Supported by Girders</b>
(GBP-6)	69	16	20.5.13 - 6mm	<b>Supported by Girders</b>
(GBP-7)	41	8	No crack	No physical indications
(GBP-9)	83	20	Broken on 28.11.13	<b>Roof Fall</b>
(GBP-10)	47	6	No crack	<b>Steel cogs erected</b>
(T.T.-1)	49	10	1.12.13 - (0,5)	No physical indications
(T.T.-2)	46	6	5.5.13 - (0,1)	No physical indications
(T.T.-3)	49	10	18.12.13-(3,10)	<b>Steel Cog erected.</b>
(T.T.-4)	50	8	Damaged	<b>Positive support</b>



				<b>Erected.</b>
(T.T.-9)	41	8	Damaged	Indicator prop erected
(T.T.-12)	47	8	14.11.13 -(0,5)	No physical indications
(T.T.-13)	44	6	23.12.13- (4,3)	No physical indications
(R.C.-1)	41	6	Nil	No physical indications
(R.C.-2)	41	10	Nil	No physical indications
(R.C.-3)	44	6	Nil	No physical indications
(R.C.-4)	59	15	23.12.13-(6mm)	<b>Positive support Erected.</b>
(R.C.-5)	42	6	Nil	Indicator prop erected
(R.C.-6)	44	6	19.12.13 -(1mm)	No physical indications
(R.C.-7)	41	8	Nil	No physical indications
(R.C.-8)	43	10	Nil	No physical indications
(R.C.-9)	44	8	19.12.13-(3mm)	No physical indications
(R.C.-10)	44	10	5.12.13-(3mm)	No physical indications
(R.C.-11)	41	8	Nil	No physical indications
(R.C.-12)	41	8	Nil	No physical indications
(R.C.-13)	41	8	Nil	No physical indications
(R.C.-14)	44	4	10.09.13-(1mm)	No physical indications
(R.C.-15)	38	4	Nil	No physical indications
(R.C.-16)	44	8	2.12.13-(1mm)	No physical indications
(R.C.-17)	44	8	13.12.13-(2mm)	No physical indications
(R.C.-18)	41	10	Nil	No physical indications
(R.C.-19)	44	10	25.11.13-(1mm)	No physical indications
(R.C.-20)	41	10	Nil	No physical indications
(R.C.-21)	44	10	29.11.13-(1mm)	No physical indications
(GBP-8)	92	20	Complete break in 4 days	Roof fall on 5 <sup>th</sup> day
(GBP-13)	92	20	Complete break in 3 days	Roof fall on 3 <sup>rd</sup> day
(GBP-14)	94	20	Complete break in 3 days	Roof fall on 3 <sup>rd</sup> day
(T.T.-5)	98	20	Up to 16mm in 3days	Roof fall on 4 <sup>th</sup> day
(T.T.-10)	92	20	Up to 20mm in 4days	Roof fall on 5 <sup>th</sup> day
(R.C.-11)	92	20	Up to 20mm in 3days	Roof fall on 4 <sup>th</sup> day
(GBP-11)	42	10	No crack	No physical indications
(GBP-12)	48	10	No crack	Steel cog erected
(T.T.-6)	50	10	2-5mm	Steel cog erected
(T.T.-7)	52	15	1 mm	Supported by Girders
(T.T.-8)	49	10	NO Convergence	Supported by Girders
(R.C.-22)	49	10	NO Convergence	Supported by Girders
(R.C.23)	49	10	NO Convergence	Supported by Girders
(R.C.24)	45	10	NO Convergence	Supported by Girders

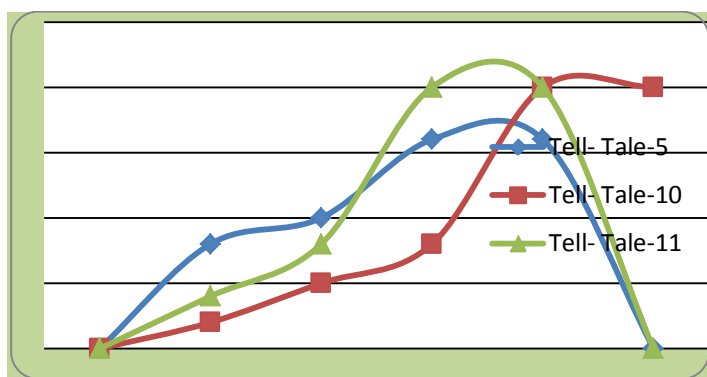


Figure 8 Time elapsed between start of convergence and occurrence of roof fall –Tell Tale

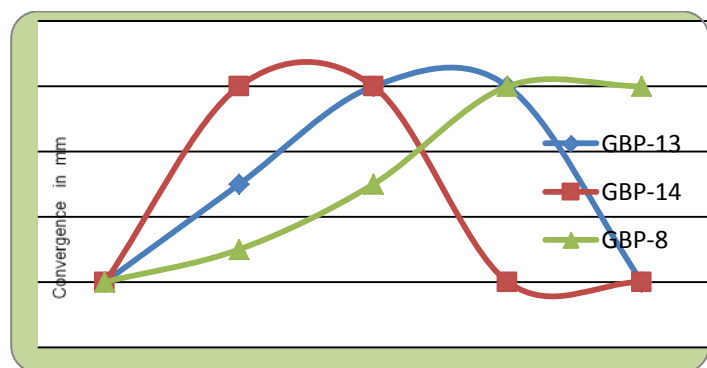


Figure 9 Time elapsed between start of convergence and Occurrence of roof fall – Glass Bearing Plate

IV. DISCUSSION AND ANALYSIS

Roof falls represent a great hazard for the workmen in underground mines. The modern, highly productive underground mining operations need to assure the safety of their work force. This could be achieved by proper risk assessment exercise and updating it from time to time by understanding where major strata fractures and roof failures could occur. The strata monitoring systems with sufficient number of stations can be used to provide the information required for risk assessment. These in-mine systems must be robust in design and moved regularly to keep up with the mining advancement. Installing two instruments that measure different parameters at the same location increases the probability that collected data will be more realistic.

On the whole, 1/6th of the accidents are attributable to lack of prior knowledge of unsafe conditions. S Jayanthu (2011) [13] thinks that, experienced strata control engineers with proper understanding of the field problem, and sufficient knowledge on interpretation of the so generated data are primary requirements for a successful instrumentation program.

Mark K. Larson, Douglas R. Tesarik, J. Brad Seymour and Richard Rains (2000) [13] stated that under varying conditions, the amount and type of roof support may greatly affect stability. It is therefore desirable to optimize roof support, i.e., the density and/or type should be sufficient to minimize the risk of ground fall, yet minimize costs. Technical personnel must determine this point using good engineering judgment.

Instruments have been used increasingly in mines to measure deformation, stress, strain, and load. Such measurements serve two purposes. First, they provide quantitative information that can be useful in determining the mechanics of stability and in aiding engineering decisions. Second, they can be useful in verifying and tuning numerical models. Because one of the goals of an instrumentation program is to monitor ground stability and take corrective action for any imminent problem, instruments that sense

In addition to estimating the Warning limit of potential strata failures the strata monitoring instrumentation is useful in many ways like - obtaining data needed for mine design, such as rock mass deformability or rock stresses, Verifying design data and assumption, thereby allowing calibration of computer models, Adjustment of mining methods to improve stability, Assessing the effectiveness of existing supporting system and directing the installation of additional support. Aweek Mangal (2013) [15] Surface and underground inspections must be done carefully and with the assistance of high intensity inspections lights if necessary; miners, supervisors, engineers and geologists all have an important role to play in carrying out regular inspections for strata monitoring. Monitoring of strata conditions can be done either visually as given above or with the help of specialized instruments.

During the present investigation it was experienced that, the process of risk assessment is highly dependent on the technical knowledge, skill and experience of the person performing it. Therefore the Risk Ranking of particular site, process or operation may vary when the assessment is carried out by two different persons. This makes the process less reliable. The records of strata monitoring instruments, if correlated carefully with physical observation at the site, provides great help in Risk assessment of roof fall. The final risk ranking and RPRI can also be again correlated with the strata monitoring records for taking any corrective actions like providing additional support or the withdrawal of persons from site. Analysis of the observed data shows that:

- Almost all the risk factors considered for investigation were present with high to moderate severity at all the roof fall sites but there are many cases where roof fall did not occur even in the presence of one or more of these factors.
- The continual convergence was recorded at all the sites of roof fall well before its occurrence.
- All the Roof falls occurred in the cases having RPRI values between 83 and 98 (Highest ranking level).
- All the Roof falls occurred in the cases having High RRI levels (20 in all the sites).
- The convergence values recorded at greater RPRI and RRI stations were also high.

After going through the observations and analyzing the results, it is revealed that strata monitoring instruments gives early indications about initiation of strata movement and potential roof fall. The proper analysis and interpretation of the readings from strata monitoring instruments is very much helpful in updating the risk assessment and preventing the roof fall by risk management.

## V. CONCLUSION

Measuring roof deflection is the most common method of detecting roof instabilities. These measurements aid in monitoring mine roof performance and in determining where, and often when, a roof fall may occur. The experience demonstrates that Risk assessment techniques can be utilized to forecast roof rock instabilities in underground coal mines. Risk assessment techniques, suitably supplemented by Strata monitoring technology can provide a means to warn of hazardous roof fall conditions.

The success and growth of underground coal mine is very much required to meet the growing needs of energy in the country. The safety in underground mines by awareness amongst the technocrats about basic rock mechanics and best strata control practices is the pre-requisite for this success. There are no cases of roof fall in the investigation where roof fall occurred in absence of any of the factors considered and roof to floor convergence. Though various factors influence the process of roof fall to different extent, their collective effect is responsible for the final occurrence.

It was observed that strata monitoring instruments gives early indications about initiation of strata movement and potential roof fall. The proper analysis and interpretation of the readings from strata monitoring instruments is very much helpful in updating the risk assessment and preventing the roof fall by risk management.

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# Phytosociological Study of *Sida cordifolia* L. in District Rewa (M. P.), India

Dr. Sangeeta Mishra\*, Dr. Sanjeev Dubey\*\* and Dr. Arpita Awasthi\*

\*Department of Botany, Govt. T. R. S. College, Rewa

\*\*Department of Botany, Govt. Science College, Rewa

**Abstract-** A field survey was conducted at four different sites viz Kothi Compound, Civil Lines, A. G. College and Kuthuliya (Bichhiya) in Rewa district M.P. during years 2005-07. The phytosociological studies made during the course of the present investigation that there were 48 associates of *Sida cordifolia* in the Kothi Compound Campus, 41 associates each in the Civil Lines Area and A. G. College Campus and 42 in Kuthuliya (Bichhiya) Rewa were recorded. The highest Important Value Index (IVI) calculated in case of *Sida cordifolia* was 47.354, 45.857, 45.121 and 42.397 in Kothi Compound, Civil Lines, A. G. College Campus and Kuthuliya (Bichhiya) respectively.

**Index Terms-** *Sida cordifolia* L., Phytosociological profile, IVI.

## I. INTRODUCTION

*Sida cordifolia* L. belongs to family Malvaceae, commonly known as “Indian ephedra” because of the presence of alkaloid ephedrin. In Hindi it is known as “Vatya” and in English it is known as “Country Mallow”. It is native of tropical and subtropical part of Africa, Australia, China, Nepal, Srilanka, Bhutan and Pakistan. [1]

*Sida cordifolia* L. is a perennial herb of the family Malvaceae. It is common weed of gardens, cultivated fields and waste lands. The plants grow in open, partial shaded and dense shaded places, both in grazed and ungrazed areas. The species is also reported on disturbed grounds such as cleared areas in forest found in boggy and marshy places. [2]

*Sida cordifolia* is a small, erect, downy shrub. The leaves of the plant are chordate-oblong or ovate-oblong and fruits with a pair of awns on each carpel. Roots of the plant which constitute a drug are 5-15 cm long with few lateral roots of

smaller size. The tap roots are generally branched at the tip. The outer surface of the root is off to grayish yellow. It is almost odourless with slightly bitter taste. [3]

In the present study qualitative characteristics viz. relative frequency, relative dominance or cover and important value index (IVI) were estimated in the different localities of Rewa Nagarpalica area.

## II. MATERIALS AND METHODS

### Study sites

The study area is situated between 81°-15' east longitude and 24°-42' north latitude and is situated on Vindhya plateau at the height of 318 meter above m. s. l. The climate is mainly sub tropical and sub humid. The average annual rainfall of the region is 82.953 mm and relative humidity is 79.36 %. Present work was done in the four selected fields of Rewa i.e. Kothi Compound, Civil Lines, A. G. College and Kuthuliya (Bichhiya). Information regarding the distribution of *Sida cordifolia* L. incorporated from various literatures, such as Flora of Madhya Pradesh [4], the wealth of India (vol. VI) and Indian Medicinal Plants (Kirtikar and Basu Vol. I to IV) [5].

### Phytosociology

Phytosociological studies were carried out during 2005 to 2007 which covered pre monsoon, monsoon and post monsoon periods. In the present study quantitative characteristics viz. relative frequency, relative dominance or cover, relative density and Important Value Index (IVI) were estimated using standard methodologies [6, 7]. The following are the formulae to derive relative frequency, relative density, relative dominance and IVI:

$$\text{Relative Frequency (R. F.)} = \frac{\text{Number of occurrence of one species}}{\text{Number of occurrence of all species}} \times 100$$

$$\text{Relative Density (R. D.)} = \frac{\text{Total number of one species}}{\text{Total number of plants of all species}} \times 100$$

$$\text{Relative Dominance (R. Dom.)} = \frac{\text{Total Basal area of one species}}{\text{Total Basal area of all species}} \times 100$$

$$\text{Basal area} = \pi r^2$$

Where r = radius of stem

$$\text{Important Value Index (IVI)} = \text{Relative Frequency} + \text{Relative Density} + \text{Relative Dominance}$$



### III. RESULTS AND DISCUSSION

*Sida corifolia L.* is widely distributed along with other species are common throughout the tropical and sub tropical plains all over India and Srilanka up to an altitude of 1050 m., growing wild along the roadside. It grows as wasteland weed. It is also known as the “Bala” in Sanskrit. The plant name Bala is coined on the name of ‘Parvati’ (goddess of strength and beauty). [3]

Quantitative analysis was done for the study of vegetation in the study area covering the pre monsoon, monsoon and post monsoon seasons of the years 2005 to 2007. Relative frequency, relative density, relative dominance and IVI values were computed. The results obtained indicating that the 48 associates of *Sida cordifolia L.* in the Kothi Compound Campus, 41 associates each in Civil Lines area and A. G. College Campus and 42 in Kuthuliya (Bichhiya).

The tables 1,2,3 and 4 shows that the relative frequency of *Sida cordifolia L.* was 6.184 on Kothi Compound, 6.405 on Civil

Lines, 6.235 on A. G. College and 5.830 on Kuthuliya (Bichhiya). The relative density of *Sida cordifolia L.* was 10.354 on Kothi Compound, 8.972 on Civil Lines, 8.041 on A. G. College and 7.633 on Kuthuliya (Bichhiya). The relative cover of *Sida cordifolia L.* was 30.816 on Kothi Compound, 30.480 on Civil Lines, 30.845 on A. G. College and 28.934 on Kuthuliya (Bichhiya).

The species having the highest IVI were considered as the leading dominants of the plant community in the study area. The highest IVI calculated in case of *Sida cordifolia L.* was 47.354, 45.857, 45.121 and 42.397 in Kothi Compound, Civil Lines, A. G. College and Kuthuliya (Bichhiya) respectively.

Anushree *et al.*, 2014 [8] observed that plant diversity and distribution of weeds in winter season crops of agro-ecosystems in Bilaspur district, Chhatisgarh. Seshagiri *et al.*, 2013 [9] surveyed the phytosociology, soil conservation and socio-economic aspects in red sand dunes near Bhimili of Visakhapatnam.

**Table 1- Important value Index (IVI) of the species found in Kothi Compound Campus, Rewa as associates of *Sida cordifolia L.***

S. No.	Name of the species	Relative Frequency	Relative Density	Relative Cover	I. V. I.
1	<i>Abutilon indicum</i>	0.837	1.339	2.886	5.062
2	<i>Achyranthes aspera</i>	3.347	4.284	8.948	16.579
3	<i>Amaranthus gangeticus</i>	0.837	1.071	2.294	4.202
4	<i>Alysicarpus monilifer</i>	3.766	3.079	0.323	7.168
5	<i>Alysicarpus longifolius</i>	2.510	1.606	0.324	4.440
6	<i>Aurea lanata</i>	0.837	1.803	0.054	2.694
7	<i>Ageratum conyzoides</i>	1.674	1.606	4.722	8.052
8	<i>Biophytum sensitivum</i>	3.347	2.409	0.061	5.817
9	<i>Boerhaavia diffusa</i>	2.929	2.008	0.476	5.413
10	<i>Bothriochloa pertusa</i>	1.674	1.473	4.964	8.111
11	<i>Caesulia oxilaris</i>	0.837	0.535	0.127	1.499
12	<i>Cassia obtusifolia</i>	2.510	2.945	0.448	5.903
13	<i>Corchorus capusularis</i>	1.255	0.937	0.098	2.290
14	<i>Cyperus rotundus</i>	2.184	3.024	0.917	6.125
15	<i>Cynodon dactylon</i>	4.184	4.355	0.018	8.557
16	<i>Desmostachya bipinnata</i>	0.837	0.535	5.223	6.595
17	<i>Desmodium triflorum</i>	3.347	4.016	0.334	7.707
18	<i>Dicanthium annulatum</i>	4.184	4.622	1.523	10.329
19	<i>Dicliptera micranthes</i>	1.674	1.473	0.099	3.246
20	<i>Eclipta prostrata</i>	1.255	1.339	0.203	2.797
21	<i>Eragrostis tenella</i>	0.837	0.535	14.169	15.541
22	<i>Euphorbia microphylla</i>	0.837	0.937	0.639	2.413
23	<i>Euphorbia hirta</i>	2.510	3.481	0.132	6.123
24	<i>Evolvulus alsinoides</i>	2.510	2.141	0.145	4.796
25	<i>Gomphrena celosiodes</i>	3.347	3.614	0.060	7.021
26	<i>Heliotropium supinum</i>	1.255	1.071	4.641	6.967
27	<i>Indigofera cordifolia</i>	2.092	1.339	0.035	3.466
28	<i>Indigofera linifolia</i>	0.837	0.803	0.102	1.742
29	<i>Launea nudicaulis</i>	3.347	2.945	6.982	13.274
30	<i>Malvestrum tricuspidatum</i>	2.510	2.811	0.297	5.618
31	<i>Martinia diandra</i>	0.837	0.535	0.172	1.544
32	<i>Melilotus parviflora</i>	2.094	1.606	0.042	3.740
33	<i>Melilotus alba</i>	1.674	1.339	0.444	3.457

34	<i>Oldenlandia corymbosa</i>	0.837	0.535	0.001	1.373
35	<i>Oxalis corniculata</i>	2.092	2.677	0.070	4.839
36	<i>Phyllanthus niruri</i>	2.929	3.078	0.159	6.166
37	<i>Peristrophe bicalyculata</i>	3.347	3.212	0.870	7.429
38	<i>Phasiolus trilobus</i>	2.929	2.409	0.652	5.990
39	<i>Parrthenium hystrophorus</i>	2.929	2.543	0.387	5.859
40	<i>Ruellia tuberosa</i>	1.355	1.070	0.072	2.397
41	<i>Rungia elegans</i>	1.674	1.606	0.015	3.295
42	<i>Sida cordifolia</i>	6.184	10.354	30.816	47.354
43	<i>Striga euphrasioides</i>	0.837	0.535	0.056	1.428
44	<i>Sopubia delphenifolia</i>	0.418	0.267	0.028	0.713
45	<i>Solanum surattense</i>	0.837	0.669	1.631	3.138
46	<i>Tridax procumbens</i>	2.929	2.945	2.730	8.604
47	<i>Vandellia crustacean</i>	0.418	0.133	0.580	1.131
48	<i>Vernonia cinerea</i>	0.803	0.339	0.339	1.979

Table 2- Important value Index (IVI) of the species found in the locality of Civil Lines, Rewa as associates of *Sida cordifolia* L.

S. No.	Name of the species	Relative Frequency	Relative Density	Relative Cover	I. V. I.
1	<i>Abutilon indicum</i>	1.081	1.870	2.916	5.867
2	<i>Achyranthes aspera</i>	2.162	1.870	6.375	10.407
3	<i>Amaranthus gangeticus</i>	1.081	1.020	2.011	4.112
4	<i>Ageratum conyzoides</i>	1.621	2.040	3.951	7.612
5	<i>Alysicarpus monilifer</i>	4.324	3.401	0.488	8.213
6	<i>Aurea lanata</i>	1.081	1.020	0.252	2.353
7	<i>Biophytum sensitivum</i>	3.783	2.552	0.077	6.411
8	<i>Boerhaavia diffusa</i>	4.324	2.891	0.531	7.746
9	<i>Bothriochloa pertusa</i>	4.405	4.972	1.637	11.014
10	<i>Caesulia tora</i>	2.162	2.40	9.592	13.794
11	<i>Cassia obtusifolia</i>	3.243	3.571	0.675	7.489
12	<i>Corchorus capusularis</i>	1.081	1.020	0.114	2.215
13	<i>Cyperus rotundus</i>	2.162	1.870	5.426	9.458
14	<i>Cynodon dactylon</i>	5.405	6.632	1.892	13.929
15	<i>Desmostachya bipinnata</i>	1.081	0.680	4.630	6.391
16	<i>Desmodium triflorum</i>	3.783	4.591	0.408	8.782
17	<i>Eclipta prostrata</i>	1.081	1.090	0.206	2.477
18	<i>Euphorbia hirta</i>	4.324	5.102	0.284	9.710
19	<i>Eragrostis tenella</i>	1.621	1.360	6.804	9.785
20	<i>Gomphrena celosiodes</i>	4.324	4.081	0.106	8.511
21	<i>Heliotropium supinum</i>	1.081	1.020	4.032	6.133
22	<i>Indigofera linifolia</i>	2.702	3.061	0.383	6.146
23	<i>Justicia simplex</i>	1.081	1.020	4.133	6.234
24	<i>Launea nudicaulis</i>	0.540	0.170	0.005	0.715
25	<i>Malvestrum tricuspidatum</i>	2.162	2.721	0.378	5.261
26	<i>Martinia diandra</i>	1.081	0.680	0.222	1.983
27	<i>Melilotus parviflora</i>	2.702	2.721	0.088	5.511
28	<i>Merrimia emarginata</i>	1.621	1.700	0.220	6.762
29	<i>Oxalis corniculata</i>	3.243	3.401	0.118	7.192
30	<i>Phyllanthus niruri</i>	3.243	3.741	0.208	7.192
31	<i>Peristrophe bicalyculata</i>	3.783	3.061	0.425	7.269
32	<i>Parthenium hystrophorus</i>	3.243	3.061	0.038	6.342
33	<i>Ruellia tuberosa</i>	1.081	1.020	0.252	2.353
34	<i>Rungia parviflora</i>	2.162	1.530	0.147	3.839
35	<i>Rungia elegans</i>	1.081	1.870	0.259	3.21
36	<i>Sida cordifolia</i>	6.405	8.972	30.480	45.857
37	<i>Sida acuta</i>	1.081	0.680	0.430	2.191

38	<i>Striga euphrasioides</i>	1.081	1.190	0.372	2.643
39	<i>Sopubia delphenifolia</i>	0.540	0.340	0.887	1.767
40	<i>Solanum surattense</i>	1.081	0.680	1.774	3.535
41	<i>Tridex procumbens</i>	4.864	3.571	3.059	11.494

**Table 3- Important value Index (IVI) of the species found in A. G. College Campus, Rewa as associates of *Sida cordifolia* L.**

S. No.	Name of the species	Relative Frequency	Relative Density	Relative Cover	I. V. I.
1	<i>Abutilon indicum</i>	3.141	3.497	0.473	7.111
2	<i>Achyranthes aspera</i>	4.188	4.133	7.825	16.146
3	<i>Alysicarpus monilifer</i>	2.617	3.179	0.389	6.185
4	<i>Amaranthus gangeticus</i>	1.047	0.953	1.758	3.758
5	<i>Ageratum conyzoides</i>	1.570	1.589	0.275	3.434
6	<i>Boerhaavia diffusa</i>	2.617	2.861	0.540	6.018
7	<i>Bothriochloa pertusa</i>	4.235	4.359	1.102	9.696
8	<i>Cassia obtusifolia</i>	3.141	2.384	3.277	8.802
9	<i>Commelina benghalensis</i>	1.047	0.635	0.057	1.739
10	<i>Corchorus capusularis</i>	1.047	0.635	0.057	1.739
11	<i>Cyperus rotundus</i>	1.570	1.271	9.801	12.643
12	<i>Cynodon dactylon</i>	5.235	5.087	1.467	11.789
13	<i>Desmostachya bipinnata</i>	2.094	2.225	8.591	12.910
14	<i>Desmodium triflorum</i>	4.712	4.451	0.389	9.552
15	<i>Dicanthium annulatum</i>	5.235	6.041	1.338	12.614
16	<i>Eclipta prostrata</i>	1.047	1.127	0.220	2.538
17	<i>Eragrostis tenella</i>	0.523	0.317	10.007	10.847
18	<i>Euphorbia hirta</i>	4.712	4.769	0.212	9.693
19	<i>Evolvulus alsinoides</i>	1.570	1.589	0.177	3.276
20	<i>Gomphrena celosiodes</i>	2.094	1.907	0.054	4.055
21	<i>Indigofera linifolia</i>	1.570	1.907	0.241	3.718
22	<i>Indigofera linifolia</i>	1.047	1.271	0.106	2.424
23	<i>Justicia simplex</i>	1.047	1.112	4.685	6.844
24	<i>Launea nudicaulis</i>	1.570	2.066	2.007	5.643
25	<i>Malvestrum tricuspidatum</i>	4.188	4.133	0.455	8.776
26	<i>Martinia diandra</i>	0.523	0.317	1.000	1.840
27	<i>Melilotus parviflora</i>	2.617	2.543	0.040	5.200
28	<i>Merrimia emarginata</i>	1.570	1.907	0.173	3.650
29	<i>Oldenlandia corymbosa</i>	1.047	0.953	0.500	2.500
30	<i>Oxalis corniculata</i>	3.664	3.497	0.107	7.268
31	<i>Phyllanthus niruri</i>	4.188	3.338	0.124	7.650
32	<i>Peristrophe bicalyculata</i>	3.141	2.861	0.510	6.512
33	<i>Phasiolus trilobus</i>	1.047	1.112	5.252	7.411
34	<i>Parthenium hystrophorus</i>	3.141	2.702	0.014	4.857
35	<i>Ruellia tuberosa</i>	1.570	1.589	0.222	3.381
36	<i>Rungia elegans</i>	2.094	1.907	0.180	4.181
37	<i>Sida cordifolia</i>	6.235	8.041	30.845	45.121
38	<i>Sopubia delphenifolia</i>	0.523	0.158	0.391	1.072
39	<i>Solanum surattense</i>	1.047	0.635	1.345	3.027
40	<i>Tridex procumbens</i>	3.664	3.656	2.838	10.158
41	<i>Vernonia cinerea</i>	1.047	0.476	1.361	2.884

**Table 4- Important value Index (IVI) of the species found in the locality of Kuthuliya (Bichhiya), Rewa as associates of *Sida cordifolia* L.**

S. No.	Name of the species	Relative Frequency	Relative Density	Relative Cover	I. V. I.
1	<i>Abutilon indicum</i>	1.932	1.990	3.441	7.363

2	<i>Achyranthes aspera</i>	1.932	1.990	0.280	4.202
3	<i>Amaranthus gangeticus</i>	0.966	1.326	2.634	4.926
4	<i>Alysicarpus monilifer</i>	3.381	3.482	0.418	7.281
5	<i>Aurea lanata</i>	1.449	1.160	0.065	3.674
6	<i>Ageratum conyzoides</i>	1.932	2.321	3.885	8.138
7	<i>Biophytum sensitivum</i>	2.415	2.653	1.069	5.137
8	<i>Boerhaavia diffusa</i>	3.830	5.965	1.456	11.281
9	<i>Bothriochloa pertusa</i>	3.830	5.965	1.486	11.281
10	<i>Cassia obtusifolia</i>	1.932	1.658	0.043	3.633
11	<i>Caesulia tora</i>	3.564	3.482	0.490	7.836
12	<i>Caesulia oxilaris</i>	0.966	0.497	0.108	1.571
13	<i>Corchorus capusularis</i>	0.966	0.829	0.439	2.234
14	<i>Cyperus rotundus</i>	2.898	2.653	4.020	9.571
15	<i>Cynodon dactylon</i>	4.830	5.970	1.577	12.377
16	<i>Commelina benghalensis</i>	1.449	1.160	0.576	3.185
17	<i>Desmostachya bipinnata</i>	2.898	2.155	3.171	8.224
18	<i>Desmodium triflorum</i>	3.864	4.145	0.124	8.133
19	<i>Dicanthium annulatum</i>	4.830	6.633	1.346	12.809
20	<i>Digitaria biformis</i>	1.449	1.658	2.388	5.495
21	<i>Eclipta prostrata</i>	0.996	0.995	0.135	2.096
22	<i>Eragrostis tenella</i>	0.483	0.165	10.004	10.652
23	<i>Euphorbia hirta</i>	3.864	4.643	2.947	11.456
24	<i>Evolvulus alsinoides</i>	1.449	0.995	0.688	3.132
25	<i>Gomphrena celosiodes</i>	2.415	1.824	0.097	4.336
26	<i>Heliotropium supinum</i>	0.966	0.829	3.030	4.825
27	<i>Indigofera linifolia</i>	1.966	1.995	1.140	5.101
28	<i>Launea nudicaulis</i>	1.932	1.990	6.840	10.762
29	<i>Malvestrum tricuspidatum</i>	4.347	3.648	0.368	8.363
30	<i>Martinia diandra</i>	0.966	0.497	0.140	1.603
31	<i>Melilotus parviflora</i>	3.864	2.985	0.083	6.932
32	<i>Oxalis corniculata</i>	3.864	2.985	0.083	6.932
33	<i>Phyllanthus niruri</i>	3.864	3.316	0.159	7.336
34	<i>Peristrophe bicalyculata</i>	3.810	2.653	0.318	6.352
35	<i>Phaseolus trilobus</i>	1.966	1.663	1.108	4.737
36	<i>Parthenium hysterophorus</i>	2.415	2.487	0.298	5.200
37	<i>Ruellia tuberosa</i>	2.449	1.326	1.078	4.853
38	<i>Rungia elegans</i>	1.483	1.165	1.267	3.915
39	<i>Sida cordifolia</i>	5.830	7.633	28.934	42.397
40	<i>Striga euphrasioides</i>	1.483	1.331	1.070	3.884
41	<i>Solanum surattense</i>	0.966	0.995	0.707	2.668
42	<i>Tridax procumbens</i>	3.864	3.482	2.579	9.925

#### IV. CONCLUSION

*Sida cordifolia* L. is a perennial branched herb of the family malvaceae. There is appreciable variation in the phytosociological studies. It shows a vast number of common associates in all the four study sites. The various data on frequency, density, cover and IVI were obtained from the associates found in different localities. On the basis of Important value index the community of different localities were recognized.

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#### AUTHORS

**First Author** – Sangeeta Mishra , PhD, Department of Botany, Govt. T. R. S. College, Rewa, Email - [bttrsrewa@gmail.com](mailto:bttrsrewa@gmail.com)

**Second Author** – Sanjeev Dubey, PhD, Department of Botany, Govt. Science College, Rewa Email – [jayse25@gmail.com](mailto:jayse25@gmail.com)

**Third Author** – Arpita Awasthi, PhD, Department of Botany, Govt. T. R. S. College, Rewa Email - [arpita.awasthi@ymail.com](mailto:arpita.awasthi@ymail.com)

**Correspondence Author** – Sangeeta Mishra, Email – [bttrsrewa@gmail.com](mailto:bttrsrewa@gmail.com)

# Transient Stability and Cost Analysis of a System with Distributed Generation and Energy Storage Devices

A. Preethi \*, D.Gifty Deborah, M.Tech., (Ph.D) \*\*

\* M.E.(PED) - Final Year, Department Of EEE, Agni College of Technology, Thalambur, Chennai - 600 130

\*\* Assistant Professor, Department of EEE, Agni College of Technology, Thalambur, Chennai - 600 130

**Abstract-** Renewable energy integration focusses on incorporating renewable energy, distributed generation, energy storage, thermally activated technologies and demand response into the electric distribution and transmission system. Energy Storage plays a key role in enabling a low-carbon electricity system. Energy storage can supply more flexibility and balancing the grid, providing a backup to intermittent renewable energy. It can improve the management of distribution networks, reducing cost and improving efficiency. Electrical power system is always subjected to different loading conditions. The load variation gives negative impact on the entire power system parameters. The assessment of transient stability is an essential requirement for the security of electrical power system This paper presents the simulation results of a transient stability and economic analysis with battery backup and ultra capacitor in grid connected operation

**Index Terms-** renewable energy, battery backup, ultra capacitor energy storage, transient stability and economic analysis.

## I. INTRODUCTION

Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves and geothermal heat. Renewable energy replaces conventional fuels in four distinct areas i) electricity generation ii) hot water/space heating, motor fuels and rural (off-grid) service areas. Rapid development of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation and economic benefits.

In international public opinion surveys there is a strong support for promoting renewable sources such as solar panel and wind power. In recent years the development of alternative energy sources have become a global priority giving rise to intensive research about less environmentally polluting renewable source[1]. The installation of smaller and distributive power plants have been made possible due to changes in both the power system concept and the economy of scale.

A micro grid can be defined as a combination of loads and micro sources that provides electric power to a local area [2]. Many commercial pv systems work as a current source in grid connected mode [3]. The operation of micro grid offers distinct advantages to customers and utilities (i.e) improved energy efficiency, reduced environmental impact and greater reliability. Energy storage improves the efficiency and reliability of electric supply system by reducing the requirements for spinning reserves

to meet power demands, making better use of efficient base load generation and allowing greater use of intermittent renewable energy technologies. Energy storage can help to increase the energy security, reduce the environmental impact of electricity generation, transmission and consumption and broaden the diversification opportunities for utilities by adding more generation options to their portfolios. Eg: Distributed power and renewable energy.

Super capacitors are also known as electro chemical capacitors or ultra capacitors. They have characteristics of both batteries and capacitors and could be used by utilities to regulate power quality. Battery systems allow utilities or utility customers to store electrical energy for dispatch at a time when its use is more economical strategic (or) efficient. It uses lead - acid batteries. Low maintenance have been developed for distributed power application.

## II. SYSTEM CONFIGURATION

The block diagram of the system is shown in figure 2.1.

### A. PRINCIPLE OF OPERATION OF PV SYSTEM

Sunlight is composed of photons or particles of solar energy, photons comprise of various amounts of energy of different wavelengths of the solar spectrum. When enough sunlight is absorbed by the material, electrons are dislodged from the material's atoms.

When electrons leave their position holes are formed. The performance of a photo voltaic array is dependent upon sunlight. Climatic conditions have a significant effect on the amount of solar energy received by an array and in turn its performance. Current technology photo voltaic modules are about 10% efficient in converting sunlight. The characteristic and equivalent circuit of PV array is shown in figure 2.2 and 2.3 respectively.

### B. PRINCIPLE OF OPERATION OF WIND SYSTEM

Wind is simply defined as moving air. When the earth heats up from sunrays it releases wind, this is a balanced reaction meant to cool the earth. The sun heat is felt more on dry land than on the sea. The air expands and easily reaches maximum high altitudes, then cool air drops down and moves as wind. Wind energy is generated by converting kinetic energy through friction process into useful forms such as electricity and mechanical energy. These two energy sources are put in to use by humans to achieve various purposes. In the past, people constructed wind mills to generate energy meant for grinding rains. They also constructed mechanical wind pumps to be used to pump large amounts of water into the farms.

C. SINGLE PHASE INVERTER

A current controlled H-bridge single phase inverter is been chosen [4]. It is fed from a dc source in which I-V curve of a PV panel has been programmed to emulate an array of 12 series connected PV panels. It enables the voltage to be applied across the load in either direction.

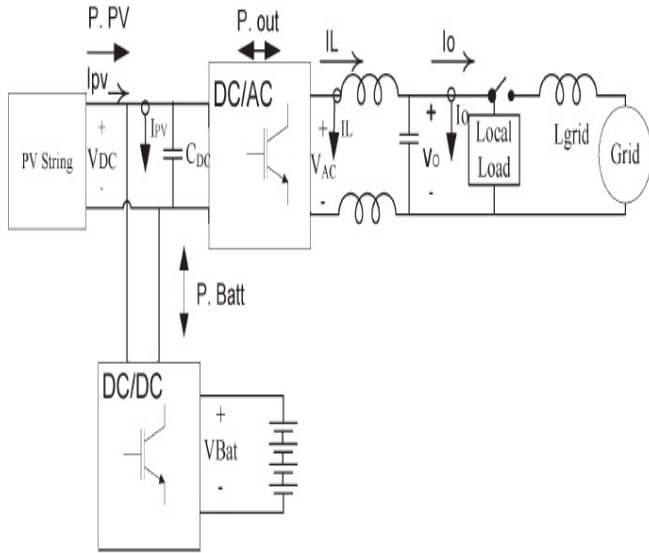


Fig-2.1: Block Diagram of PV system under study

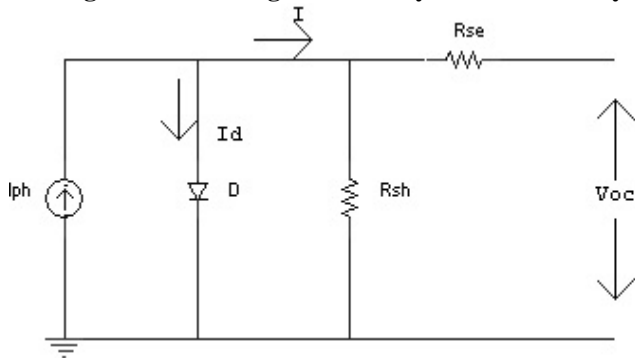


Fig-2.2: Characteristic of PV array

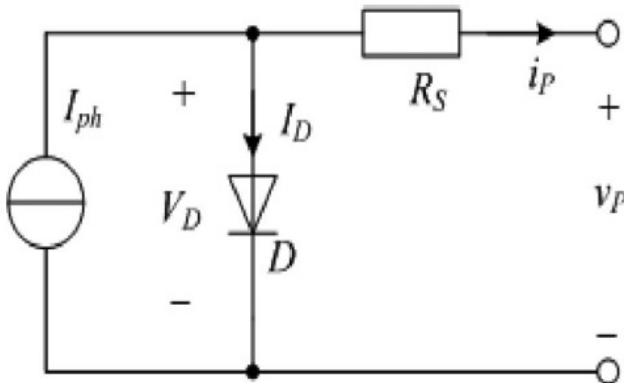


Fig-2.3: Equivalent circuit of PV array

D. DC-DC CONVERTER

DC- DC converter regulates the output voltage. It performs multiple functions such as a battery charge regulator and a boost converter to deliver energy from the battery to inverter [3]. It offers to increase the voltage from a partially lowered battery

voltage thereby saving space instead of using multiple batteries to accomplish the same thing.

III. ENERGY MANAGEMENT

Electric utilities are faced with many challenges imposed by today’s smart grid. High penetration of bulk renewable demand response options, coupled with increased operating and maintenance costs, security contribute to the needs of today’s advanced Energy Management System (EMS). It has its origin in the need for electronic utility companies to operate their generation as economically as possible. EMS own and operates the generation, transmission and the distribution the economic dispatch and scheduling of generation usually done to minimize the total operating cost of generation.

IV. ENERGY STORAGE DEVICES

A. BATTERY

It is an electrochemical device that stores energy and then supplies it as electricity to a load circuit. They are typically organized in strings and can be connected in series or parallel or a combination of both, to provide the operating voltage and current. It impact the overall reliability of the battery solution. Battery system are treated as short term to medium term sources of stored energy capable of supporting a critical load for minutes or hours. Battery systems can be the primary source of back up power, but they usually support the load until an alternate source of power is available. The data regarding battery is explained in the table1.

Batteries usually provide 5-15mins of backup power. The extended battery run time allows for both humans and softwares to perform emergency procedures.

B. ULTRA CAPACITOR

A capacitor is an electric circuit element used to store an electrical charge temporarily. In general, it consists of two metallic plates separated and insulated from each other by a non -conductive material such as glass (or) porcelain.

An ultra capacitor is a double layer electro chemical capacitor that can store thousands of times more energy than a common capacitor. It shares characteristics with both batteries and conventional capacitors and has an energy density (ratio of energy output to its weight) approaching 20% of a battery. In other words , a battery would have to be 80% heavier thanthe ultra capacitor in order to produce the equivalent energy output. It could be a suitable battery replacement in situations where a long run time is not required. It is highly reliable energy storage system that would require little or no maintenance.

Table-1: BATTERY CONFIGURATION

Sl. No	Parameters	Range
1	Environmental Impact	Consider less toxic
2	Discharge/Recharge rate	Fast
3	Current Cost	High

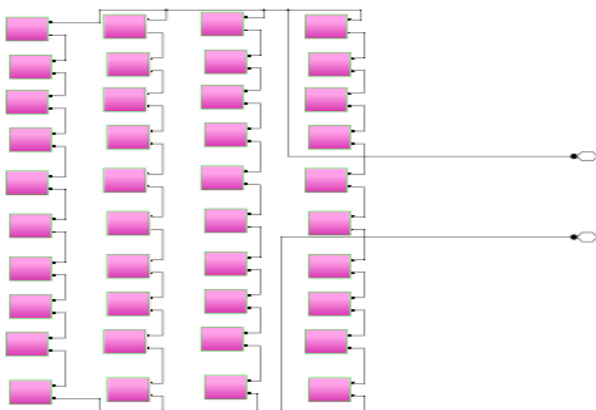
4	Broad field performance history	Less than 5 years
5	Operating temperature range	-40°C to 60°C
6	Life expectancy range	6-20 years

Ultra capacitor still in an emerging phase of development are very promising power bridging technology for short backup applications such as fuel start up. They are used primarily for peak load sharing due to very fast charge and discharge cycles. Large ultra capacitors with energy densities over 29KWh/m<sup>3</sup> are still under development. The data regarding ultra capacitor is briefed in table2.

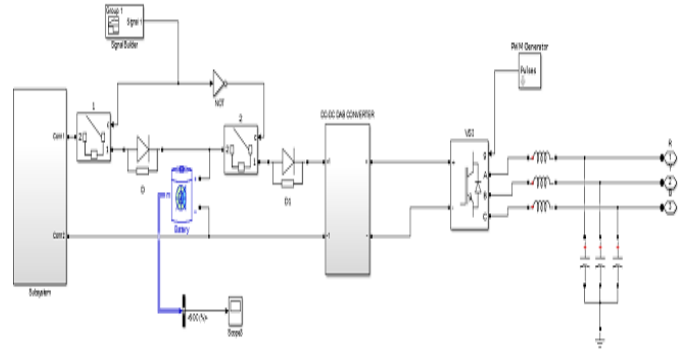
**Table- 2: ULTRA CAPACITOR CONFIGURATION**

Sl. No	Parameters	Range
1	Temperature performance	Low and its capable of delivering energy down to -40°C with minimal effect on efficiency
2	Low equivalent series resistance	Less than 1Ω
3	Charge rate	36.8% of full charge
4	Discharge rate	63.2% of full charge
5	Current charging and discharge rate	High
6	Energy density	10% of conventional batteries
7	Power density	10 to 100 times greater
8	Maximum Voltage	2.7V or less
9	Typical time constant	1 second
10	Efficiency	>90%
11	Operating temperature range	-40° to 70°C
12	Life time	10 to 20 years
13	Charge/discharge rate	500000 to 1000000 cycles

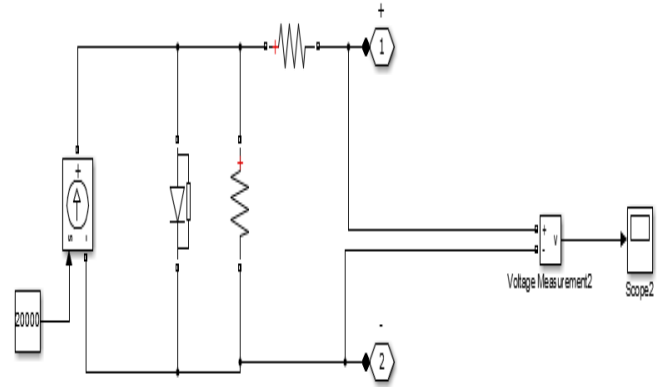
**V. SIMULATION RESULTS**



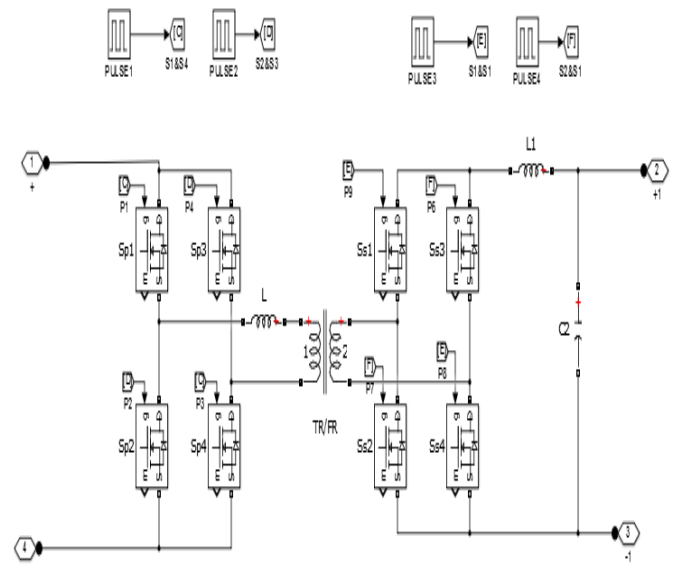
**Fig-5.1: Subsystem of PV array**



**Fig-5.2: Modelling of battery in test system**

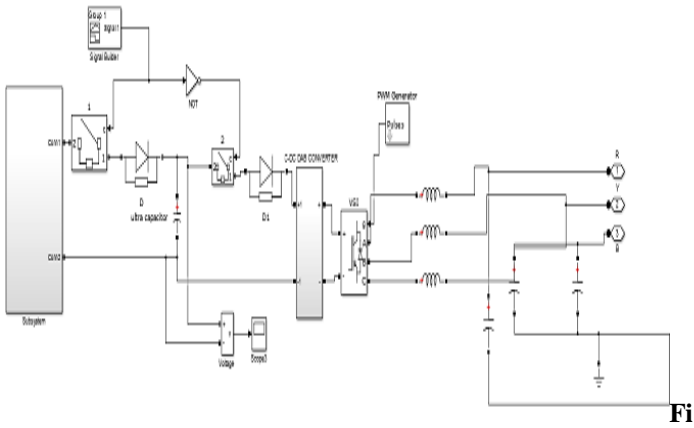


**Fig-5.3: Subsystem representing equivalent circuit of PV array**

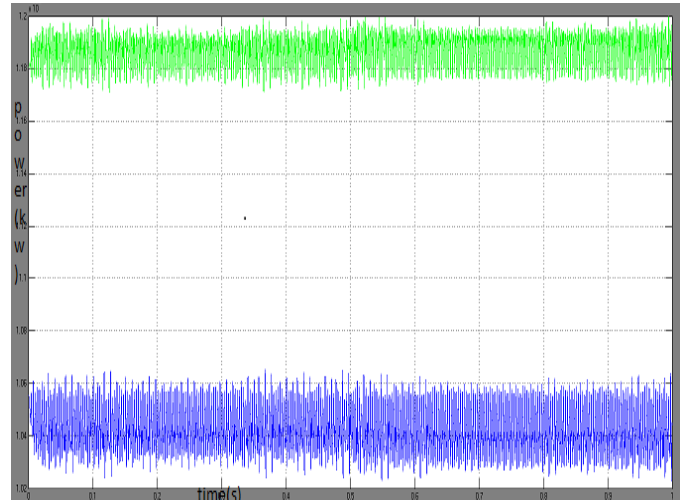


**Fig-5.4: DAB converter Subsystem**

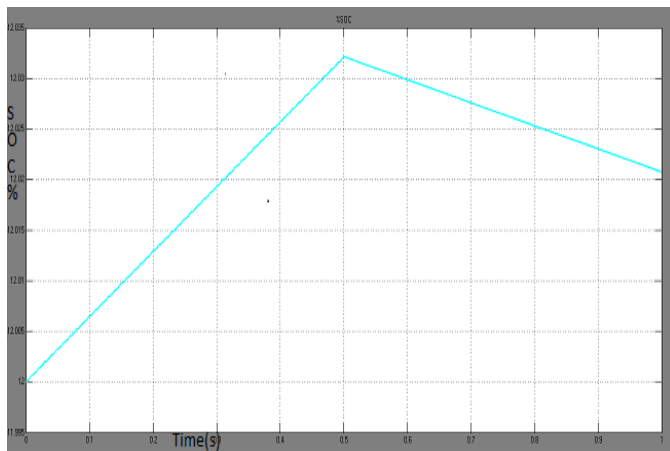




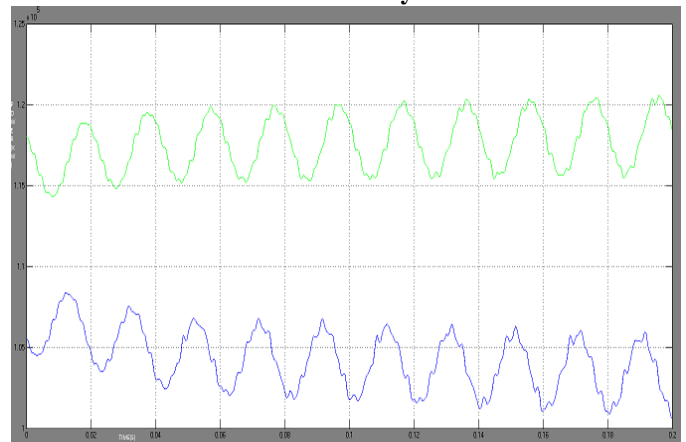
**Fig-5.5: Modelling of ultra-capacitor in test system**



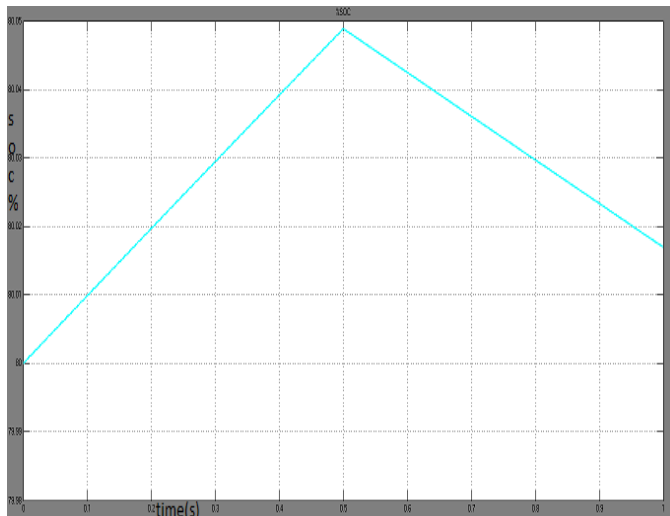
**Fig-5.8: Active and reactive power of an ultra-capacitor connected test system**



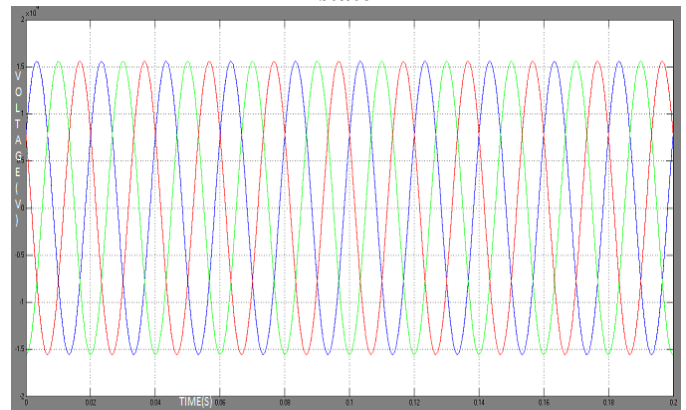
**Fig-5.6: State of Charging of Ultra capacitor in a test system**



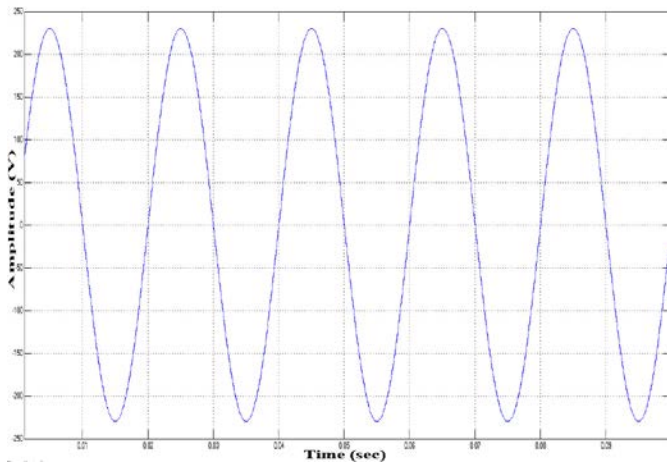
**Fig-5.9: Active and Reactive power of a test system in steady state**



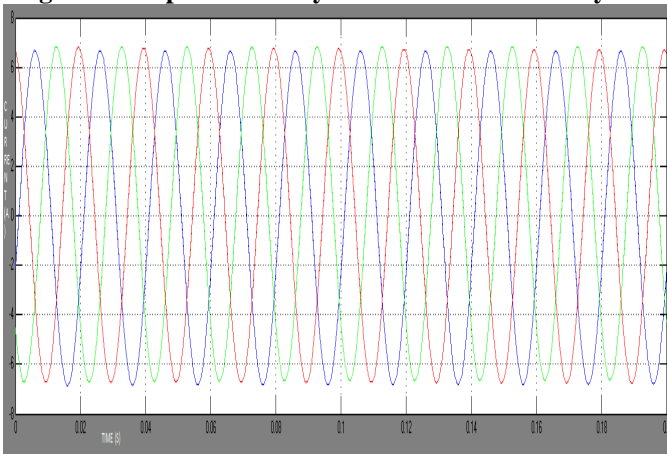
**Fig-5.7: State of Charging of Battery in a test system**



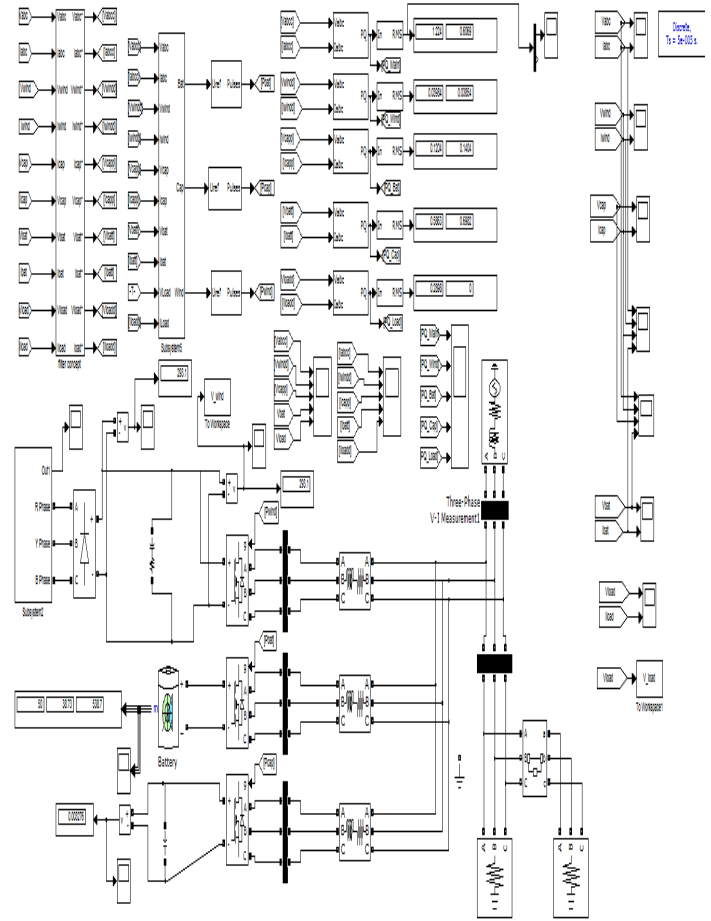
**Fig-5.10: Output voltage of test system in steady state**



**Fig.5.11: Output of Battery connected Closed PV System**



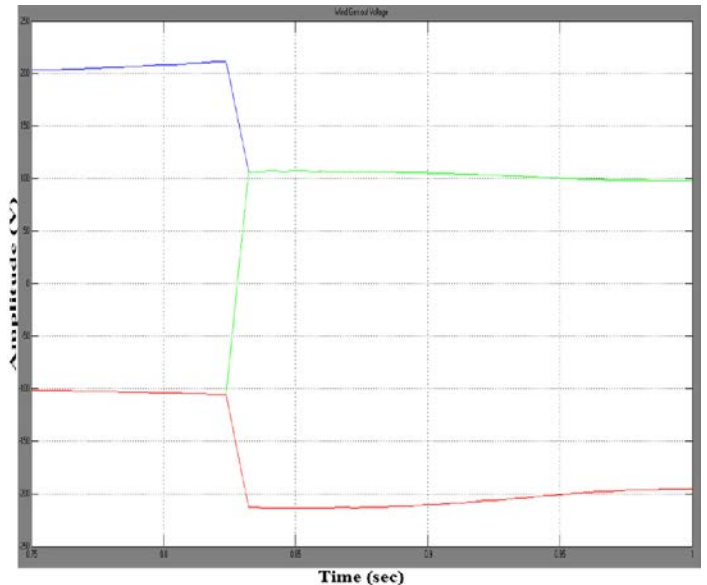
**Fig.5.12: Output current of test system in steady state**



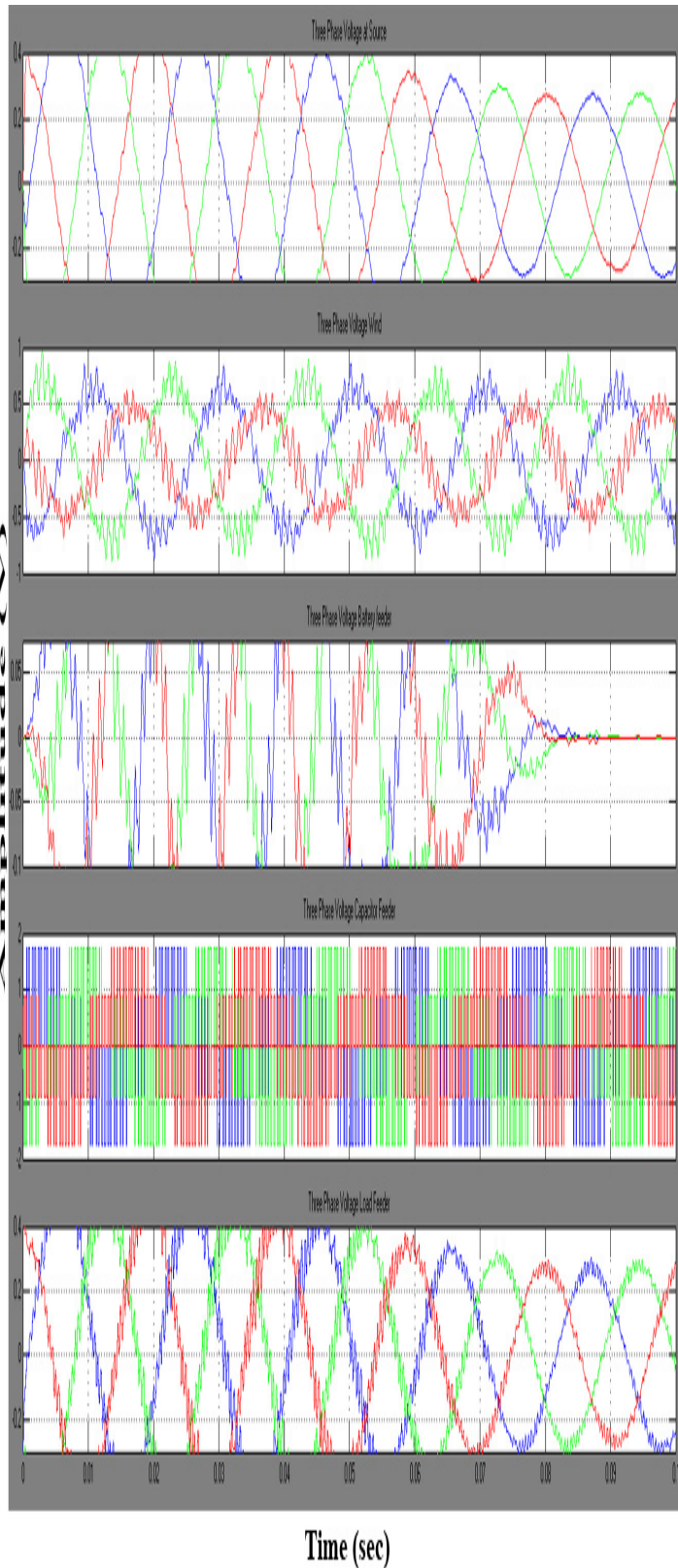
**Fig-5.13: Simulink model of hybrid grid connected system**

**VI. TRANSIENT STABILITY ANALYSIS**

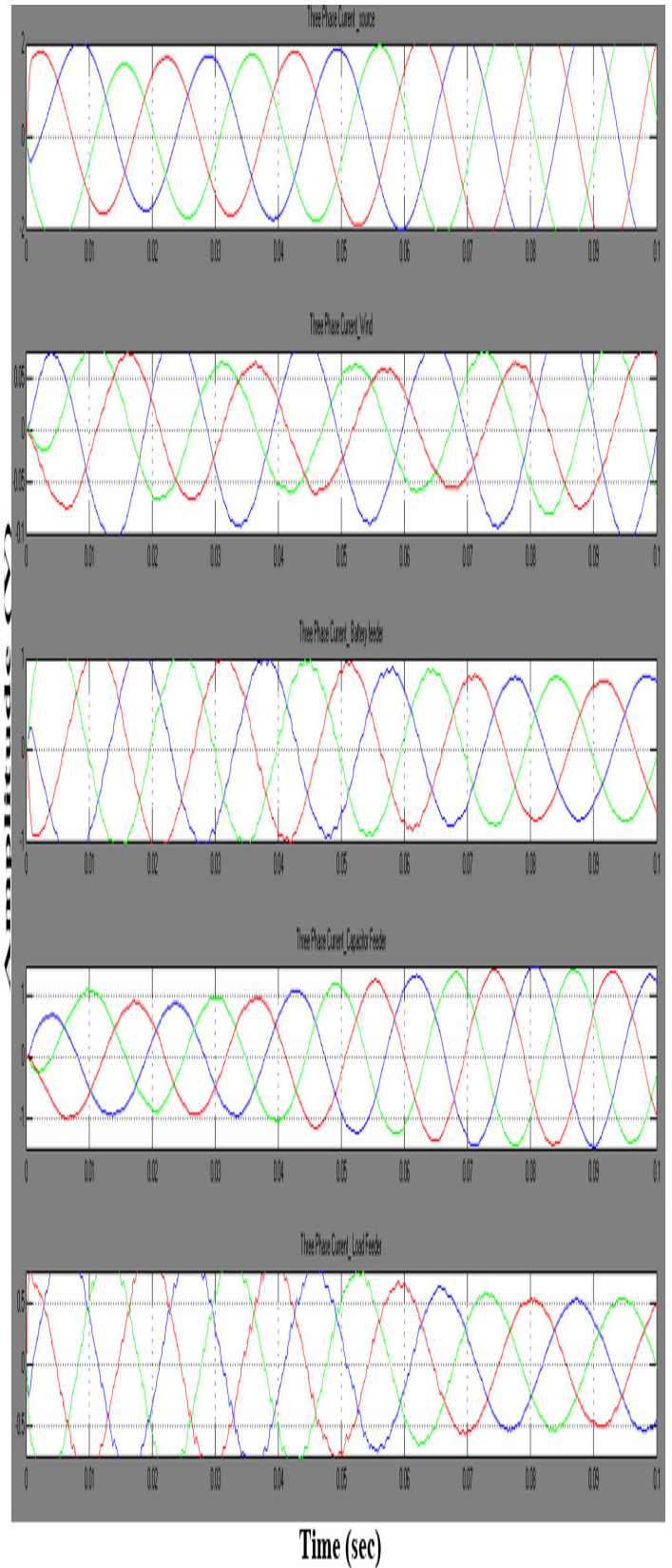
Transient Stability involves the study of the power system following a major disturbance. The objective of the transient stability study is to ascertain whether the load returns to a steady value following the clearance of the disturbance. The ability of a power system to maintain stability under continuous small disturbances is investigated under the name of Dynamic Stability (also known as small-signal stability). These small disturbances occur due random fluctuations in loads and generation levels. In an interconnected power system, these random variations can lead catastrophic failure.



**Fig.6.1: Wind generated output voltage**

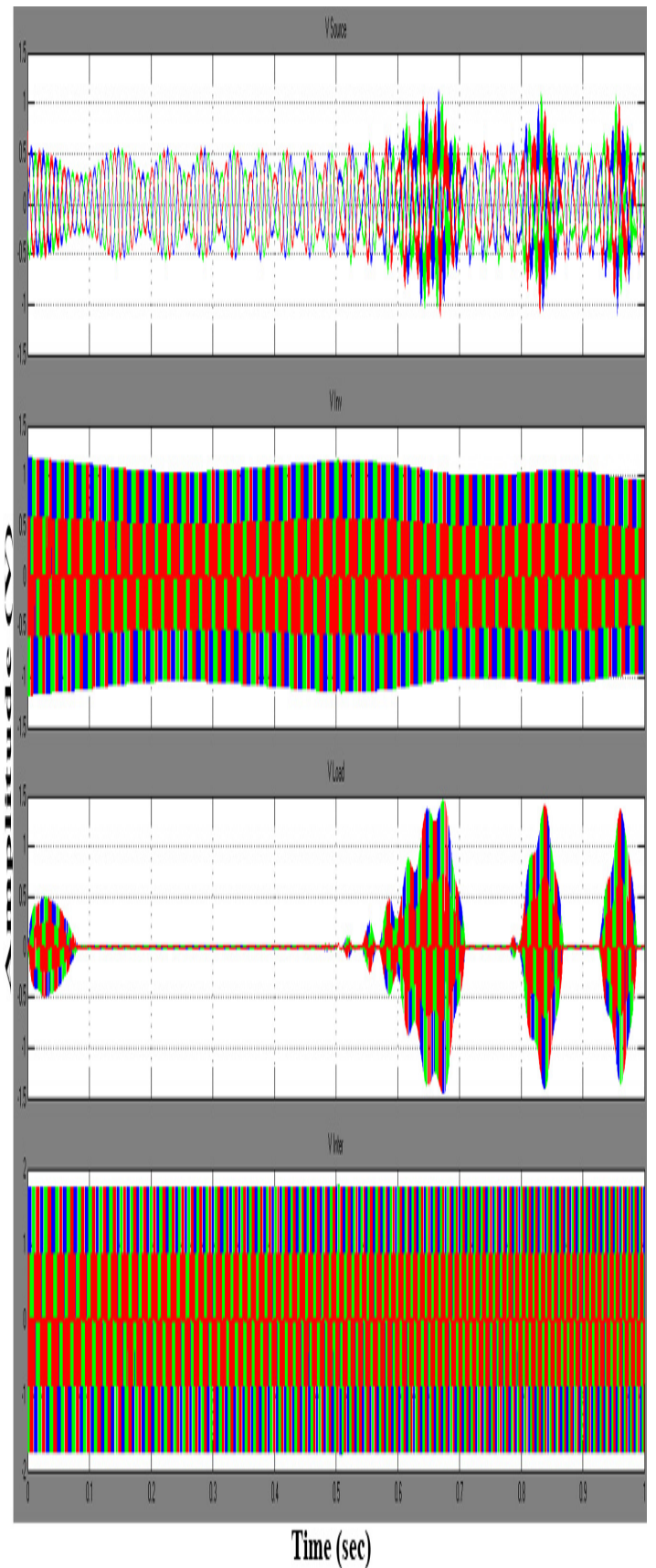
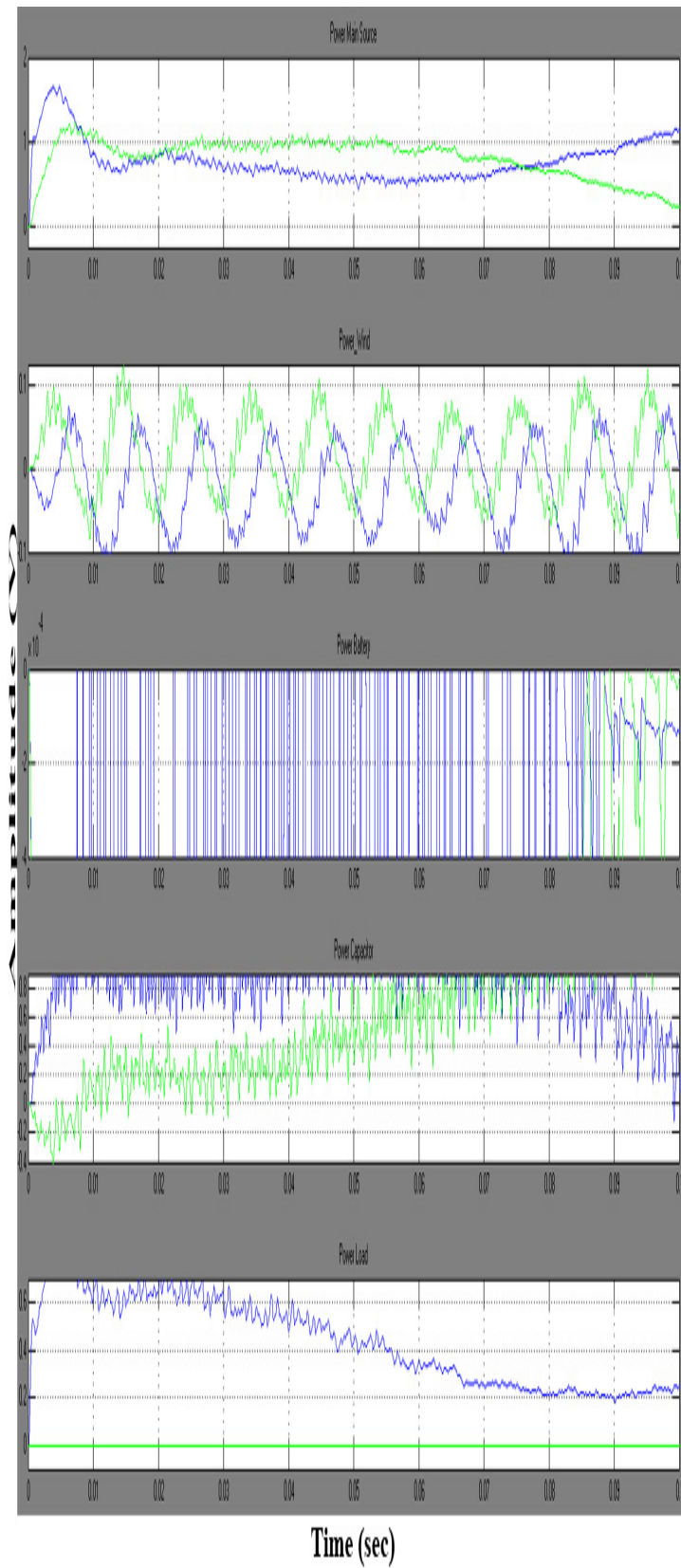


**Fig-6.2: Three phase amplitudes of source, battery and capacitor feeder, load feeder, wind.**



**Fig-6.3: Three phase currents of source, battery and capacitor feeder, load feeder, wind.**





**Fig-6.4: Three phase power of source, battery and capacitor feeder, load feeder, wind.**

**Fig.6.5: Transient stability analysis of a hybrid system**

## VII. ECONOMIC ANALYSIS

Consider a battery of 12V and 100A-h capacity. For a 14 bus system, 14 nodes are present and hence 20 batteries are required and they are connected in series at a cost of 6000 each. In the same way consider an ultra-capacitor connected 5 in series at a cost of 2500 each. Hence the total cost for these energy storage devices comes upto 20 lakhs. In a substation there are various equipment's like power transformer, switch gear, insulators, generator, windmill, protection device, measurement device, switch yard etc.. Hence the cost of per equipment per annum comes upto 30 lakhs including its maintenance. By the usage of these energy storage devices we can reduce the damaging amount. The benefit comes upto 20-30%.

## VIII. CONCLUSION

The landscape of alternative energy storage is gaining more recognition. Despite the growth of alternative technologies, the view over the next few years is that batteries will still remain the principle resource for energy storage in the data center. The result analysis suggests that energy storage devices in the system along with distributed generators can improve the transient stability of the system. An economic study for the cost with energy storage devices was analyzed. The main operational aspects of the system were verified by means of simulation results.

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## AUTHORS

**First Author** – A. Preethi, M.E.(PED) - Final Year, Department Of EEE, Agni College of Technology, Thalambur, Chennai - 600 130, preethikarthikram@gmail.com

**Second Author** – D. Gifty Deborah, M.Tech., (Ph.D.), Assistant Professor, Department of EEE, Agni College of Technology, Thalambur, Chennai - 600 130, gift.yee@act.edu.in

# SDRAM Controller Based Vedic Multiplier in DWT Processor for Video Processing

Prof Pramod Kumar Naik\*, Prof Gurusandesh M\*, Prof Arun S Tigadi\*\*, Dr.Hansraj Guhilot\*\*\*

\* Department of Electronics & Communication Engineering, VCET, Puttur, Karnataka, India

\*\* Department of Electronics & Communications, KLE DR. M.S.S CET, Belgaum, Karnataka, India

\*\*\* Principal K.C.College of Engineering & Management Studies and Research, Thane, Maharashtra, India

**Abstract-** Real time video processing has been the subject of interest for research work in last decade. Image and video processing technique are computationally demanding for various applications in various domains. Due to overwhelming demand we have focused on designing and implementing this new architecture which is effective. This paper we have focused on designing a DWT VEDIC processor which has a special SDRAM controller which takes care of this real time video processing. The design here is focused on real time DWT video compression and implementing the design on a Spartan 6 Altys FPGA board. Real time video applications have been implemented in the architecture with various results are projected to demonstrate its applicability and flexibility.

**Index Terms-** DWT, DCT, SDRAM.

## I. INTRODUCTION

Discrete wavelet transform (DWT) decomposes images into multiple sub bands of low and high frequency component. This encoding of sub band components leads to compression of image and video. Image compression finds application in every discipline such as entertainment, medical, defence, industrial and commercial sectors. Thus the core of compression unit is DWT. DWT has lot of computational mathematical operations which are very intensive operations which consumes lot of time and power. Our focus is on design of SDRAM controller which controls data movement in DWT computation and to increase the performance of DWT Processor we are designing and implementing a 16\*16 vedic multiplier in the DWT processing unit. This architecture has greatly reduce the power consumption of the circuit and at the same time increase the speed of operation of processing unit. The rapid increase in packing density, clocking frequency and computational power of an embedded system in general has inevitably resulted in rise in power consumption. For many years to come, miniaturization of size of devices together with the search of various architectures for low power and voltage requirement will continue. The work explores the new DWT architecture with Vedic multipliers incorporated in designing the hardware and determining its power consumption.

## II. SYNCHRONOUS CONTROLLER

The usual memory hierarchy of a FPGA includes the data path, Main Memory Controller (MMC) and Local Memory Controller (LMC) as shown in the below figure1. The MMC will

control the SDRAM (Synchronous Dynamic Random Access Memory) and generates the burst signals for the remaining units of the device. The LMC controls the data path and waits for the burst signals from the MMC. The main aim of our paper is to design Synchronous Ram Controller which will help to improve the performance matrix of the Vedic multiplier which will act as one of the component inside the DWT processor.

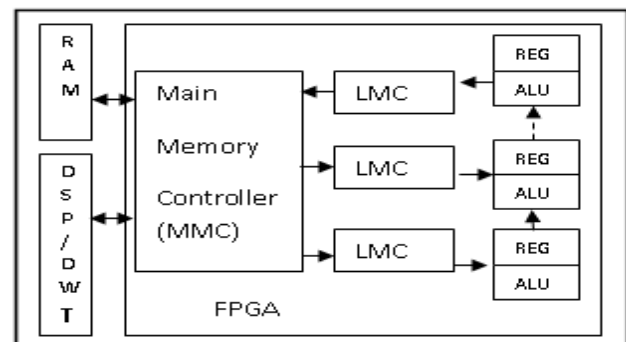


Fig 3.1 Architecture of MAC Unit in a processor.

## III. MULTIPLY AND ACCUMULATE UNIT

In most of the digital signal processing units the critical operations involved are comprised of many multiplications and accumulations. There for the key focus is to increase the speed of any digital signal processing unit. In this regard our focus is to use vedic mathematics and design a high speed and high through put Multiplier-Accumulator Unit. These days computers contains dedicated video graphics unit similarly computers may contain dedicated

MAC unit. The generalised structure of MAC unit is shown in the figure 3.1 below. The MAC unit consists of a multiplier implemented in combinational logic followed by an adder and an accumulator registers which stores when clocked. The output of the register is fed back to one input of the adder, so that on each clock, the output of the multiplier is added to the register. Combinational multipliers require a large amount of logic, but can compute a product much more quickly than the shift and add based multiplier.

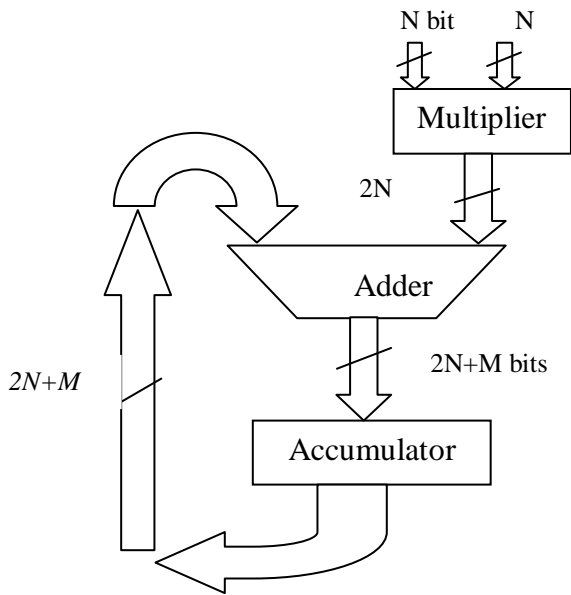


Fig 3.1 Architecture of MAC Unit in a processor

IV. 16\*16 VEDIC MULTIPLIER ARCHITECTURE FOR DWT PROCESSOR

The proposed Vedic multiplier is based on the Vedic multiplication formulae (Sutras). These Sutras have been traditionally used for the multiplication of two numbers in the decimal number system. In this work, we apply the same ideas to the binary number system to make the proposed algorithm compatible with the digital hardware. Vedic multiplication based on Urdhva Tiryakbhyam (Vertical & Crosswise) of ancient Indian Vedic Mathematics. Urdhva Tiryakbhyam Sutra is a general multiplication formula applicable to all cases of multiplication. like power This Vedic algorithm through which DWT video compression architecture is build using DSP Slices available in MATLAB system generator helps us to make various analysis. Some analysis performed that can be constantly checked for various parameters consumed, processing time and overall performance can be evaluated. This algorithm is implemented on a Spartan 6 FPGA.

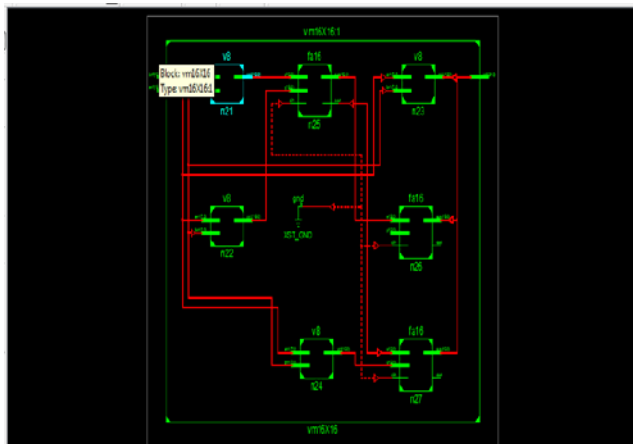


Fig4.1 Architecture of 16\*16 Vedic Multiplier

Architecture of a 16\*16 Vedic Multiplier is structured based on building basic blocks. The individual 4\*4 Vedic multiplier blocks is implemented using Verilog hardware description language. Once we have verified the functionality of 4\* 4 Vedic multiplier, we have designed 8\*8 Vedic multiplier. In the above architecture we have four 8\*8 Vedic multipliers and three full adders. Instead of three full adders we can go to latest adders like carry save or carry select adders. Vedic multiplier has the greatest advantage as compared to other multipliers over gate delays and regularity of structures. Delay in Vedic multiplier for 16 x 16 bit number is 32 ns while the delay in Booth and Array multiplier are 37 ns and 43 ns respectively [1]. The functionality of each block is verified using Xilinx ISE 14.2

V. DIGITAL VIDEO PROCESSING

Digital video processing is the technology that is almost evergreen domain of research which is also the fastest growing technology this century and, therefore, it poses tremendous challenges to the engineering community. Faster additions and multiplications are of extreme importance in DSP for convolution, discrete Fourier transforms digital filters and Discrete Wavelet Transforms etc. The core computing process is always a multiplication routine therefore DSP engineers are constantly looking for new algorithm and architecture to improve performance of the system. Using this algorithm we can constantly design and implement it on suitable hardware.

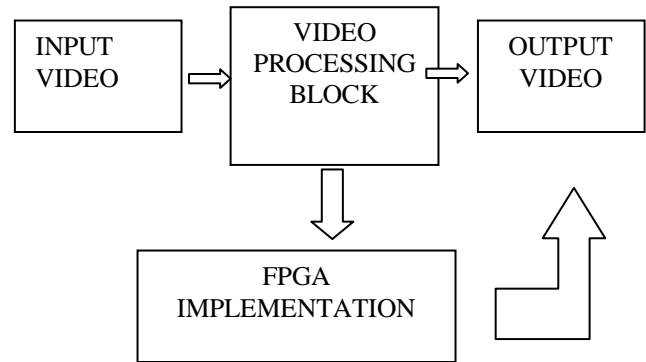


Fig 5.1 Block Diagram Approach

The block diagram shown in figure 5.1 gives the complete flow of digital video compression flow. The block diagram basically consists of an input block, processing block, output block and the entire video processing algorithm is implemented on desired FPGA implementation. Initially we have a video file which is to be processed is received from real time camera which feeds in the input video. This video is processed in the processing block. The main objective is to save the real time video for surveillance or any security measures in restricted areas. To save the video continuously it will tedious task as it consumes lot of memory space. Thus to reduce the memory space utility, we compress the real time video using DWT video compression technique. The major processing is done according to our algorithm then the video compressed will be displayed in output video file. This algorithm is designed in MATLAB Simulink which is finally implemented on a FPGA with certain

modifications in the MAC unit and controlling the processing using SDRAM controller.

### VI. VIDEO COMPRESSION USING DISCRETE WAVELET TRANSFORM

There are several technique can be used to compress image which are Discrete Cosine Transform (DCT) and Discrete Wavelet Transform. DCT works by separating images into parts of differing frequencies. During the step quantization, where part of compression usually occurs, the less important of frequencies are discarded, hence the use of the term of “lossy”. Then, only the most important frequencies are used to retrieve the image compression process. As a result, the reconstruct image contains some distortion but this level of distortion can be adjusted during the compression stage. There is some loss of quality in the reconstructed image below; it is clearly recognizable, even though almost 85% of the DCT coefficients were discarded. Images contain large amounts of information that requires large transmission bandwidths, much storage space and long transmission times. Therefore it is crucial to compress the image by storing only the essential information needed to reconstruct the image. An image can be thought of as a matrix of pixel values.

In order to compress the image, redundancies must be exploited, for example, areas where there is little or no change between pixel values. Therefore large redundancies occur in the images which having large area of uniform color and conversely images that have frequent and large changes in color will be less redundant and harder to compress.

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### VII. SUB BAND CODING

A signal is passed through a series of filters to calculate DWT. Procedure starts by passing this signal sequence through a half band digital low pass filter with impulse response  $h(n)$ . Filtering of a signal is numerically equal to convolution of the tile signal with impulse response of the filter.

$$x[n] * h[n] = \sum_{k=-\infty}^{\infty} x[k].h[n-k] \tag{7.1}$$

A half band low pass filter removes all frequencies that are above half of the highest frequency in the tile signal. Then the

signal is passed through high pass filter. The two filters are related to each other as

$$h[L-1-n] = (-1)^n g(n) \tag{7.2}$$

Filters satisfying this condition are known as Quadrature mirror filters. After filtering half of the samples can be eliminated since the signal now has the highest frequency as half of the original frequency. The signal can therefore be sub sampled by 2, simply by discarding every other sample. This constitutes 1 level of decomposition and can mathematically be expressed as

$$Y1[n] = \sum_{k=-\infty}^{\infty} x[k].h[2n-k] \tag{7.3}$$

$$Y2[n] = \sum_{k=-\infty}^{\infty} x[k].g[2n+1-k] \tag{7.4}$$

Where  $Y1[n]$  and  $Y2[n]$  are the outputs of low pass and high pass filters, respectively after sub sampling by 2. This decomposition halves the time resolution since only half the number of sample now characterizes the whole signal. Frequency resolution has doubled because each output has half the frequency band of the input. This process is called as sub band coding. It can be repeated further to increase the frequency resolution as shown by the filter bank.

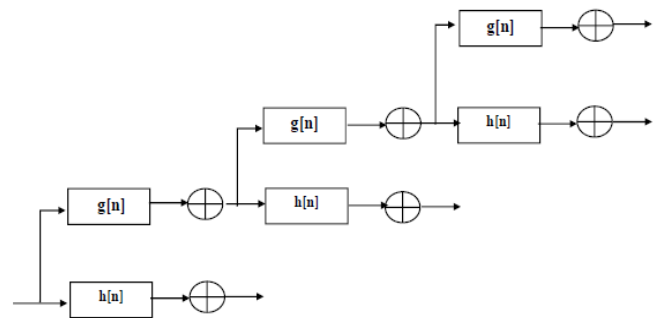


Fig 7.1 Filter Bank

### VIII. SYNCHRONOUS RAM CONTROLLER INTERFACES

As shown in the figure 8.1 is the basic interfaces of a Synchronous ram controller.

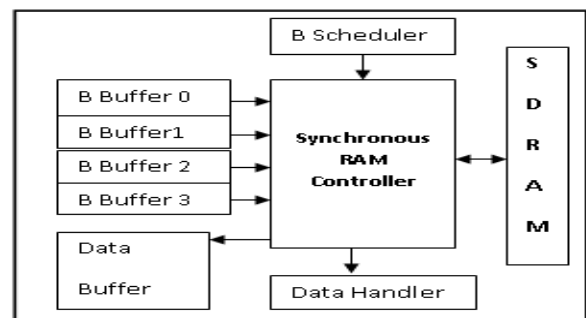


Fig 8.1 Interfaces of Synchronous Ram Controller



- a. Bank Buffers: Each bank buffer will intern refer to one of the banks of SDRAM. It receives signals from SDRAMC.
- b. Bank Scheduler: The bank scheduler will select a particular bank depending on the priorities being assigned.
- c. Data Handler: The read and write signals are being controlled by SDRAMC by sending appropriate signals to the data handler.
- d. Data Buffer: It receives two signals from SDRAMC and operates accordingly.
- e. SDRAM: Here the term SDRAM refers to CMOS high speed Synchronous Dynamic Random Access memory with R rows columns of B bits each. Internally it has been organized as quad bank DRAM with synchronous interface.

### IX. SYNCHRONOUS RAMCONTROLLER ARCHITECTURE

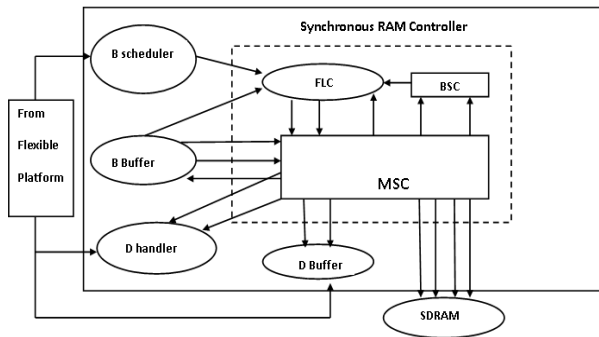


Fig 8.2. The Synchronous RAM Controller Architecture

The above Synchronous RAM Controller Architecture has following modules

**Flexible Logic Controller Module:** The bank scheduler sets the priority and the bank buffers send the request then depending upon the priority of the bank buffer a particular bank will be selected and its number will be sent to the MSC module.

**The Bank State Controller (BSC) Module:** The requested bank number and its actual request either read or write will be received by this module by the MSC module to start its own state machine.

**The Main State Controller (MSC) module:** This module will receive the request either read or write the bank number and then start its own state machine and finally creates proper SDRAM signals such as CAS, RAS, WE, address lines etc.

### X. RESULTS

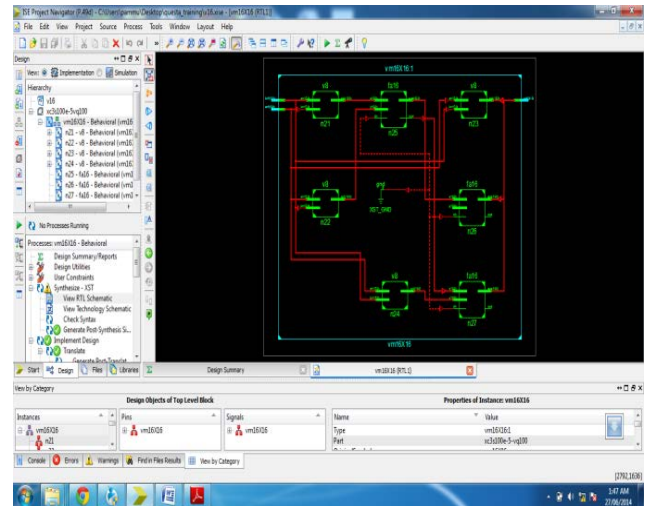


Fig 9.1 RTL schematic Results of 16\*16 Vedic Multiplier

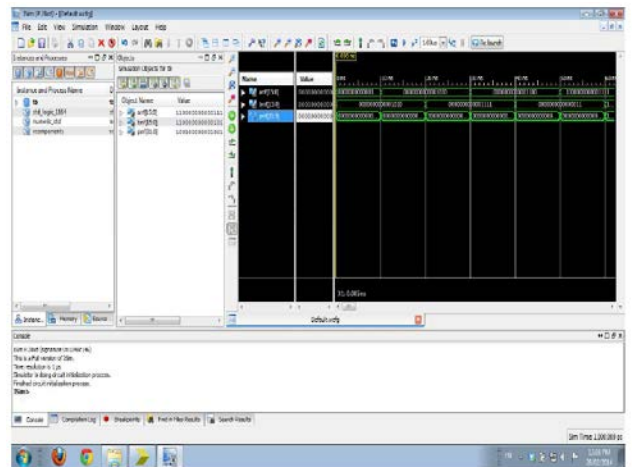


Fig 9.2 Simulation Results of 16\*16 Vedic Multiplier

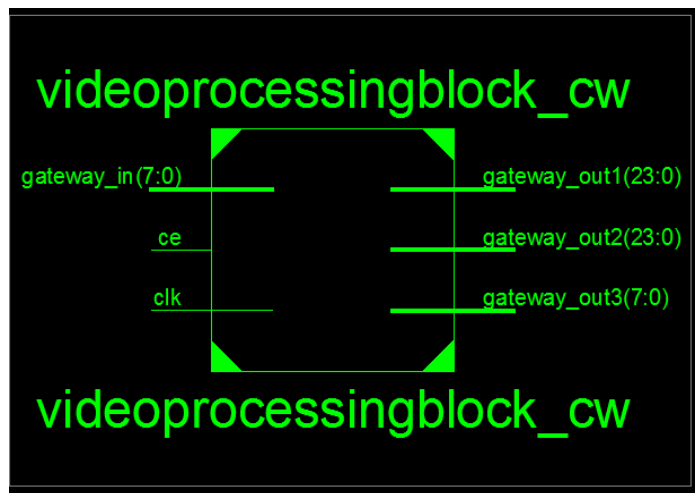


Fig 9.3 Simulation Result of DWT Video Processing Block

Fig 9.7 Implementation of Algorithm on FPGA

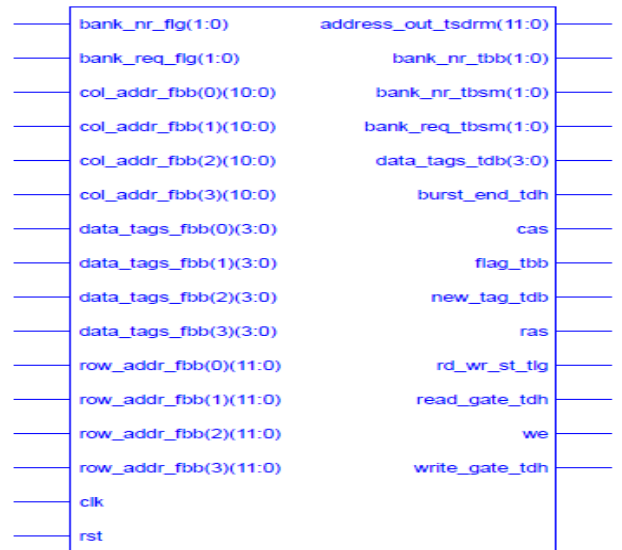
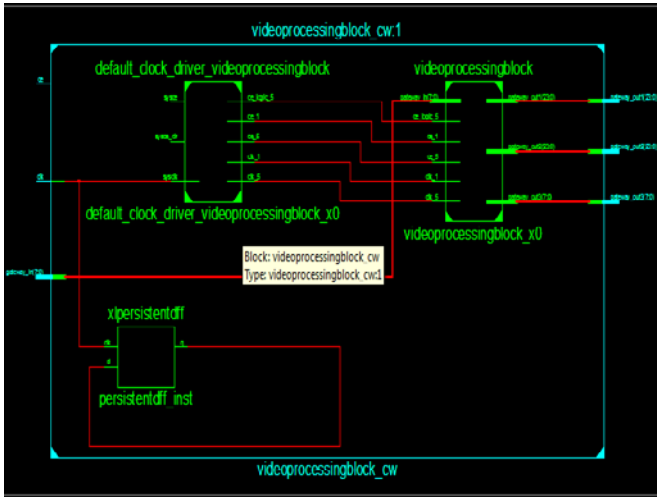


Fig 9.4 RTL results of DWT Video Processing Block

Fig 9.5 RTL MSC schematic

XI. CONCLUSION

A real-time video processing algorithms with new architecture was implemented on FPGA. Implementation of these types algorithms on a FPGAs have lot of practical application at the same time there will be issues large memory requirement and embedded multipliers which process faster. Here in order to resolve the above complexity a new architecture with SDRAM controller helps us to maintain the large memory used for processing. We can finally conclude that implementing DWT video compressing algorithm with MAC unit compromising of 16\* 16 Vedic Multiplier is implemented successfully. The algorithm created in Xilinx system generator and by using JTAG it is successfully implemented on Spartan6-LX45 FPGA board.

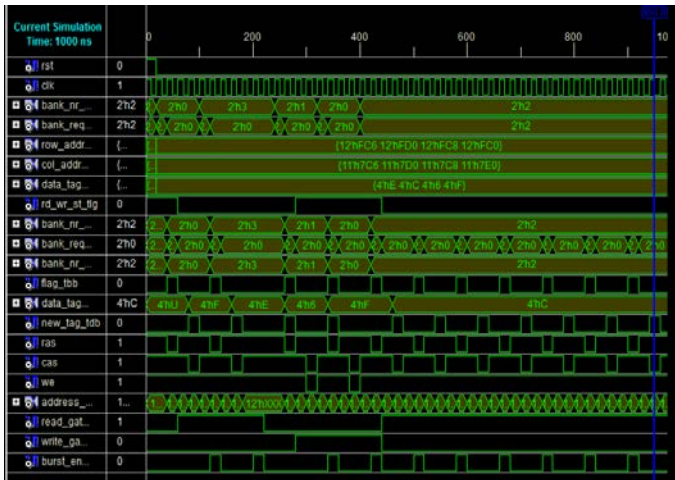


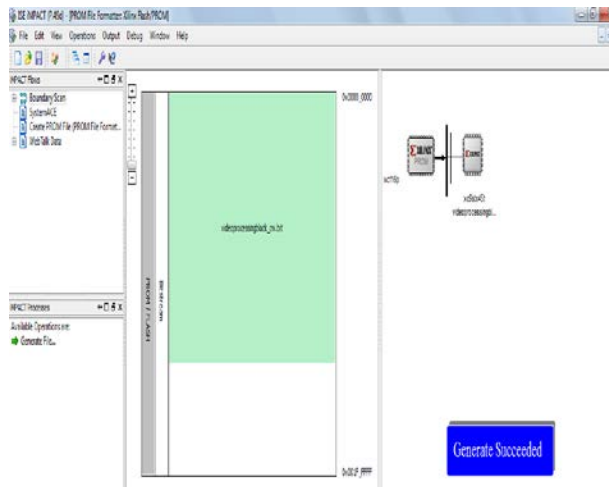
Fig 9.6 Simulation results of MSC simulation

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#### AUTHORS

**First Author** Prof Pramod Kumar Naik, B.E, M Tech, Vivekananda College of Engineering &Technology, Puttur. Karnataka, India.pramodkumarnaik.ece@vcetputtur.ac.in.

**Second Author** – Prof Gurusandesh M, B.E, M Tech, Vivekananda College of Engineering &Technology, Puttur. Karnataka, India. gurusandeshm.ece@vcetputtur.ac.in.

**Third Author- Prof Arun S Tigadi**, B.E, M Tech, KLE DR. M.S.S CET, Belgaum, Karnataka, India.

**Fourth Author-** Dr.Hansraj Guhilot Principal,K.C.College of Engineering & Management Studies and Research ,Thane, Maharashtra, India.

**Correspondence Author** - Prof Pramod Kumar Naik, B.E, M Tech, Vivekananda College of Engineering &Technology, Puttur. Karnataka, India.pramodkumarnaik.ece@vcetputtur.ac.in. Mobile:9481772690

# Design and Development of Verification Environment to Verify GPIO Core using UVM

Basavaraj Police Patil D<sup>\*</sup>, Anuradha J P<sup>\*\*</sup>, Mrs. Shanthi V A<sup>\*\*\*</sup>

<sup>\*</sup> M.Tech, Dept. of ECE, B.N.M Institute of Technology, Bengaluru, India

<sup>\*\*</sup> Asst. Professor, B.N.M Institute of Technology, Bengaluru, India

<sup>\*\*\*</sup> Senior Technical Staff, Maven Silicon Softech Pvt Ltd, Bengaluru, India

**Abstract-** The GPIO core design provides a general purpose input/output interface to a 32-bit On-Chip Peripheral Bus (OPB). This GPIO core requires simple output and/or input software controlled signals and implements the functions that are not implemented using dedicated controllers in the system. Almost all FPGA boards contain GPIO peripheral. In this project we are atomizing the functions of the GPIO core by writing the code in VERILOG and simulating it in QUESTASIM. In this project we verify the all functions of GPIO core by writing verification code in UVM with different test cases. The functional and code coverage and functional verification of the GPIO RTL design is carried out for the better optimum design.

**Index Terms-** GPIO, OPB, QUESTASIM, XILINX ISE, Verilog, UVM, Coverage, FPGA

## I. INTRODUCTION

The General purpose input/output IP core is user-selectable or user-programmable general-purpose Input/output controller. It is mainly used for implementation of functions that are not implemented with help of dedicated controllers in a system and require simple output and input software controlled or programmable signals.

The General Purpose IO module is part of Inicore's IP module family. This general purpose input/output controller gives some unique features that ease system integration and use. Each General Purpose IO port can be configured for output input or bypass mode. In one set all output data can be access. Single or multiples bits can be cleared or set independently. Every General Purpose IO port can serve as an interrupt source and has its own configuration options: • Level sensitive, single edge triggered or level change • Active low or high respectively positive edge or negative edge. • Individual interrupt enable register and status flags. The GPIO core provides several synthesis options to ease the system integration and minimize the gate count: • CPU bus width is selectable: default options are 8/16/32-bit • Selectable number of General Purpose I/O ports • CPU read back enable

## II. GPIO (GENERAL PURPOSE I/O)

General architecture of GP I/O IP core is consists of four main building blocks:

- APB interface
- GP I/O registers

- Auxiliary inputs
- Interface to external I/O cells and pads

### A. Architecture of GPIO

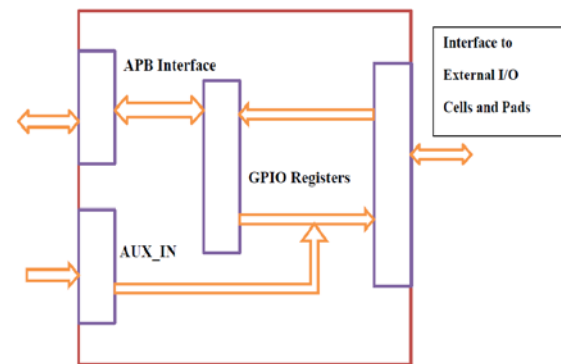


Fig.1 Architecture of GPIO

i. **Clocks:** The GP I/O core has two clock domains. All registers are in system clock domain except RGPIO\_IN. The register RGPIO\_IN can be clocked by external clock or by system clock.

ii. **APB Interface:** APB(Advanced Peripheral Bus) interface connects GP I/O core to the host system. The implementation implements a 32-bit bus width and does not support other bus widths.

iii. **GPIO Registers:** The GP I/O IP Core has several software accessible or programmable registers. Most registers have the same width as number of general-purpose I/O signals and they can be from 1 – 32 bits. The host through these registers programs type and operation of each general-purpose I/O signal or three-state outputs, appropriate open drain or three-state I/O cells must be used. Part of external interface is also ECLK register. It can be used to register inputs based on external clock reference. General-purpose inputs can generate interrupts so that software does not have to be in poll mode all the time when sampling inputs. Switching output drivers into open-drain or three-state mode will disable general-purpose outputs. To lower number of pins of the chip, other on-chip peripherals can be multiplexed together with the GPIO pins. For this purpose, auxiliary inputs can be multiplexed on general-purpose outputs.

iv. **Auxiliary Inputs:** The auxiliary inputs can bypass RGPIO\_OUT outputs based on programming of RGPIO\_AUX register. Auxiliary inputs are used to multiplex other on-chip peripherals on GPIO pins.

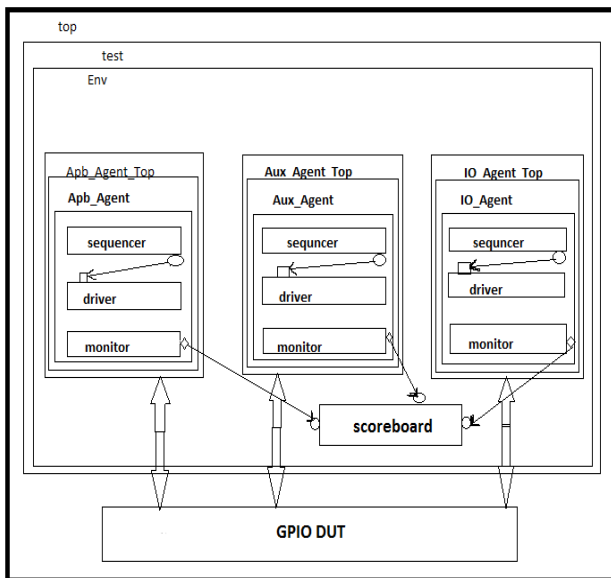
v. Interface to External I/O Cells and Pads: External interface connects GPIO core to external I/O ring cells and pads. To support open-drain or three-state outputs, appropriate open-drain or three-state I/O cells must be used. Part of external interface is also ECLK signal. It can be used to register inputs based on external clock reference.

### III. UNIVERSAL VERIFICATION METHODOLOGY

The UVM (Universal Verification Methodology) was introduced in December 2009, by a technical Sub committee of Accellera. UVM uses Open Verification Methodology as its foundation. Accellera released version UVM 1.0 EA on May 17, 2010. UVM Class Library provides the building blocks needed to quickly develop well-constructed and reusable verification components and test environments. It uses system Verilog as its language. All three of the simulation vendors (Synopsys, Cadence and Mentor) support UVM today which was not the case with other verification methodology. Today, more and more logic is being integrated on the single chip so verification of it is a very challenging task. More than 70 percent of the time is spent on the verification of the chip. So it is a need of an hour to have a common verification methodology that provides the base classes and framework to construct robust and reusable verification environment. UVM provides that.

In this paper, all the terminology related to UVM is introduced along with the sample example. In first phase uvm components are introduced. In second phase some of the features related to UVM are introduced and in final phase small environment is built using UVM from the scratch.

### IV. UVM TESTBENCH ARCHITECTURE



The following subsections describe the components of a verification component.

- Data Item (Transaction)
- Driver (BFM)
- Sequencer

- Monitor
- Agent
- Environment

- **Data Item (Transaction)**

Data item are basically the input to the device under test. All the transfer done between different verification components in UVM is done through transaction object. Networking packets, instructions for processor are some examples of transactions. From the top level test many data items are generated and applied to the dut so by intelligently randomizing the data items object we can check corner cases and Maximize the coverage on the device under test.

- **Driver (BFM)**

Driver as the name suggest, drive the dut signals. It basically receives the transaction object from the sequencer and converts it in to the pin level activity. So for example it can generate read or write signal, write address and data to be transferred. It is the active part of the verification logic.

- **Sequencer**

Sequencer is the component on which the sequences will run. The dut needs to be applied a sequence of transaction to test its behaviour. So sequence of transaction is generated and it is applied to driver whenever it demands by the sequencer.

- **Monitor**

A monitor is the passive element of the verification environment. It just sample the dut signal from the interface but does not drive them. It collect the pin information, package it in form of a packet and then transfer it to scoreboard or other components for coverage information.

- **Agent**

Agent is basically a container. It contains driver, monitor and sequencer. Driver and sequencer are connected in agent. Agent has two modes of operation: passive and active. In active mode it drives the signal to the dut. So driver and sequencer are instantiated in active mode. In passive mode it just sample the dut signals does not drive them. So only monitor is instantiated in passive mode. Normally there is one agent per interface like AHB or APB.

- **Scoreboard:**

Scoreboard is a verification component that checks the response from the dut against the expected response. So it keeps track of how many times the response matched with the expected response and how many time it failed.

- **Environment**

Environment is at the top of the test bench architecture, it will contain one or more agents depend on design. If more than one agents are there then it will be connected in this component. Agents are also connected to other components like scoreboard in this component.



V. RESULTS AND DISCUSSION

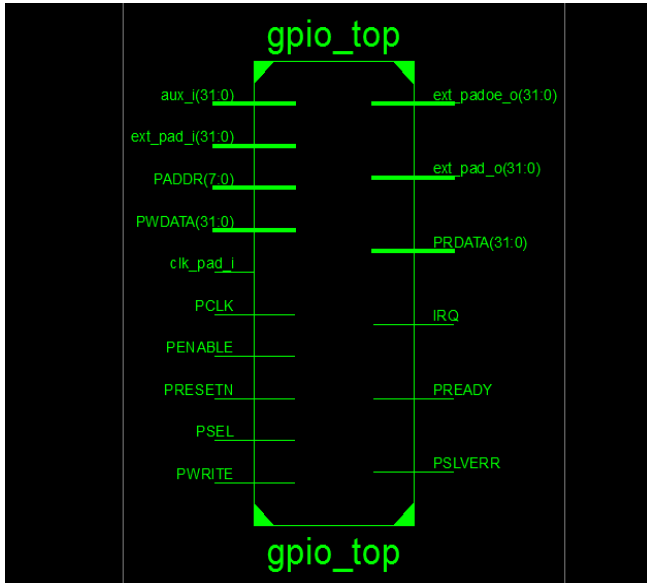


Fig 2. GPIO Schematic Diagram from Synthesis

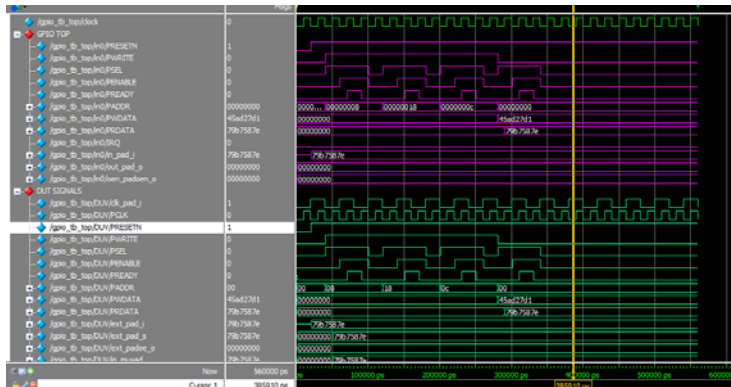


Fig 3. simulation showing GPIO Functional Verification for write operation

The GP I/O is carried out for the functional verification using the UVM technique for both the read and write operation. The functional verification is of the RTL design is of the GPIO is yields the complete code and functional coverage.

Functional Verification of GPIO Core Using UVM

As verification methodology plays a important phase in the circuit design. The read operation of the GPIO is carried out in XILINX for RTL design and the verification methodology is carried out using Questasim 10.0b. The design is carried out using in HDL and the verification is carried out in UVM. The GPIO is set up as DUT for the functional verification and the code coverage is obtained for 100%.

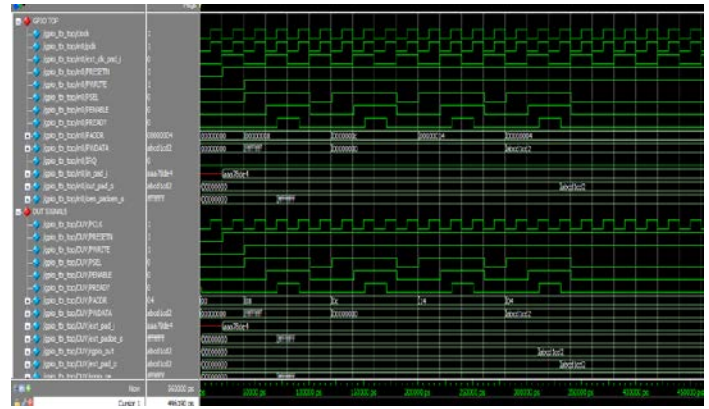


Fig 4. simulation showing GPIO Functional Verification for read operation.

VI. COVERAGE REPORT

Coverage Summary by Structure:		Coverage Summary by Type:				
Design Scope	Coverage (%)	Weighted Average: 100.00%				
uvm_pkg	100.00%	Coverage Type	Bins	Hits	Misses	Coverage (%)
uvm_callbacks	100.00%	Coveragegroup	14	14	0	100.00%
uvm_phase	100.00%	Assertion Attempted	SS	SS	0	100.00%
uvm_component	100.00%	Assertion Failures	SS	0	-	0.00%
gpio_test_pkg	100.00%	Assertion Successes	SS	SS	0	100.00%
apb_input_interrupt_seqs	100.00%					
apb_output_seqs	100.00%					
apb_bi_seqs	100.00%					
apb_a_seqs	100.00%					
apb_cclk_polled_input_seqs	100.00%					
apb_bi_cclk_seqs	100.00%					
apb_low_rst_seqs	100.00%					
apb_dc_input_interrupt_seqs	100.00%					
aux_input_interrupt_seqs	100.00%					
aux_output_seqs	100.00%					

Fig 5 Functional code coverage of GPIO

VII. CONCLUSION

In this we have designed and verified the GPIO core using Verilog and UVM technique using Questasim. The code coverage is obtained for the RTL design and 100% code coverage and functional coverage is extracted. This methodology provides the complete coverage of the RTL design so as to acquire the fault free Protocol design of GPIO. So that can be implemented in real time systems. This can be further implemented for the ASIC implementation and SOC Applications.

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**Second Author** – Anuradha J P, Asst.Professor, B.N.M Institute of Technology, Bengaluru, India, Email:[anu1572@yahoo.co.in](mailto:anu1572@yahoo.co.in)  
**Third Author** – Mrs.Shanthi V A, Senior Technical Staff, Maven Silicon Softech Pvt Ltd, Bengaluru, India, Email:[shanthi@maven-silicon.com](mailto:shanthi@maven-silicon.com)

#### AUTHORS

**First Author** – Basavaraj Police Patil D, M.Tech, Dept. of ECE, B.N.M Institute of Technology, Bengaluru, India, Email:[basavapolicepatil09@gmail.com](mailto:basavapolicepatil09@gmail.com)

# Dehumanization in Workplace: Counselling Approach to Gender-Based Violence

OJO, Funmilayo Yemi (PhD) \*, YINYINOL, W. Lasun (PhD) \*\*

\* Head, Counselling Unit, Afe Babalola University Ado-Ekiti, Ekiti State, Nigeria

\*\* Isabatudeen Senior Girls' Grammar School, Ibadan, Nigeria

**Abstract-** This paper looks at dehumanization in workplace and the implication of counselling approach to gender based violence. Dehumanizing attitudes and behaviours frequently occur in workplace, this often led to devastating psychological, health, and economic consequences on employees and the organization. One of the benefits of workplace counselling is having a professional and an impartial person who is mindful of the context in which the employees work and have a crucial understanding of the environment to which the employees will be returning. Major activities of a counsellor are listening, supporting, empathizing, exploring client potentials, and empowering client to self-help. The paper concludes that negative interaction in the workplace will negatively impact on employees' productivity, whereas with availability of counselling services, employees' moral and potentiality will be fully utilized which will improve the organizational performance. To enhance trust in counselling service in workplace, counsellors need to diligently observe the code of ethics.

**Index Terms-** Dehumanization, Workplace, Counselling; Gender-Based Violence

## I. INTRODUCTION

Workplace violence is the exercise of physical force by a person against a colleague, in a workplace, that causes or could cause physical injury to the worker. Gender based violence, including workplace violence, is exceptionally dehumanizing, pervasive and oppressive representing a clear violation of basic human rights. Dehumanization can range from blatant and severe to subtle and relatively mild form. Such relatively mild dehumanizing behaviours can manifest themselves in the form of subtle disrespect, condescension, neglect, social ostracism and other relational slights, often evident in looks, gestures and tones of voices (Christoff, 2014)<sup>[8]</sup>. Gender based violence sadly reflects and reinforces the wider inequalities between women and men. The various manifestations of gender based violence at work, such as sexual harassment, verbal or psychological abuse, intimidation, mobbing and bullying, and domestic violence impacting on the workplace can be prevented (UN, 2014)<sup>[40]</sup>.

The myth that human world is a 'men's world' is founded upon the practical reality of the complete over-riding and dominant influence of the male over the female gender in all facets of public life. Modern education together with the advancement in science and technology, which processes have accelerated in tandem especially in the last century, have

tremendously increased the skill acquisitions and enhanced the productive efficiencies and capabilities of women as much as men. Armed with these two, women have expanded their roles from procreation and social care giving within the family to major and significant contributions to development in all fields of human concern and endeavours. Yet in spite of their significant contributions in the modern society, women have continued to be regarded and treated as a second fiddle and unequal partners in the modern human development process. (Ochoga, 2015)<sup>[34]</sup>.

It could also be argued that the very notion of people as a human resource is in itself is dehumanizing (Colling & Terry, 2010)<sup>[10]</sup>. There is a considerable irony in the fact that attempts to emphasize the significance of people in the workplace and the success, or otherwise, of organizations in itself is dehumanizing. This is partly the importance of creativity, a particularly important factor in these hi-tech days where so many routine jobs are being replaced by the use of technology. Also, there is no account of the importance of meaning in people's lives (Moss, 2009)<sup>[31]</sup>.

Gender based violence in the workplace is a means of unacceptably asserting power over another and cuts across race, class, sexual orientation, and economic status. Put simply, intimate partner violence and other forms of gender based violence and abuse endanger an organization's most important asset- its employees. The violence can follow victims and perpetrators, resulting in incidents of abuse or harassment in the workplace, or its effect can impact the workplace through decreased productivity, increased absenteeism, health and safety risk and increased healthcare costs for the employer (Expert Group Meeting, 2011)<sup>[13]</sup>. Therefore, it is essential that violence be seen as a critical and preventable problem, and that it is given the attention given to many other workplace health and safety issues.

## II. LITERATURE REVIEW

### Concept of dehumanization

Dehumanization is a system of orientation in a person's world by which people of other groups or categories are not perceived as human as oneself. This is a process by which members of a group of people assert the inferiority of another group through subtle or overt acts or statements and may be directed by an organization or may be the composite of individual sentiments and action. According to Baron and Richardson (1994)<sup>[2]</sup> dehumanization occurs when an individual views another person in negative ways, which leads to the belief



that the other person is undeserving of the respect and kindness usually afforded to one self and another person. It is as if that individual is compared to being nonhuman (Haslam, Kashima, Loughnan, Shi & Suitner 2008).<sup>[18]</sup> As such, dehumanization is a psychological process of making some people seem less than human or not worthy of human treatment, dehumanization therefore serves to morally exclude individuals from the norms of society.

There are three different ways in which people are dehumanized. Haslam, et al. (2008)<sup>[18]</sup> points out that people can be compared to animals, in which uniquely human attributes are denied and the person is described as being coarse, uncultured, amoral, irrational, and childlike. Bandura (2002)<sup>[11]</sup> adds that attributing demonic or bestial qualities to a person also makes them less than human. A second way in which people are dehumanized is by comparing a person to a machine (i.e., "mechanistic dehumanization"), in which human attributes are removed, and the person is perceived to be unfeeling, cold, passive, rigid, and lacking individuality (Haslam, et al., 2008)<sup>[18]</sup>. By doing this, the person is denied of emotionality and desires (Haslam, et al., 2008)<sup>[18]</sup>. Controlling or manipulative interpersonal relationships have been identified as one antecedent of mechanistic dehumanization (Moller & Deci, 2010)<sup>[30]</sup>.

The third way that a person can be dehumanized is by perceiving the other person as being the enemy. Esses, Veenvliet, Hodson and Mihic (2008)<sup>[12]</sup> state that the enemy is constructed to exemplify manipulation and is described as being opportunistic, evil, immoral, and motivated by greed. The enemy is shown to take advantage of the weak, which in turn justifies any action taken against the enemy (Esses, et al., 2008)<sup>[12]</sup>. These authors go on to describe the barbarian image, which includes the perceptions of a ruthless, crude, and unsophisticated individual that is willing to cheat to reach glory.

### III. NEGATIVE CONSEQUENCES OF EVERYDAY DEHUMANIZATION

There is overwhelming evidence for the wide-reaching negative consequences of relatively mild dehumanizing attitudes and behaviours. Dehumanizing others leads to increased anti-sociality towards them in the form of increased aggressive behaviours such as bullying (Obermann, 2011)<sup>[33]</sup> and harassment (Rudman and Mescher, 2012)<sup>[37]</sup>, as well as hostile avoidance behaviours such as social rejection (Martinez, Mendoza-Denton & Hinshaw., 2011)<sup>[23]</sup>. This increased hostility and aggression are accompanied by reduced moral worth attributed to those who are dehumanized (Haslam and Loughnan, 2014)<sup>[19]</sup> and they are therefore judged less worthy of protection from harm (Bastian & Haslam, 2011)<sup>[3]</sup>. The perpetrators of such interpersonal maltreatments themselves may experience negative emotions such as guilt and shame (Baumeister & Leary, 1995)<sup>[5]</sup>, which may lead to even stronger dehumanizing attitudes towards their targets in an attempt to downplay their suffering and justify their maltreatment. Such dehumanization in response to guilt has been demonstrated in intergroup contexts (Castano & Giner-Sorolla, 2006)<sup>[7]</sup>. A vicious cycle may emerge, whereby dehumanization promotes maltreatment and aggression, which further promotes dehumanization.

The negative consequences for those who are dehumanized are also striking. Everyday interpersonal maltreatments can leave its victims feeling degraded, invalidated, or demoralized. There is extensive research into the negative consequences of being denied autonomy (Ryan and Deci, 2000)<sup>[38]</sup>, betrayed (Finkel, Rusbult, Kumashiro & Hannon, 2002)<sup>[15]</sup>, humiliated (Miller, 1993)<sup>[29]</sup>, socially excluded (Baumeister and Leary, 1995)<sup>[4]</sup>, Twenge, Baumeister, DeWall, Ciarocco & Bartels, 2007)<sup>[39]</sup>, or not recognized as a person (Honneth, 1992)<sup>[20]</sup> – all situations that are likely to be experienced as dehumanizing (Bastian & Haslam, 2011)<sup>[3]</sup>.

When people are mechanically dehumanized by being treated as objects, as means to an end, or as lacking the capacity for feeling, they tend to enter into "cognitive deconstructive" states that are characterized by reduced clarity of thought, emotional numbing, cognitive inflexibility, and an absence of meaningful thought (Bastian & Haslam, 2011)<sup>[3]</sup>. Experience from this type of dehumanization leads to pervasive feelings of sadness and anger. Also dehumanizing are status-reducing interpersonal maltreatments such as condescension, degradation, or being treated as embarrassing, incompetent, unintelligent, or unsophisticated (Vohs, Baumeister & Chin., 2007)<sup>[41]</sup>, which lead to feelings of guilt and shame (Bastian & Haslam, 2011)<sup>[3]</sup>.

Such dehumanizing maltreatments are likely to have a detrimental effect on psychological wellbeing in workplace. According to self-determination theory (Ryan and Deci, 2000)<sup>[38]</sup>, psychological wellbeing requires that the basic psychological needs of autonomy, competence, and relatedness are met. Dehumanizing maltreatments, however subtle, lead to impaired ability to satisfy these needs and may therefore directly contribute to mental illness such as depression, anxiety, and stress-related disorders which may lower workers' productivity.

### IV. IMPACT OF DOMESTIC VIOLENCE ISSUES AT WORK

Domestic abuse is the most prevalent form of gender-based violence. It typically occurs when a man beats his female partner. A 2005 study using data from a national telephone survey of 8,000 women about their experiencing physical intimate partner violence victimization reported an average of 7.2 days of work-related lost productivity and 33.9 days in productivity losses associated with household chores, child care, school, volunteer activities, and social/recreational activities (CIPD, 2013)<sup>[9]</sup>. In this study, 98 percent had difficulty concentrating on work tasks; 96 percent reported that domestic abuse affected their ability to perform their job duties; 87 percent received harassing phone calls at work; 78 percent reported being late to work because of abuse; and 60 percent lost their jobs due to domestic abuse.

Domestic abuse not only impacts on the well-being of women, but also affects the financial strength and success of the companies for which they work. Seventy-five per cent of those experiencing domestic abuse are targeted at work and it is often possible for perpetrators to use workplace resources such as phones, e-mail and other means to threaten, harass or abuse their current or former partner. One in four women will experience domestic abuse at some point in their lifetime. This means, it is likely that all workplaces will have staff that have experienced or are experiencing domestic abuse as well as those who are perpetrators of abuse (Cipd, 2013)<sup>[9]</sup>.

Domestic abuse causes a significant loss of paid and unpaid work time, lost work productivity and safety hazards for employees. As a result, efforts by employers to prevent domestic violence can positively impact their bottom line. Domestic abuse negatively impacts the physical and mental health of victims and sometimes even leads to death. Another less known, but highly prevalent, effect of domestic violence is the inability of victims to fully participate in the workforce. Studies show that domestic violence causes victims to miss work, lose their jobs, and have difficulty performing on the job (Eze-Anaba, 2010)<sup>[14]</sup>.

Also, in the study of Gberegbe, Osibanjo, Adeniji, and Oludayo (2014)<sup>[16]</sup> on "Gender Discrimination and Employee Performance, they reiterated that perceived female expected productive/performance is a function of variables such as emotional stability, psychological status and total physical/mental energy that when there is any form of violence against women, it is expected that there would be a shift in their emotional status, which tends to affect their productivity and overall performance.

Domestic abuse not only affects victims, but employers as well. Increased absenteeism, higher turnover, and poor performance result in lower productivity and higher costs for employers. Although domestic abuse usually occurs within the home, the effects of the violence spill over into the workplace in numerous ways. As a result, domestic violence has a considerable impact on victims, employers, and co-workers. The multiple connections between domestic abuse and work make the workplace an important and effective avenue for domestic violence intervention (WHO, 2013)<sup>[45]</sup>.

## V. MEN'S VIOLENCE AGAINST WOMEN IN THE WORKPLACE

The victims and perpetrators of men's violence against women are in every workplace. One survey finds that two thirds of women victims of men's violence are in paid employment (McFerran 2011:5)<sup>[27]</sup>. In turn, it is likely that many if not most of the men who perpetrate violence against women and girls are in paid employment. Whether it occurs outside or within the workplace, men's violence against women has a direct impact on women's and men's participation at work, and workplaces themselves may contribute to or tolerate violence against women. Men's violence against women has both direct and indirect impacts on work and employment. Domestic violence has significant negative consequences for women's physical and mental health, both short and long-term, and in turn these diminish their workforce productivity and participation (Murray and Powell 2008:3-5)<sup>[32]</sup>; Women's Health Victoria 2012: 1-13)<sup>[44]</sup>. Economic costs associated with victimization includes absenteeism, lost productivity related to use of sick leave, distraction and lack of concentration, underperformance, poor workplace relationships, access to employment support services and staff replacement.

Domestic abuse not only affects the well-being of women but also the financial strength and success of the organization where they work. Oni-Ojo, Adeniji, Osibanjo and Heirsmach (2015)<sup>[35]</sup> reported that 75% of women experiencing domestic abuse are targeted at work and often perpetrators use workplace resources like phones, e-mail to harass or threaten their partner. Domestic abuse will result into significant loss of paid and

unpaid work time, lost work productivity, safety hazards, negative on workplace interpersonal relationships and decreased concentration on job performance, difficulty in meeting basic needs of self and family and trauma from witnessing the violence.

## VI. IMPACT OF GENDER BASED VIOLENCE ON WOMEN'S HEALTH

GBV seriously affects all aspects of women's health-physical, sexual and reproductive, mental and behavioural health. Health consequences of GBV can be both, immediate and acute as well as long lasting and chronic; indeed, negative health consequences may persist long after the violence has stopped. The more severe the level of violence, the greater the impact will be on women's health. Furthermore, exposure to more than one type of violence (e.g. physical and sexual) and/or multiple incidents of violence over time tends to lead to more severe health consequences (WHO 2002)<sup>[43]</sup>.

GBV can result in women's deaths. Fatal outcomes may be the immediate result of a woman being killed by the perpetrator, or in the long-term, as a consequence of other adverse health outcomes. For example, mental health problems resulting from trauma can lead to suicidality, or to conditions such as alcohol abuse or cardiovascular diseases that can in turn result in death. HIV infection as a result of sexual violence can cause AIDS and ultimately lead to death (WHO 2013)<sup>[45]</sup>.

The World Bank estimates that rape and domestic violence account for 5% of the healthy life years of life lost to women age 15 to 44 in developing countries. Every year lost due to premature death is counted as one disability-adjusted life year (DALY) and every year spent sick or incapacitated is counted as a fraction of DALY, depending on the severity of the disability. At the global level, the number of disability-adjusted life years (DALY) lost by women in this age group is estimated at 9,5 million years, comparable to other risk factors and diseases such as tuberculosis, HIV, cardiovascular diseases or cancer (World Bank 1993)<sup>[42]</sup>.

## VII. THE CONCEPT OF COUNSELLING

Counselling is used in a variety of ways to support clients in solving their problems. It is a process through which a counsellor, who is professionally and well trained, assists a person in need to solve his problems. It is a helping relationship, in which the counsellor enters into a relationship with the counsellee mainly for the purpose of providing help to the latter on whatever issue that is at hand. Ipaye (1990)<sup>[22]</sup> noted that it means helping the individual to sharpen his or her perception of the issues at hand with a view to facilitating his getting into grips with the issue. This relationship is characterized by an intimate interaction in which each person is sensitive to other. This relationship is necessary because one needs information, instruction, understanding and advice in solving the problems and issues at stake. This can be achieved through co-operative efforts involving communication and interaction.

Counselling takes place when a counsellor sees a client in a private and confidential setting to explore a difficulty the client

in having, distress they may be experiencing or perhaps their dissatisfaction with life, or loss of a sense of direction and purpose (BACP, 2006a)<sup>[6]</sup>. Acceptance and respect for the client are essentials for a counsellor and as the relationship develops, so also does trust between the counsellor and client. The counsellor may help the client to examine in detail the behaviour or situations which are proving difficult and to find an area where it would be possible to initiate some changes. The counsellor may help the client to look at the options open to them and help them to decide the best for them. Counselling therefore is not about giving advice, but about providing a non-judgmental, empathic and accessible means to allow an employee to find a way forward (Hughes, 2015)<sup>[21]</sup>.

### VIII. COUNSELLING IN WORKPLACE

McLeod and Henderson (2003)<sup>[26]</sup> define workplace counselling as the provision of brief psychological therapy for employees of an organization, which should be paid for by the employer. Workplace counselling offers the employer a service that is valued by employees, has the potential for savings by reducing sickness absence, takes pressure off managers through the availability of constructive means of dealing with difficult staff or situations, and contributes to its reputation as caring employer. To the employers, workplace counselling is viewed as an insurance policy against the threat of compensation claims made by employees exposed to work-related stress.

McLeod (2001)<sup>[25]</sup> in a review of research into the outcomes of workplace counselling identified 34 studies, including controlled studies, naturalistic studies in which reliable pre-and post- counselling data were collected, and case studies. Employees presented for counselling have high levels of psychological symptoms. Those who received counselling were highly satisfied, and believed it had helped them resolve their problem. Clinically, significant improvement in levels of anxiety and depression was reported in 60-75% of clients. Counselling was associated with reduction in sickness absence and improvement in other organizational outcomes such as more positive work attitudes, fewer accidents and enhanced work performance.

Also, in a quantitative study, Millar (2002)<sup>[28]</sup> interviewed police officers and support staff who had received counselling for work-related difficulties. Most of the participants reported that counselling had helped them to overcome the problem that had led to them seek help. More striking, though, was the finding that all of these informants described themselves as learning something new and useful about themselves as a result of counselling.

Counselling helps people identify issues, difficulties and problems caused by thoughts, feelings and emotions and encourages them to respond and make progress towards resolution. Whilst a little bit of stress provides workers with the motivation to increase productivity and efficiency, too much stress can be counterproductive (Martins, 2012)<sup>[24]</sup>. Providing psychological therapy for stressed employees can have many beneficial effects. Counselling in the workplace can help reduce symptoms of anxiety and depression, improve mental health, lower levels of sickness and increase job satisfaction and commitment. It provides an effective method of understanding

the pressure caused by occupational stress and offers a supportive remedy

Offering formal counselling sessions to stressed employees equally help them feel valued, and will enable the individual to identify the cause of their problems and issues. Counselling can help increase staff morale, boost confidence and self-esteem, improve productivity and efficiency and create a more relaxed working environment (Martins, 2012)<sup>[24]</sup>. Counselling in the workplace can take place in person or by telephone, and provides a facilitating services. It opens up communication between staff and employers, and encourages frank discussion. Counselling also enables the worker to identify what can and cannot be changed, and to explore alternative solutions. Workplace counselling services are meant to deal with issues that occur within an organization such as conflict, stress-related absence, work-related trauma and harassment/bullying.

According to Hughes (2015)<sup>[21]</sup>, organizations sometimes think that the counselling provision they are paying for should only be used to address issues directly relating to the employee's work life. Employers should note that while work-related issues, including stress, overwork, bullying and difficult colleagues can also impact an employee's performance, personal issues can equally have a similar negative impact. He concluded that employees' access to a free, confidential, workplace counselling service can potentially be viewed as part of an employer's duty of care.

### IX. CONCLUSIONS AND RECOMMENDATIONS

Gender based violence has experienced by millions of women worldwide does not only affect their relationship in the homes and communities, but also places of work and largely their productivities in their various places of primary assignment. All negative interaction in the workplace therefore is likely to be experienced as dehumanization.

In order to address social stigma in workplace, there is need to sensitize staff on the need to support and encourage each other to seek counselling in times of distress and to make it private and confidential the counselling process. With the possibility of employee's improved well-being impacting performance positively, organizations in Nigeria should consider workplace counselling services as a tool to restore employees' morale and potentially to improve organizational performance. Observing confidentiality is thus the key in enhancing attendance to counselling services by workers in organization. The fact that the advancement and sophistication of the world in many angles have brought increased pressure and stress to many people, counselling in workplace should be put in the fore-front in both private and public settings to help people maintain the required mental health necessary to enhance workers' productivity.

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#### AUTHORS

**First Author** – OJO, Funmilayo Yemi (PhD) , Head, Counselling Unit, Afe Babalola University Ado-Ekiti, Ekiti State, Nigeria, e-mail: [yemiojo61@gmail.com](mailto:yemiojo61@gmail.com)  
**Second Author** – YINYINOL, W. Lasun (PhD), Isabatudeen Senior Girls' Grammar School, Ibadan, Nigeria

# The Influence of Strategic Management Practices on Performance of Private Construction Firms in Kenya

Paul Kamau Waweru \*, Dr. Jane Omwenga \*\*

\* Master of Business Administration, Jomo Kenyatta University of Agriculture and Technology

\*\* Supervisor, Jomo Kenyatta University of Agriculture and Technology

**Abstract-** This study sought to investigate the influence of strategic management practices on the performance of private construction firms in Kenya. Studies have shown that world construction markets are at a tipping point already with 52% of all construction activity in emerging markets today. This is expected to increase to 63% by 2025, with China and India contributing most to growth in emerging markets. A report published by Deloitte further expounds that the East African region is turning the heads of investors, construction firms and multi-national corporations. This research was carried out on three private construction firms namely; First Acres Construction, Blue Urban Construction and Nipsan Construction Company. A total sample of 68 respondents formed the sampling frame. The researcher chose simple random sampling as a sampling technique. Primary data was collected using pre-determined questionnaires. The study used questionnaires containing closed ended, open ended, multiple choice and dichotomous questions. Likert scale questions were also used since the responses were easily quantifiable and subjective to computation. The study used both primary and secondary data. Secondary data was cited from library resources and organizational process assets such as company project reports. Statistical Package for the Social Sciences (SPSS) was used as a platform for data analysis. Data analysis was done to generate a view of how the objectives of the study were satisfied. This was done using descriptive statistics, which saw the usage of frequency tables, measures of central tendency, percentage charts, distribution tables and bar graphs. Through this study, it was established that all three construction firms have employed strategic management practices which in turn increases performance. The research carried out on this study led to identification of the crucial aspects of strategic management practices that will facilitate better management and overcome prevalent obstacles within the market players within the construction industry therefore enhance achievement of the core business objectives within the construction firms and spearhead growth and performance. Recommendations to the study were made and as well as other areas that stand to benefit from this study, were also identified.

**Index Terms-** Architectural Competency, Corporate Branding, Stakeholders, Strategy.

## I. INTRODUCTION

**A** 1.1 Background of the study  
According to Bryson (2010), strategic management can be

perceived as a structured process that engages all levels of an organization with the ultimate intention to map out a mission that defines the organization, illuminate a shared vision of the organization's trajectory and in particular, involve the structure of long term goals and objectives which encompasses financial growth and stakeholder appreciation while maintaining moral and ethical considerations in the decision making process. Wheelen and Hunger (2006) looks at strategic management as a set of managerial decisions and actions that determines the long-term performance of a firm. Literature shows that from 1980 onwards, the field of strategic management has progressed and transitioned from its primary domain in business into other disciplines. The ultimate goal however is a clear direction and increased performance within the organization.

As stated by Nag et al. (2007), this includes the major intended and emergent initiative taken by senior management in utilizing organizational resources to enhance performance, while mitigating the pressures of the external environment. This brings to the fore-front the correlation between strategic management and strategy. As Johnson, Scholes and Whittington (2007) elaborate, strategy gives an organization the direction and visual scope that yields benefit both in operational efficiencies and financial targets and sustains the chartered mission and vision of the organization within a challenging environment. Importance of strategic management in the construction industry is validated by its requirement for better performance. Technology, communication, and market advances are fundamentally changing the global perspectives of time, distance, and socio-economic boundaries. With the emergence of knowledge experts and industry innovations, the construction industry has undergone a tremendous dynamic trend that complement design and project construction work in almost any location, therefore having a direct influence on competition and market share. This therefore necessitates the need for the adoption of strategic management practices within construction firms while factoring in the concept of knowledge workers and domain experts, new markets and the use of information technology. According to Yates (2007), construction firms should transition from an indigenous business approach within their local conditions of operation and embrace a global perspective that is characterised by benchmarks and innovative processes that increase efficiency. As expounded by Blair (2009), construction firms are increasingly being called upon to revisit and revise their strategy in-order to leverage against a volatile market.

### 1.1.1 Strategic Management Process

According to Carpenter & Sanders (2009), the strategic management process involves four distinct elements namely; environmental scanning, strategy formulation, strategy

implementation and strategy evaluation. Essentially, the strategic management process is a continuous motion of anticipating, recognizing, evaluating, resolving, controlling, documenting and learning from previous experiences in order to sustain the overall viability of the project or venture (Ibbs, Wong & Kwak, 2001; Arain and Low, 2005). Johnson and Scholes (2008), stress that organizations that use strategy seek to leverage against competitors and other external influence by configuring and using their superior resources to fulfill stakeholder expectations. Dye and Sibony (2007) support that a well thought out approach to the strategic management process is a key factor to the success and growth within the organization as well as contributing to higher satisfaction levels among those involved within the process. The first step within this process is the determination and clear structure of the company's mission and vision which defines the fundamental reason of existence of the firm and its trajectory. A strong mission statement together with situational analysis tools facilitates the formulation of a competitive strategy enabling long term commitment to all stakeholders. This results in a superior strategy that is geared towards innovation and organizational re-engineering which transforms the firm into a market leader (Hamel, 2000).

The analysis stage follows, which is critical to information gathering in order to accomplish the organization's vision. This is where the needs of the organization are made explicit and identification of initiatives that will help in the growth of the firm is done. This stage is complemented by the formulation of strategy. As iterated by Johnson, Scholes and Whittington (2007), strategy gives an organization the direction and visual scope that yields benefit both in operational efficiencies and financial targets and sustains the charted mission and vision of the organization within a challenging environment. The succeeding stage involves implementation of strategy. This involves action, where all stakeholders in particular internal are made aware of their responsibilities and duties in alignment to the overall goal. Finally, the concluding stage involves structuring evaluation and control measures and defining parameters that can be used to gauge performance and attainment of targets while providing action plans for corrective measures. It is important to note however, that the strategic management process is a continuous motion and lobbies for continuous improvement of process and procedure as emphasized by (Arain and Low, 2005).

### **1.1.2 Construction Industry- Global Perspective**

According to a report published by PricewaterhouseCoopers (2013), world construction markets are at a tipping point already with 52% of all construction activity in emerging markets today. This is expected to increase to 63% by 2025, with China and India contributing most to growth in emerging markets. China overtook the US to become the world's largest construction market in 2010, and is expected to increase its global share from 18% today to 26% in 2025, despite an expected slowdown. A report published by EC Harris Research (2013), states that the UK construction industry has turned around to become one of the fastest growing sectors in the economy. It further elaborates that the changes in the international economy are creating new opportunities for Britain. To help boost the economic recovery, the government is doing all it can to help British businesses grow and have the aspiration, confidence and drive to compete in the

global race. This includes reforming the planning system, ensuring funding is available for key infrastructure projects and supporting the housing market through key initiatives such as the Help-to-Buy Equity Loan Scheme and the Funding for Lending Scheme (Harris, 2013). According to Canada's National Economic Accounts statistics, the construction industry accounted for 7.8% of Alberta's Gross Domestic Product in 2011. This industry had the third largest employment and its share of Alberta's total employment increased from 8.4% in 2002 to 10.5% in 2012. The U.S. Department of Labor perceives that the demand for residential construction is expected to continue to grow. The demand for larger homes with more amenities, as well as for second homes, will continue to rise, especially as the baby boomers reach their peak earning years and can afford to spend more on housing.

### **1.1.3 Construction Industry- Local Perspective**

From a regional forefront, a report published by Deloitte, titled 'African Construction Trends Report 2013' states that East Africa is fast becoming a leading African region and a strategic hub of continental growth. Though historically one of the world's poorest and least developed regions, it is fast tracking infrastructure development with countries such as Ethiopia having shown annual growth of over 10% per annum in recent years (Deloitte, 2013). The report further expounds the East African region is turning the heads of investors, construction firms and multi-national corporations. As aggressive development gains momentum, investors will rely on local governments to develop basic infrastructure such as rail, roads, healthcare facilities, housing, real estate and retail space. Closer to home, data from the Kenya National Bureau of Statistics shows that the construction industry in Kenya, emerged among the top performing sectors in the period alongside financial services and transport and communication. The sector grew by 10.7% compared to the dismal performance of 0.3% in the same period in 2010 and contributed Sh12.6 billion to the GDP in the period supported by massive road infrastructure projects currently in progress across the country (KNBS, 2011).

### **1.2 Statement of the Problem**

A report titled, 'The Kenyan Construction Industry 2011', published by Moramati Foundation in conjunction with Proinvest, cited a number of problems and challenges that plague the construction industry namely; poor staffing and management competencies at all levels of the construction firm, access to finance and poor planning of monies, absence of a unified legal and regulatory framework for all contractors, poor or non-maintenance of structures, inadequate supervision within the technical and managerial level, improper project designs by consultants, poor engagement with regulatory and legal stakeholders but to mention a few (Moramati Foundation, 2011). Developers and construction firms are grappling with inefficiencies both internal and external that have a massive impact on profitability and growth. Some of the major concerns within an internal perspective is the deployment and use of technology platforms to improve efficiency levels, cohesion and fluidity of various teams and professionals and the adoption of management strategies that focus on the core pillars of strategic management namely; strategic planning, strategic choice and strategic implementation. The problem that this study seeks to address is the poor management and lack of strategic roadmaps

within the structures of construction firms in Kenya. It takes into account the challenges faced by contractors namely poor management efficiencies and a weak approach to the use of strategic management practices within the holistic mission of the construction firms, with a view to study the influence of strategic management practices on the performance of private construction firms in Kenya. The investigation of these influences can lead to stronger management structures and create awareness on effective practices that can sustain the presence of construction entities that deliver quality and resonate with international practices now and in the long run.

A sample of previous studies done within this area include Kagioglou, Cooper and Aouad (2001), who highlighted Performance Management in Construction: A Conceptual Framework, which focused on performance measurement approaches within construction firms. Although a valiant effort was made in drawing a link between the philosophies of organizational performance and modern tools of measure it was highly subjective to the implementation of the balanced scorecard as performance measurement tool within a construction framework and fell short on the holistic influence of strategic management practices within private construction firms and their consequent impact on performance.

Another study carried out by Kamuiru (2013) shed light on the Elements of Project Management applied by Home Builders in the Construction of Single Family House; A Case of Ngoingwa Estate-Kiambu County. The study placed emphasis on the project management techniques and methods in the construction of a family houses by the contractors. Again, this study fell short of identifying the strategic management approaches that can be employed by contractors and developers that can strengthen the objectives of operational efficiencies, financial robustness and corporate profiling that can complement the delivery of quality homes therefore boosting the firm's portfolio.

Finally, a third study by Mungeria (2005), focused on professional teamwork and project performance in the construction industry in Kenya but did not capture a holistic approach of using strategy and the strategic management process for operational, functional and corporate level optimization of the vision and mission of the construction firms. The researcher has identified this area as deserving attention in exposing the strategic management practices employed within private construction firms and the influences that these practices have on the performance of the firm. The researcher will seek to find that this area has received little attention in literature in response to the problems show-cased in the public domain that plague the construction industry and the impact on the growth of the construction firm. This study therefore sought to investigate the strategic management practices in private construction firms in Kenya and the influence they have on the performance of the firm.

### **1.3 Objectives of the Study**

This section outlines the general objectives and specific objectives of this study.

#### **1.3.1 General Objective**

The general objective of this study was to investigate the influence of strategic management practices on the performance of private construction firms in Kenya.

#### **1.3.2 Specific Objective**

The specific objectives of this study were;

1. To identify the influence of the elements of operational excellence to the performance of the construction firm.
2. To investigate the strategies employed at the business level that influence the performance of the construction firm.
3. To determine the adoptability of corporate level practices that influence the performance of the construction firm.

#### **1.4 Research Questions**

1. What are the elements of operational excellence that influence the performance of the construction firm?
2. What are the strategies employed at the business level that influence the performance construction firm?
3. What is the adoptability of corporate level practices that influence the performance of the construction firm?

#### **1.5 Significance of the study**

This study sought to provide information on how strategic management practices influence to the performance of private construction firms in Kenya. The following stood to benefit this study; Private developers that seek knowledge on strong management approaches and best practices to leverage against their competitors; knowledge experts and managers within the construction industry namely; construction engineers, contractors, and human personnel at the three levels of the management within the construction firm; researchers and scholars of business strategy with a particular focus on the construction industry.

#### **1.6 Scope of the study**

The building construction industry in Kenya is generally regulated by among others Engineers Registration Board (ERB) established by Cap 530 of the Laws of Kenya, the Board of Registration of Architects and Quantity Surveyors (BORAQS), established by Cap 525, the Physical Planners Act Cap 286, the Public Procurement and Disposal Act 2005, the Public Health Act Cap 242 and the National Environmental Management Authority. This study looked at three private building construction firms in Kenya and identify the strategic management practices used to gain competitive advantage and align the business objectives with the overall vision of the firms. It also identified the gaps within this industry and the challenges faced in the management of the construction firms. It sought to identify why some construction firms are doing better than others in an ever growing market of real estate development. The variables under study included; elements of operational excellence and execution strategies, business level practices and corporate level practices and the overall performance of the private construction firms.

#### **1.7 Limitations**

The research suffers from the quality of the composition of the sample. By virtue of the small number of respondents from each firm, their characteristics were not sufficiently heterogeneous. The limited heterogeneity in respondents'

demographic characteristics could have affected both the nature and the extent of the responses obtained. The objective of this study was to look into the influences of strategic management practices on the performance of the construction firms. During the study, it was noted that these firms also experienced varying challenges in project management which as a subset of strategy has an implication on performance. This is an area that could not be covered due to the specific nature of the research objectives for this study.

There is limited research study within the area of strategic management practice in the construction industry. Much scholarly material dealt with the issues of construction project management and operations management. This presented the researcher with a challenge in laying the foundations and structure for the literature review. The researcher encountered difficulties where some respondents felt that the information required was too confidential to be disclosed. To mitigate these effects, the respondents were given an assurance that findings would be made confidential and used only for the intended purpose.

## II. LITERATURE REVIEW

### 2.1 Introduction

This chapter takes a look at a theoretical review of strategic management practices within the construction industry. It commences by a reiteration of the challenges within the construction industry pointing towards the problem statement. It also highlights three theories that are directly related to the building and construction industry in respect to strategic management and drawn in parallel to the problem being investigated. This chapter expounds on a conceptual framework that exposes the variables under study and also highlights an empirical study which show cases the findings of previous studies done with a critique of the same. Finally, this chapter concludes with a summary and identification of research gaps.

### 2.2 Theoretical Review

Construction is a complex array of interdependent activities that some would say is at best organized "chaos". The very nature of construction introduces challenges typically not encountered within other industries. The following traits give a lead as to why the construction industry differs from other typical industries namely; the work is often seasonal, each project is unique, the process is not as predictable, costs can vary according to conditions, it is difficult to manage and supply utilities and other resources instantaneously, success is dependent upon the quality of its people and professionals contracted to carry out the project and most projects are custom-oriented. According to Braimah and Ndekugri (2008), delays and disruption to contractor's progress are a major source of claims and disputes in the construction industry. The matters often in dispute concern the dichotomy in responsibility for delays (i.e.) projects owner or

his contractors, partly because of the multifarious nature of the potential sources of delays and disruptions. Iyer and Jha (2005), attribute poor performance within the construction industry to conflict among project participants, ignorance and lack of knowledge, presence of poor project specific attributes and non-existence of cooperation, hostile socio economic and climatic condition, reluctance in timely decision, aggressive competition at tender stage and short bid preparation time. Historically according to Gray and Flanagan (1989), the foundation of measuring performance of construction firms was greatly influenced by the achievement of the strategic objectives in line with the level of productivity both from a management and supervision view point to a more business level approach of material usage. This study has exposed three theories namely; the resource based view, dynamic capability framework and the stakeholder theory, that encapsulate the variables under study as well as offer insight towards the influence of strategic management practices on the performance of construction firms and buffer a solution based approach to the challenges exposed within the problem statement.

### 2.2.1 Resource Based View Theory

This theory was first authored by Wernerfelt (1984) and later reviewed by other contributors who expounded on the influence that both tangible and intangible assets have on the performance of an organisation (Crook et al., 2008). The resource based view theory magnifies the importance of internal resources within the firm and the use of these resources in formulating strategy to achieve sustainable advantage within the firms' competitive markets (Schroeder et al. 2002). According to the RBV, a firm's internal capabilities determine the strategic choice it makes in competing in its external environment. This is in line with the influence that strategic management practices have on the performance of a firm. Closer within the context of the construction industry, the RBV is used to identify and explore man-power expertise and strategic planning systems that can help construction firms manage present construction projects and grab future business opportunities therefore increasing the firms portfolio. Capabilities, resources and knowledge acquired over time create options for future business exploration and gives a firm leverage over its competitors (Kogut and Kulatilaka, 2001). Within the context of the construction industry these may include, plant and machinery, planning and schedule templates, cost and financing models, professional consultants and knowledge workers as well as certified organizational processes and best practices. Loasby (2002) explores the view that investments in resources and capabilities are choice decisions made in the context of uncertainty and that it is the combination for these factors that make real options potentially valuable. In his earlier work, Wernerfelt (1984) highlighted four issues that the RBV addresses illustrated in the table below:



**Table 2.1 : Factors of RBV**

On which resources should a company diversify?	By analyzing a firm's resources and capabilities in terms of diversification potential and/ or exploitability, a firm can determine which ones would be most favourable to utilize as a basis of corporate strategy formation.
Which resources should be developed further?	An internal analysis should identify areas of weakness within the firm and enable managers to address these issues.
What markets a firm should diversify into?	By firstly identifying internal strengths a firm is in a better position to identify markets where diversification resources can be exploited. By matching the internal resources and external opportunities the chances of a successful strategy being implemented is increased.
What type of firms other firms should acquire?	RBP identifies weak areas of a resource base as well as which resources are compatible with others. This knowledge will enable decision makers to make better informed judgments with regards to acquisitions and mergers.

Source: Wernerfelt, 1984

The argument of assets and capabilities is clarified by Galbreath (2005) who explains that assets are what a company "has" or owns while capabilities are what a company "does" both of which can form the basis for long term planning and strategic mapping resulting in economic success of the firm. To explain the combination of assets and capabilities further, Barney and Wright (1998) attempt to link the core resource of human capital and the competency levels and skill sets that the personnel bring on board. For this reason, there is a strong link between the corporate strategy of a firm and that of learning and development processes defined at the business level because as argued by Senge (1990), human resources play a crucial role in the attainment and success of a firms core objectives. The resources and capabilities possessed by a company are linked to the

business environment by the firm's business processes such as material purchasing, product manufacturing and service providing (Ray et al. 2004).

Performance of a firm whether short term or long term can be influenced by the exploitation of resources and capabilities that are deemed to be valuable and rare offering a greater advantage and provide leverage towards the attainment of the firm's strategic goals (Barney 1991). Therefore to attain competitive advantage, the approaches within the RBV help define and exploit the resources within the firm that are both valuable and rare and dictate that these resources should be both incomparable and non-substitutable in order to sustain market advantage.

**Table 2.2 Resource Portfolio for a Construction Company**

<b>Resources</b>	<b>Description</b>
Tangible Assets	Physical Assets Raised financial capital Cash on hand Financial investments Building and Land
Intangible Assets	Intellectual Property assets Held-in-secret technology State of art equipment Construction Process Trademarks Designs Copyrights
	Organizational assets Contracts Operating structure Culture HRM Policies
	Reputational assets Company reputation Customer service reputation Product / service reputation
	Capabilities of human capital Manager expertise Employee know-how External relationship

Source: J. G. Combs et al. 1999

### 2.2.2 Dynamic Capabilities Framework

This theory was authored by Teece (2007), who expounds that dynamic capabilities refer to the firm's ability to buffer its internal and external propensities in tandem with the changing

environment. Consensus within the field of strategic management highlights dynamic capabilities as having three core attributes namely; they are embedded within organizational processes, they are captured by the established routines within the firm and they are directed towards effecting change within the firm. Nelson and Winter (1982) offer a possible framework for integrating these attributes which align a firm's resources and capabilities with its operational efficiencies. Eisenhardt & Martin (2000) also attempt to draw a correlation between the RBV and the dynamic capability framework by identifying the organizational processes and aligning them with the firm's resources to match or even stimulate market change. A firm's dynamic capabilities may also be viewed as the ability to develop new knowledge as argued by Henderson & Cockburn (1994) who apply the term, 'architectural competence' to increase competitive advantage. The holistic view point is that a firm concerned with optimal growth and performance should tie in their assets with their processes combined with a management that has the capability to

effectively coordinate and reorganize internal and external competences leading to market success.

The ownership and utilization of dynamic capabilities provides the business firm with a chance to generate superior profitability over the longer run. When firms are dynamically competitive, management will be active at sensing and seizing opportunities. This will in turn require their ability to orchestrate non-tradable assets, so that they are in their first best use and so that co-specialization economies are captured. If a firm possesses resources and competences but lacks dynamic capabilities, it has a chance to make a competitive return for a short period, but superior returns cannot be sustained. Augier and Teece (2006) argues that the fundamental nature of dynamic capabilities approach is that competitive success stems from continuous development, and reconfiguration of specific assets that can leverage an organization against competition to give it a superior edge within its operating market.

**Table 2.3 Dynamic Capabilities Framework**

<b>Dynamic</b>	<b>Foundations</b>	<b>Micro-foundations</b>
Sensing	Analytical systems (and Individual capabilities) to learn and to sense, filter, shape, and calibrate opportunities	Processes to direct internal R&D and select new technologies Processes to tap supplier and complementing innovation Processes to tap developments in exogenous science and technology Processes to identify target market segments, changing customer needs
Seizing	Enterprise structures, procedures, designs, and incentives for seizing opportunities	Delineating the customer solution and the business model Selecting decision-making protocols Selecting enterprise boundaries to manage, complement and "control" Building loyalty and commitment
Transforming / Managing Threats	Continuous alignment and re-alignment of specific tangible and intangible assets	Decentralization and near decomposability Governance Co-specialization Knowledge management

Source: Teece, 2007

Dynamic capabilities, when well crafted, permit firms to achieve coordination and benefit from complementarities both from a resource and process perspective. Developing decision-making skills and organizational processes to sense and seize opportunities, is an essential managerial function which is encased within the dynamic capabilities framework. These functions can be the cornerstone of an economic approach to strategic management of the firm. Holistically, this has important implications for the choice and design of business models as well as for managing strategic change in organizations. According to Simon (2002), organizational structures can serve as reference points for effective decision making. He further adds that the dynamic capabilities theory recognizes broader behavioral and cultural foundations and accommodates more flexible organizational structures required in a dynamic market (Simon, 2002). The dynamic capability paradigm sees the firm as an incubator and repository for difficult-to-replicate co-specialized assets. Technological and other intangible assets are more central than tangible assets. Distinctive processes support the creation,

protection, and augmentation of firm-specific assets and competences. Competences reflect both individual skills and experiences as well as distinctive ways of doing things inside firms. The dynamic capabilities framework is offered as a guide to the understanding of complex business organizations and contemporary management practices in high performing enterprises.

**2.2.3 Stakeholders Theory**

Contributors to this theory include Friedman and Miles (2002) and Phillips (2003). The Stakeholder theory offers another multi-dimensional approach for enterprise strategic management. The theory generally identifies five primary stakeholder groups for a company: three of them, shareholders, customers, and communities, define the external expectations of a company's performance; the other two, suppliers, contractual professionals and employees, participate with the company to plan, design, implement and deliver the company's products and services to its customers (Atkinson et al., 1997). According to Post (2002), stakeholders can be perceived as individuals that have a direct or indirect interest in the subject organization.

Historically, Freeman (1984) exposed stakeholders as those who can affect or in turn be affected the achievement of the defined objectives within an organization.

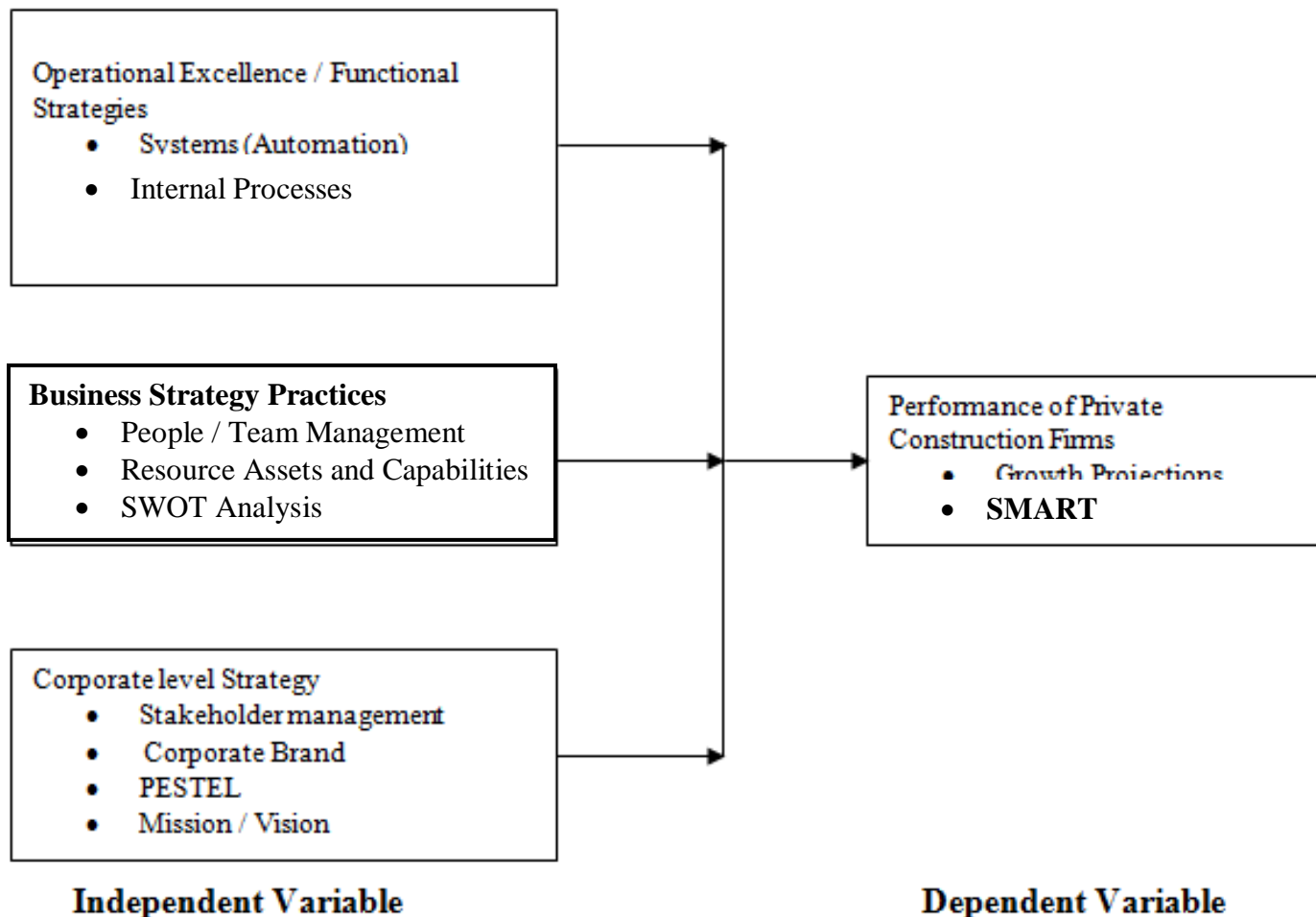
Having its roots within strategic management, argument and discussions on stakeholder theory have pervaded other disciplines. Clarkson (1995); Hillman and Keim (2001) explored stakeholder theory within the confines of corporate social responsibility. Jonker and Foster (2002), investigated the application of stakeholder theory in environmental management and more recently, studies of stakeholder management within the construction industry have been explored (Bourne and Walker 2005; Crawford 2000; Elias, Jackson and Cavana 2004; Newcombe 2003). Freeman (1984) emphasizes that the primary focus of the stakeholder approach is the correlation of the business environment, management, internal and external organizational relationships and the promotion of shared interests with an aim of stimulation business growth and attainment of strategic objectives. Hill and Jones (1992) draws a relationship between the various actors of stakeholder management using a managerialist view that places the firm's management as center focus illustrated in the Stakeholder Wheel.

Ideally, a firm's management should be able to conceptualize and digest the expectations of various stakeholders towards the endeavour of attaining the goals of the firm. Newcombe (2003) rationalizes that meaningful and impactful stakeholder management commences with identification of key stakeholders. He emphasizes that the efforts in aggregating the strategic importance of various stakeholder groups can aid the firm determine the best strategic approach to tie in all interested parties towards the endeavour. Mitchell, Agle and Wood (1997) attempt to classify various stakeholder parties in relation to their power, legitimacy and urgency towards the venture.

### 2.3 Conceptual Framework

Within the confines of construction management, an important skill managers must possess is that of controlling and handling construction stakeholder expectation and keeping all on board (Vinten, 2000). Bourne and Walker (2005) expound that failure or inability to satisfy these expectations can result to project failure particularly if the major stakeholders and direct participants to the project are not managed well who consequently with greater political and financial influence can bring a project to a halt (Lim et al. 2005). Freeman and McVea (2001) bring to the forefront two approaches for managing stakeholders in relation to construction projects. They identify the 'buffering' and 'bridging' approach.

These two approaches seek to mix both a barrier effect that limits the extent to which a stakeholder has influence towards the overall objectives but at the same time offers an 'olive branch' in effort to form common ground and plan of action therefore decreasing discontent within the trajectory of the firm's strategic roadmap. Hillman and Keim (2001) attempt to draw a link between the stakeholder theory and the RBV theory by indicating that a 'bridging' approach can provide additional resources to the firm and stimulate competitive advantage within the firm's operative markets. Harrison and St. John (1996) offer a summarized view of the balance between the level interest of the stakeholder and their power of influence within the firm's endeavour, through a power matrix. Stakeholder management concerns people and management of people. Individuals represent organisational needs as well as spearhead various stake holding functions. Stakeholder theory provides an understanding of how to deal with these needs and provides a channel in applying good stakeholder management practice.



**Figure 2.1: Relationship between Strategic Management Practices and Performance of Construction firms**

**2.3.1 Operational Excellence and Functional Strategies**

According to Analoui and Karami (2003), functional level strategy focuses on operational activities, management and control of automation systems and internal processes. As stated by Dess et al. (2010) the use of technology and developments within the sphere of innovation and design leads to improved outputs and service delivery to customers and end-users. Pearce and Robinson (2003) places emphasis on using available technological adaptations to induce product improvement and harmonize marketing techniques. Core functional areas within construction project management is the scheduling and coordination of work activities, resource allocation and management of scope and costing. These core components in construction management also present various challenges if not managed well. According to Krajewski & Ritzman (2002), operations management that forms the backbone to functional strategy has its core need in the control and management of processes, identification and removal of bottle-necks to map the outputs at the functional level to the strategic objectives. Therefore operational excellence within construction entities can be highlighted into various variables namely; automation and use of technology platforms, coordination and communication control, compliance, quality control and process improvement. Mintzberg (1994) highlights that the development of an operational strategy invokes core actors at the operational level

involved in the day to day activities during project execution such as site engineers, project schedulers to provide input towards technical architecture required for the development and deployment of information systems that would support the intended growth strategies for the firm. High-performing organizations seek to develop their own superior bodies of processes, which become the foundation of the firm’s standard operating procedures. This can be facilitated by creating a process map that provides a unified understanding of the process for all stakeholders and allows visibility of the entire endeavour or project and highlights areas of disconnect or gaps that may inflate the consequences of poor operation management at the functional level.

**2.3.2 Business Strategy Practices**

Senior executives and managers involved in the development and implementation of business-level strategies are tasked with identifying the core competencies within the various functional departments of the company and combining them in a way that provides the company with the best opportunity for achieving and sustaining a competitive advantage in its chosen environment. The overall goal of business-level strategy is to protect the company’s position in its current domain and, if possible, enlarge the domain in which the company can operate with a competitive advantage. According to Pearson and Robinson (2003), business level strategies specify how the firm

will compete within its market arena strategy within the business level of a firm is mapped out to provide a blue print for competitive advantage. Hunger and Wheelen (2006) draw a link between the formulation of strategy in tandem with the market position a firm has within its segment.

Harris and McCaffer (2001) expound that a firm should carry out a thorough investigation of its own processes and procedures, key areas of competence as well as potential business opportunities. A firm should exercise a SWOT analysis therefore effectively positioning themselves within their operative market. The business-level strategy includes decisions about which of the main types of organizational structure namely; functional, divisional or matrix, is best suited for successful execution of the company's operational activities in each of its target markets. This points towards a link between the operation / functional level and the business level of a firm. In general, three factors are most relevant to the choice that must be made by the senior management team. First, as the range of products and services offered by the company expands the organizational structure must be able to provide increasing levels of control and coordination with respect to development, production and marketing activities. Second, as the company increases its focus on specific customer segments it will need an organizational structure that can quickly and efficiently satisfy the unique requirements of each segment. Finally, if and when the pace of new product development accelerates within the domains in which the company is competing, it must establish an organizational structure that facilitates the type of cross-functional coordination necessary for continuous innovation and refreshment of the company's product line.

Another key component within the business level strategy is people management. People and people processes provide great leverage for competitive advantage for any company. According to Gratton et al. (1999), people's skills and motivations stem from an entire portfolio of "people policies, procedures, and processes which serve to train, develop, and retain" consequently developed by the function of human resource departments. To create a binding link between business strategies and human resource management, the emphasis must be on metrics that evaluate all aspects of the business strategy, not just the financial targets but also the non-financial aspect such as employee satisfaction and motivation. As defended by Huselid (1998), sustained competitive advantage is mostly attained by enforcing effective systems of human resource management practices that "simultaneously exploit the potential for complementarities or synergies among such practices and help to implement a firm's competitive strategy".

### 2.3.3 Corporate level Strategy

As illustrated by Hill and Jones (2009), corporate strategy is concerned with avenues and roadmaps structured to maximize and sustain long-term profitability and growth of the firm. Within the context of construction, Analoui and Karami (2003) identified three areas that define corporate strategy namely; diversification, internationalization or conglomerates and vertical integration. Analoui and Karami (2003) continue to expound that diversification revolves around new market penetration for growth, sentiments echoed by Smyth (2000). Internationalization invokes structuring strategic partnerships and alliances while

vertical integration looks at acquiring control over additional links within the value chain of producing and selling of services in order to reduce over-reliance of suppliers. Zeithmal and Bitner (2000) identify as part of the corporate strategy, a good corporate marketing plan should be developed which should describe the tactics that a company would use to meet its overall corporate objectives. An even more pertinent approach to corporate level strategy is corporate branding.

Keller (2001) expounds on brand equity and substantiates this terminology by explaining brand equity is the differential effect that brand knowledge has on responses to the marketing of that brand. The construction sector is very competitive and branding is one avenue that the firm can gain a competitive advantage. Branding humanizes the company and allows people to make associations with favourable qualities that comprise the firms brand identity. Essentially, the benefit of branding and in particular the construction industry include trust and consistency stemming from a set of expectations which customers know that they are getting a consistently high quality product or service. Architects tend to recommend brands that they trust and are familiar with so construction product manufacturers need to cut through the clutter by building a strong and reliable brand. Another benefit includes competitive advantage. There are many companies offering similar products and services, so a firm needs to prove why they are different and this is a key component to competitive advantage. Another consideration within the corporate level strategy is that of stakeholder management. Companies are searching for ways to develop long-term, collaborative relationships with their stakeholders. These relationships involve both tangible and intangible investments. Investments and lessons learned through the process of developing a dialog and relationship with one stakeholder should add value to other stakeholder relationships.

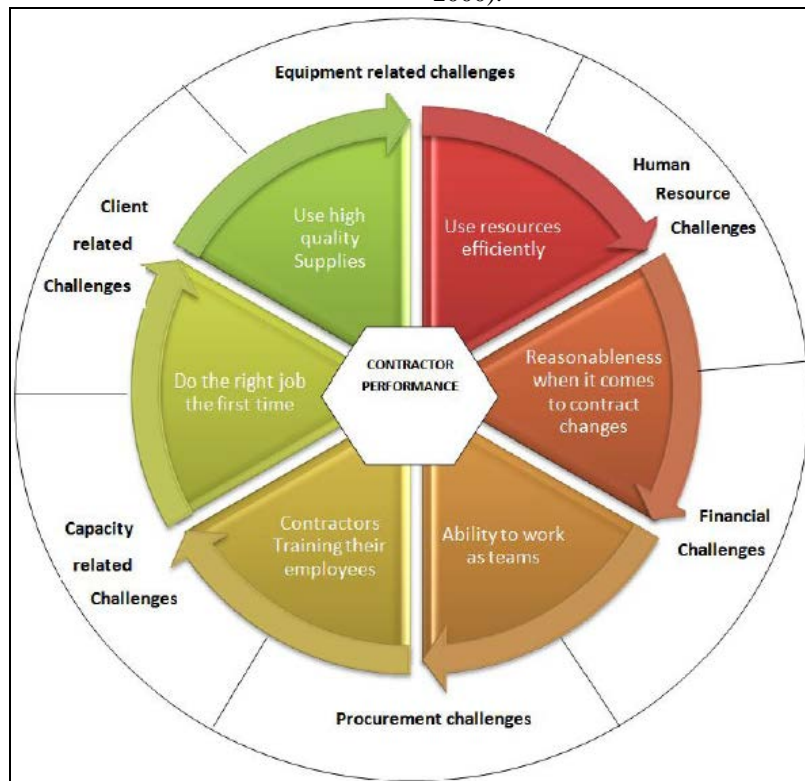
These efforts result in social capital, an asset that resides in relationships and is characterized by mutual goals and trust. Reputation management is the process of building and sustaining a company's good name and generating positive feedback from stakeholders. The process of reputation management involves the interaction of organizational identity (how the firm wants to be viewed), organizational image (how stakeholders initially perceive the firm), organizational performance (actual interaction between the company and stakeholders), and organizational reputation (the collective view of stakeholders after interactions with the company). Stakeholders will reassess their views of the company on the basis of how the company has actually performed.

### 2.3.4 Performance of private construction firms

Growth and increased performance is developed by identifying and seeking out new opportunities, promoting the firm's products and services, including responsibility for technical appraisals and supply of advice to customers on all aspects of the firm's business from procurement to final delivery. The construction industry's core business is undertaking projects in erecting new structures or refurbishing existing ones for a variety of clients. According to Ward et al (1991), the success or failure of construction projects has been pegged on the pillars of cost, time and quality achieved. Kagioglou et al (1998) proposes additional approaches or philosophies as measures of performance within the construction industry. These include BPR

(business process re-engineering), TQM (total quality management), CP (continuous improvement) and BPM (business process management). As argued by Kagioglou et al (1998), this has a holistic view of performance and does not concentrate measure of success on the traditional pillars of cost, quality and time. A report compiled by the U.K best practices program (bprc, 1999) highlighted various KPI's that can be used as measures of performance namely; defects, productivity levels, client satisfaction, cost / profitability and health and safety. These measures are directly related to the strategic objectives set as the core nature of business entities is to perpetuate success through a robust and successful road map chartered through the firm's mission and vision. It therefore involves the development of a framework upon which performance measures can be developed and implemented as to identify the degree to which an organisation is able to implement its strategy. According to Takim and Akintoye (2002), construction projects encompass a

number of phases, stakeholders, processes that require a great deal of input in the form of tangible and intangible resources. The level of success in a project which translates to the performance of the construction firm largely depends on the expertise of management, financial, technical and organizational process flows. Chan and Tam (2000) emphasize that just as in any industry, the key success factor or rating is based on quality. A construction project is deemed successful when it is completed on time, within budget and in accordance to the primary stakeholder's specifications. According to Hanson et al.(2003) there are several factors that if not mitigated properly can have a negative impact on the performance of the construction firm. These include; poor conflict resolution procedures and poor workmanship. The generally perceived factors that influence quality performance can be grouped under the headings of client, project, project environment, project team leaders, project procedures and project management procedures (Chan and Tam, 2000).



**Fig. 2.5: Contractor Performance (Chan and Tam, 2000)**

**2.4 Empirical Review**

An attempt to draw a link between strategic management practices and the growth of the construction industry has been made with previous studies done highlighting organizational performance of construction firms as the key dependent variable. A study conducted by Kagioglou, Cooper and Aouad (2001), expounded on performance management in construction. The researchers discussed that the measurement of an organisation's current and past performance is an important issue, which has been considered closely in the past decade. The researchers highlight that it involves the development of a framework upon which performance measures can be developed and implemented as to identify the degree to which an organisation is able to

implement its strategy. The researchers presented a performance process conceptual framework (PPF) which integrates the main themes of performance management in a simple matrix like arrangement. Its basis was on the balanced scorecard (BSC) but included the addition of the 'project' and 'supplier' perspectives, which in the view of the researchers were specific for the construction industry.

Another study carried out by Kamuiru (2013) shed light on the Elements of Project Management applied by Home Builders in the Construction of Single Family House; A Case of Ngoingwa Estate- Kiambu County. The study placed emphasis on the project management techniques and methods in the construction of a family houses by the contractors. The finding of

the study exposed that once the contract is awarded, the first action plan the home builder did was to search for material suppliers and to seek for the second opinions of what needed to be done before commencement of the work. The researcher recommended that project management methodologies be applied and implemented within the context of building and construction of family housing which would improve the performance and increase the productivity of contractors.

A third study was done by Mungeria (2005) which focused on professional teamwork and project performance in the construction industry in Kenya. The purpose of this study was to establish the factors leading to effective team work management of professional firms in the building construction industry in Kenya, to determine the extent to which teamwork management of professional firms has been employed in the construction industry in Kenya; to evaluate the relationship between teamwork management of professional firms in the construction industry and successful completion of construction projects in Kenya and to establish the challenges facing the teamwork management of professional firms in the construction industry in Kenya. The findings revealed that effective teamwork is determined by good team leadership, project atmosphere, project members and project management strategies.

### **2.5 Critique of the existing literature**

Within the first study conducted by Kagioglou, Cooper and Aouad (2001), although a valiant effort was made in drawing a link between the philosophies of organizational performance and modern tools of measure, it was highly subjective to the implementation of the balanced scorecard as performance measurement tool within a construction framework and fell short of describing the holistic influence of strategic management practices within private construction firms and their consequent impact on performance. Within the second and third study by Kamuiru (2013) and Mungeria (2005), looked at project management techniques and effective teamwork management respectively, which is an important consideration in construction management. Project management is an important domain of practice that is perceived as a temporary endeavour with a definite start and end to produce a unique product or service. Team management is a core facet to achieving synergy within the confines of targeted business outcomes. The two studies predispose project management and teamwork as sub entities and not the overall influence to organisational performance of construction firms. Both studies took a narrower approach and did not capture or pinpoint the holistic influences of strategic management practices on the performance of construction firms.

### **2.6 Research Gap**

The researcher identified this area as deserving attention since none of the studies highlighted addressed the influence of strategic management practices on the performance of private construction firms in Kenya. The researcher identified a gap in evidence of approaches of using strategy and the strategic management process for operational, functional and corporate level optimization of the vision and mission of the construction firms and performance their performance.

### **2.7 Summary**

This chapter took a look at a theoretical review of strategic management practices within the construction industry. It commenced by a reiteration of the challenges within the

construction industry pointing towards the problem statement. It also highlighted three theories that are directly related to the building and construction industry in respect to strategic management and drew in parallel to the problem being investigated. This chapter expounded on a conceptual framework that exposed the variables under study and also highlighted an empirical study which show cased the findings of previous studies done with a critique of the same.

## **III. METHODOLOGY**

### **3.1 Introduction**

This chapter describes the research methodology that was employed within the study. The research methodology is the process used to collect information and data for the purpose of making business decisions. The methodology may include publication research, interviews, surveys and other research techniques, and could include both present and historical information. The research methodology may also be viewed as the procedural plan that is adopted to provide validity, objectivity, accuracy and economic metrics to the defined research questions. The researcher in this section provided an overview of the research design, target population, sampling frame, sampling technique, data collection instruments as well as defined the procedures and analysis of data that was employed within the study.

### **3.2 Research Design**

Research design refers to the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in the procedure (Babbie, 2002). This study adopted a descriptive design. This design refers to a set of methods and procedures that describe variables. It involves gathering data that describe events and then organizes, tabulates, depicts and describes data. Descriptive studies portray the variables by answering who, what and how (Babbie, 2002). According to Cooper and Schindler (2004), a study was concerned with finding out who, what, where, when and how of a phenomenon is a descriptive study, which is the concern of the proposed research project. The variables under study included; elements of operational excellence and execution strategies which encompasses the firm's internal processes, level of resource optimization and level of use of automation; business level practices which exposed measures on team management and positioning models such as SWOT analysis; corporate level practices which sought to measure the extent of stakeholder management, influence of corporate branding and use of models to measure external influences; and the overall performance of the private construction firms. A cross-sectional survey on three private construction companies from which data was collected, was performed in this study.

### **3.3 Population**

The study population comprises the entire groups of individuals, objects, items, cases, articles or things with common attributes or characteristics existing in space at a particular point of time (Baker, 1999; Majumdar, 2005). The study population comprised of 62 building construction and consulting companies in Kenya as at September, 2014. According to Mugenda and Mugenda (2003), a target population is that population which the researcher wants to generalize results. The target population for

this study identified all the employees both contractual and permanent in the three construction firms identified from the study population.

**Table 3.1 : List of Registered Contractors in Kenya**

<b>Name of Construction Firm</b>	<b>Name of Construction Firm</b>
Mecada Contractors	Blue Urban Construction Ltd.
Elsek And Elsek Construction	Dawda Group Construction Limited
Intex Construction	First Arces Construction Ltd.
Jaha Construction Company	Archbuild Limited
Erdemann Limited	Arcs Africa Ltd
Kingspride Contractors Ltd	Dara Consulting Ltd
Mutungechi Contractors Ltd.	Nipsan Construction Ltd.
Garden Real Development Contractors Ltd	Dankie Limited
Xilman Contractors Limited	Barker And Barton Kenya
Developing Africa Constrution Limited	Becam Constructors Ltd
Frame Consultants Ltd	Dinara Developers Limited
Lee Construction Ltd	Elgon Towers Construction Company Limited
Rex Construction Consultants Ltd	Homeland Real Estate Development Ltd
Simba Corp.	Innovative Planning And Design Consultants
E.D.G. & Atelier	Construction Cost Consultancy
Mavji Construction Ltd	Ecocare Consultants
Edarns Enterprises Ltd.	Gugobuild Ltd
AMS Construction	Kings Developers
Intersec Construction Consultants	SDS Construction Ltd
Urbanis Africa	Intersec Technical Kenya Limited
Africost Kenya Consulting Quantity Surveyors	J. S. Kalsi Contractors & Associates
Bella Line Interor Contractors Ltd	Oaks Construction Company Limited
Classic Mouldings Contractors	Building Scope Limited
Adventis In-house Africa	Civicon Engineering Africa
Chania Gardens Limited	Costing Consult Contractors
Contrastrict Associates	Image 360 Designs Ltd
Actis Construction	Midroc Construction Limited
Cuak Construction	Archens Company Limited
Acorn Group Limited	Bluebell Construction Limited
Aktasis Construction Consultants	Parbat Siyani Construction Limited
Arprim Contractors	Gibb Africa Ltd

Source: National Construction Authority, 2014



At present, the employee structure of the three firms stands as follows;

**Table 3.2: Target Population**

Name of Construction Firm	Employee (Contracted)	Number	Employee Number (Permanent)
First Arces Construction Ltd.	70	20	
Blue Urban Construction Ltd.	50	15	
Nipsan Construction Ltd.	65	10	

### 3.4 Sample Size and Sampling Technique

#### 3.4.1 Sampling Frame

A sample is a subset of a particular population while sampling is the practice concerned with the selection of individual observations intended to yield some knowledge about a population of concern especially for the purpose of statistical inference (Mugenda and Mugenda, 2003). The sample size is a

representative of the target population. According to Mugenda and Mugenda (2003) a researcher would have to use 30% of the total target population as a sample size for it to be accepted as a good representative sample. Thus, a total sample of 68 respondents were selected from the target population. This was obtained using the formula illustrated below:

$$\frac{30\%}{100} \times \text{Total Number of Employees in the construction firms}$$

**Table 3.3 Sampling Frame**

Name of Construction Firm	Employee Number (Contracted)	Employee Number (Permanent)	30% Sample Size (Contracted) n	30% Sample Size (Permanent) n
First Arces Construction Ltd.	70	20	21	6
Blue Urban Construction Ltd.	50	15	15	4
Nipsan Construction Ltd.	65	10	19	3
<b>Total</b>	<b>185</b>	<b>45</b>	<b>55</b>	<b>13</b>

Therefore, total sampling frame = (contracted (n) ) + ( permanent (n) ) = 68 respondents

**3.4.2 Sampling Techniques**

The researcher chose to use simple random sampling because of the following reason namely; the ease of assembling the sample. It was considered as a fair way of selecting a sample from a given population since every member was given equal opportunities of being selected; due to the representativeness of a sample obtained by simple random sampling, it was reasonable to make generalizations from the results of the sample back to the population as one of the goals of research was to be able to make conclusions pertaining to the population from the results obtained from a sample.

**3.5 Data Collection Instruments**

Primary data was collected using pre-determined questionnaires. The study used questionnaires containing closed ended, open ended, multiple choice and dichotomous questions. According to Creswell (1994), data collection methods for primary data include; structured and semi-structured questionnaires, mailed questionnaires, structured and semi-structured interviews (personal and telephone interviews), observation and focus groups. Likert scale questions were also used since the responses are easily quantifiable and subjective to

computation. Since it does not require the participant to provide a simple and concrete yes or no answer, it does not force the participant to take a stand on a particular topic, but allows them to respond in a degree of agreement; this makes question answering easier on the respondent. Unstructured questions (where respondents were to answer based on the knowledge one has) was used so as to encourage the respondents to give an in-depth and felt response without feeling held back in revealing any relevant information. Secondary data was sourced from organizational process assets and published materials.

**3.6 Data Collection Procedures**

The study used both primary and secondary data. Secondary data was cited from library resources and organizational process assets such as company project reports. The drop and pick method was used to collect primary data.

**3.7 Pilot Testing**

According to Connelly (2008), extant literature suggests that a pilot study sample should be 10% of the sample projected for the larger parent study. Prior to the main study, a pilot study was conducted with 7 employees of a different contractor company. This process was to help refine the questionnaire, enhance its legibility and minimize the chances of misinterpretation. This was obtained using the formula illustrated below:

$$68 = \frac{10\%}{100} \times 7$$

**3.7.1 Reliability**

Reliability refers to a measure of the degree to which research instruments yield consistent results (Mugenda and Mugenda, 2003). In this study, reliability was ascertained by pre-testing the questionnaire with a selected sample of employees from a different firm to avert biasness.

**3.7.2 Validity**

The accuracy of data collected largely depended on the data collection instruments in terms of validity. Validity as noted by Robinson (2002) is the degree to which result obtained from the analysis of the data actually represents the phenomenon under study. Validity was ascertained by having all the objective questions included in the questionnaire.

**3.8 Data Presentation and Analysis**

**3.8.1 Data Analysis**

Common data collection methods used in qualitative research are focus groups, in-depth interviews, uninterrupted observations, interviews with managers regarding strategic decision making, how they perceive it and what they use as a guide to making these decisions. Statistical applications such as

Statistical Package for the Social Sciences (SPSS) was used as a platform for data analysis. Data analysis was done to generate a view of how the objectives were to be achieved. This was done using descriptive statistics, which saw the use of frequency tables, percentage charts/ pie charts, distribution tables and bar graphs.

**3.8.2 Data Presentation**

According to Miller (1991), descriptive statistics is used to describe data collected from a sample. The mean, median, percentage, mode and standard deviation are the most commonly used descriptive statistics. Measures of central tendency were used in this study to give a description of the data. Graphs bar and pie charts was used for further representation.

**IV. RESEARCH FINDINGS AND DISCUSSIONS**

**4.1 Introduction**

This chapter presents the findings from the respondents from three construction firms namely; First Acres, Nipsan and

Blue Urban Construction Company who were drawn from the three levels of the organizational structure. The operational level included labourers, foremen and site engineers; the business level encompassed business developers / marketing and sales staff and corporate level included C-level management such as the managing directors, project manager and finance directors. They were given questionnaires to fill out of which data was collected,

analyzed and interpreted. The results are presented in form of tables and charts

**4.2 Response Rate**

Out of 68 questionnaires that were issued 56 were filled and returned. This gave 82.35% response rate of the study. The respondents from the three companies were distributed in table below.

**Table 4.1: Frequency Table of title of Respondents**

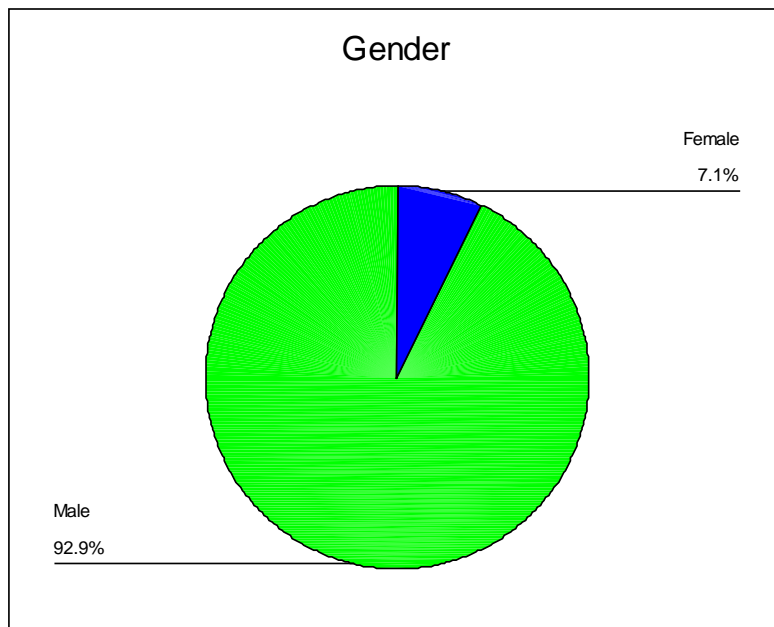
Organization structure	Frequency	Percent	Cumulative Percent
Business Level	14	25	25
Corporate Level	7	12.5	37.5
Operational Level	35	62.5	100
Total	56		

From table 4.1, 62.5% of the respondents were employed at operation level, 12.5% were from corporate level and 25% were from business level. This indicates that majority were from operational level.

**4.3 General Information on Respondents**

**4.3.1 Gender**

From the study regarding gender of the respondents it was revealed that majority were male as shown in figure 4.1 below.



**Figure 4.1: Gender Pie-Chart**

From figure 4.1 regarding gender, 92.9% were male and 7.1% of the respondents were female. This indicates that majority of the employees in construction industry as men.

**4.3.2 Age of the respondents**

Age of the respondents were as in the table below:

**Table 4.2 Descriptive Statistics of age of Respondents**

	N	Minimum	Maximum	Mean	Std. Deviation
Age	56	26	48	32.57	4.902
Valid N (list wise)	56				

From table 4.2, the average age of all of respondents was found to be 32.57 years of age. The minimum age being 26 and maximum age being 48 years. The standard deviation was 4.902 which is small and it indicates that majority of the respondents had almost the same age being close to the average age.

### 4.3.3 Years of Service

Years of service for each respondents was summarized in the figure 4.2

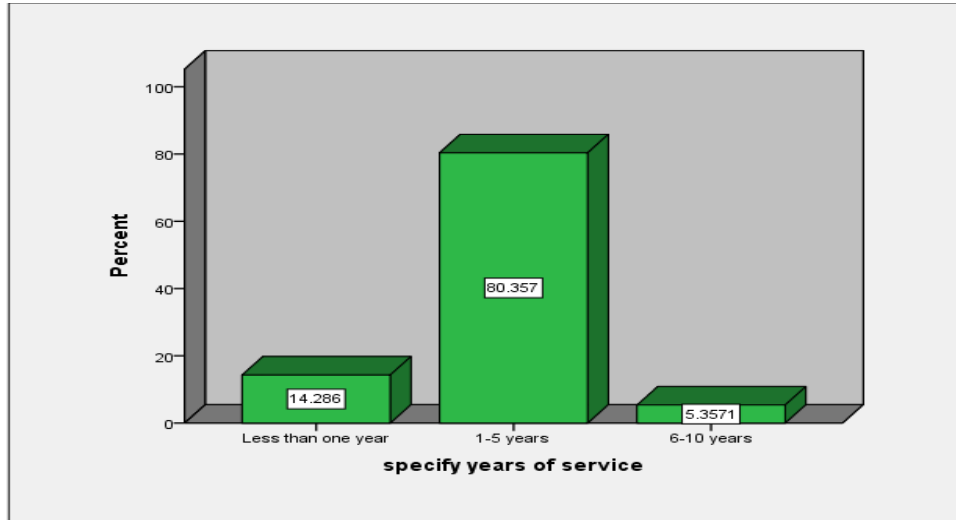


Figure 4.2: Year of Service

From fig 4.2, 14.286% of the employees have worked for less than one year, 5.35% have worked for 6-10 years and majority of around 80.36% have worked between 1-5 years. This indicates that many of the respondents had worked for the Construction Companies for a good time and hence data was collected from more experienced respondents.

### 4.3.4 Level of Practice

Level of Practice of the respondents was observed to be as in the figure 4.3

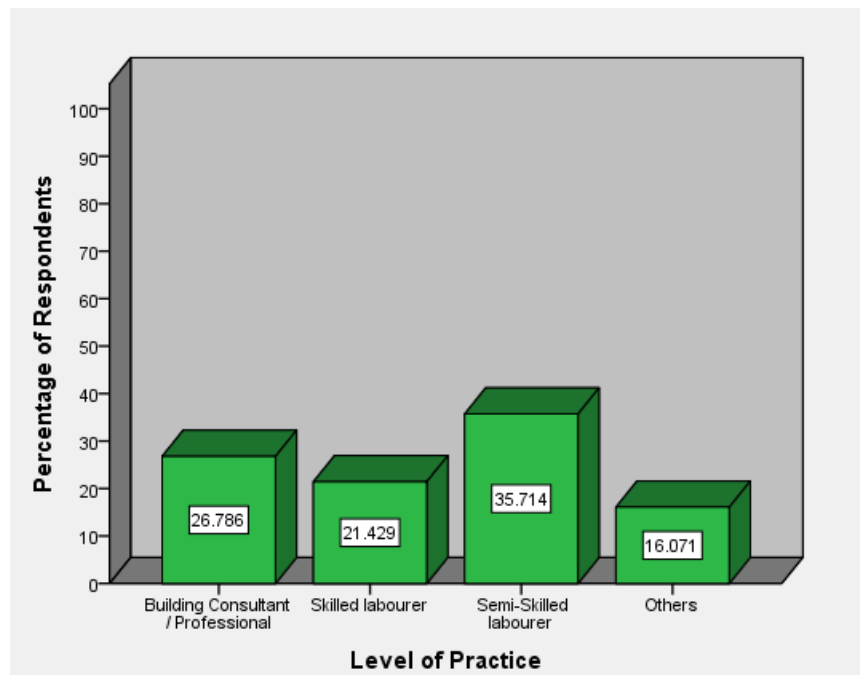


Figure 4.3: Level of Practice of Respondents

From figure 4.3, 26.78% of the respondents are practicing building consultants, 21.43% are skilled labours, 35.71% are semi-skilled and 16.07% had other levels of practice in the company.

**4.3.5 Other Level of practices**

**Table 4.3 Frequency Table of Other Levels of Practice**

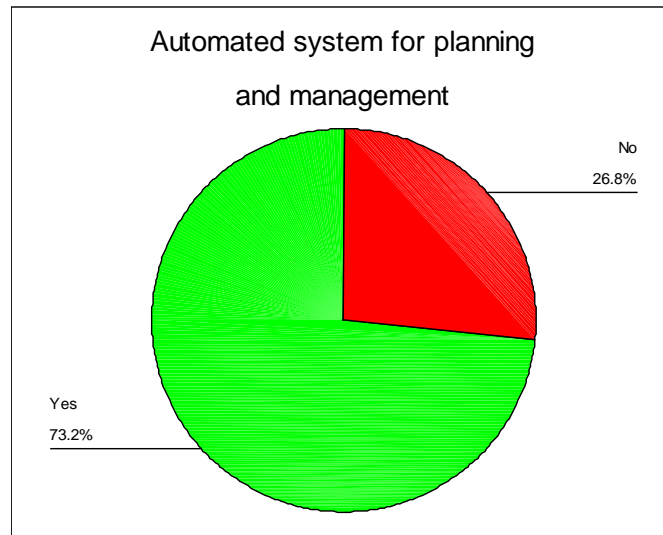
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No. of Response	47	83.9	83.9
	Office Staff	9	16.1	100.0
Total		56	100.0	100.0

From table 4.3, the respondents were asked to specify their other levels of practice, 83.9% of the respondents had no other levels of practice, and 16.1% were office staff.

**4.4 Operation Excellence Strategies**

**4.4.1 Use of Automated System**

Respondents were asked if the firm uses automated system for planning and Management of construction timelines and milestone and they responded as follows



**Figure 4.4 Automated system for planning and Management**

From figure 4.4, 73.2% of the respondents accepted that they are using automated system for planning and management of construction timelines and milestone while 26.8% said that they do not use the system.

**4.4.2 Rate on the impact of automated system on operational efficiency**

Respondents were asked regarding their rate on the impact of this system on operational efficiency and it was shown in the frequency table below.

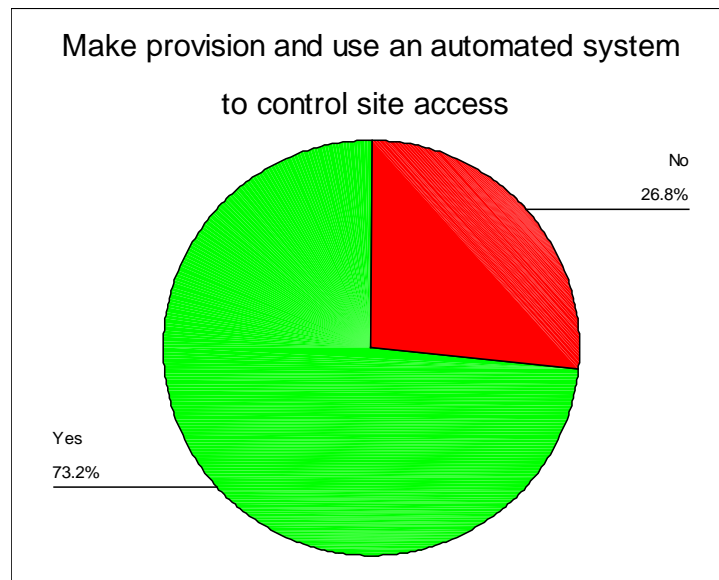
**Table 4.4 Frequency table on the rate of the impact of Automated System on operational efficiency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Response	15	26.8	26.8	26.8
	Least Impact	6	10.7	14.6	37.5
	Less Impact	7	12.5	17.1	50.0
	Moderate Impact	10	17.9	24.4	67.9
	High Impact	16	28.6	39.0	96.4
	Highest Impact	2	3.6	4.9	100.0
	Total	41	73.2	100.0	
Total		56	100.0		

From table 4.4, 26.8 % did not respond on the rating of the system, 10.7% of the respondents had least impact, 12.5% had less impact, 17.9% had moderate impact, 28.6% had high impact and 3.6% had highest impact. Majority of the respondents suggested that automated system has high impact on operational efficiency and this will result to operational excellence which then influences the growth and performance within the construction company.

**4.4.3 Provision and use of automated system to control site access.**

Respondents were asked if the firm has provision and uses an automated system to control site access and provide vigilance for the security and control of material storage and they responded as follows



**Figure 4.5 Provision and use of automated system to control site access**

From figure 4.5, 73.2% of the respondents accepted that they provide and use of automated system to control site access while 26.8% said that they are not provide and use of automated system to control site access and provide vigilance for the security and control of material storage.

**4.4.4 Rate on provision and use of automated system to control site access**

**Table 4.5 Rate of impact of this system on operational efficiency**

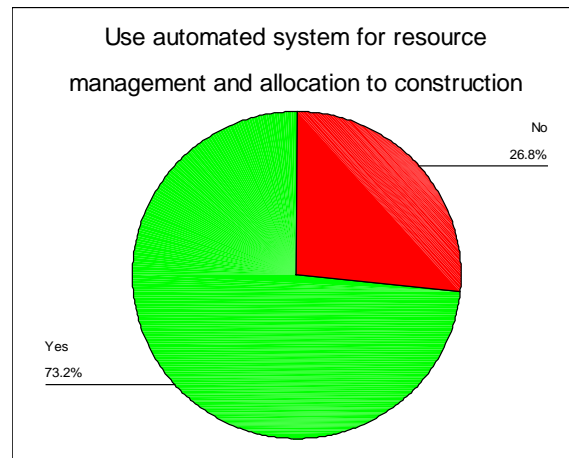
		Frequency	Percent	Cumulative Percent
Valid	No Response	15	26.8	26.8
	Least Impact	6	10.7	37.5

Less Impact	7	12.5	50.0
Moderate Impact	10	17.9	67.9
High Impact	16	28.6	96.4
Highest Impact	2	3.6	100.0
Total	56	100.0	

From table 4.5, 26.8 % did not respond on the rating of the system, 10.7% of the respondents had least impact, 12.5% had less impact, 17.9% had moderate impact, 28.6% had high impact and 3.6% had highest impact. Majority of the respondents suggested that provision and use of automated system to control site access and this will result to operational excellence which then influences the growth and performance of the construction company.

**4.4.5 Use of automated system for resource management and allocation to construction projects.**

Respondents were asked if the firm use of automated system for resource management and allocation to construction projects awarded to their firm and they responded as follows



**Figure 4.6 Use of automated system for resource management and allocation to construction projects**

From figure 4.6, 73.2% of the respondents accepted that they use automated system for resource management and allocation to construction projects while 26.8% said that they do not have provision and use of automated systems.

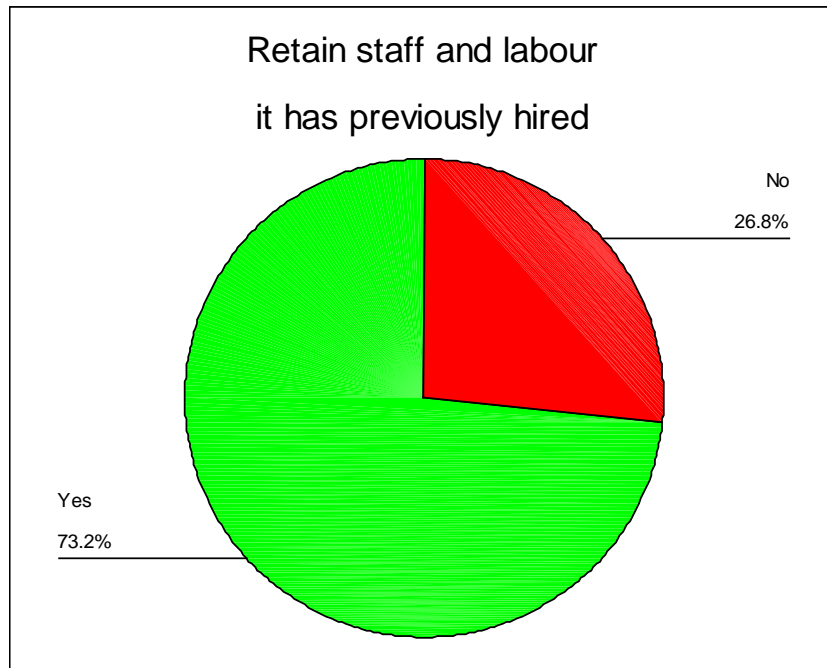
**4.4.6 Rate on Use of automated system for resource management and allocation**

**Table 4.6 Rate the impact of this system on operational efficiency**

		Frequency	Percent	Cumulative Percent
Valid	No Response	15	26.8	26.8
	Least Impact	6	10.7	37.5
	Less Impact	7	12.5	50.0
	Moderate Impact	10	17.9	67.9
	High Impact	16	28.6	96.4
	Highest Impact	2	3.6	100.0
	56	100.0		

From table 4.6, 26.8 % did not respond on the rating of the system, 10.7% of the respondents had least impact, 12.5% had less impact, 17.9% had moderate impact, 28.6% had high impact and 3.6% had highest impact. Majority of the respondents suggested that the firm use of automated system for resource management and allocation to construction projects had high impact and this will result to operational excellence which then has a direct influence to the growth and performance of construction companies.

**4.4.7 Firm’s Retention of staff and labour it had previously hired**



**Figure 4.7: A graph of the Firm’s Retention of staff and labour it had previously hired**

From figure 4.7, 73.2% of the respondents accepted that the firms retains staff and labour it has previously hired to work for the company while 26.8% said that it does not retain staff and labour.

#### 4.5 Internal Processes and Quality Management

##### 4.5.1 Organization has a quality assurance mechanism

Respondents were asked if the company has a quality assurance mechanism and they responded as from the chart below



**Figure 4.8: Organization has a quality assurance mechanism**

From figure 4.8, 92.9% of the respondents accepted that organization has a quality assurance mechanism while 7.1% said that it does not have. Since majority accepted then it indicates that the system is in place hence the quality of work is monitored and influences the performance of the construction firms.



**4.5.2 Measures to ensure quality and continuous improvement of the firm's performance**

**Table 4.7 Measures to ensure quality and continuous improvement of the firm's performance**

	Frequency	Percent
No Response	11	19.6
Benchmarks	6	10.7
Communication Channels	14	25.0
Customers Feedback analysis	1	1.8
employee motivation	4	7.2
Friendly Work environment	1	1.8
gather all requirements	2	3.6
key performance indicator	1	1.8
Market surveys	1	1.8
Valid open door policy	1	1.8
qualified personnel	1	1.8
quality audit	1	1.8
regular meetings	1	1.8
Site Inspection	6	10.8
training staff	2	3.6
updating reports	1	1.8
use of ICT	1	1.8
using standards	1	1.8
Total	56	100.0

From table 4.7, improve on Communication Channels had the highest response of 25.0% ,set benchmarks had 10.7%,site inspection had 10.8% and employee motivation had a significant

response of 7.25. Also 19.6% did not response on this issue and the rest had some significant response.

**4.5.3 Descriptive statistics on Internal Process perspective Indicators within the organization.**

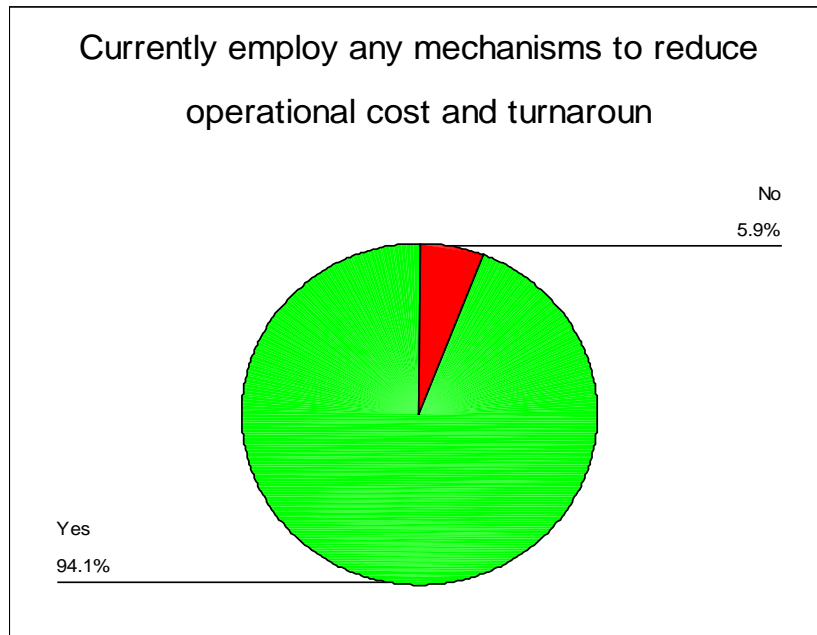
**Table 4.8 Descriptive Statistics of Internal Process**

	We adopt processes that address concerns of our stakeholders	We use benchmarking to continuously improve our business processes	We are able to objectively measure the social impact of our operations	Our internal business processes contribute greatly towards organizational profitability
N	Valid 49	49	49	49
	No Response 7	7	7	7
Median	3.00	4.00	3.00	4.00
Mode	3	4	3	4

From table 4.8, 'we adopt processes that address concerns of our stakeholders' has a mode and median 3 which is somehow agree as per the likert scale and this indicates that many respondents somehow agreed that the organization adopt processes that address concerns of our stakeholders and this influences strategic management practices on the performance of private construction firms. 'we use benchmarking to continuously improve our business processes' has a mode and median of 4 which is agree as per the likert scale this indicates that many respondents agreed that the organization uses benchmarking to continuously improve our business processes. 'we are able to objectively measure the social impact of our operations' has a

mode and median of 3 which is somehow agree as per the likert scale and this indicates that many respondents somehow agreed that the organization is able to objectively measure the social impact of our operations and 'our internal business processes contribute greatly towards organizational profitability' has a mode and median of 4 which is agree as per the likert scale this indicates that many respondents agreed that their internal business processes contribute greatly towards organizational profitability. From the study 7 respondents did not suggest anything on the internal process perspective indicators within their organization.

**4.5.4 Currently employ any mechanism to reduce operational costs and turnarounds Times.**



**Figure 4.9 Employ any mechanism to reduce operational costs and turnarounds Times**

Figure 4.9, 94.1% of the respondents indicated that the companies currently employ mechanism to reduce operational costs and turnarounds times while 5.9% indicate that the company is not employing any mechanism to reduce operational costs and turnarounds times.

**Table 4.9 Mechanisms to reduce operational costs and turnarounds times**

	Frequency	Percent	Valid Percent	Cumulative Percent
No Response	8	14.3	14.3	14.3
attendance system	1	1.8	1.8	16.1
baseline measures	3	5.4	5.4	21.4
control charts	1	1.8	1.8	23.2
Cutting back on materials	1	1.8	1.8	25.0
Dividing Labour	1	1.8	1.8	26.8
performance report	8	14.3	14.3	41.1
proper communication	1	1.8	1.8	42.9
record keeping	2	3.6	3.6	46.4
reducing paper waste	4	7.1	7.1	53.6
Risk analysis	1	1.8	1.8	55.4
risk management	1	1.8	1.8	57.1
save on stationery	1	1.8	1.8	58.9
site inspection and audits	3	5.4	5.4	64.3
Site Meeting	3	5.4	5.4	69.6
Training staff	1	1.8	1.8	71.4
using control charts	1	1.8	1.8	73.2
Using organizational process assets	1	1.8	1.8	75.0
Using Quality audits	2	3.6	3.6	78.6
Using Quality Audits	1	1.8	1.8	80.4
Work Schedules	11	19.6	19.6	100.0
Total	56	100.0	100.0	

From table 4.9 performance reports and use of work schedules are the significant mechanisms that can be employed to reduce operational cost and improve turnaround times where they have 14.3% and 19.6% respectively.

Overall, the findings within this emanating from analysis of operational excellence as an influence to performance of construction firms tally with literature exposes operations strategy, technology management, quality and operations planning and scheduling systems as the most prominent in the construction industry as facets that contribute to the success of operational excellence and management (Scudder & Hill 1998). Operational activities and management continue to be of central importance in developing construction. Seen from a management

perspective, organisational, quality and productivity issues on the site still are very important explanations for the lack of economic success for contractors, with important implications for clients, architects and consulting engineers. There should therefore be a continual interest within construction management on operations strategy and operations management. This argument supports the findings in regard to operational excellence.

**4.5.5 Greatest concern within the operational Level**

Respondents were asked on the Greatest Concern within their operational Level in their working environment and their response were as shown in the table below

**Table 4.10 Greatest concern within the operational level of the firm**

Greatest concern	Percentage (%)
Remuneration	19.6
Health and Safety	21.4
Working Hours	10.7
Communication from supervisors	41.1
Other	0.0

From table 4.10, 41.1% of the respondents accepted that communication from supervisors is the greatest concern to them, 21.4% accepted that Health and Safety is the greatest concern, 19.6% accepted that remuneration is the greatest concern and 10.7% accepted that working hours is the greatest concern within the operational level of the firm.

**4.6 Business Strategy Practices**

**4.6.1 Skills and traits exhibited by the team leader**

Respondents were asked on the skills and traits exhibited by their team leader and they respond as shown in the table 4.11

**Table 4.11 Descriptive Statistics of Skills and traits**

		Dynamism	Resilience	Technical Knowledge	Management Skills	Understanding of clients requirements	Negotiation Skills	Motivation
N	Valid	56	56	56	56	56	56	56
	Missing	0	0	0	0	0	0	0
Median		3.00	3.00	4.00	4.00	4.00	4.00	4.00
Mode		3	3	4	4	4	4	4
Range		3	3	2	3	2	2	2
Minimum		2	2	3	2	3	3	3
Maximum		5	5	5	5	5	5	5

From table 4.11, out of 56 of the respondents that were interviewed all responded .The median and mode of dynamism was 3 which is moderate as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and trait exhibited by their team leaders as moderate. The median and mode of resilience was 3 which is moderate as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and trait exhibited by their team leaders as moderate. The median and mode of technical knowledge was 4 which is greater extent as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and

trait exhibited by their team leaders as greater extent. The median and mode of management skills was 4 which is greater extent as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and trait exhibited by their team leaders as greater extent. The median and mode of understanding of clients required was 4 which is greater extent as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and trait exhibited by their team leaders as greater extent. The median and mode of negotiation Skills was 4 which is greater extent as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and

trait exhibited by their team leaders as greater extent. The median and mode of motivation was 4 which is greater extent as per the likert scale, this indicated that majority of the respondents ranked the extent of this skill and trait exhibited by their team leaders as greater extent. This shows that within team leadership as a factor to improve the performance of the construction firm, technical knowledge, management skill, understanding of requirements,

negotiation skills and worker motivation were key to the traits of an effective team leader.

**4.6.2 Behaviour and attitude exhibited by team members**

Respondents were asked on the behaviour and attitude exhibited by team members and they respondent as shown in the table below

**Table 4.12 Descriptive Statistics on behaviour and attitude**

		Disciplined	Co-operative	Communicative	Creative and Proactive
N	Valid	56	56	56	56
	Missing	0	0	0	0
Mode		3	3	4	4
Range		3	2	3	3
Minimum		2	3	2	2
Maximum		5	5	5	5

From table 4.12, out of 56 of the respondents that were interviewed all responded. The mode of disciplined is 3 and this is moderate as per the likert scale, this indicated that majority of the respondents accepted that they were being disciplined to a moderate extent. The mode of Co-operative is 3 and this is moderate as per the likert scale, this indicated that majority of the respondents accepted that team members were co-operative to a moderate extent. The mode of communicative is 4 and this is great extent as per the likert scale, this indicated that majority of the respondents accepted that team members were communicative to a great extent. The mode of creative and proactive is 4 and this is great extent as per the likert scale, this indicated that majority of the respondents accepted that team members were creative and proactive to a great extent.

The findings above are in support of existing literature on previous studies done within the domain of team management within construction projects. The project team which mainly constitutes of the contractor and the design consultants are the key project participants in construction projects and their respective team leaders form the main focus of this of team management as a variable to business strategy. As they form core management personnel, they should possess pertinent

management skills, namely leading, planning, organizing and coordinating skills and perform to the greatest extent of their capability to ensure robust and efficient operational flow within the defined project timelines (Smith and Wilkins, 1996). It is important as a team to capture the client needs and be mindful to the business and cultural aspects of the company (Deakin, 1999). Indeed, all project team leaders should be devoted to the integration of specialized knowledge for a common purpose towards project success and ultimately the performance of the construction firm (Hemlin, 1999) and should be equipped with knowledge on construction documentation and dissemination (Songer and Molenaar, 1997). Apart from working within the constraints of the project itself, project team leaders should also possess certain human skills in coping with stresses, establishing good relationships among team members and inducing a harmonious working atmosphere (Smith and Wilkins, 1996).

**4.6.3 Availability of assets and capability within their firm give competitive advantage**

Respondents were asked on the availability of assets and capability within their firm give competitive advantage and they responded as shown in the table 4.13

**Table 4.13 Descriptive Statistics on availability of assets and capability**

		Technological Assets and Capabilities	Financial Assets and Capabilities	Reputational Assets and Capabilities	Organisational Assets and Capabilities	Institutional Assets and Capabilities
N	Valid	56	56	56	56	56
	Missing	0	0	0	0	0
Median		3.00	3.00	4.00	4.00	4.00
Mode		3	3	4	4	4
Range		3	4	4	3	2
Minimum		2	1	1	2	3
Maximum		5	5	5	5	5

From table 4.13, out of 56 of the respondents that were interviewed all responded. The median and mode of technological assets and capabilities is 3 which is somehow agree as per the likert scale, this indicated that majority of the respondents somehow agreed that technological assets are

available within their firm are capable to give competitive advantage. The median and mode of financial assets and capabilities is 3 which is somehow agree as per the likert scale, this indicated that majority of the respondents somehow agreed that financial assets available within their firm and are capable to

give competitive advantage. The median and mode of reputational assets and capabilities is 4 which is agree as per the likert scale, this indicated that majority of the respondents agreed that reputational assets are available within their firm and are capable to give competitive advantage.

The median and mode of organizational assets and capabilities is 4 which is agree as per the likert scale, this

indicated that majority of the respondents agreed that organizational assets are available within their firm and are capable to give competitive advantage. The median and mode of institutional assets and capabilities is 4 which is agree as per the likert scale, this indicated that majority of the respondents agreed that institutional assets are available within their firm and are capable to give competitive advantage.

**Table 4.14 One-Sample Test on availability of assets and capability**

		Test Value = 0			Mean Difference	95% Confidence Interval of the Difference	
		t	Df	Sig. (2-tailed)		Lower	Upper
Technological Capabilities	Assets and	36.380	55	.000	3.464	3.27	3.66
Financial Capabilities	Assets and	29.040	55	.000	3.286	3.06	3.51
Reputational Capabilities	Assets and	32.075	55	.000	3.464	3.25	3.68
Organizational Capabilities	Assets and	36.708	55	.000	3.500	3.31	3.69
		47.545	55	.000	3.589	3.44	3.74

From table 4.14, the computed p-values of all the resources are all significant at p-value < .05 since their p = 0.000

The findings above complements the literature that exists on the resource based view. According to RBV theory, if resources can be readily obtained in the factor markets or can be easily imitated by competitors, they cannot represent a meaningful source of economic benefit. As emphasized by Galbreath (2005), tangible assets or resources are mostly prone to imitation and therefore dilute a firm’s competitive leverage. Emanating from a business point of view, core competencies can be viewed as combination of attributes that an organization possesses which in turn allows it to achieve competitive advantage. Therefore, construction firms should attain those competencies that may curb competitor duplication. The managers must turn their attention to resources that are intangible in nature to build strategic capability. For the company, three core components also known as assets to competitive leverage arise, namely organizational assets, reputational assets and tangible assets.

Organizational assets, such as culture, human resource management policies and corporate structure can significantly impact on a company’s success. Such assets should be carefully planned and developed, particularly with respect to their synergistic impact on the development and utilization of firm capabilities. Organizational assets may also be intangible assets that can resist the duplication efforts of competitors. For example, contracts (e.g. franchise agreements, licensing agreements) can be one of the most important resources for some companies. Because contracts are legally enforceable by law, they may prevent competitors from replicating the benefits derived from such agreements. Likewise, other organizational assets such as culture, human resource management policies and organizational structure may be difficult to duplicate as well. Management must turn its attention to such resources whose

accumulation over a period of time represent high levels of asset specificity.

Reputational assets are among the most important the company can develop. Logically, a good reputation leads to positive performance, both financially and socially. Strategic efforts aimed towards building and maintaining a good reputation is essential in the management of company’s resources. Marketing scholars have particularly emphasized the impact of the intangible asset reputation on firm success. Largely, reputational assets, in its various forms, summarize a good deal of information about firms and shape the responses of customers, suppliers, and competitors. Similarly, as signaling theory suggests, reputational assets can inform external constituents about the trustworthiness, credibility and quality of the firm. Therefore, reputational assets can be key drivers of external constituents positive reactions toward a firm vis-à-vis its competitors, thus positively impacting on firm success. Reputation is built, not bought, suggesting that it is a non-tradable intangible asset that may be much more difficult to duplicate than tangible assets.

Tangible assets may still have a viable place in the performance of company. Company should able to generate high value-in-use of financial or physical assets which may indeed be able to leverage such assets for competitive advantage while creating barriers to duplication. Proprietary processes and equipment includes equipment protected by patents as well as unpatented processes and equipment held in secret. It also includes state-of-the-art equipment and construction processes that have been developed exclusively by the firm. Focus should be on competitive assessments of production processes of the construction plant as a whole, and the degree to which production processes are proprietary.

**4.6.4 Conducted SWOT Analysis**

Respondents were asked if they conduct SWOT analysis to determine strength and weakness, opportunities and threats and they responded as shown in the figure 4.11

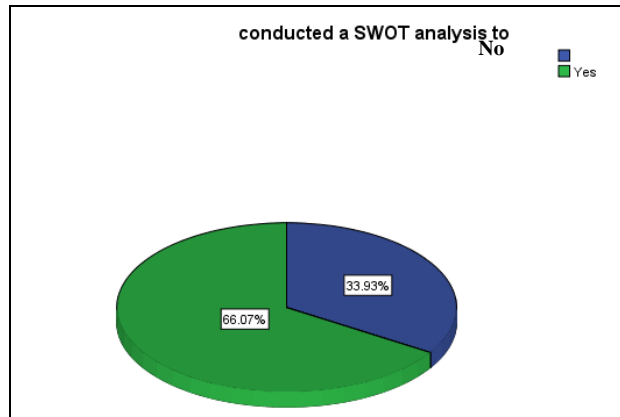


Figure 4.10 SWOT Analysis

From figure 4.10, 66.07% of the respondents indicated that the firms conduct a SWOT analysis while 33.93% said that construction companies do not conduct SWOT analysis when determine strength and weakness, opportunities and threats of the company.

**4.6.5 Importance of Conducting SWOT analysis**

Respondents were asked to rate the importance of conducting SWOT analysis in tandem with the business goal at middle level and they responded as shown in the table below.

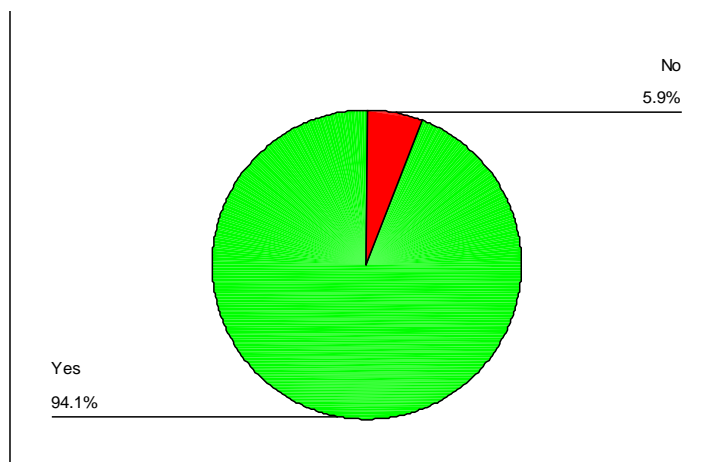
**Table 4.15 Level of Importance of conducting SWOT**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less Importance	3	5.4	8.8	8.8
Moderate Importance	11	19.6	32.4	41.2
Valid High Importance	14	25.0	41.2	82.4
Highest Importance	6	10.7	17.6	100.0
No Response	22	39.3		
<b>Total</b>	<b>56</b>	<b>100.0</b>		

From table 4.15, 5.4% rated the importance to less importance, 19.6% to moderate importance, 23% to high importance, 10.7% to highest importance and 39.3% did not respond to rating.

**4.6.6 Strategies to leverage on Strengths and Opportunities and combat Weaknesses and Threat**

Respondents were asked to if they have devised strategies to combat strengths, opportunities, weaknesses and threat and they responded as shown in the figure 4.11



**Figure 4.11 Pie-chart of Strategies devised to leverage on Strengths, opportunities and combat weaknesses and threat**

From figure 4.11, 94.1% accepted that strategies devised to leverage on strengths, opportunities and combat weaknesses and threat were within the firms’ management structures in place and 5.9% said they have not been devised.

**Table 4.16 Strategies to leverage on strengths, opportunities and combat weaknesses and threats**

	Frequency	Percent	Valid Percent	Cumulative Percent
Planning and Communication management	31	55.4	55.4	55.4
Analyzing performance	1	1.8	1.8	57.1
Stakeholder management	3	5.4	5.4	62.5
Historical data	4	7.1	7.1	69.6
Improve funding	1	1.8	1.8	71.4
Internal audits	1	1.8	1.8	73.2
Market surveys	2	3.6	3.6	76.8
Valid Organisation culture	1	1.8	1.8	78.6
Performance report	1	1.8	1.8	80.4
Team building	1	1.8	1.8	82.1
Training staff	5	8.9	8.9	91.1
Use of responsibility matrix	1	1.8	1.8	92.9
Using progress charts	1	1.8	1.8	94.6
Using consultants	1	1.8	1.8	96.4
Using risk registers	2	3.6	3.6	100.0
Total	56	100.0	100.0	

From table 4.16, 55.4 % of the respondents identified planning and communication management as ways to capitalize on strengths and opportunities as well as identification of weakness, threats and remedies thereof. Training staff as a strategy was confirmed by 8.9%, using historical data by 7.1%, communication channels by 5.4% and other strategies were below 4.0% as shown in the table. The findings show that SWOT analysis should be considered a structured and viable approach that helps strategists to systematically analyse the issues that may affect the fulfillment of the vision, mission and strategic

objectives. The SWOT analysis is a convenient and concise way of past, present and future evaluation to leverage on strengths and opportunities while guarding against threats and weaknesses (Pearce and Robinson Jr., 2000, Rabin et al., 2000, Macmillian and Tampoe, 2000).

**4.7 Corporate Level Strategy Practices**

**4.7.1 Influence of stakeholders on the strategy of the firm**

Respondents were asked to response on influence of the stakeholders on the strategy of the firm and they responded as below:

**Table 4.17 Descriptive Statistics on Influence of the stakeholders on the strategy of the firm**

		Government	Suppliers	Competitors	Trade Association	Employees	union	customer advocate group	customers	Financial community
N	Valid	25	25	25	25	25	25	25	25	25
	Missing	31	31	31	31	31	31	31	31	31
Median		4.00	4.00	4.00	3.00	4.00	2.00	2.00	4.00	3.00
Mode		4	4	4	2	4	2	2	4	3
Range		2	3	3	3	3	2	3	3	3
Minimum		3	2	2	1	2	1	1	2	2
Maximum		5	5	5	4	5	3	4	5	5

From table 4.17, out of 56 of the respondents that were interviewed only 25 respondents regarding this issue. A median and mode of 4 was achieved that indicated government, suppliers, competitors, employees and customers as the stakeholders with high influence as per the likert scale on the strategy of the company. The median and mode of trade associations as stakeholder is 3 which is moderate influence as per the likert scale, this indicated that majority of the respondents confirmed that trade association has moderate influence as stakeholders on the strategy of the firm. The median and mode of employees as stakeholder is 4 which is high influence as per the likert scale, this indicated that majority of the respondents confirmed that employees has highest influence as stakeholders on the strategy of the firm. The median and mode of union as stakeholder is 2 which is less influence as per the likert scale, this indicated that majority of the respondents confirmed that union has less influence as stakeholders on the strategy of the firm. The median and mode of customer advocate group as stakeholder is 2 which is less influence as per the likert scale, this indicated that majority of the respondents confirmed that customer advocate group has less influence as stakeholders on the strategy of the

firm. The median and mode of financial community as stakeholder is 3 which is moderate influence as per the likert scale, this indicated that majority of the respondents confirmed that financial community has moderate influence as stakeholders on the strategy of the firm.

The findings show that an organisation(s) can be influenced on several dimensions and in different ways, as the checklist of stakeholders in most undertakings is often long and their differing stakes can also become a major source of conflict. It is thus worthwhile to manage stakes in most undertakings. As stakes are not static but dynamic, there is a need to manage the constantly shifting balance between the interests of stakeholders (Goodijk, 2003). Stakeholder management dictates that an organisation should relate with many constituent groups and should engender and maintain the support of these groups by considering and balancing their relevant interests (Goodpaster, 1991; Freeman, 1994; Logsdon and Wood, 2000). Stake holding is thus a form of social inclusion and so it diminishes barriers to the expertise that is flowing into and out of organisations and groups (Moloney, 2006).

**4.7.2 Impact of Market forces (PESTEL) to the operations of the firm**

**Table 4.18 Descriptive Statistics on Market forces**

		Political Policies	Environmental forces	Social-Economic Forces	Legal forces
N	Valid	25	25	25	25
	Missing	31	31	31	31
Median		3.00	4.00	4.00	4.00
Mode		3	4	4	4
Range		4	2	2	2
Minimum		1	3	3	3
Maximum		5	5	5	5

From table 4.18, out of 56 of the respondents that were interviewed only 25 respondents regarding this issue. The median and mode of political policies as a market force 3 which is moderate impact as per the likert scale, this indicated that majority of the respondents confirmed that political policies has moderate impact to the operation of the firm. The median and mode of environmental forces as market force is 4 which is high impact as per the likert scale, this indicated that majority of the

respondents confirmed that environmental forces has high impact to the operation of the firm. The median and mode of social-economic forces as a market force is 4 which is high impact as per the likert scale, this indicated that majority of the respondents confirmed that social-economic forces has high impact to the operation of the firm. The median and mode of legal forces as a market force is 4 which is high impact as per the likert scale, this



indicated that majority of the respondents confirmed that legal forces has high impact on the operation of the firm.

### 4.7.3 Presence of Corporate Branding

Respondents were asked if the firm has a corporate brand and they responded as shown in the figure below

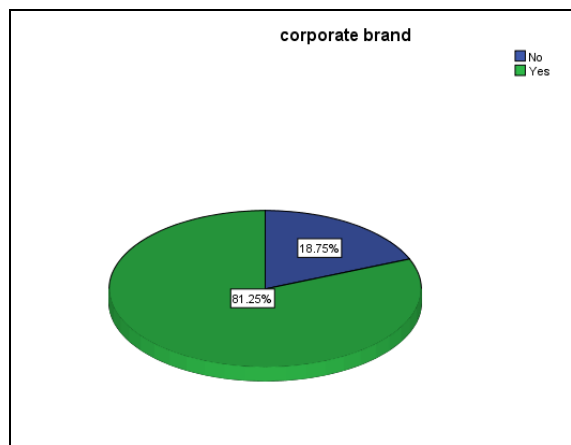


Figure 4.12 Corporate Brand

From figure 4.12, 81.25% accepted that the firm has a corporate brand and 18.75% said that it does not have a corporate brand.

Table 4.19 Frequency table of how brand play role in the firm

	Frequency	Percent	Valid Percent	Cumulative Percent
No Response	36	64.3	64.3	64.3
Valid				
accountable to client	1	1.8	1.8	66.1
attract clients	17	30.4	30.4	96.4
business continuity	2	3.6	3.6	100.0
Total	56	100.0	100.0	

From table 4.19, 64.3 % of the respondents did not respond on this issue, 1.8% said that it ensures accountability to clients, 30.4% said that it attracts clients and 3.6 said that it enhances business continuity.

### 4.7.4 Influences to the corporate strategy within the firms

Respondents were asked to indicate the level of importance on the following influences to the corporate strategy within the firm and they responded as shown in the table below

Table 4.20 Descriptive Statistics on the influence to the corporate strategy within the firm

	Increased Margin	Satisfying Customers	Getting Business	RepeatIncreasing Productivity	Reduce Costs
N	Valid 21	21	21	21	21
	Missing 35	35	35	35	35
Median	4.00	4.00	4.00	4.00	4.00
Mode	4	4	4	4	4
Range	2	1	1	1	1
Minimum	3	4	4	4	4
Maximum	5	5	5	5	5

From table 4.20, out of 56 of the respondents that were interviewed only 21 respondents regarding this issue. The median and mode of Increased Margin is 4 which is more important as per the likert scale, this indicated that majority of the respondents confirmed that Increased Margin has more important influence to the corporate strategy of the firm. The median and mode of Satisfying Customers is 4 which is more important as per the likert scale, this indicated that majority of

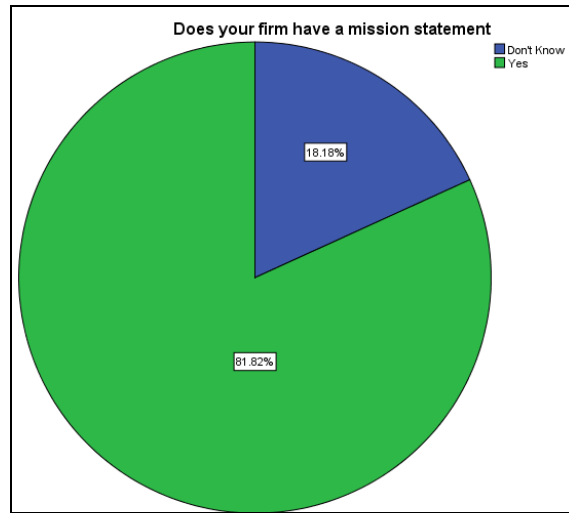
the respondents confirmed that Satisfying Customers has more important influence to the corporate strategy of the firm.

The median and mode of getting repeat business is 4 which is more important as per the likert scale, this indicated that majority of the respondents confirmed that getting repeat business has more important influence to the corporate strategy of the firm. The median and mode of increasing productivity is 4 which is more important as per the likert scale, this indicated that majority of the respondents confirmed that increasing

productivity has more important influence to the corporate strategy of the firm. The median and mode of reduce costs is 4 which is more important as per the likert scale, this indicated that majority of the respondents confirmed that reduce costs has more important influence to the corporate strategy of the firm.

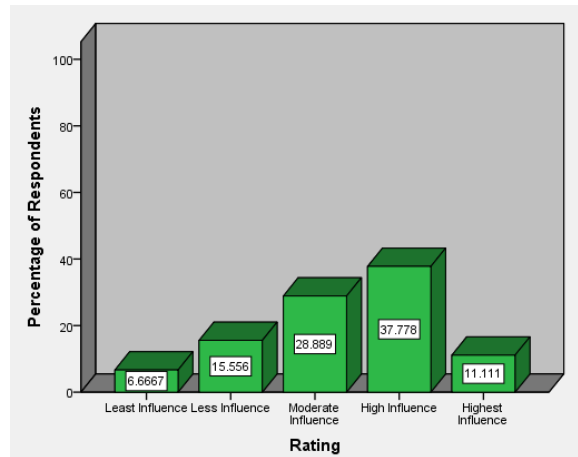
**4.7.5 Mission Statement**

Respondents were asked to indicate if the firm has mission statement and they respond as shown in the figure 4.14



**Figure 4.13 Mission statement**

From figure 4.13, 81.82% of the respondents accepted that the organization has a mission statement and 18.18% said that they don't know if it has a mission statement.



**Figure 4.14 Rate of the influence to the performance of the firm**

From figure 4.14, 6.7% of the respondents rate least influence of the mission statement on performance of the firm, 15.6% rated less influence, 28.9% rated moderate influence, 37.7% rated high influence and 11.1% rated highest influence.

**4.7.6 Vision Statement**

Respondents were asked to indicate if the firm has vision statement and they respond as shown in the figure below

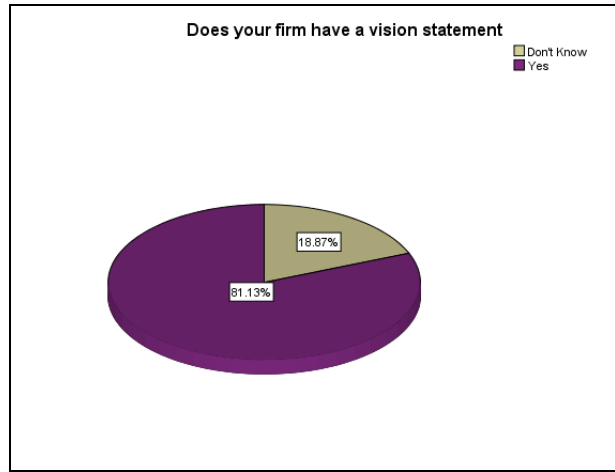


Figure 4.15 vision statement

From figure 4.15, 81.13% of the respondents accepted that the firm has a vision statement while 18.87% said they don't know.

Table 4.21 Rate of the influence of vision statement to the performance of the firm

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Least Influence	3	5.5	6.7
	Less Influence	8	12.7	22.2
	Moderate Influence	12	21.8	48.9
	High Influence	17	30.9	86.7
	Highest Influence	6	10.9	100.0
Missing	System	10	18.2	
Total		56	100.0	

From table 4.21, 5.5 % of the respondents rated the least influence of vision statement to performance, 12.7% rated less influence, 21.8% rated moderate influence, 30.9% rated high influence, 10.9% rated highest influence and 18.2% did not rate the importance of vision statement.

4.7.7 Level of adoption of Mission and Vision

Respondents were asked to indicate if they agree firm has mission and vision statement and they respond as shown in the figure 4.17



Figure 4.16 Agree with firm's Mission and vision

From figure 4.16, 86.67% accepted that they do agree with the firm's mission and vision statement while 13.33% said that they don't agree with the statement.

**Table 4.22 Suggestions to what should be included within the Mission Statement**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Response	49	89.1	89.1	89.1
	workers are not taken care of	7	10.9	10.9	100.0
	Total	56	100.0	100.0	

From table 4.22 89.1% did not respond on this issue but 10.9% said that the mission and vision statement do not take care of workers welfare and concerns.

According to literature on corporate planning performed by c-level management and encompasses a number of components namely; company mission and vision, market plan and growth options (Pryor, 2001). A mission statement is an important strategic tool because it states the company's expectations (Pryor, 2001). The goals and objectives look forward to what the company plans to achieve in the future. These should always be related to the company mission. There are three primary areas of company goals profit, finance and personnel (Pryor, 2001). Many

plans fail because of lack of time, commitment and forethought. The best approach is for senior management to calculate their objectives and to understand completely all types of issues that they will have to deal with in a growth environment. The findings show a consensus to studies previously done within the area of corporate planning within the construction industry and demonstrate the importance of elements that constitute the corporate planning practices and their influence on performance.

#### **4.8 Measures of Performance of Private Construction Firms**

##### **4.8.1 Presence of S.M.A.R.T Objectives**

Respondents were asked to indicate if firm has set strategic objectives and they responded as shown in the table 4.23

**Table 4.23 Response on whether firm has set strategic objectives**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Response	37	67.3	67.3	67.3
	No	12	21.8	21.8	89.1
	Yes	7	10.9	10.9	100.0
	Total	56	100.0	100.0	

From table 4.23, 21.8 % said that the firm has not set strategic objectives, 10.9% said it has set strategic objectives and 67.3% did not respond on this issue.

**Table 4.24 Metric used to measure Specific Objective**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Response	47	85.5	85.5	85.5
	defining market	1	1.8	1.8	87.3
	identify clients	2	1.8	1.8	89.1
	residential project	1	1.8	1.8	90.9
	using project charter	3	5.5	5.5	96.4
	Workers welfare	2	3.6	3.6	100.0
	Total	56	100.0	100.0	

From table 4.24, 85.5% did not respond on this issue regarding metric used to measure specific objective, 5.5% said they use projects charter, 3.6% said use workers welfare and the rest said identifying client requirements and defining markets to operate in.

**Table 4.25 Metric used to measure Measurable Objective**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Response	49	89.1	89.1	89.1
	case notes	3	3.6	3.6	92.7
	number of customer enquiries	2	3.6	3.6	96.4
	number of projects	1	1.8	1.8	98.2
	performance baselines	1	1.8	1.8	100.0
	Total	56	100.0	100.0	

From table 4.25,89.1% did not respond on this issue regarding metric used to measure Measurable objective, 3.6% said they use case notes ,3.6% said number of inquiries and the rest said use number of projects and baseline performance values.

**Table 4.26 Metric used to measure Achievable Objective**

	Frequency	Percent	Valid Percent	Cumulative Percent
No Response	49	89.1	89.1	89.1
Valid assessment of previous project	1	1.8	1.8	90.9
historical data	6	9.1	9.1	100.0
Total	56	100.0	100.0	

From table 4.26, 89.1% did not respond on this issue regarding metric used to measure Achievable objective, 1.8 % said they use assessment of previous project, 9.1% said historical data.

**Table 4.27 Metric used to measure Realistic Objective**

	Frequency	Percent	Valid Percent	Cumulative Percent
No Response	49	89.1	89.1	89.1
Valid expert judgment	2	3.6	3.6	92.7
historical data	3	5.5	5.5	98.2
resources available	2	1.8	1.8	100.0
Total	56	100.0	100.0	

From table 4.27, 89.1% did not respond on this issue regarding metric used to measure Realistic objective, 3.6 % said they use expert judgment, 5.5 % said historical data and 1.8% said use resources available

**Table 4.28 Metric used to measure Time Bound Objective**

	Frequency	Percent	Valid Percent	Cumulative Percent
No Response	49	89.1	89.1	89.1
Valid 18-24 month timeline	3	5.5	5.5	94.5
agreed time	1	1.8	1.8	96.4
construction time	1	1.8	1.8	98.2
Schedule	1	1.8	1.8	100.0
Total	55	100.0	100.0	

From table 4.28, 89.1% did not respond on this issue regarding metric used to measure Time Bound objective, 5.5 % said they use 18-24 month timelines, 1.8% said agreed time, 1.8% said use construction time and 1.8% said they use schedule.

**4.8.2 Financial model used to gauge performance**

Respondents were asked to indicate financial model used to gauge performance and they responded as shown in the table 4.29

**Table 4.29 Financial Modeling**

Financial model	(%)
Profitability Index	0.0
NPV	0.0
IRR	0.0
Earned value Modeling	100

From table 4.29, 100% of the respondents said they use Earned value modeling for financial projections and gauging performance.

**V. SUMMARY, CONCLUSION AND RECOMMENDATIONS**

**5.1 Introduction**

This chapter consists of a summary of the findings of the research, conclusions relating to the research objectives, suggestions or recommendations on the influence of strategic

management practices on the performance of private construction firms in Kenya and finally areas that need further research.

**5.2 Summary**

This study sought to highlight the gaps in the construction industry in regards to management efficiencies by exposing the influence of strategic management practices on the performance of private construction firms in Kenya. This study sought to satisfy three core objectives, namely; to identify the elements that

contribute to the operational excellence within the management of the construction firm, to investigate the strategies employed at the business level that will influence the growth and performance of the construction firm and to determine the adoptability of corporate level practices that influence the growth and performance of the construction firm. This research was carried out on three private construction firms namely; First Acres Construction, Blue Urban Construction and Nipsan Construction Company.

The first variable under study was operational excellence which included the use of automation and efficiency of internal processes and quality management. The findings indicate that all three firms within the study have exploited the use of automation and execute their operations by utilizing platforms that increase the operational efficiency and therefore enhance the performance of the operations at this level. Overall, this is in agreement to where operations strategy, technology management, quality and operations planning and scheduling are the most prominent in the construction industry as factors that contribute to the success of operational excellence and management (Scudder & Hill 1998).

The second variable under study was the extent to which business level strategies influence the performance the construction firms. The findings demonstrate the use of SWOT analysis as an important tool to gauge a firm's strength and leverage against potential opportunities as well as guard against threats and counter weaknesses. All three firms saw the need to identify and leverage their resources and assets by using the RBV approach. Of equal importance was the need to explore team management and identification of team leader skills and team member attitude to their involvement of construction operations and management. All three firms possess structures that support team management and use these as a guide to structure the business strategy on the right personnel to hire and supplement core competencies within their firms. The third variable under study looked at the corporate level practices that influence the performance of the firms. All three firms demonstrated the use of elements such as mission and vision, corporate branding and using a framework that measures the impact of external influences so as to make informed decisions on the direction the firm is to take.

### 5.3 Conclusion

From the findings of the research, it is evident that strategic management practices have a great influence on the performance of private construction firms in Kenya. This is evident in the three companies within the survey with regard to areas such as the usage of automated systems, the rate on use of automated system for resource management and allocation to construction projects, staff and labour, quality assurance mechanisms, mechanisms to reduce operational costs and turnarounds times, the administration of SWOT analysis and team management, the prioritization of various stakeholders, corporate branding and PESTEL analysis. The firms under study, which were randomly selected exhibited the use of a certain degree of strategic practices within all three levels of the firm.

Equally important, is the communication and internalization of the mission and vision of the firms. In some cases, some respondents exhibited no knowledge such statements which leads to conclusions such as failure of communication and education of

such statements or lack of such statements within the company structures. Also lacking is the adoption of SMART objectives that can help in the strategic makeup of the firm hence influence the decisions in regard to growth and performance.

### 5.4 Recommendations

In relation to the influence of the elements of operational excellence on the performance of the construction firm, the level of success in a project which translates to the performance of the construction firm largely depends on the expertise of management, financial, technical and organizational process flows that, to a large extent, forms a firm's strategy. It is therefore the recommendation from the researcher to emphasis on automation and process management be regarded as high priority to achieve increased operational efficiency and consequently improve the performance of the firm.

In relation to the strategies employed at the business level and the adoptability of corporate level practices that influence the performance of the construction firm, it is the recommendation of this research that every construction firm develop a business strategy looking at the core strategic pillars of strategic planning, strategic choice and strategic implementation, encompassing the three critical levels of the firm, that is, the corporate, business and operational levels of the firm.

The use of strategic management practices within the construction industry ensures that the holistic view of performance is pegged on strategic planning, strategic choice and strategic implementation and does not merely concentrate on measures of success on the traditional pillars of cost, quality and time. These practices are directly related to the strategic objectives set as the core nature of business entities is to perpetuate success through a robust and successful road map chartered through the firm's mission and vision. It therefore involves the development of a framework upon which performance measures can be developed and implemented as to identify the degree to which an organisation is able to implement its strategy.

### Further Areas for Research

There still exists opportunities to carry out further research. Much still needs to be explored in the public sector arena where construction is on an upward growth. Further areas of research may include the public sector road and amenities and the strategic management practices used to govern such projects in relation to the objectives set. Also as an area of further research, the exploration of private entities that finance construction projects and the strategic practices they execute to govern the role they play as financiers and legitimate stakeholders to construction projects

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#### AUTHORS

**First Author** – Paul Kamau Waweru, Master of Business Administration, Jomo Kenyatta University of Agriculture and Technology

**Second Author** – Dr. Jane Omwenga, Supervisor, Jomo Kenyatta University of Agriculture and Technology



# Factors Affecting Out-Of-Pocket Medical Expenditure Among Out Patients in Hospitals in Nairobi County

Nicholas Otieno Okello\*, Dr. Agnes Njeru\*\*

\*Master of Business Administration, Jomo Kenyatta University of Agriculture and Technology

\*\* Supervisor, Jomo Kenyatta University of agriculture and technology

**Abstract-** Several studies have brought up the following variables as determining factors of out of pocket health spending such as income levels, employment status, cost of medical services and access to health financing/health insurance. This study's specific objectives include: to investigate, examine and establish the association between income levels, employment and cost of treatment and access to health insurance/ health insurance status on Out-of-Pocket medical expenditures among out patients at the following selected health facilities in Nairobi county Kenya. A mixed research design technique was used to collect data which involved the use of both primary and secondary data sources. A structured questionnaire was used to collect primary data. Data collected for this study was analyzed using both qualitative and quantitative techniques with SPSS software. The target group of this study was the prior mentioned hospitals. The accessible population of the study was 115 respondents. The study's pilot test results indicate that the survey instruments were reliable and consistent. The response rate was 100% with 59% of the respondents being male and 41% of the respondents being females. A regression model was estimated where the associations between the regressor Y i.e. out of pocket medical expenditure and  $X_1$  : Household Monthly Income (Independent Variable),  $X_2$  : Duration of Occupation (Independent Variable),  $X_3$  : Household Cost of Medical Services, and  $E_t$  : Stochastic/Error term were estimated. The summary findings were thus (holding other factors constant); - For every Kshs increase in household monthly income, out of pocket medical expenditure rises by Kshs 0.25 on average; for every incremental month of occupation duration from the time of the study, out-of-pocket medical expenditure was reported to decrease by Ksh 705.574 on average; for every Kshs increase in household costs of medical services, out- of- pocket health expenditure reduces by Kshs 0.211 and the presence of health insurance reduces out-of pocket health expenditure by Kshs 8,099.973 on average.

**Index Terms-** Employment Status, Health insurance, Cost of treatment, Out of pocket Health expenditure

## I. INTRODUCTION

According to the WHO (2010), Out-of-Pocket medical expenditure is defined as the direct outlay by households including gratitude's and in kind payments to health practitioners and pharmaceutical suppliers and the purchases of goods and services whose main intent is to contribute to the restoration on the enhancement of the health status of individuals and

population groups -which is described as a component to private health expenditure.

Xu et al, (2003), postulates that Out-of-pocket health care expenditure, where individuals and households pay for health care out of their own resources, is an important feature of health care systems all over the world. The impact of health care financing systems on the welfare of households, particularly poor households is mainly regarded as an important issue encountered by policy makers when developing healthcare systems and insurance mechanisms. In most low and middle income countries, private Out-of-Pocket health expenditure accounts for 20% to 60% of National Health Expenditure while in most developed economies, this amount accounts for only 15% to 25% of the same (WHO, 2010). Organization for Economic Cooperation and Development, (2012) reveals that there exists three main ways in which health care is financed in any country in the world and they include: Tax based financing through public health insurance schemes and through private funds such as Out-of-Pocket medical expenditure and donor funds. Zikusooka et al (2009) posits that healthcare financing in East Africa is heavily dependent on donor agencies with very few mechanisms existing for pooling and risk sharing.

Out-of-Pocket healthcare expenditure remains one of the most typical means of financing health expenditure around the world and more specifically in developing countries where access to financial protection provided by health insurance is minimal due to low income levels by citizens. This situation is made worse by the fact that in some countries, the burden of Out-of-Pocket spending creates barriers to health care access and use.

According to Hoffman et al (2005) and Banthin et al, (2008), households that have difficulty in paying medical bills tend to forego health care services. In contrast to publicly-funded care, Out-of-Pocket payments rely on the ability to pay. If the financing of health care becomes more dependent on Out-of-Pocket payments, its burden is, in theory, shifted towards those who use the services frequently, and possibly from high to low income earners, where health care needs are higher (Banthin et al, 2008).

Most industrialized countries have exemptions and caps to Out-of-Pocket payments for lower income groups to protect healthcare access. Switzerland for example has a high proportion of Out-of-Pocket expenditure with cost sharing exemptions for large families and social assistance beneficiaries among others (Paris et al, 2010). In Netherlands, households in the lowest income category spend up to 6.5% of their disposable income on Out-of-Pocket payments whereas the high income category groups spend up to 1.5% on the same (Westert et al, 2010). In Turkey, the 2006 Household Budget Survey indicated that Out-

of-Pocket spending was reasonably progressive in that low income families ended up spending 3.4% of their household income on healthcare services whereas the high income households spent about 4.2% on the same (World Bank, 2008). In America, one in six American families experience high Out-of-Pocket healthcare spending especially the disabled and elderly headed households. These costs tend to escalate over time due to chronic illnesses and one off events such as injuries and accidents especially among non-insured households. The most vulnerable group to high medical costs was found to be the low income families with 25% of the families stating that they spend more than 5% of their total household income on medical care services. According to Merlin (2002), 28% of Americans living in low income households spend more than 10% of their disposable income on health services and health insurance premiums. According to Banthin et al (2008), low income households pay high Out-of-Pocket payments in relation to their income with prescription for drugs constituting the biggest share. Health financing difficulties and high outlays has been observed to contribute to the very wide gap between healthcare needs and access. This forces individuals to go without medical care since cost of medical services imposes a too significant strain on household's income which forces sick individuals to forego healthcare services (Merlin, 2002).

In Kenya, for instance; the financial benefits of health insurance are insignificant to the majority population considering the vast difference between minimal premiums available in the market and the Out-of-Pocket health expenditure that an average Kenyan spent on an annual basis. On average the cost of outpatient visits were estimated to be a per-capita annual average of Kshs 328 Nationally in 2007 whereas a similar wide variance was observed comparable to the first study in 2003 that is; in Nairobi the average annual Out-of-Pocket expenditure amounted to Kshs1, 089 per annum versus Kshs159 per annum for North Eastern (MOH, 2007). According to Open Capital Advisors (OCA) in their assessment of the Kenyan health insurance industry, the cost of an average health insurance cover premium amounts to Kshs30,000 a year an amount way above the average Kenyan's annual health spending and an amount that equates 33% of annual per capita income.

In relation to the association between Out-of-Pocket health payments and health care costs, the American Association of Retired Persons (AARP) report found that Out-of-Pocket medical spending increased with the degree of infirmity and the treatment costs involved with the disease. Persons who reported to have good health spent on average \$3,905 compared to those in poor health who spent an annual average of \$5,468 while those who reported cancer spent \$6,370 an expensive disease but less expensive than Alzheimer's disease at an annual, average, Out-of-Pocket spending of \$7,670 (which involves more nursing assistance) (AARP, 2006). In Kenya, an increased prevalence of expensive chronic conditions is resulting in skyrocketing health costs due to among others low limits on insurance covers and the prevalence of co-payment terms. One of the greatest emerging chronic diseases is renal disease such as kidney diseases. One dialysis session costs about Kshs 9,000 and Kshs1.5 million for a kidney transplant in private health institutions whereas in public health institutions the services are a bit cheap at Kshs 2,000 per session and about Kshs 500,000 for a kidney transplant

considering the fact that Kenya's per capita income is Kshs 146,600 or the equivalent of \$1,800 (The People, September 4<sup>th</sup> 2013). This implies that the average cost of renal treatment in the cheapest facility is 341% of average income in Kenya (The People, September 4<sup>th</sup> 2013).

On the other hand, Cancer patients in Kenya pay an average of Kshs 300 per session on cancer treatment, translating to an estimated Kshs 1,500 a week in a public hospital. In contrast, Private Hospitals in Kenya charge Kshs 80, 000 per Week. For solid tumors, where tests may include but are not limited to CT Scans, Magnetic Resonance Imaging procedures (MRI) and biopsy costs of between Kshs 10,000 to Kshs 30,000 per session (Neondo, 2012).

With insurance maximum cover limits averaging Kshs 5 million with adult members paying Kshs30, 000 annually and Kshs 20,000 for dependents, payments exceeding such thresholds are always met by Out-of-Pocket spending in the instance of chronic conditions.

The employment and education status of an individual or household tends to affect their Out-of-Pocket medical expenditures. An educated household (probably earning higher incomes and more likely to be employed) may make more effective use of modern medicine and is less likely to incur large expenditures on self-medication and traditional therapies. In all cases, households with a working head are 14%-63% less likely to incur catastrophic payments (O'Donnell, 2005). Although it was argued that education is a proxy for lifetime income or wealth and that it reflects a negative effect of wealth on health expenditures through better health; -The argument holds to the extent that our measure of living standards that is; current consumption – does not reflect lifetime income due to constraints on the inter-temporal smoothing of consumption (O'Donnell et al, 2005). Since they were controlling for total consumption, they suggest that this phenomenon is probably attributable to health expenditures incurred where a head of household cannot work due to sickness. In Bangladesh and India, waged labor, as opposed to working in the household farm or business, was associated with a higher incidence of catastrophic payments. Locally, according to the World Health Organization a working person in Kenya was observed to be 8.02% more likely to have health insurance with NHIF and 0.27% with a private health insurance scheme (Xu et al, 2006).

Several factors exist which affect Out-of-Pocket medical expenditure among out patients in hospitals in Nairobi County and Kenya in general. Chief among the factors include; the level of disposable income earned by an individual or household, the employment and educational status of an individual; the number of dependents an individual has; the cost of medical services and the availability of insurance covers among others. This study dug in and investigated the factors that affect Out-of-Pocket medical expenditure among out patients in hospitals in Nairobi County. Out-of-Pocket medical expenditure is a term that is generally understood to refer to health spending that is not covered by a healthcare plan such as; a private health insurance cover, or a public health scheme (Merlin, 2002). In most developing countries, the cost of out-of-pocket medical expenditures is way too high and this tends to push majority of the population who cannot afford it towards poverty.

Various aspects of the contributing factors to out of pocket health expenditure have been investigated before such as the correlation between out of pocket health expenditure and insurance such as Merlin (2002) did in his study titled “ Family Out of pocket Health Care Spending;- A Continuing Source of Financial Insecurity” observed that families with lower incomes such as retirees are often faced with catastrophic type Out-of-Pocket medical payments (defined in his study as payments on health above 10% of income) and Mutyambizi (2002) In South Africa did such that in his study titled “Promoting Equitable Health Care Financing In The African Context: Current Challenges and Future Prospects” a correlation between employment status and out-of pocket medical expenditure was observed such that it was found out that health financing alternatives are concentrated among more wealthy South Africans typically in urban areas and formally employed.

According to an Open Capital Advisors (2012 report titled “The Next 33 Million”;- 33 Million Kenyans lack any type of health insurance coverage. This is mainly attributed to the inability of self employed and un employed citizens who are the majority to register and acquire covers from the National Health Insurance Fund (NHIF) due to their razor thin income levels. In Kenya, there exists an un-insured and under-insured Kenyan middle numbering 10 million -out of an estimated 18 million middle class population who cannot afford current private insurance products with the average premiums on private health insurance covers estimated at 33% of average annual incomes (OCA, 2012). This existing income-out of pocket health expenditure cause-effect dynamic is seconded by Dana’s, (2009) study titled “ The Unsustainable Cost of Health Care” which established that rising personal income leads to higher spending on health care because medical care is a desired service. As individuals become better off financially, spending on extending life and improving health and well-being becomes more attractive than spending on other goods.

None the less, notwithstanding all the above described factors, no studies have purely focused on the Factors that affect out-of-pocket medical expenditure among patients in hospitals with particular attention to; income level of patients, employment status of patients and the cost of medical services incurred by patients in Kenya. Therefore, this clearly depicts that studies which tend to focus on patients financial well being are quite unequalled due to the hardships that patients often go through during sickness. Therefore, this study set about to delve into the Factors that affect Out-of-Pocket Medical expenditure among patients in hospitals in Nairobi county which over the years has stayed on un-researched.

The general objective of the study was to investigate the factors that affect Out-of-Pocket medical expenditure among out patients in hospitals in Nairobi County. The specific objectives were: to identify the association between household income levels and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County, to examine the association between employment status and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County, to establish the relationship between cost of medical services and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County and to determine the association between health Insurance status

and household out-of- pocket medical expenditures among out patients in Nairobi county.

The results of the study will benefit the following: Private Researchers, who will use it as a reference for different studies, and by enabling the development of more studies under the field of factors influencing Out-of-Pocket Medical Expenditure; Health Patients who will be enabled to make informed decisions on medical financing with regards to the different health insurance schemes which exist in the country; The Government (MOH, NHIF) by enhancing public policy utility to the NHIF and MOH through the provision of research findings on the factors that influence out-of-pocket medical expenditure among health seekers specifically out-patients who are the most typical health seekers in Kenya and then Policy Makers by ensuring that they understand factors which affect out-of-pocket medical spending so as to make judicious policies which will have robust impacts on the society.

The study covered approximately 10 of the 34 registered Private and Public Hospitals by the Ministry of Health operating in Nairobi County according to MOH, 2008. The accessible population (respondents) of the study was the Out-Patients who were expected to visit the 10 Hospitals.

## II. LITERATURE REVIEW

### 1.1 Theoretical Review

#### 1.1.1 Theory of Elasticity

The factors that affect out-of-pocket medical expenses will be explained by use of elasticity theory. According to (Jacob Ramskov, 2001) elasticities examine how sensitive the demand for a good or service is to changes in price of the good or service itself or to changes in the price of related goods or services and to changes in income. According to (Campbell, 2008) the demand for goods is a function of several factors and not only price. The concepts of elasticity include: Own price elasticity, Income elasticity and Cross-Price elasticity (Jacob Ramskov, 2001).

The concept of own price elasticity is also referred to as price elasticity. It illustrates the percentage rise in the demand at a percentage rise in the price of a good itself. Simply put, own price elasticity shows the responsiveness of the demand of a certain good to changes in its own price (Campbell, 2008).

Demand curves generally have negative slopes as the Law of Demand states when the price of a good increases, the demand of the good decreases. Price elasticity of demand is computed as the percentage change in quantity demanded divided by the percentage change in the price of the same good. According to (Campbell, 2008), own price elasticity of demand results may be Elastic, In-Elastic, Perfectly Elastic, Perfectly In-Elastic and Unitary Elastic. An elastic demand occurs when the elasticity value is greater than one, so that the quantity moves proportionate more than the price. Demand is In-elastic when when the elasticity result is less than one, meaning that the quantity of demand moves proportionately less than the price. In other cases, elasticity of demand result will be one or unit implying that the quantity moves the same amount proportionately as the price. In extreme cases where elasticity is zero, demand is normally said to be perfectly inelastic and it is drawn vertically. In this case, no matter how the price changes,

the quantity of demand remains constant. This when shown graphically normally illustrates the demand curve becoming flatter and flatter as the elasticity rises. Conversely, demand is perfectly elastic when the price elasticity of demand approaches infinity and the demand curve becomes horizontal, reflecting the fact that very minute changes in the price lead to significant changes in quantity demanded.

The concept of income elasticity of demand is used to measure how the quantity demanded changes as the consumers income changes. This is computed as the percentage change in quantity demanded divided by the percentage change in income. The concept of income elasticity of demand describes the nature of goods as either normal or inferior. Most goods are normal if the rise in income of consumers leads to the rise in quantity demanded of the good itself since income and quantity demanded tend to move in the same direction and thus are directly related having positive elasticities. The demand of inferior goods on the other hand tends to decrease with the increase in the income of consumers. Thus, the demand for inferior goods move in the opposite direction with an increase in consumers income and thus they normally have negative elasticities.

The concept of Cross-price elasticity of demand measures how the quantity demanded of one good changes as the price of another good changes. It is measured as the percentage change in quantity demanded of good A divided by the percentage change in the price of good B. Cross price elasticity of demand describes whether two goods are either substitutes or complements. Substitutes are goods that are typically used in place of another where as complements are goods which are typically used together. For substitute goods, the cross price elasticity of demand result is always positive and thus the increase in price of good A, will lead to the increase in consumption of good B since consumers will find good B to be cheaper and affordable. For complement goods, the cross price elasticity of demand result is normally negative indicating that an increase in the price of good A reduces the quantity of demand of good B.

### 1.1.2 Theory of Income

Income is the consumption and savings opportunity gained by an entity within a specified time frame which is generally expressed in monetary terms. For the case of households and individuals, income is the sum of all the wages, salaries, profits, interest payments, rents and other forms of earnings received within a given period of time. Theory of income is normally explained by the concepts of Permanent Income Hypothesis and Relative Income Hypothesis.

According to Milton Friedman as cited in (Coastas, 2004) consumers always wish to smooth consumption and not let it fluctuate with short run fluctuations in income. Individuals/consumers base their consumption on a long term view of an income measure on a notion of lifetime wealth or a notion of wealth over a reasonable long horizon. According to his hypothesis, individuals consume a fraction of permanent income in each period and thus the average propensity to consume equals the marginal propensity to consume. The ingredients of Friedman's model of permanent income hypothesis are permanent income, permanent consumption, transitory consumption and transitory income. According to Coastas (2004) measured income is the sum of permanent and

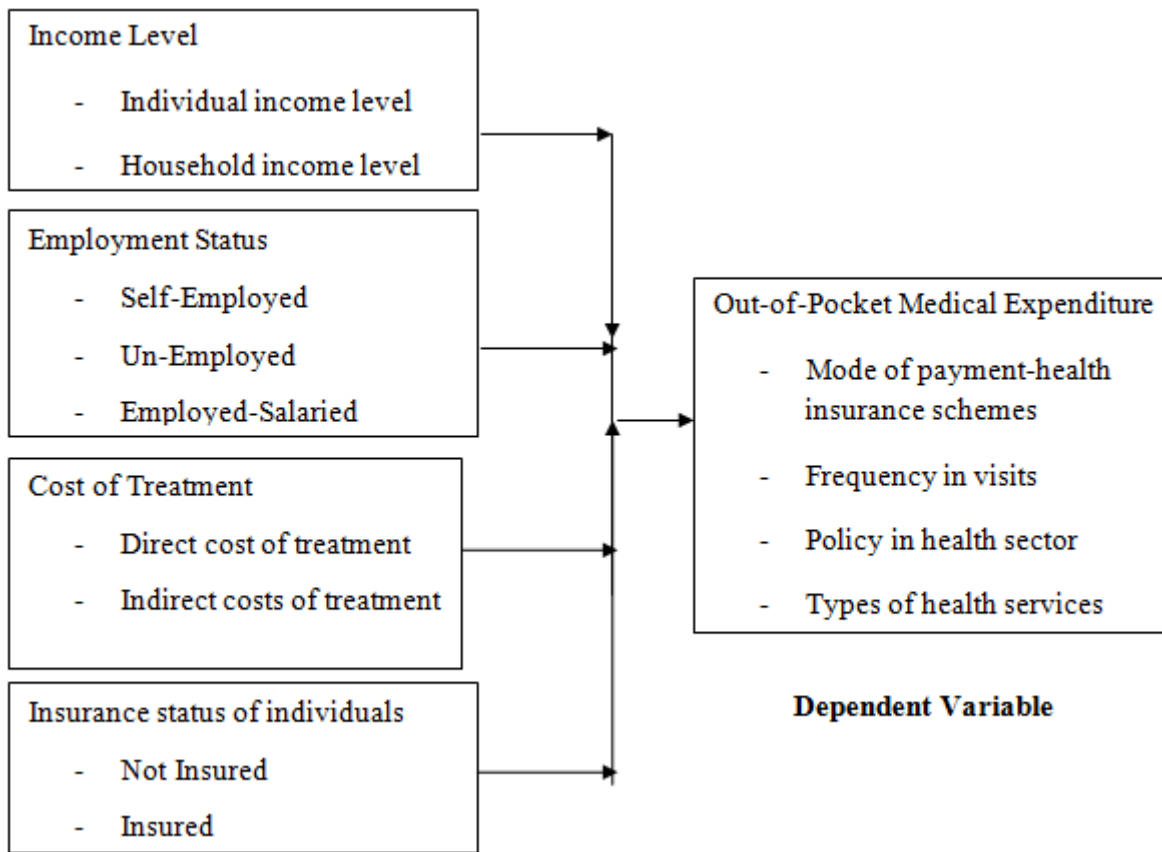
transitory income and measured consumption is the sum of permanent and transitory consumption. The consumption plan of an individual does not depend on the transitory components and transitory components are uncorrelated to each other and uncorrelated to permanent components. Friedman shows that the slope coefficient of a regression of observed income leads to an underestimate of the marginal propensity and to a positive estimated intercept. Therefore, the rate of attenuation of the marginal propensity to consume is equal to the ratio of the variance of the permanent income to total income. Permanent income hypothesis shows that permanent income goes up and thus for a given level of observed income, permanent income is higher in later years than in earlier ones. In his explanation, Friedman stated that the joining of the average points of consumption-income across time recovers a function that implies the marginal propensity is equal to the average one the key point here being that average income reflects average permanent income since the transitory components averages out by law of large numbers. For example on an interpretation on why blacks save more than whites in America, Friedman observed that the former have lower permanent income than whites. Similar arguments can also be made when we compare the self employed to the salaried workers or farm to non-farm households, the first in each pair having larger transitory components to their income. The concept of Relative Income Hypothesis on the other hand states that the satisfaction or utility an individual derives from a given consumption level depends on its relative magnitude in the society for example, relative to the average consumption rather than its absolute levels. (Duesenberry J, 1949).

According to (Palley, 2008) the present consumption is not influenced merely by present levels of absolute and relative income, but also by levels of consumption attained in the previous period and it is difficult for a family or an individual to reduce the level of consumption once attained. This is because, the aggregate ratio of consumption to income is assumed to depend on the level of present income relative to past income.

Therefore, according to (Palley, 2008), relative income hypothesis maintains that consumption decisions are motivated by relative consumption concerns also known as keeping up with the Joneses. The theory also shows that consumption patterns are subject to habit and are slow to fall in the face of income reductions and therefore it is difficult for an individual to reduce his/her expenditures from a higher level than for him/her to refrain from making high expenditures in the first place (Palley, 2008).

### 1.2 Conceptual Framework

The conceptual framework depicts the relationship between independent variables which include income levels, employment status and the cost of medical services and the dependent variable which in this case is out-of-pocket medical expenditure. Figure 1 below shows the conceptual framework which will be relied upon in this study.



**Figure 2.1: conceptual Framework**

**2.3.1 Income Levels of Individual/ Household head**

In most of the world’s wealthiest countries, individuals pay few health care costs directly. In Germany, for example, where the GDP is US\$ 32,860 per capita, 11.3% of all medical expenses are borne by households and the rest by social health insurance or by the government. In the Democratic Republic of the Congo, by contrast, where GDP per capita is only US\$ 120, about 90% of the money spent on health care is paid directly by households to providers (WHO, 2012). From 1994-2013, out of pocket health expenditure has oscillated between 76.7% to 76.9% of private health expenditure. In Kenya, approximately 77% of household health expenditure is from out of pocket sources given that less than 8% of the Kenyan population is insured for health services (WHO, 2012). Being that studies related to out of pocket health expenditure are often primarily interested in the effects of health insurance membership on Out of Pocket payments i.e. payments for health care made by households at the point of receiving health services. It is a priori expectation that health insurance membership should significantly reduce the level of OOP, given use (Merlis, 2002).

Out of pocket medical expenditure may reach a non-trivial share of overall expenditures; especially for low-income families even among insured families, on average, half of total MOOP spending is on health insurance premiums (Banthin et al., 2008). In some cases, health events may result in high non-premium out of pocket medical spending regardless of health insurance coverage status. For example in a United States study researchers

estimated that approximately half of all U.S. bankruptcies in 2001 involved medical debt and approximately 75 percent of the people affected had health insurance coverage at the onset of their illness (Himmelstein et al., 2005). On the other hand, others have identified correlations with health events and significant wealth losses (Cook et al., 2010; Smith, 1999). In short, medical out of pocket expenditure has been observed to lower family resources such that available income for food and shelter decreases –namely, these components used to measure poverty status decrease as medical out of pocket expenditures rise.

Research indicates also that the poor are less likely to report illness than the rich such that for both chronic disease and acute illness, individuals in higher consumption quintiles are more likely to report illness. While one would expect higher reported illness among the poor due to living conditions and exposure findings are that the poor are underreporting their actual illness. One explanation is that the wealthy and better educated have better information about their health through personal knowledge or through better access to medical care ( AIID, 2011).

Given this reality, the private sector is more at the forefront of innovative solutions counter this problem with communication service providers teaming up to hedge low income earners from the damaging effects of out of pocket medical spending through micro insurance. One of Kenya’s leading insurance companies BRITAM has partnered with Kenya’s largest mobile operator, Safaricom and microfinance Changamka in recognition of this correlation between low income and catastrophic health

expenditure and announced the launch of a 'micro-insurance' healthcare product for users of M-Pesa –the most wildly popular mobile money solution to launch a medical insurance product called Linda Jamii which is to target around one million subscriptions, mainly in low-income areas using the M-Pesa platform as its premium collection platform.

Customers will be able to subscribe to the insurance service at "an annual premium of Kshs12 000 [about US\$140] for cover worth Kshs290 000 [about US\$3500]." Linda Jamii will cover everything from dental to maternity, optical, in-out patients, and hospital and funeral expenses. It is currently only available in Nairobi but Safaricom plans to have it across the country by the end of the year, providing access to 1000 hospitals (Ventureburn, 2014).

Income does also play a role in disease incidence and by extension out of pocket health expenditure incidences. The likelihood of spending a high share of income on Out of Pocket health costs drops as income rises. This is not surprising: If two families with different incomes spend the same amount for medical care, the family with the lower income will have spent a higher share. However, it is also the case that low-income families are more likely to have health problems. Either because poverty contributes to poor health or because poor health reduces income (Merlis, 2009)

### **2.3.2 Employment Status of Individual/ Household Head**

There are different approaches to social health protection, but all have one thing in common: they create a system, called a risk pool that allows a large group of people to share the risk that they may need expensive health care. That means funds dedicated for health care are collected through prepayment, and managed in such a way as to ensure that the risk of having to pay for health care is borne by all the members of a pool and not by each contributor individually. In a risk pool, at any given time healthy people who only need limited health care are subsidizing the sick, who will draw more heavily on available health resources (WHO, 2012).

Employer group coverage provides better financial protection than individual private coverage. Among families with insurance, those who are most at risk for high OOP costs are those with individual private coverage. These plans tend to have higher deductibles and coinsurance payments, and are less likely to cap patient liability for health care expenses or to cover prescription drugs. One of five families with private non group plans spends more than 5 percent of income on health expenses, compared with one of 12 families with employer coverage. Mark Merlis, 2009 study found that among those afflicted with high out of pocket expenditure, working families were not exempt.

The report finds that OOP spending on health care services remains a major source of financial insecurity for people with inadequate health insurance coverage. Those most at risk include Medicare beneficiaries, whose poor health and limited Medicare benefits can impose heavy financial burdens. Working families are affected too. While the growth of managed care brought them lower levels of cost-sharing and better financial protection, the rising cost of prescription drugs and rising premiums increasingly threatens this protection. At the bottom of the economic ladder, some families may be forced to forgo spending on necessities to meet the out-of-pocket cost of health care. And, while the uninsured are especially at risk, even those with

privately purchased individual health insurance can fall victim to burdensome outlays for health care or be forced to forgo needed care.

With regards to the employment status of individuals, Education levels, a determinant of employment has been found to increase the probability of taking up insurance of all types with more educated individuals intending to insure. The results are in line with the hypothesis that educated people have the ability to not only to acquire skills and knowledge but also to make informed choices on health related matters among them purchase of health insurance to avoid catastrophic health expenditures. This important role played by education is well documented by Grossman (1972). Similar results were obtained by Kirigia et al., 2005; Kidd and Hopkins, 1996; (Nketiah-Ampomensah, 2009) and Bourne and Kerr-Campbell, 2010 among others. The results however indicate that education is most responsive in mutual schemes. Also, it is realized that individuals taking up private insurance belong to the highest wealth index, are relatively older with a higher awareness and the highest education level than the rest (that is, employed individuals stereotypically) while those Individuals taking up no insurance or mutual community schemes belong to the lowest education level than the rest (that is, stereotypically the unemployed).

In many lower- and middle-income countries, private insurance may be the only form of risk pooling available and it usually provides principal coverage to those in the formal sector, with private policies frequently subsidized by employers. Historically, this is not unlike the situation in Western Europe in the nineteenth century when the only significant forms of insurance were provided by mutual associations, employers, guilds or unions - on a voluntary basis. For example, 10% of Sweden's workforce was covered by voluntary private insurance Schemes called "Friendly Societies" in 1885. In Germany, Bismarck established the first national social insurance system by knitting together voluntary pre-existing occupationally and industrially based sickness funds (WHO, 2004).

### **2.3.3 Cost of Health Services**

The quantifiable costs associated with human disease and illness -are typically categorized into direct and indirect costs. Direct costs represent the costs associated with medical service utilization which includes the consumption of in-patient and out-patient pharmaceutical services within the health care delivery system. The term indirect costs on the other hand is representative of the expenses incurred from the cessation or reduction of work productivity as a result of the morbidity and mortality associated with any given disease. Indirect costs in this case consist of work loss, worker replacement, reduced productivity from illness and disease (Bocuzzi, 2003).

Serious health problems lead to serious out-of-pocket expenses. Families that have a member with any health problem are twice as likely as other families to spend a high portion of their incomes on health services. Chronic conditions place families at the highest risk. For instance, 25 percent of families reporting a member with heart disease also report spending more than 5 percent of their income on OOP expenses. Other conditions especially likely to lead to high OOP costs include diabetes, mental disorders, Employer group coverage provides better financial protection than individual private coverage. Among families with insurance, those who are most at risk for

high Out of Pocket costs are those with individual private coverage. These plans tend to have higher deductibles and coinsurance payments, and are less likely to cap patient liability for health care expenses or to cover prescription drugs. One of five families with private non-group plans spends more than 5 percent of income on health expenses, compared with one of 12 families with employer coverage. (Merlis, 2002)

One of four families with a serious health problem who are covered by private individual insurance is at risk for high outlays. Health insurance does not necessarily protect families against the high costs of getting sick, especially if the coverage is private individual insurance. Twenty-seven percent of families with serious health problems who are covered by private individual insurance spend 5 percent or more of their incomes on OOP costs, compared with 13 percent of families with serious health problems who are covered by employer group insurance. Poverty and poor health multiply exposure to high health costs. Among families with serious health problems, low-income families face an especially high hurdle when it comes to OOP expenses. One-quarter of families with any health problem and incomes below 200% of poverty spend 5% or more of their incomes on OOP. (Merlis, 2002)

As with the analysis of health care utilization, outpatient and inpatient care are analyzed separately. Individual, household and geographical factors are controlled for, with similar rationales for inclusion as in the models discussed so far. We expect those with higher income, chronic health conditions, aged greater than sixty-five, living in urban areas, including Nairobi to have higher OOP. For those living in urban areas and/or Nairobi, this could also reflect the availability of services of higher quality as well as supplier induced demand. Those aged less than five are expected to have lower OOP, because of special government policies for this age group. Two additional variables are included, related to facility ownership. It is expected that private health facilities charge higher user fees than both mission and public health facilities. We are also interested in comparing public and mission facilities to see if there is a significant difference in the user fees charged. Further factors expected to have an effect on the probability of both NHIF and other insurance membership include household income, the education level of the household head, the sex of the individual, severity of disease, and the presence or availability of health insurance schemes at provincial level. For all of these factors other than health insurance availability, their positive effects will be qualified to some extent by the compulsory nature of the NHIF. For severity of disease, this is further qualified by likely risk selection by private health insurers. (Ke Xu, 2006) (O'Hara, 2010).

Due to the lack of robust primary data required to estimate the indirect cost component of health services, most studies use bench mark or normative data to estimate indirect costs. Indirect costs are thus more difficult to quantify because of a lack of quality data despite the fact that they represent up to 150% of the total economic burden associated with disease e.g. the cost of lost work days, economic death due to morbidity, the costs of labor substitution, the costs of children dropping out of schools to become caretakers, the costs of lost leisure days and the costs associated with declined life quality (Bocuzzi, 2003).

### **2.3.4 Insurance Status of Individuals**

Insurance uptake is for the purpose of curbing the catastrophic potential of out of pocket health expenditures however among the very low income groups in society, this type of expenditure has been observed to be on average less than an insurance policy would cost. Kiplagat, 2013 conducted a study on the factors that affect the demand for health insurance in Kenya. Despite the protection insurance offers to households in preventing catastrophic out of pocket expenditure and to mitigate out of pocket costs of medical services, his findings were that a vast majority of the Kenyan population remains uninsured. Among the factors that this study identified as contributing factors to health insurance policy ownership were;- age, education, wealth and residency. If these factors influence health insurance uptake, it is then conceivable that they influence out of pocket health expenditure as well. Their findings on this phenomenon were thus;- The effect of age on demand for health insurance is positive across all forms of health insurance schemes indicating that purchase of health insurance relative to being uninsured increases with age. (Kiplagat, 2013)

Since economic theory predicts that stock of health depreciates at a decreasing rate with increase in age it is evident that as individuals health naturally declines, their out of pocket expenditure on health will increase especially if they are uninsured. However, due to the health increasing benefits of health insurance such as lower net cost of health care services, older individuals thus tend to increase their investments in health (health insurance included) in order to decrease the rate of health depreciation. This could be confounded by other variables such as education and income which are likely to increase with age. These particular results were found to be similar to those by Kirigia et al. (2005) in South Africa, Bhat and Jain (2006) in Gujarat, (Gius, 2010) in the US and Owando (2006) in Kenya among others. Conclusively, older people in Kenya were observed to be more likely to choose NSSF (which is statutory) and private schemes (which they can afford in agreement with life-cycle hypothesis). We also note that the age variable is not statistically significant for mutual health insurance scheme.

In relation to gender and insurance status;- Gender was found to have a significant bearing on choice of insurance schemes. To begin with, males formed the majority of respondent without cover, indicating their risk taking behavior. Another study by (Bourne, 2010) in Jamaica determined that health insurance coverage is partly a function of the number of males in a household. And choice of insurance schemes discriminates against gender with males preferring private options whereas females have preference for mutual/community and employer-based schemes. Mutual schemes are based on trust and it connotes that this aspect plays a role in determining female choice of health insurance cover. Access to media was also found to have a significant effect on health insurance take up.

Similarly with other studies a similar effect was observed such as Nketiah-Amponsah's (2009) study in Ghana and Bhat and Jain (2006) in Gujarat realized that awareness and knowledge about health insurance were significant determinants of health insurance coverage. Similarly, the study by (Matheuri, 2008) on demand for Social Health Insurance of informal sector workers in Kenya established that lack of information was a major barrier to enrolment. Access to information therefore

becomes a vital component of increasing uptake of health insurance cover.

Wealth index, Income and Employment Status were also observed to have an impact on out of pocket health expenditure. Those in the poorest wealth index are less likely to take health insurance. A rise in wealth index significantly increases the odds of choosing all the four types of insurance scheme. This is an indication that health insurance is a normal good also notice that wealthier people will choose private schemes more than any other option. The findings concur with those by (Paul A. Bourne, 2010) that the employed are more likely to be covered by mutual and NHIF than private and NSSF. Obviously, employees are twice likely to choose employer based cover than their unemployed colleagues which is because employers are mandated to insure their workers.

Studies have established that larger sized households associate more with NSSF and mutual fund schemes whereas smaller households associate with private schemes in agreement with previous works. For instance, (Bhat, 2006) who studied factors which affect the decision to purchase insurance as well as the amount of health insurance bought in micro health insurance scheme settings of Gujarat found the number of children to be an important determinant. The findings however differ from those of (Kirigia, 2005).

Rural residents on the other hand are more likely to be in mutual and statutory schemes. Kenyan villages have more tendencies for residents to come together in social self help groups which explain their preference for mutual cover. Concerning statutory cover, NHIF has in last 5 years done aggressive marketing in the villages which has increased coverage there. Urban residents are most likely to be in private health cover, perhaps because they can afford it. Residence has been found to determine choice of health insurance by previous works as observed in the Chilean study by (Torche, 2001)

### **2.3.5 Out of Pocket Health Expenditure**

Health expenditure can be categorized as out-of-pocket payments and prepayments. Out-of-pocket payments refer to the payments made by the patients at the point of receiving services (WHO, 2011).

Out of pocket health expenditure is common to a large extent all over the world. It is not a problem that some out of pocket health expenditure exists rather the proportion of out of pocket health expenditure relative to total private health expenditure is the concern of both policy makers and policy researchers. High user fees and other out-of-pocket payments (OOPs) have negative impact on the access to and utilization of health care services in Kenya (MOH, 2007).

The majority of the population cannot afford to pay for health care, the poor are less likely to utilize health services when they are ill, and wide disparities in utilization exist between geographical regions and between urban and rural areas (MOH, 2007). This is due in part to the complex interaction between income levels, employment status, insurance status and residency /geographical location, location related costs of medical services etcetera. Socio-economic and geographic inequities are wider for inpatient care than outpatient care. Those who pay for care incur high costs that are sometimes catastrophic and adopt coping strategies with negative implications for their socio-

economic status, while others simply fail to seek care (Chuma and Okungu, 2011).

The Kenyan government has encouraged the development of the private health sector, a move that has seen an upsurge in private health care providers in the country as many such providers have come up to respond to the high demand for health care. Since the introduction of user fees for medical services in the 1980's, public hospitals have been perceived to offer low quality care hence;- a significant population of people have since opted to pay for private health care services that have since been perceived to be of better quality. The private sector has since grown in Kenya, owning 49% of health service facilities and growing while regulating it remains a major challenge (Chuma & Okungu, 2013); (MOH, 2008).

The very fact that income, employment, access to health financing and affordable healthcare services are equity concerns that affect health equity, a series of reforms are under way to address equity challenges in the Kenyan health system. Key among these reforms is the development of a health financing strategy and the sector plan for health (GOK, 2010) (MOH, 2010). Since these concerns (Income constraints, unemployment and under employment, lack of health financing options such as health insurance and high costs of health services) all contribute to health access inequalities as a result of high out of pocket health care costs, thus as evidenced by these strategy documents there is a movement of government health policy towards an equitable financing system. This is documented by the policy options and highlights of priority health sector reforms for achieving universal health coverage such that the specific actions highlighted in the strategy include: implementing a national health insurance scheme; channeling funds directly to health facilities without passing through the district; increasing resources to underserved and disadvantaged areas and; scaling up the output based approach of financing (OBA) to include a range of health services (currently OBA in Kenya focuses on reproductive health services) (Chuma & Okungu, 2013)

### **1.3 Empirical Review**

In this processes of financially costing a disease and determining it's private costs i.e. individual or household costs of a disease such concepts emerge such as;- catastrophic health expenditure which occurs when people spend a disproportionate amount of their income (sometimes non-food expenditure) on the condition. (Xu et al. 2003) Despite this, a great variety of specific definitions for catastrophic health expenditure have been utilized since although the theory is agreed upon, the exact constitution the concept in explaining disease burdens on households such that the thresholds for determining a disproportionate level of expenditure vary from 10% to 60%. (Sun et al, 2009) Some studies on the other hand deviated from this more standard approach of describing large proportion of health expenditure relative to income such that for instance; Mukherjee et al used the concept of "high health care expenditure" instead of catastrophic health payments. In this study, a household was identified as having incurred high out-of-pocket expenditure on health care if its annual health care expenditure was high in comparison to those of other households within the same caste group in India (Mukherjee et. al, 2011).

In regards to out of pocket medical expenditure for medical services a survey conducted by (Margaret Perkins, 2009),the



majority of interviewed women reported paying out of pocket for facility based delivery services. This findings related increased out of pocket health services to the use of middle and upper tier health facilities such as health centers and hospitals as well as to the utilization of private and mission owned health facilities that required the full medical costs to be covered by the patient or their private insurer at the time of the survey. Out of pocket costs were highest in Kenya with a mean cost of \$18.4 and 98% of women who had to deliver at a health facility had to pay some user fees.. In Burkina Faso, 92% of women reported paying user fees at a mean amount of \$7.9 and in Tanzania, the lowest user fees were reported at a mean \$5.1 - 91% of women reported paying user fees (Margaret Perkins, 2009).

In the 2006 survey, the majority of births in Tanzania (56%) took place in health facilities, whereas in both Burkina Faso and Kenya, 45% and 33% of births, respectively, took place in health facilities. Among women who delivered outside the health system, the primary reason given for delivering at home was lack of time to reach a health facility. In Burkina Faso and Tanzania, the majority of institutional deliveries took place at government health facilities; relatively few births took place in private or mission health facilities (16% and 11%, respectively). However, in Kenya, 28% of institutional deliveries were at private or mission facilities. In all three countries in both surveys, almost all women who delivered at a facility reported that they had to pay some costs, and these costs were not significantly different between wealth quintiles. In the 2006 survey, the majority of births in Tanzania (56%) took place in health facilities, whereas in both Burkina Faso and Kenya, 45% and 33% of births, respectively, took place in health facilities. Among women who delivered outside the health system, the primary reason given for delivering at home was lack of time to reach a health facility. In Burkina Faso and Tanzania, the majority of institutional deliveries took place at government health facilities; relatively few births took place in private or mission health facilities (16% and 11%, respectively). However, in Kenya, 28% of institutional deliveries were at private or mission facilities. In all three countries in both surveys, almost all women who delivered at a facility reported that they had to pay some costs (Margaret Perkins, 2009).

In addition to direct financial expenditures attributed to medical services, the overall cost of treatment was also attributed to among other factors indirect expenses such as;- the cost of transportation to a health facility (McIntyre et al, 2006). There also exist the additional cost lost wages among other indirect costs have been observed to have a direct impact on treatment costs being that they often exceed the cost of medical services. (Mcintre et al, 2006).

With regards to out of pocket health spending between income groups (richer and poorer households) in such a way that conducted studies found that poorer households spend a higher proportion of their income on care for diabetes than richer households. These differences may (Elrayah H, 2005) be so intense that one study from India found that in urban areas, the share of income spent on diabetes care in the poorest households was seven times that of the richest households (Ramachandran A, 2007) On chronic illnesses such as diabetes it was observed that a considerable share of health expenditure relative to overall household spending was observed such that a study in Sudan

reported that on average 65% of household health expenditure was spent on caring for a child with diabetes Medications are frequently found to be the largest component of expenditure on diabetes (Falconer et al, 2009).

Spending on medications represents from 32% to 62% of total expenditure on diabetes care in various country settings such as India, Mexico, Pakistan and Sudan. As a ratio of income, a study on diabetics in rural Ghana reported that spending on insulin alone represented around 60% of the monthly income of those on the minimum daily wage (Aikins, 2005)

Concerning the cost of medical services it was found out that using originator-brand (non-generic) medication was found to result in much higher levels of medical spending in diabetes studies that used random sampling rather than convenience samples. A study in Yemen and Mali on the purchase of an originator brand medicine "Glibenclamide" (a medicine used to treat type II diabetes) found that in the private sector there was a potential to impoverish an additional 22% and 29% of the population, respectively, versus 3% and 19%, respectively, if the lowest priced generic product was purchased (Nuns et al 2010).

Other contributing factors observed with regards to treatment costs were laboratory and transportation costs which were often found to be the second largest component of expenditure. Such that some studies documented expenditure related to special dietary regimens (which were up to 20% of the direct costs in North India). Other factors that have been observed to contribute to additional expenditure are; the presence of complications and the duration of the illness which coincide with an increase of the direct costs. For instance, Khowaja et al. found that in Pakistan, the direct cost for patients with co-morbidities was 45% higher than the direct cost for patients without co-morbidities (Khowaja et al, 2007). Similarly, in India, those without complications were found to have an 18% lower cost compared to the mean annual cost for outpatient care for all patients with diabetes, while those with three or more complications had a 48% higher cost (Kapur, 2007).

In relation to income and coping strategies used by household which incurred particularly high out-of-pocket treatments costs, it had been observed in India, that the majority of patients (89%) used their household income to fund the monitoring and treatment of their diabetes, while household savings were used by 22% of retired patients and by 19% of those in the lowest income bracket. Additionally, when faced with hospitalization, 56% of patients had to dip into their savings or borrow in order to fund the costs. (Kapur,2007) Additionally, very few households are reimbursed by insurance such that in India, Kapur found that only 1% of patients claimed the costs of treatment on insurance (Kapur,2007) while Ramachandran et al. observed that medical reimbursement was obtained by 14.2% of urban patients but by only 3.2% of rural patients (Ramachandran et al, 2005) Moreover, Khowaja et al. found that in Pakistan, none of the persons with high cost chronic illnesses (diabetes) indicated that their cost was borne by an insurance company or their employer (Khowaja et al, 2007).

#### **1.4 Critique of Existing Literature**

Assessing out-of-pocket costs of health services is challenging and potentially sensitive— especially when medical costs differ markedly from official service delivery policies and norms. Several recent studies on out-of-pocket costs of maternity

care in low income countries in sub-Saharan Africa and Asia have consistently shown that out-of-pocket costs of maternity care vary considerably depending on the type of delivery (normal or complicated), as well as the type of health facility (public vs. private) and the level of the health system (Borghi et al. 2003; Levin et al. 2003; Borghi et al. 2006a; Borghi et al. 2006b).

In Ghana, Malawi and Ghana, for example, Levin et al. (2003) found that out-of-pocket costs for normal delivery (including user fees, travel costs and accommodation costs) ranged from US\$2.30–22.80 in Uganda, US\$0.40–7.90 in Malawi, and US\$12.60–20.70 in Ghana. Fees for complicated deliveries were considerably higher, ranging from US\$13–59 in Uganda to US\$68–140 in Ghana.

In other countries such as Kenya, Tanzania and Burkina Faso, physical access was an inhibitor to out of pocket health expenditure rather than financial access among those women who opted out of institutional/ facility deliveries. (Margaret Perkins, 2009).

### 1.5 Research Gaps

The major research gap in the researchers perception is the limitation of the few studies conducted in Africa is that they do not assess the implications of health care costs on national poverty estimates (Merlis, 2002). Assessing the determinants of out of pocket health care payments is key to determining the role of out of pocket health care spending on poverty. This is important for informing policy on the need to incorporate health financing designs in poverty reduction programs and for highlighting the urgent need to ensure that health financing systems offer financial risk protection. This paper contributes to the literature by assessing the association of these determinants (income levels, employment status, insurance status and cost of health services) on out of pocket health spending in Nairobi County, Kenya.

## III. METHODOLOGY

### 1.6 Research Design

This research utilizes the mixed research design which involves using multiple ways in exploring the research problem such as; basing design on either or both perspectives; examining research problems or questions based on prior literature knowledge; collection of data using any appropriate technique and continual interpretation which can influence stages in research process (Mugenda & Mugenda, 2003). The reason for choice of mixed research design is to overcome the limitations of a single research design. According to (Mugenda & Mugenda, 2003) mixed research design often complements the strength of a single design, addresses different questions at different levels and addresses theoretical perspectives at different levels.

### 3.2 Population

(Mugenda & Mugenda, 2003) defines population as a complete set of individuals, cases or objects with some common observable characteristics. Researchers many times draw samples from the population from which generalizations are made. The target population of the study is be out-patients from the private and public hospitals operating in Nairobi County. The respondents or the accessible population of the study are out-

patients from 10 of the 34 selected public and private hospitals operating in Nairobi County (MOH, 2008).

### 3.3 Sample and Sampling Size

#### 3.3.1 Sampling Frame

A sampling frame requires each member of the population under consideration to be known and identifiable (Francis A, 1998). Sampling frames indicate the listings of the population together with the certain characteristics of the population. According to Mugenda & Mugenda (2003) Gay suggests that at least 30% of the cases under accessible population are required for research. Therefore, this study used at least 30% of the accessible population which drew the sampling frame 10 out of the 34 public and private hospitals operating in Nairobi County. Table 1 below illustrates the sampling frame formulated by the study by visiting the different 10 out of 34 hospitals operating in Nairobi County. The study managed to establish that the estimate number of patients who visit the different hospital clinics on a monthly basis. This was achieved by conducting an interview in the different clinics. As illustrated in the sampling frame, there is an estimate of about 14,684 patients who visit the 10 selected hospitals on a monthly basis in Nairobi County.

#### 3.3.2 Sample Size

Researchers are often encouraged to take a big sample size as possible where time and resources allow. Studies which normally use large sample sizes are often confident that if another sample of similar size were to be selected, findings from two samples would end up being similar to a high degree (Mugenda & Mugenda, 2003). However, as already mentioned, researchers are faced with challenges of time and resources in selecting large populations. Therefore, in this study relies on the following formula in Mugenda and Mugenda, (2003) in coming up with the sample size.

The sampling frame in Table 1 is indicates that the population is more than 10,000 individuals. Mugenda and Mugenda (2003) recommends that in such a case 384 of them should be recommended for as the desired sample size given that the Z statistic is 1.96 at 95% confidence level as shown in the following formula.

$$N = \frac{Z^2 Pq}{d^2}$$

Where:

N = The desired sample size (When population is less than 10,000)

Z = The standard normal deviate at the required confidence level

P = The proportion in the target population estimated to have characteristics being measured

q = 1-p

d = The level of statistical significance set

$$384 = \frac{1.96^2 (0.5)(0.5)}{(0.05)^2}$$

Since resources and time are a major constraint in deciding the sample size, the above procedure will help guide the study in determining the actual sample size. According to Gay as cited in Mugenda and Mugenda (2003) at least 20%-30% of the accessible population is normally required for descriptive studies

and 10% of the accessible population is required for experimental studies.

Therefore, as indicated above, the study being descriptive used a sample size of 30% of the desired sample size (384) as the actual sample size.

$$115 = 30\% \times 384$$

Therefore the actual sample size that the study considered was 115 respondents from the 10 public and private hospitals operating in Nairobi County.

This study used stratified random sampling as described in Mugenda and Mugenda (2003) to achieve the desired population representation from the 10 selected hospitals. As Sellitz, Weigtsaman & Cook (1976) argue in Mugenda and Mugenda (2003), every hospital clinic selected in this study was based on the relative variability of the characteristic under study in this case being the sample estimate number of monthly patients.

**Table 3. 1: Sampling Frame**

No	Name of Hospital	Name of Clinic	Location	Estimate No of Monthly Patients	Desired Sample Size	Actual Sample Size
1	Aga Khan University Hospital	Pediatrics Clinic	3rd Parklands Avenue	1,500	39	12
2	Guru Nanak Ramagarhia Sikh Hospital	Orthopedic Clinic	Muranga Road	275	7	5
3	Kenyatta National Hospital	Out Patient Department	Hospital Road	5,000	131	30
4	M.P Shah Hospital	Child Health Clinic	Shivachi Road Parklands	1,200	31	9
5	Mama Lucy Kibaki Hospital	Out Patient Department	Kangundo Road	500	13	5
6	Mater Hospital	Dental Clinic	South B Dunga Road	454	12	5
7	Mbagathi District Hospital	Aids Clinic	Mbagathi Road	2,450	64	19
8	Nairobi Hospital	Physiotherapy Clinic	Argwings Kodhek Road	200	5	5
9	Nairobi West Hospital	Out Patient Department	Ghandhi Avenue	855	22	7
10	Pumwani Maternity Hospital	Obstetrics & Gynecology	Pumwani	2,250	59	18
<b>Total</b>				<b>14,684</b>	<b>384</b>	<b>115</b>

### 3.3.3 Sampling Techniques

The technique that was adopted for this study was random sampling. This technique enables the study achieve a desired representation of the respondents from the 10 selected Public and Private Hospitals operating in Nairobi County. According to (Mugenda & Mugenda, 1999), there exist two types of random sampling which include Simple and Stratified Random Sampling. Stratified random sampling is ideal for this study since it ensures that subjects are selected in such a way that the existing subgroups in a population are reproduced in the sample. The study started first by stratifying the population from the 10 selected hospitals into partitions. This was followed by calculating the proportion of population in each partition and combining the results to obtain the actual stratified sample. Table 1 below illustrates the name of hospital, name of out-patient clinic selected, location of the hospital, the estimate number of patients who visit the selected clinics on a monthly basis and the desired sample size and actual sample size which was derived using stratified random sampling.

### 3.4 Data Collection Instruments

A structured questionnaire was used to obtain the data. The questions were in line with the study objectives as well as the

research questions. Section I of the questionnaire captured the general information or bio-data of the respondent, Section II captured information relating to the factors that affect out-of-pocket medical expenditure among out-patients in hospitals in Nairobi County. Part A of section II captured the level of income details of the respondents, part B captured the employment status of respondents, part C captured information relating to the cost of medical services, part D captured information relating to health insurance status and finally part E captured information relating to out-of-pocket medical spending of respondents.

### 3.5 Data Collection Procedures

The study will used self-administered questionnaires to collect data from the respondents. The main reason for use of the questionnaires was because it collects important information from the population since each item in it is developed to address the specific objectives and research questions of the study.

The questionnaires were distributed by the researcher to the 10 branches of public and private hospitals operating in Nairobi County. The respondents were randomly selected by the researcher when administering the questionnaires.

The questionnaires were accompanied by a brief introduction of the study and purpose of the study for the respondent.

According to Mugenda and Mugenda (2003), breaching confidentiality, is a matter of concern to all respondents. In view of this, the study withheld the names of the respondents and their respective view with utmost confidentiality. During the data collection emphasis was be given to the primary and secondary data.

### 3.6 Pilot Test

The questionnaires were pre-tested to establish their reliability and validity before conducting the study. A pilot study of 1% (4) of the 384 respondents was carried out at The Kenyatta National Hospital-Upper Hill Hospital road in their outpatient department. Pretesting instruments helped in ensuring that items in the instruments are stated clearly and have the same meaning to all respondents (Mugenda & Mugenda, 2003). The pretest assisted the study asses the clarity of the instrument and the ease of use of the instrument. This were be looked into by examining the time it takes to administer an instrument, identifying questions which confuse respondents and identifying sensitive and annoying questions.

The reason for choice of Kenyatta National Hospital is because the hospital has similar features as the other hospitals existing and operating in Nairobi County. The Hospital is also the biggest in the country and is a major referral hospital. The study subjected the pretest to the internal consistency technique of Kuder-Richardson (K-R) 20 Formula as shown below:

$$KR_{20} = (K) (S^2 - \sum s^2) / (S^2) (K-1)$$

Where:

$KR_{20}$  = Reliability coefficient of internal consistency

$K$  = Number of items used to measure the concept

$S^2$  = Variance of all scores

$s^2$  = Variance of individual items

To determine whether items correlate, the correlation coefficient was examined. A high coefficient for instance between 0.70 to 0.1 implies that items correlate strongly among themselves which implies that there is consistency among items in the measuring the concept of interest (Mugenda & Mugenda, 1999).

### 3.7 Data Collection Procedure

Questionnaires were used by the study to collect data from the desired target population who in this case are patients. The questionnaires were distributed to the different out-patients in the different outpatient clinics illustrated in Table 3.1 operating in Nairobi County. Questionnaires are useful for conducting research mainly because the respondent's response in this case may end up giving more insights into his feelings, background, hidden motivation, interest and finally decisions.

### 3.8 Data Analysis and Presentation

#### 3.8.1 Data Analysis

Once the questionnaires have been administered, the mass raw data collected must be organized in a manner that facilitates the analysis. Therefore, the study did this by use of quantitative techniques which employs the use of both descriptive and inferential statistics. Descriptive statistics were used to meaningfully describe distributions of scores, measurements and statistics. Descriptive statistics such as Measures of central tendency (Mean, Mode and Median) and Measures of variability

(range, standard deviation, frequency distribution, histograms, frequency polygons, bar charts, percentages and relationships) were used in analyzing the data. Inferential statistics on the other hand were used to make inferences about the population based on results obtained from samples. In this study, Correlation tests and multiple regression tests were used as inferential statistic parameters.

Correlation is a technique used to measure the strength of the relationship between two variables. it provides a measure if how well a least square regression line fits the given set of data and points how closer the data fits the regression line. Correlation coefficient ranges between (+ or -) 0 and (+ or -) 1 and is represented by a symbol R (Francis, 1998). A correlation coefficient value of  $R=0$  signifies that there is no correlation present whereas a value further away from the origin signifies a stronger correlation. The study used the product moment correlation test on all the regressors to test the association between the variables. The Level of Significance was set at 0.05 at 95% Confidence Level. The main advantage of using correlation test was that it is concerned in describing the strength of the relationship between two variables by measuring the degree of association of the data values.

The multiple regression model was estimated using ordinary least squares and it took the following form of equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + E_t$$

Where:

$Y$  : Household out of Pocket Payment (Dependent Variable)

$X_1$  : Household Monthly Income (Independent Variable)

$X_2$  : Duration of Occupation (Independent Variable)

$X_3$  : Cost of Medical Services (Independent Variable)

$X_4$  : Health insurance status (Independent Variable)

$E_t$  : Stochastic/Error term (Independent Variable)

The advantage of using this model is because it assisted to predict the value of household out of pocket medical spending given the value of household income, duration of occupation and household cost of medical services. According to Francis A (1998), the multiple regression model uses independent variables with each controlling for the others. Multiple regression models are also very flexible and allow one to use either numeric or categorical independent variables to allow for interactions between the variables.

The study coded the questionnaires and the data was entered into the computer using Statistical Package for Social Science (SPSS V-17) as well as STATA (12) statistical softwares. The statistical softwares aided the study in analyzing both descriptive and inferential statistics stated above.

#### 3.8.2 Data Presentation

Data was presented using Tables, Charts and Graphs. Tables included frequency tables, contingency tables, pivot tables and regression result tables. Charts included Pie charts and Graphs included bar graphs and line graphs among others.

## IV. DATA PRESENTATION AND ANALYSIS

### 4.1 Introduction

This chapter focused on data presentation, analysis and discussions of the survey results. The presentation of results from the survey will be based on the order of the study objectives and research questions.

**4.1.1 Pilot Test Results**

The study’s pilot test was carried out prior to the main survey and this was mainly aimed to determine the reliability and consistency of the survey instrument. The study obtained a Kuder Richardson reliability coefficient of 0.7 which clearly illustrated that the items to be surveyed had a high positive correlation among themselves.

**4.2 General and Background Information**

**4.2.1 Response Rate**

The study with the help of research assistants administered 115 questionnaires and all of them were filled and returned. The response rate in this case was 100% and was therefore considered for analysis (Mugenda & Mugenda, 2003). The survey covered a sample of public and private hospitals operating in Nairobi County.

**4.2.2 Gender of Respondents**

The survey results indicated that 59% of the respondents were male whereas 41% of the respondents were female. The total population of the respondents was 115. See Table 4.1.

**Table 4. 1: Gender of Respondents**

Gender	Frequency	Percent	Cumulative Percentage
Male	47	41%	41
Female	68	59%	100
<b>Total</b>	<b>115</b>	<b>100%</b>	

**4.2.3 Name of Hospital**

Results from the survey indicated that 26% of the respondents were from Kenyatta National Hospital and 17% were from Mbagathi district Hospital and Pumwani Maternity Hospital respectively. 10% of the respondents were from Aga Khan University Hospital whereas 6% & 7% of the respondents hailed from Nairobi West Hospital and M.P Shah Hospital respectively. A paltry 4% of the total respondents hailed from Guru Nanak Ramargarhia sikh Hospital, Mama Lucy Kibaki Hospital, Matter Hospital and Nairobi Hospital respectively. See Table 4.2 below.

**Table 4. 2: Name of Hospitals**

Hospital Name	Frequency	Percent	Cumulative Percent
Aga Khan University Hospital	12	10%	10%
Guru Nanak Ramargarhia Sikh Hospital	5	4%	15%
Kenyatta National Hospital	30	26%	41%
M.P Shah Hospital	8	7%	48%
Mama Lucy Kibaki Hospital	5	4%	52%
Mater Hospital	5	4%	57%
Mbagathi District Hospital	19	17%	73%
Nairobi Hospital	5	4%	77%
Nairobi West Hospital	7	6%	84%
Pumwani Maternity Hospital	19	17%	100%
<b>Total</b>	<b>115</b>	<b>100%</b>	

**4.2.4 : Age Bracket**

Majority of the respondents stated that they were between 30-35 years old. 29% of the toal respondents stated that they were between 25-30 years and above 40 years old respectively. a

paltry 3%, 2% and 1% of the respondent stated that they aged between 30-35 years, 30-36 years and 36-40 years respectively. See Table 4.3 below.

**Table 4. 3: Age Bracket of Respondents**

Age Bracket	Frequency	Percent	Cumulative Percentage
25-30	33	29%	29%
30-35	43	37%	66%
30-36	3	3%	69%
31-35	2	2%	70%

36-40	1	1%	71%
Above 40	33	29%	100%
<b>Total</b>	<b>115</b>	<b>100%</b>	

**4.2.5: Level of Education of Respondents**

The study also sought to collect the level of education of respondents. The results indicated that 44% of the respondents had Bachelors Degree followed by 22% who had Diploma Certificates. 20% of the respondents had KCSE Certificate

meaning they were form four leavers. A paltry 45 of the respondents had Higher diploma Certificate and Masters Degree respectively. See Table 4.4

**Table 4. 4: Level of Education of Respondents**

Level of Education of Respondents	Frequency	Percentage %
Higher Diploma	5	4%
CPA K	5	4%
Masters Degree	7	6%
KCSE Certificate	23	20%
Diploma	25	22%
Bachelors Degree	51	44%
<b>Total</b>	<b>115</b>	<b>100%</b>

**4.2.6: Sole Financial Provider**

The study established that 35% of the Male and Female respondents stated that they were no the sole financial providers In their households. The study also established that 47% and 53% of the Male and Female respondents respectively were the sole financial providers on their households. See Table 4.5.

**Table 4. 5: Sole Financial Provider of the Household**

Gender	Are you the Sole Financial Provider	
	No	Yes
Male	35%	47%
Female	65%	53%
<b>Total</b>	<b>100%</b>	<b>100%</b>

**4.3: Descriptive Statistics**

**4.3.1: Income Level of Respondents**

The study collected the monthly income earned by the 115 respondents. It was established from the descriptive statistics results that the maximum income earned by the respondents was 560,000 Ksh whereas the minimum amount earned by the respondents was 7,000 Ksh. the average monthly income earned by the respondents was 84,591 Ksh which had a standard deviation of 91,115 Ksh. See Table 4.6 below.

**Table 4. 6: Level of Income of Respondents**

N	Minimum Income	Maximum Income	Mean	Standard Deviation
115	7,000	560,000	84,591	91,115

**4.3.2: Employment Status**

**4.3.2.1 : Employment Status of Respondents**

The study sought to establish the employment status of the different respondents. Approximately 69% of the respondents were identified to be employed on salary whereas 30% of the respondents were identified to be self employed. A paltry 2% of the respondents were identified to be Semi Employed casual workers. See Figure 4.1 below.



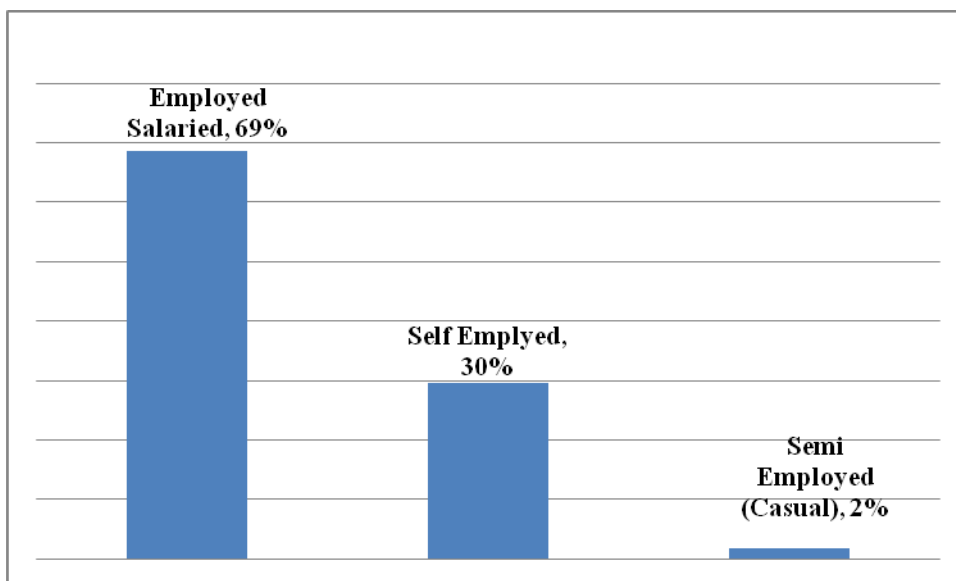


Figure 4. 1: Employment Status of Respondents

**4.3.2.2: Cross Tabulation of Employment Status and Duration in Current Occupation**

The cross tabulation of employment status against the duration in current occupation of respondents revealed that 265 of the respondents have been in their current occupations for 3 years whereas 19%, 18%, 13% and 10% of the respondents have been in their current occupations for 4, 2, 5, and 1 year respectively. See Table 4.7 below.

Table 4. 7: Cross Tabulation of Employment Status against Duration of Occupation

Employment Status	Duration In Current Occupation											Total
	1	2	3	4	5	6	7	8	9	10	12	
Employed Salaried	6%	15%	15%	12%	11%	5%	2%	1%	1%	1%	0%	<b>69%</b>
Self Employed	3%	3%	11%	7%	2%	0%	2%	0%	0%	1%	1%	<b>30%</b>
Semi Employed (Casual)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	<b>2%</b>
<b>Total</b>	<b>10%</b>	<b>18%</b>	<b>26%</b>	<b>19%</b>	<b>13%</b>	<b>5%</b>	<b>3%</b>	<b>1%</b>	<b>1%</b>	<b>2%</b>	<b>1%</b>	<b>100%</b>

**4.3.3: Cost of Medical Services**

**4.3.3.1 Number of Chronically Ill Members per Household**

The study made an attempt to establish the current number of chronically ill members from the different households. 60% of the respondents indicated that none of their members are chronically ill whereas 40% of the respondents indicated that at least 1 member from their household was chronically ill. See Table 4.8 below.

Table 4. 8: Number of Chronically Ill Members per Household

No of Chronically Ill Members in Household	Frequency	Percentage	Cumulative Percentage
0	69	60%	60%
1	46	40%	100%
<b>Total</b>	<b>115</b>	<b>100%</b>	

**4.3.3.2: No of Children under Age 5 per Household**

The study identified that almost 44% of the households had 1 child under the age of 5 years old whereas 28% had 2 children under age 5. A paltry 4% of the households had 3 children under age 5. 24% of the respondents stated that their households had no child under the age of 5 years old. See Table 4.9 below.

**Table 4. 9: No of Children under Age 5 in the Household**

No of Children under Age 5 in the House Hold	Frequency	Percentage %
3 Children	5	4%
None	28	24%
2 Children	32	28%
1 Child	51	44%
<b>Total</b>	<b>115</b>	<b>100%</b>

**4.3.3.4 Cost of Monthly Associated Sicknesses**

The study established that the maximum cost spent on average on associated sicknesses was 87,000 Ksh whereas the some respondents stated that they incur zero costs on the same. The mean of the stated costs by the 115 respondents was 9,579 Ksh with a standard deviation of 14,878. See Table 4.10 below.

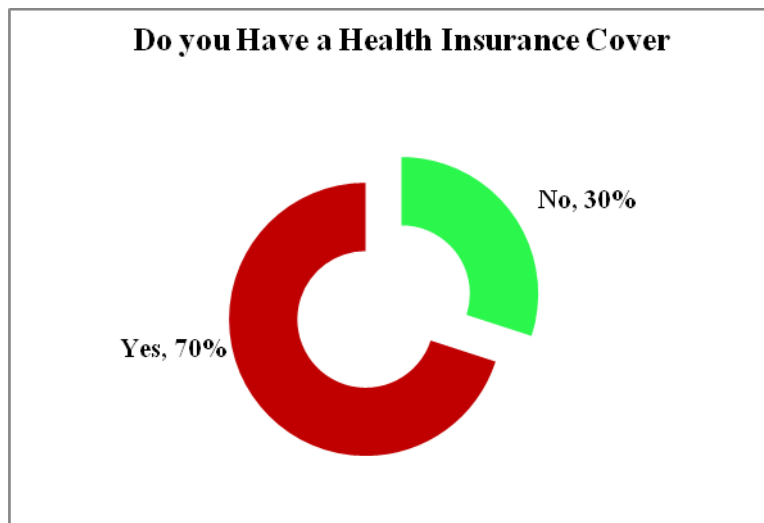
**Table 4. 10: Cost of Monthly Associated Sicknesses**

N	Minimum	Maximum	Mean	Standard Deviation
115	0	87,000	9,579	14,878

**4.3.4: Health Insurance Status**

**4.3.4.1: Respondents Health Insurance Status**

It was established that 70% of the respondents had Health Insurance Cover whereas 30% did not have any. See Figure 4.2 Respondents Health Insurance Cover



**Figure 4. 2: Respondents Health Insurance Cover**

**4.3.4.2 : Respondents Health Insurance Compnay**

The study carried out a cross tabulation of Health Insurance Companies against Health Insurance Cover. It was established that majority of the respondents belonged to NHIF whereas 7% of the respondents belonged to AON and Liberty Insurance Companies. 6% and 4% of the respondents belonged to Resolutin Insurance and KenGen Insuraance respectively whereas 3% and 2% of the respondents belonged to Jubilee Insurances, Madison Insurance, UAP insurance and Linda Jamii, respectively. 35% of the respondents held the Co Payment and Exclusive Provider Plan wheras 30% of the respondents as previously stated held no insurance cover plan. See Table 4.11 below.



**Table 4. 11: Cross Tabulation of Health Insurance Company With Health Insurance Cover**

Health Insurance Company	Health Insurance Cover			Total
	Co Payment	Exclusive Provider Plan	None	
AON	7%	0%	0%	7%
Jubilee	3%	0%	0%	3%
KenGen	4%	0%	0%	4%
Liberty	7%	0%	0%	7%
Linda Jamii	2%	0%	0%	2%
Madison	3%	0%	0%	3%
NHIF	0%	35%	0%	35%
Resolution	6%	0%	0%	6%
UAP	3%	0%	0%	3%
None	0%	0%	30%	30%
<b>Total</b>	<b>35%</b>	<b>35%</b>	<b>30%</b>	<b>100%</b>

**4.3.4.3: Household Average Health Insurance Cost**

The maximum health insurance cost charged to members was 45,000Ksh. Other respondents stated that they currently incur zero costs on health insurance because they lack any health insurance cover. The mean household health insurance cost was 6,385 which had a standard deviation of 10,283. See Table 4.12 below.

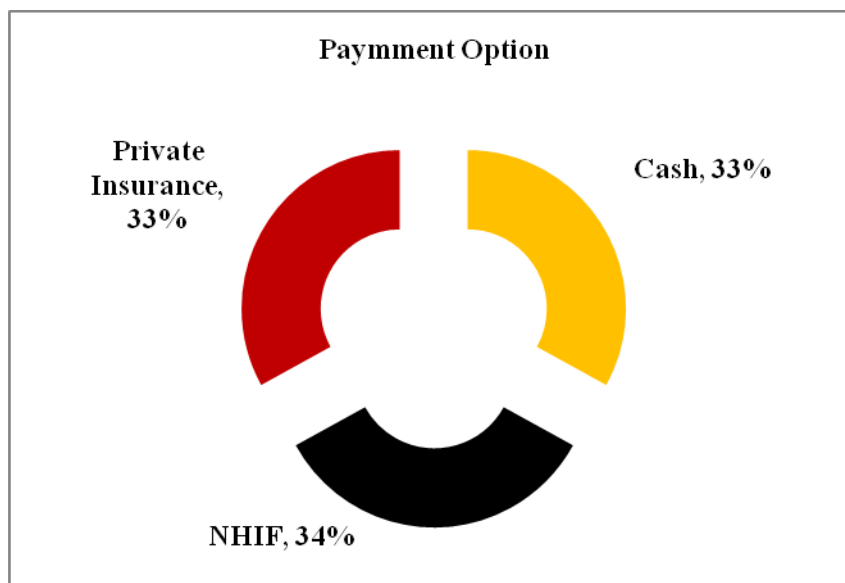
**Table 4. 12: Household Average Health Insurance Cost**

N	Minimum	Maximum	Mean	Standard Deviation
115	0	45,000	6,385	10,283

**4.3.5: Out of Pocket Medical Expenditure**

**4.3.5.1: Payment Option for Medical Services**

Majority of the respondents (34%) stated that they often rely on nthe Governrmtn Health Insurance of NHIF as their most preferred payment option for medical services cost. 33% of the respondents stated that they often use cash to pay for medical services and privat insurance respectively. See Figure 4.3 below.



**Figure 4. 3: Payment Option for Medical Services**

**4.3.5.2: Monthly Out of Pocket Health Expenditure**

The study found out that the maximum out of pocket health expenditures cost incurred by the 115 respondents was 35,000Ksh which had a mean of 6,997 Ksh and with a standard deviation of 8,572. See Table 4.13.

**Table 4. 13: Monthly Out of Pocket Health Expenditure**

N	Minimum	Maximum	Mean	Standard Deviation
115	0	35,000	6,997	8,572

**4.3.5.3: Frequency of Monthly Visits to Health Facilities**

Finally, the study established that most of the respondents (60%) visit the health facilities once in a month whereas 22%, 17% and 1% of the respondents visit the health facilities 2 times, 4 times and 4 times respectively on a monthly basis. See Table 4.14 below.

**Table 4. 14: Frequency of Monthly Visits to Health Facilities**

Monthly Visits to Health Facilities	Frequency	Percentage	Cumulative Percentage
1	70	60%	60%
2	25	22%	82%
3	19	17%	99%
4	1	1%	100%
<b>Total</b>	<b>115</b>	<b>100%</b>	

**4.4 Inferential Statistics**

**4.4.1 Correlation Analysis**

The study carried out the Pearson Product Moment Correlation Coefficient on the dependent variable and independent variables so as to measure the strength of the direction of the linear relationship between the variables. The results presented in the correlation matrix below indicate that most of the independent variables had no significant statistical correlation. The results however indicated that there existed a strong positive relationship between household income and cost of household medical services (R=0.727) and a weak significant positive correlation between cost of medical services and health insurance status (R=-0.331).

**Table 4. 15: Correlation Matrix**

Correlation Analysis Matrix		Household Income	Duration in Current Occupation	Cost of Household Medical Services	Health Insurance Status
<b>Household Income</b>	Pearson Correlation	1.000	0.094	0.727**	0.170
	Sig. (2-tailed)	0.000	0.319	0.000	0.069
	N	115	115	115	115
<b>Duration in Current Occupation</b>	Pearson Correlation	0.094	1.000	0.036	-0.036
	Sig. (2-tailed)	0.319	0.000	0.701	0.699
	N	115	115	115	115
<b>Cost of Household Medical Services</b>	Pearson Correlation	0.727**	0.036	1.000	0.331**
	Sig. (2-tailed)	0.000	0.701	0.000	0.000
	N	115	115	115	115
<b>Health Insurance Status</b>	Pearson Correlation	0.170	-0.036	0.331**	1.000
	Sig. (2-tailed)	0.069	0.699	0.000	0.000
	N	115	115	115	115

**4.4.2 Regression Analysis**

The study carried out regression tests so as to describe the relationship between the dependent variable (Out of Pocket Medical Payment) and the independent variables (Household Income, Duration in Current Occupation and Cost of Household Medical Services). Table 4.12 below illustrates the model summary results output generated from SPSS V.20. The correlation coefficient R=57.1 indicates that the variables on average are positively moderately correlated. The (R Squared) coefficient of determination

value of  $R^2=0.335$  indicates that 33.5% of the variation in out of pocket medical payments and was explained by the variation in household income, duration in current occupation and cost of household medical services. The adjusted coefficient of determination (Adj R Squared) was less than the un-adjusted Coefficient of determination as it should always be (Adj R Squared=0.311 < R Squared = 0.335). This still implied that 33.5% of the variation in variation in out of pocket medical payments and was explained by the variation in household income, duration in current occupation cost of household medical services and insurance status. See Table 4.16.

**Table 4. 16: SPSS Regression Model Summary Results**

Model	R	R-Squared	Adjusted R Squared	Standard Error of Estimate
1	0.579	0.335	0.311	7,115.99

SPSS V.20 when generating regression results also generates Analysis of Variance Results (ANOVA). The ANOVA results in Table 4.17 below shows how well the sample regression model fits. The significance value  $P = 0.00$  of the regression model was less than the level of significance of 0.01 at 99% confidence level. This therefore showed that the regression model was statistically significant and predicts out of pocket medical payments.

**Table 4. 17: Analysis of Variance Regression Test Results**

	Sum of Squares	Degrees of Freedom	Mean Square	F Statistics	Probability Significance Value
Regression	2,808,290,321.959	114	702072580.490	13.865	0.000
Residual	5,570,118,895.432		50637444.504		
<b>Total</b>	<b>8,378,409,217.391</b>				

The linear regression model results -with out of pocket medical payments as the dependent variable and household income, duration in current occupation and cost of household medical services as independent variables was estimated. The study used the unstandardized beta coefficients because the raw units of the dependent and independent variables are familiar as commonly used units of measurements.

On average, holding duration in current occupation and cost of household medical services constant, an increase in household income increases households out of pocket medical payments by (0.025 units) 0.025 Ksh.

On average, holding household income and cost of household medical services constant, an if employees stay for a long period of time in current occupation, the out of pocket medical payments reduce by 705.574 Ksh.

On average, holding house hold income and duration in current occupation constant, an increase in the cost of household medical services reduces the cost of out of pocket medical payments by 0.211 Ksh. See Table 4.14 below.

On average, insurance status holding all other factors constant decreases the cost of out of pocket medical payments by 8,099.973 Ksh. See Table 4.14 in the next page.

**Table 4. 18: Regression Coefficient Results**

Regression Model	Un standardized Coefficients		Standardized Coefficients	t Statistics	Probability Significance Value
	B	Standard Error	Beta		
Constant	15,199.975	1,636.67		8.440	.000
Household Income	.025	.011	.264	2.306	.023
Duration in Current Occupation	-705.574	333.866	-.165	-2.113	.037
Cost of Household Medical Services	-.211	.069	-.366	-3.075	.003
Health insurance status	-8099.973	1551.812	-.433	-5.220	.000

## V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 Introduction

This chapter will present the summary of findings, conclusion and recommendations and will give the areas for further research based on the results from chapter four. It is important to note that the findings in the study followed a chronological sequence based on the objectives of the study.

### 5.2 Summary of the Findings

The number of the respondents in the study was 115 which is quite significant and they were surveyed from the 10 public and private hospitals located in Nairobi County. The study collected information from the respondents and mainly focused on different age brackets as well as different income groups so as to ensure an adequately large amount of information. A regression model estimated based on the results from the survey.

#### 5.2.1 Income Levels of Individual/ Household head

One the first specific objective, the study investigated the association between household income levels and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County. The results indicated that for every Kshs increase in household monthly income, out of pocket medical expenditure rises by Kshs 0.25 on average. This indicated that household monthly income had a positive association on out of pocket medical expenditure.

#### 5.2.2 Employment Status of Individual/ Household Head

One the second specific objective, the study examined the association between employment status and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County. The results indicated that for every incremental month of occupation duration, out-of-pocket medical expenditure was reported to decrease by Ksh705.574 on average. This indicated that employment status and out of pocket medical expenditure had negative associations.

#### 5.2.3 Cost of Health Services

One the third specific objective, the study established the relationship between cost of medical services and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County. The results indicated that for every Kshs increase in household costs of medical services, out- of- pocket health expenditure reduces by Kshs 0.211 on average. This indicated that the cost of medical services and household out of pocket expenditure had a negative relationship.

#### 5.2.4 Insurance Status of Individuals

One the fourth and final specific objective, the study investigated the association between health Insurance status and household out-of- pocket medical expenditures among out patients in Nairobi County. The results indicated that the presence of health insurance reduces out-of pocket health expenditure by Kshs 8,099.973 on average. This indicated that the cost of health insurance status and household out of pocket expenditure had a negative relationship.

### 5.3 Conclusion

The implications of these findings are as follows;

#### 5.3.1 Income Levels of Individual/ Household head

With regards to the association between household income levels and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County. There was a tendency

for higher income earners to spend more of their income on out-of-pocket medical spending. This could be attributed to their preferences for the more expensive private sector medical services and their tendency towards preventive medical services such as medical screening.

#### 5.3.2 Employment Status of Individual/ Household Head

With regards to the association between employment status and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County, the duration of employment causes a marginal reduction in monthly out-of-pocket spending. This could be attributed to the fact that firms tend to register their employees in health insurance schemes and or have group health insurance covers.

#### 5.3.3 Cost of Health Services

With regards to the relationship between cost of medical services and household out-of-Pocket medical expenditures among out patients in hospitals in Nairobi County, the cost of medical services relates very slightly negatively to out-of-pocket medical expenditure perhaps because more costly services are demanded less but also because medical services are not sought for the larger part by consumer choice but by absolute necessity.

#### 5.3.4 Insurance Status of Individuals

With regards to the association between health Insurance status and household out-of- pocket medical expenditures among out patients in Nairobi county. Health insurance status had a very large and significant impact on out-of-pocket health expenditure due to the fact that 3<sup>rd</sup> party payers such as health insurance shield the consumer from the monetary effects of ill health.

With regards to the general objective i.e. the factors that affect Out-of-Pocket medical expenditure among out patients in hospitals in Nairobi County ; - Out-of-pocket health expenditure increases with increased household income but declines with increased;- cost of medical services, duration of employment, cost of medical services and the presence of health insurance/subscription to health insurance. This is in line with theoretical proposition that more costly health service mixes are demanded by higher income earners for instance; private health services, screening services, preventive health services etcetera.

### 5.4 Recommendation

The following are the recommendation of the study based on the objectives and the research questions:

#### 5.4.1 Income Levels of Individual/ Household head

With regards to household income, the study recommends the subsidization of healthcare services to low income households by the National and County Government.

#### 5.4.2 Employment Status of Individual/ Household Head

With regards to employment status the study recommends the introduction of low budget health insurance schemes for employees with short employment duration, informal workers, and the newly employed.

#### 5.4.3 Cost of Health Services

With regards to the relationship between cost of medical services, the study recommends the introduction of price ceilings for healthcare medical services.

#### 5.4.4 Insurance Status of Individuals

With regards to health insurance the study recommends policy actions to compel employers to provide insurance cover to short term contract workers.

### 5.5 Suggestions for Further Research

The limitations of this study are its general focus on out-of-pocket health expenditure across all income categories. The study proposes that future research should be carried out in the following areas:

1. To investigate the relationship between out of pocket medical expenditure and income level of patients across hospitals in Nairobi County
2. To determine the challenges encountered by out of pocket medical patients across hospitals in Nairobi County.

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## AUTHORS

**First Author** – Nicholas Otieno Okello, Master of Business Administration, Jomo Kenyatta University of Agriculture and Technology  
**Second Author** – Dr. Agnes Njeru, Supervisor, Jomo Kenyatta University of agriculture and technology

# Human Resource Management Practices and its Influence on Organizational Performance: An Analysis of the Situation in the Ghana Postal Services Company Limited

Dr. Felix Kwame Opoku (Senior Lecturer) \*, Mr. Dominic Degraft Arthur \*\*

\* Department of Management studies, School of Business, University of Cape Coast, Ghana

\*\* PhD Fellow, Department of Culture and Global Studies, Aalborg University Denmark

**Abstract-** The study was carried out to assess the impact of human resource management practices on the performance of the Ghana Postal Services Company. The main objective of the study was to determine the major factors contributing to the inability of the company to meet the challenges of the global market competitiveness in the postal and communication industry. The study adopted purely qualitative approach and used both primary and secondary data. The primary data were collected from management and clients of the company. The results indicated that human resource management practices have a significant effect on organizational performance. Thus, the contribution of this study is that human resource management practices will have significant effect on organizational performance through positive HRM outcomes.

**Index Terms-** Knowledge Economy, Organizational Goals, Employment Security

## I. INTRODUCTION

The recent transformation in market systems in knowledge economy has made the adoption of human resource management practices imperative for competitive advantage. As argued by Delaney and Huselid (1996), the contemporary organization can gain competitive advantage and successfully attain her goals only when it can synergize all its human resource practices in the right manner, and in response to constantly changing business environments. The motivation for this line of action is that there is a key connection between human resource management practices and organizational performance (Yeung & Brenman, 1997). For example, Huselid (1995) observes that human resources management practices are used to manage the pool of human resources, and to ensure that the resources are utilized effectively towards the achievement of the organizational goals. Dittmer (2002) also contended that human resource management practice is an individual's perception on the extent of the implementation of strategies, plans, and programs which are used to attract, motivate, develop, reward and retain the best employees to meet the organizational goals.

Supporting the preceding perspective, Pfeffer (1998) emphasizes that, human resource management practice comprises of the formal policies and procedures that are designed

to attract, develop, motivate and retain employees who ensure the effective functioning and survival of the organization. According to Pfeffer, the link between human resource management practice and organizational performance is based on two approaches; the contingency (best fit) approach and the universal (best practice) approach. Pfeffer (1995) opined that the "best fit" approach involves a set of human resource management practices which are associated with improved performance in all types of organizations and, by implication, for all types of employees. According to him, "best practice" approach is the human resource management practice that is consistent with the business strategy of the organization designed to enhance employee's performance in the attainment of the organizational goals.

In a knowledge-based economy driven by technology, the success of organizations will depend more and more on the value of intangible human capital (Hatala, 2006). This capital may be the creativity and proficiency of their human resources. In supporting this view, Wachira (2010) argued that the scope of contemporary human resource management is much more than the accumulation of skill sets in the person. What is now needed is an entirely new way of learning through professional support that may enhance the adaptive capability of the workforce in order to ensure the efficient and effective use of resources in the organisation (Wachira, 2010).

## Problematizing Ghana Postal Service Company Limited

The Ghana Postal Service Company, like other postal companies, is vital for her contribution to the economic development of the country, and therefore, is considered as one of the key pillars of public sector institutions that provides the bulk of the revenue to the state. Yet, in recent times, given the poor nature of its performances, the state does not generate the needed revenue from the company. This is arising from the inability of the company to meet the challenges of the global market competitiveness in the postal and communication industry. The underlying tenet of the problem however is that, Ghana Postal Service Company Limited suffers from inefficient and poor human resource management practices, largely because of the negative human resource management practices in the organization. Recent report on the performance of the Ghana Postal Services Limited has shown that the company is facing a great number of setbacks including; mismanagement and improper planning and control. In the light of this, the following

questions draw the attention of many Ghanaians. Why Ghana Postal Services Company Limited is interested enough to practice efficient human resource management practices? Do the poor human resource management practices of the company affect her efficient and effective operations to meet the competitive global economic order?

To address the preceding research questions, we set out to organize this paper into four sections. The first section discusses the theoretical framework, within which the study is anchored, specifically the scholars' viewpoints on human resource management practices and organizational performance. The second section seeks to provide a general overview of the Ghana Postal Services Company Limited, highlighting on the functions of the company to the national economy. The third section focuses on the methodology. The final section presents the results and discussions of the study.

## II. THEORETICAL FRAMEWORK

Human resource management practices, if genuinely developed to reflect their beliefs and principles in organizations, have a tendency to create a workforce whose contributions are valuable and unique to improve the organizations' performance (Dittmer, 2002). According to Yeung and Brenman (1997), the integrative framework through which human resource practices can contribute to organizational performance consists of building organizational capabilities, improving employee satisfaction, and shaping customer and shareholder satisfaction. The authors noted that in order to ensure dynamic changes in the organization's human resources that will refocus the priorities and resources of the human resource function, human resource management practice must be business driven rather than human resource driven. The organization should be forward looking and innovative rather than backward looking. Instead of focusing on individual human resource practices, the focus of the human resource should be on the entire human resource systems, taking into account synergies existing among all human resource practices in the organization (Barney, 2001).

As a follow-up to previous studies, Psareek and Rao (1998) stressed that, good human resource management practices require a well-structured function and a carefully designated human resource management practice. These human resource management practices, according to the authors are performance appraisal, feedback and counseling, career-planning, training and development, employment security, employee participation, and performance based compensation. According to them, proper application of the human resource management practices can help an organization to achieve her stipulated goals.

Selden, Willow, Salwa and Wright (2000) have shown that, human resource management interventions are effective if the objectives and goals for which they were implemented were achieved. These human resource management interventions include; skills development, performance improvement, attitude change, and knowledge acquisitions. The purpose of the human resource management interventions is to ensure an organization's effectiveness through the attainment of its strategic and operational goals. According to them, these goals can be effectively achieved through the proper use of the human resource management practices in the organization.

Justifying the influence of human resources management practices on organizational performance, Morrison (1996) emphasized that the nature of human resource management practices adopted by the management can convey the message that the organization's value their employees as the most strategic asset. Such positive valuations tend to strengthen employees' judgment about the level of organizational support. This line of argument corroborates with Shore and Martins (1989) viewpoint that certain human resource practices such as formal training systems, employee security, performance based compensation and results oriented performance appraisal tend to show an organization's readiness to ensure the welfare of employees. Ulrich (1997) used the systems approach to substantiate his viewpoints. In trying to explain the link between human resource management practices and organizational performance, Ulrich focuses more on inputs, such as, the type of resources that the organization needed and the process of channeling and transforming all those resources into quality outputs that are important for the achievement of the organizational goals.

Again, Wernerfelt, (1984) has shown that every organization needs three key result criteria to ensure total organizational effectiveness. These are flexibility and control, people and organization, as well as means and ends. As Wernerfelt argued, if an organization wants to change their structure, product or the job requirement, it has to redirect the old ways of managing employees in the organization. As regards people and organization, Wernerfelt emphasizes that the organization as an entity has to open up its focus of control, and encourage participation from employees so that the organization is more competitive and effective to win the supports of its employees. In Wernerfelt's view, means refers to the structure, systems, products, resources, economic factors, social factors and strategy that are used to get the desired results in an organization. As Wernerfelt observes, these sets of values, if properly and genuinely combined together may serve as prerequisite for the achievement of organizational goals and performance.

Following the same line of argument, Klinger (1993) asserts that managing core employees effectively means identifying their needs, aspirations providing them with an enabling work environment where they can utilize their abilities and satisfy many of their basic needs. Klinger observed that, any organization that provides such facilities tend to create an opportunity for increasing employee's commitment towards organizational goals. In contrast, if an organization fails to provide employees with challenging and meaningful tasks, commitment levels tend to diminish, which, therefore, affects the organization in its effort to attain higher performance. For example, employees become more committed to employers' who take concrete steps to help those (employees) to develop their knowledge, skills and abilities whilst in the organization. Klinger concluded that employees' attitude and behaviors (including performance) reflect their perceptions and expectations reciprocating the treatment they receive from the organization.

In the opinion of Perry (1993), values, such as, strategy, structure, system, style, staff, skills, and shared vision are important criteria for measuring organizational performance. Perry emphasized that for an organization to be effective it must first plan and design a structure which is linked to its business

plans and goals. The structure must also have a system that compliments the structural type. The style of management must be based on the systems in place. Staff must then be employed according to the business needs and systems requirements. Skills must be developed to compliment the organizations as well as strategy that is planned to achieve long term goals. All these must then be discussed between staff and managements to build shared visions of the organization (Perry, 1993).

### **General Overview of the Ghana Postal Services Company Limited**

Postal Services in Ghana (Gold Coast) started in 1854. This followed a representation made to the Secretary of State for the colonies by the Governor of the Gold Coast during the colonial period. Consequently, major Stephen Hills who was the British postmaster general in London was requested to establish a separate postal service for the Gold Coast as directed (Office of Ghana Post Accra, 1990). Before that time, receiving and dispatching of mails in Ghana (Gold Coast) was confined to British Secretary of State for colonies in London through his representative who was stationed in Cape Coast and Accra. In Ghana (Gold Coast), unlike other British colonies in West Africa, the first step towards the development of the national postal services to incorporate both internal and external services started in 1860. In that year, the legislative council of the Gold Coast colony enacted legislation for the pre-payment of postage on certain classes of letters passing through the post.

In 1873, the first post office was opened at Cape Coast with Rowland Cole - a Sierra Leonean as the first postmaster. In 1879, the General Postal Office was moved to Accra with the transfer of the national capital from Cape Coast to Accra. In light of this, in 1879, Gold Coast became a member of the Universal Postal Union (UPU) which was set up in Berne in Switzerland in 1874. Following from that, the British Secretary of State for colonies created the office of the colonial postmaster responsible for coordinating postal services on a country-wide basis. This position was later re-designed as postmaster-general. The first private letter boxes were established in 1888 in Accra soon after the enactment of the post office ordinance that year. In addition, in 1912, a postal service was mandated to provide all aspect of postal duties including tele-printer operation in Ghana (Gold Coast) (Office of Ghana Post, Accra, 1990). This trend reflects the willingness of the Colonial Government to improve the development of postal services in Ghana to enhance access to exchanges of information of the citizens during the colonial period.

However, it is worthy to note that, all this period, the post and telecommunication was part of department of the Ghana civil service. The post and telecommunication department became a corporation on November 1974 with the promulgation of National Redemption Council Decree 311 of January 1974. It is important to emphasize that, these legislative frameworks and laws helped to strengthen the operation of the postal services in Ghana. The Decree of Incorporation also enjoined the corporation to operate in broad functions including; internal and external postal services, National and International telecommunication services on commercial lines.

As part of the second Telecommunication Projects, Government accepted a proposal to separate the Posts from the

Telecommunication and to restructure both entities with the view to stimulating foreign investment in both divisions, expanding and improving their network to provide viable commercial ventures and improving the managerial capacity to ensure effective and efficient operations and maintenance of their facilities and services. To this end, on December 13, 1993 the telecommunication division of the corporation was established as a telecommunication entity under the company's code by Act 401 of Parliament of Ghana. Additionally, on August 31, 1995 the Ghana Postal Services Corporation was established with enactment of Act 505 to operate as a separate and independent entity and to provide allied services including; collection and safe delivery of letters, delivery of printed materials, delivery of small packets, advice on delivery of parcels, provision of letter boxes and private mail bags, provision of the operation of post shops to the customers in the country.

### **Data, Rationale, and Method**

This research was conducted to gain insight into human resources management practices and the performance of Ghana Postal Services Company Limited. Data on the study were collected within a time frame of one month at different levels with diverse research tools. The source of data for this paper is drawn from field interviews, Focus group discussion combined with desk research. The field work took the form of face-to-face interviews almost carried out entirely by the researchers, so as to ensure consistency in questioning and depth of probing from March, 2<sup>nd</sup> to April, 2<sup>nd</sup> 2015. The respondents were the managers, workers and the clients of the Ghana postal services.

To obtain the sample size for the study, we obtained a list of the number of clients of the postal services with registered boxes in the ten (10) regional capitals of Ghana. From a combination of these lists, a random sample of thirty (30) was drawn from the postal services from the ten regional capitals of Ghana. Again, all the managers from the ten (10) regional capitals were purposively selected for the study. Altogether there were forty (40) respondents selected for the study. The rationale for the inclusion of the clients in this study was that they are the service beneficiaries; therefore, it is important to explore the nature of the services provided by the Ghana postal services. In addition, the key informants (managers) was also included because of their in-depth knowledge in the management of human resources of the company, and also because they are the direct strategic implementers of human resource practices. Out of the forty (40) respondents, five (5) FGD were held for the study. Each group consisted of six (6) members comprised of three women (3) and three (3) men. In addition, the face to face interview was conducted for the remaining ten (10) respondents who were mainly the regional managers selected for the study. Information gathered through the field interviews and the focus group discussions were supplemented with the desk research obtained from the published and unpublished scholarly documents (books, journal, newspapers, and magazines).

### **III. RESULT AND DISCUSSIONS**

The goal of this study is to examine the effects of the human resource management practices on the performance of the Ghana postal services. The analysis of the paper was guided by six



human resource management practices; recruitment and selection, formal training systems, result-oriented performance appraisal, employment security, employee participation in decision making in organization, and performance-based compensation. The data for the study was mainly qualitative.

### **Selection and Recruitment**

To examine the issue of merit-based induction system during recruitment and its effect on the performance of Ghana Postal Services Company Limited, respondents were asked: How does the merit-based induction in the organization influence the employee's performance? The results show that merit-based induction was very poor in the organization. Further discussion with the respondents reveals that the company does not organize any merit-based induction programs for newly recruited employees in the organization. This in the view of the respondents was worsening the existing poor performance of the Ghana Postal Services Company Limited. This conclusion supports Cascio's (2006) argument that the nature and content of selection and recruitment can attract highly talented employees who would be encouraged to perform in order to achieve competitiveness (Cascio, 2006).

### **Formal Training Systems**

To find out whether formal training program works in the company, a question was asked: Do you think Ghana postal services are committed to training and development of its employees? Interviews with the employees indicated that, the company is not committed to training and development programs. The discussion with the respondents revealed that the company had not organized a training and development workshop for the employees in the past 5 years, even though training and development of employees is a key human resource management practice for an organizational productivity and employee performance. During the interview session, one respondent had this to say to substantiate training and development:

*"I do not remember the last time a training programme was organized for any staff of this company. Even when we decide to use our own money to embark on further studies we are told our pay would be stopped"*

Many of the managers supported this view and indicated that, the absence of training and development programmes have affected the company's service delivery to the clients. Undoubtedly, this poor mode of service delivery has made majority of the clients to shift to other alternatives, such as, money transfer, delivery of letters and parcels and the sale of army, police and fire service forms by other financial and private postal service institutions (e.g. FedEx, DHL, State Transport Corporation) to enjoy quality and faster services than those provided by the Ghana postal services company limited.

The results support the arguments of Huselid, (1995) who opined that the most knowledgeable and skilled worker still requires training so as to fit into the organization and become a valuable contributor to the team. Justifying his arguments, Huselid noted that training helps the employees to orient themselves to the organizational culture, operations and practices; confide new employees to effective performance during their probationary period; provide knowledge and skills

to improve job performance; prepare employees with demonstrated potential for increased responsibility in meeting future staffing requirement, provide continuing professional and technical training to avoid knowledge or skills obsolescence, and to develop the managerial workforce focusing on competencies identified as essential to effective performance at supervisory, managerial and executive levels.

### **Results-oriented performance appraisal**

To find out whether performance appraisal was practiced in the organization, a question was posed: Do management conduct performance appraisal in your company? What effects does performance appraisal have on the operational success of the company? The results indicated that the effects of the performance appraisal on the organization's performance was "Negative" primarily because since the last five years, the organization had never conducted performance appraisal to help evaluate the performance of the employees, identify the basis of sound personnel policy in relation to transfers and promotions, and evaluation of the effectiveness of the training programmes. The results also show that this poor organizational practice is affecting their performances because the working environment in the Ghana Postal Services Company is not encouraging, and does not motivate the employees to work to enhance the company's performance. One interviewee made the following statement when he was asked to explain the effect of the inexistence of performance appraisal in the service:

*Performance appraisal is based on demonstrated achievement of performance objectives established pertaining to a specified job within a given time period. This process plays a vital role in influencing the perception of employees about self and about their contribution toward organizational goals. Performance appraisal is used as an aid in making judgment decisions pertaining to promotion, demotion, retention transfer, and pay. The lack of these can hinder the performance of the company.*

### **Employment Security**

The results of the study on employment security showed that the employment security issues are not favorable and this is reflected by the poor nature of its operation in the past ten years, resulting from the keen competition in postal services and communication industry. The field interview reveals that, majority of the employees do not have requisite qualifications coupled with the absence of in-service training programs in the company. To probe further, a question was asked: Do you have job security in this organization? The aim of this question was to solicit for the responses to support the results generated from the respondents' records. The results revealed that, the company has a job security, but it does not utilize it efficiently to benefit the employees, even though, job security remains a hallmark of improved performance in a work environment, primarily because it motivates the professionally employees to devote their attention to the job in order to meet the target of the organization. One of the discussant noted:

*Employment security serves as a safeguard for guaranteeing that employees are accorded the basic dignity that every human being is entitled to enjoy as an employee in an*

organization. However, the Ghana postal company is handicapped in this area.

#### **Performance-based Compensation**

To examine whether the issue of performance based compensation works in the organization, the question was asked: Do the workers in the organization receive performance based compensation? The interview with the employees revealed that the company did not provide balanced, fair and competitive compensation and reward system for the workers. The interaction with management showed that, performance based compensation in the company was very poor. Worthy of note is that, this poor state of situation in the company is a cause of poor retention of competent employees in the company, because of poor employee's commitment to the company and, therefore, has effects on the company performance. The results support the argument that comprehensive compensation mix, augmented by an effective system of disbursement plays an effective role in attracting best candidates, shaping employees behavior and performance outcome, and facilitates retention of talents (Bishop, 1998).

#### **IV. RECOMMENDATION**

The study seeks to examine the influence of the human resource management practices on the attainment of the performance of Ghana Postal Services Company. In light of the empirical evidences established from the foregoing analysis the following recommendations are outlined to help address the situations in the Ghana postal services company.

First, merit-based recruitment and selection system should be practiced by the company because this type of recruitment procedures help to recruit a large pool of qualified applicants paired with reliable and valid knowledge, skills and abilities. Given their backgrounds, such category of employees' will be capable to work efficiently to enhance the company's performance if given formal and informal orientations training programs, such as basic skills training, on- the- job experiences, coaching, mentoring by the company.

Second, the company should make it a duty to organize training and development programs to the employees'. The programs should aim at constantly improve competencies levels of the workforce towards the enhancement of the company's performance. Besides, motivation is a key factor to the organization's performance. For instance, the effectiveness and efficiency of highly skilled employees are likely to be low if the employees do not have motivation from the company. For this reason, Ghana Postal Services Company has to effectively provide motivational packages (see the use of performance appraisal, that assesses individual or group work performance, linking these appraisals tightly with incentive compensation merit, and other forms of incentives intended to align the interests of employees. This will influence the employees' efficiency and effectiveness in the company.

Furthermore, the company must provide job security for its employees, as being the case, job security remains a hallmark of public employment Act in Ghana. Job security in organization provides an assurance to the employees that, he is part and parcel of the organization. This therefore encourages the professional employees to devote their attention towards performing his duties

in an organization in order to enhance the organization's performance.

Finally, the contributions of the highly skilled and motivated workforce towards the organizations performance is likely to be low if jobs are structured, or programmed, in a manner that employees, who presumably know their work better than anyone else, do not have the opportunity to use their skills and abilities to design new and better ways of performing their roles in an organization. In view of that, the Ghana Postal Services Company Limited must design the organizational structures in a way that will encourage employee's participation and initiatives regarding the performance of their roles in the company.

#### **V. CONCLUSIONS**

This study sought to examine the influence of the human resources management practices and the Ghana Postal Services Company Limited's performance. Review of literature provides strong evidence that the effective human resource management practices have greater impact on the attainment of the organizational performance. My study empirically substantiated the results of earlier studies with regard to this linkage. The study has highlighted that the importance of human resource management practices to achieve and sustain superior performance in changing business environment depended on the use of an integrated approach toward formulation and implementation of human resource management practices. To this end however, the Ghana Postal Services Company needs to proactively pursue a strategic approach to human resources management practices and invest in such practices to achieve sustainable competitive advantage in tangible and intangible dimensions. Finally, though, this study has made significant contributions to the understanding of the human resource management practices in Ghana Postal Service Company, one of the most important sectors of the Ghanaian economy, yet, my work focused on the small scale sample for the analysis and interpretation of results. In this regard, I strongly propose that future research should include large scale sample in other industries in Ghana to statistically validate the results of present study.

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#### AUTHORS

**First Author** – Dr. Felix Kwame Opoku (Senior Lecturer),  
Department of Management studies, School of Business,  
University of Cape Coast, Ghana, felixopoku@yahoo.com,  
+233244974205/+233505280813

**Second Author** – Mr. Dominic Degraft Arthur, PhD Fellow,  
Department of Culture and Global Studies, Aalborg University  
Denmark, dominic@cgs.aau.dk,  
+233554499381/+233507122795

# EFFECTS OF STRATEGY DEVELOPMENT ON SUSTAINABILITY OF SME'S IN THIKA TOWN

Lorraine Minayo Musanga, Dr.Kepha Ombui

Department of Human Resource Management. Jomo Kenyatta University of Agriculture and Technology

**Abstract-** The small and micro enterprises (SMEs) play an important role in the Kenyan economy, they are the sources of innovation in products, technology and services, provide a competitive check on existing firms, contribute to industries where optimal size is small and create jobs in formal and informal sectors..SMEs play a fundamental role in the economy, but despite their significance, past statistics indicate that three out of five businesses fail within the first few months of operation. This study aimed at examining the effects of strategy development on sustainability of Smes in Kenya while using Thika town as a case study. Kaplan and Norton (1992) Balanced Scorecard was adopted to create and test measures of sustainability appropriate to SMEs, Porters five forces of competitive position was also adopted. Data was collected from 50 small and Micro-enterprises within Thika town. The results showed that competition, financial resources, government regulations and entrepreneurial skills affect strategy development of SMEs. Majority of the SMES felt that high cost of business licenses, lack of sufficient capital, Changes in customer expectations and competition from existing and new competitors is are aspects that have an effect on sustainability of SMES.

**Index Terms-** SMEs, Strategy, Sustainability, Enterprises.

## I. INTRODUCTION

Small Micro-Entrepreneurs have grown tremendously both in size and number playing a vital role in the development of transitional economies. According to Ministry of Trade survey of 2009, Kenya has about 1.6 million registered SMEs constituting 96% of all registered enterprises in the country. The small businesses employ about 75% of the total labour force and contribute to 20% of Kenya Gross Domestic Product (Nalo, 2008)

According to the Economic Survey (2006), the sector contributed over 50% of new jobs created in the year 2005. Despite their significance, past statistics indicate that three out of five businesses fail within the first few months of operation (Kenya National Bureau of Statistics, 2007).Based on this statistics, the government Kenya has initiated efforts to encourage the development of small enterprises. This culminated in a national strategy for small enterprise development (Government of Kenya, 2006) that became an official government policy in2006. SMEs have the capacity to achieve rapid economic growth, while generating a considerable extent of employment opportunities (Reddy, 2001). SMEs create about 85 percent of Kenya's employment (African Economic Outlook, 2011 report).While the subsector constitutes close to 85 percent of employment, it only contributes about 20 percent of the total

GDP. This implies dismal performance of the subsector. The development trajectory of the subsector thus requires a system which holistically fosters SME development. More policy initiatives definitions towards revitalizing the SME sub-sector should not only be government engineered, but also enjoy the input of all stakeholders in all sectors of development. The effort from both private and public sector towards reinforcing the existent SME policy provisions is highly recommended based on the fact that all appear to recognize the SMEs' critical role in spurring not only self sustenance but also the country's economic boom. Thika town is one of the fast growing industrial towns whose businesses have been closing down during its infant stages and its location is to the proximity of the researcher. This study therefore sought to explore the effects of strategy development on sustainability of SMEs.

## 2. LITERATURE REVIEW

According to the (Kenya National Baseline Survey,1999) SME refers to any business in the private sector, which employs up to 50 employees. Small and medium business research represents a vast field of study that incorporates many disciplines from the social sciences in addition to business and thus adds to the complexity of undertaking research in this area (Giroux, 2008; Curran and Blackburn 2001). The study will be guided by two models and one theory that include;

Balance Score Card Model of measuring performance of firms developed by Kaplan and Norton is used to assess performance of firms in three perspectives: Consumer perspective, internal process, financial and innovation and learning perspectives.

Michael Porter's famous Five Forces of Competitive Position model provides a simple perspective for assessing and analyzing the competitive strength and position of a business regarding market entrants, Competitive rivalry, Supplier power, buyer power and product and technology development.

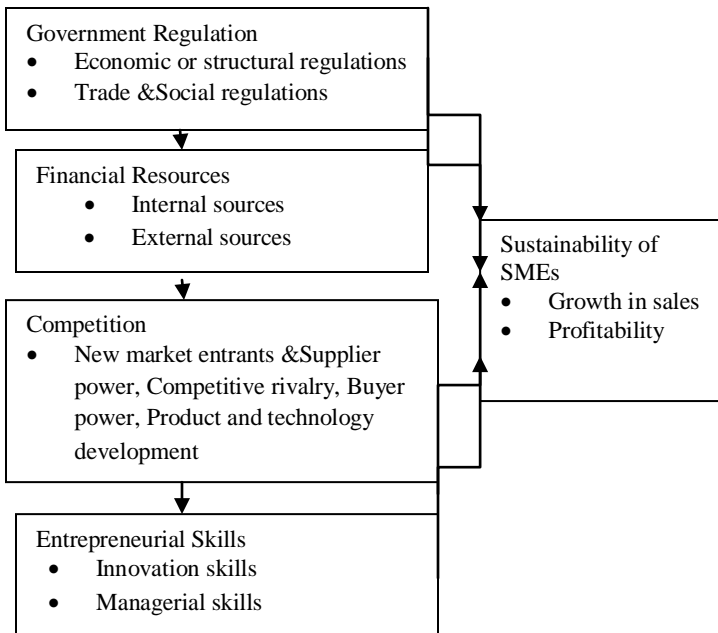
Ducker's Theory of Entrepreneurship considers entrepreneurship to be based on the same principles, whether the entrepreneur is an existing large institution or an individual starting. The rules are pretty much the same. These entrepreneurial skills include managerial and innovative skills.

### 2.1 Research objectives.

1. To examine how government regulations affect sustainability of SMEs in Thika town.
2. To determine how financial resources affect sustainability of SMEs in Thika town.
3. To examine how competition affect sustainability of SMEs in Thika town.

- To establish how entrepreneurial skills influence sustainability of SMEs in Thika Town.

### 2.2 Conceptual framework



### 2.3 Sustainability of SMEs

If a micro entrepreneur is able to maintain the business without affecting the quality of the product/service, with consistency in increasing turnover and profitability, such an attribute is called sustainability. Business sustainability requires firms to adhere to the principles of sustainable development (Delmar et al.2003) According to the World Council for Economic Development (WCED), sustainable development is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs.” So, for industrial development to be sustainable, it must address important issues at the macro level, such as: economic efficiency (innovation, prosperity, and productivity), social equity (poverty, community, health and wellness, human rights) and environmental accountability (climate change, land use, biodiversity).

### 2.4 Methodology

The study adopted a survey research design. This is a systematic process of gathering information from a sample of respondents for the purpose of understanding and predicting some aspects of the behaviour of the population of interest (Mugenda and Mugenda 2006).

The survey design is important for the following reasons;

- It provides broad capability of comparison which ensures a more accurate sample to gather targeted results in which to draw conclusions and make important decisions.
- It describes the characteristics of a large population because the population involved was relatively large.

50 questionnaires were distributed,45 were found to be flawless and used for the study.

## 3. RESULTS AND FINDINGS

The findings indicate that majority of the Smes in Thika town are affected by the government regulations put in place by the government. The costs of obtaining business licences is high to any struggling Sme, many government agencies have come up with different operational licenses that makes the licences too many and costly to acquire. Smes are also finding it hard to register their businesses due to the many requirements required to register the businesses. This study therefore concludes that the governments need to be sensitive enough to pass and ensure that regulations placed on operating an SME does not hinder its growth rather it should promote growth of such industries. These findings are also supported by Masurel (2007) who argues that legislation and the desire to provide safe working conditions as the major motivating factors for SMEs to invest in improved sustainability performance

According to the views of the SMEs, financial resources were found to have an effect on the sustainability of SMEs. This is true as majority of the participants strongly agreed with every statement in table 4.3 below. For instance, a majority of 70%, n=35 strongly agreed that rent charged on business premises affected SME sustainability, 80%, n=40 strongly agreed that lack of capital also had the same effect and most importantly, all the SME operators 100%, n=50 unanimously agreed that access to bank and private loans affect the sustainability of SMEs. It is therefore clear that every aspect of financial availability and access to capital greatly influences sustainability of SMEs in Thika town. the main aspect of competition that influence sustainability of SMEs was the ability of competitors to access credit as this gives them a competitive advantage and forces other SMEs to close due to lack of customers as all the 100%, n=50 of the SME operators observed, aggressive advertisement by competitors (80%, n=40), well established businesses (60%, n=30), product diversification (56%, n=28), better human resource management by competitors (80%, n=40) were also some of the aspects of competition that the operators believed influenced sustainability of their business. Lastly, another aim of this research was to evaluate the influence of entrepreneurial skills on the sustainability of SMEs in Thika town and the findings showed that all the SME operators agreed that different aspects of entrepreneurial skills in Thika town influenced the sustainability of SMEs.

### 3.1 Model Summary

Based on the findings of this study, as shown in table 4.7 other factors held constant, government regulations, financial resources, competition and entrepreneurial skills influence sustainability of SMEs in Thika town by 68.9% as represented by the adjusted R<sup>2</sup> in table below 4.7. This shows that there are other variables not studied that affect sustainability of SMEs in the study area by 31.1%.

**Table 1:Model Summary**

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
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1	.845 <sup>a</sup>	.715	.689	.71001
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### 3.2 Results of analysis of variance

Analysis of variance as in table 4.6 indicates a significance value of 0.001 which is less than 0.05% thus there was a significant relationship between the four independent variables under study and the sustainability of SMEs in Thika town. The F calculated value for the study at 95% confidence level is 128.186 also indicating a statistical significant relationship between variables under study. This indicates that there is a significant relationship between sustainability of SMEs and the four variables studied.

**Table 2: Anova**

Model	Sum of squares	Df	Mean square	F	sig
Regression	56.835	49	14.209	128.186	.001 <sup>a</sup>

### 4. Conclusion

It is therefore my conclusion that all matters investigated in this study which are government regulations, financial resources, competition and entrepreneurial skills influence sustainability of SMEs in Thika town. Based on the results, effective entrepreneurship skills is necessary for entrepreneurs to manage and sustain their businesses. Also government regulations imposed on SMEs hinder their growth instead of supporting their existence they become too costly for SMEs to afford. Effective competition can either build or bring an SME down, in this case SMEs are being affected by ineffective competition. For growth and expansion of any SME the study reveals that finances are the backbone of their growth and expansion.

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#### AUTHORS

Lorraine Minayo Musanga, MBA,Jomo Kenyatta University of Agriculture [andTechnology.ceolorra87@gmail.com](mailto:andTechnology.ceolorra87@gmail.com)  
Dr.Kepha Ombui,PHD,Jomo Kenyatta University of Agriculture and technology.

# A Trust Management for Peer 2 Peer Information Systems

**Suraj Suryawanshi**

(M. Tech. Computer Science and Engineering, Rajiv Gandhi Institute of Technology, Bengaluru)

**Pavan Gujjar Panduranga Rao**

(Research Scholar, CSSE Department, Andhra University, Vishakapatnam, Andhra Pradesh)

**Abstract-** Due to the open nature of P2P system exposes them to malicious activity. P2P system means computer in the system can act as both client and server. In a P2P network, the peers are computer systems which are connected to each other via the internet. Files can be shared directly between systems on the network without the need of a central server. Building trust relationships among peers can decrease the attacks of malicious peers. A good peer uploads reliable files and gives fair recommendations. A peer's trustworthiness is evaluated by considering provided services and given recommendations with service and recommendation contexts. A malicious peer performs both service and recommendation-based attacks. Uploading a virus infected (or) an inauthentic file is a service based attack. Self-Organizing Trust Model (SORT) detects the service based attack and recommendation based attack. If one peer wants to upload/download file from another peer means peer will send the query to peer that interacted in the past for learn the trust information of other peers. So, neighboring node will give the recommendation to peer. Based on the recommendation only Peer decides whether the node is good (or) malicious. Find the node is malicious node means peer will not interact with malicious node. Isolate the malicious node from the network. Find the node is good means peer interact with good peer Peer stores a separate history of interactions for each Acquaintance.. Experiments on file sharing application demonstrate that peers with the highest trust value are considered and build the trust model in their contiguity and insulate malignant peers.

**Index Terms-** Peer-to-peer systems, trust management, reputation, security.

## I. INTRODUCTION

P2p computing is the sharing of computer resources and services by direct exchange between systems.[1]These resources and services include the exchange of information, processing cycles, cache storage, and disk storage for file.P2P computing takes advantage of existing computing power, computer storage and networking connectivity, allowing users to leverage their collective power to the 'benefit' of all. In peer to peer system Trust metrics defined on service and recommendation trust contexts help a peer to reason more precisely about capabilities of other peers in providing services and giving recommendations. If all peers are behave good,

reputation of a peer is proportional to its capabilities such as network bandwidth, average online period and number of shared files. In a malicious network, service and recommendation-based attacks affect the reputation of a peer. Three individual attacker, three collaborator and three pseudo spoofer behaviors are studied. SORT mitigates service-based attacks in all scenarios. For individual attackers, hypocritical ones take more time to detect. Identification of collaborators usually takes longer than Identification of an individual attacker. Pseudo spoofers are more isolated from good peers after every pseudonym change. Since good peers get more acquaintances with time, they do not prefer to interact with strangers and leave pseudo spoofers isolated. Two types of collaborators present interesting behavior. Hypocritical collaborators use unfairly high recommendations and attract more good peers at the beginning. They can take advantage of SORT for their attacks. However, good peers eventually identify them and contain their attacks.

Interactions and recommendations are evaluated based on importance, recentness, and peer satisfaction parameters. Additionally, recommender's trustworthiness and confidence about a recommendation are considered while evaluating recommendations. Simulation experiments on a file sharing application show that the proposed model can mitigate attacks on 16 different malicious behavior models. In the experiments, good peers were able to form trust relationships in their proximity and isolate malicious peers. Peer to Peer (P2P) systems rely on collaboration of peers to accomplish tasks. Ease of performing malicious activity is a threat for security of P2P systems. Creating long-term trust relationships among peers can provide a more secure environment by reducing risk and uncertainty in future P2P interactions. However, establishing trust in an unknown entity is difficult in such a malicious environment. Furthermore, trust is a social concept and hard to measure with numerical values. Metrics are needed to represent trust in computational models. Classifying peers as either trustworthy or untrustworthy is not sufficient in most cases. Metrics should have precision so peers can be ranked according to trustworthiness. Interactions and feedbacks of peers provide information to measure trust among peers. Interactions with a peer provide certain information about the peer but feedbacks might contain deceptive information. This makes assessment of trustworthiness a challenge. In the presence of an authority, a central server is a preferred way to store and manage trust information. The central server securely stores trust information and defines trust metrics.

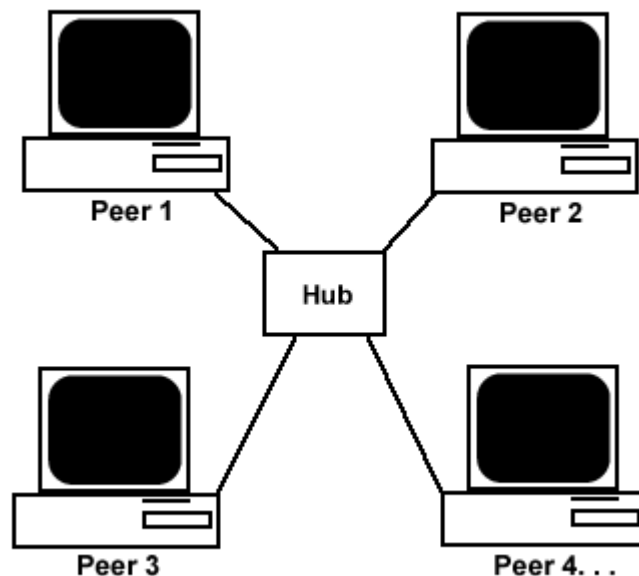


Since there is no central server in most P2P systems, peers organize themselves to store and manage trust information about each other [2], [3]. Management of trust information is dependent to the structure of P2P network. Managing trust is a problem of particular importance in peer-to-peer environments where one frequently encounters unknown agents. Existing methods for trust management that are based on reputation focus on the semantic proper- ties of the trust model. They do not scale as they either rely on a central database or require maintaining global knowledge at each agent to provide data on earlier interactions. In this paper we present an approach that addresses the problem of reputation-based trust management at both the data management and the semantic level. We employ at both levels scalable data structures and algorithms that require no central control and allow assessing trust by computing an agentsreputation from its former interactions with other agents. There are no well defined methods for managing trust relationships in p2p systems. The DHT based approaches are only suited for structured p2p networks not for unstructured p2p networks. Some of the existing methods introduce central authority in p2p networks which may collapse p2p nature. Every agent must keep rather complex and very large data structures that represent a kind of global knowledge about the whole network.

This paper presents distributed algorithms that enable a peer to reason about trustworthiness of other peers based on past interactions and recommendations. Peers create their own trust network in their proximity by using local information available and do not try to learn global trust information.

Two contexts of trust, service, and recommendation contexts are defined to measure trustworthiness in providing services and giving recommendations. Self-Organizing Trust model (SORT) that aims to decrease malicious activity in a P2P system by establishing trust relations among peers in their proximity. In SORT, peers are assumed to be strangers to each other at the beginning. A peer becomes an acquaintance of another peer after providing a service, e.g., uploading a file. If a peer has no acquaintance, it chooses to trust strangers. An acquaintance is always preferred over a stranger if they are equally trustworthy. Using a service of a peer is an interaction, which is evaluated based on weight (importance) and recentness of the interaction, and satisfaction of the requester. An acquaintance's feedback about a peer, re commendation, is evaluated based on recommender's trust worthiness. It contains the recommender's own experience about the peer, information collected from the recommender'sacquaintances, and the recommender's level of confidence in the recommendation. If the level of confidence is low, the recommendation has a low value in evaluation and affects less the trustworthiness of the recommender. SORT defines three trust metrics. Reputation metric is calculated based on recommendations. It is important when deciding about strangers and new acquaintances. Reputation loses its importance as experience with an acquaintance increases. Service trust and recommendation trust are primary metrics to measure trustworthiness in the service and recommendation contexts, respectively. The service trust metric is used when selecting

service providers. The recommendation trust metric is important when requesting recommendations. When calculating the reputation metric, recommendations are evaluated based on the recommendation trust metric. One peer is marked as trusted by SORT and if it is turned OFF from network, there is a possibility to another malicious peer takes its position and act as trusted peer. This can be avoided by Auto Update Mechanism.



The simulation runs as cycles. Each cycle represents a period of time. Downloading a file is an interaction. A peer sharing files is called an uploader. A peer downloading a file is called a downloader. The set of peers who downloaded a file from a peer are called downloaders of the peer. An ongoing download/ upload operation is called a session. Simulation parameters are generated based on results of several empirical studies [6], [7] to make observations realistic. A file search request reaches up to 40 percent of the network and returns online uploaders only. A file is downloaded from one uploader to simplify integrity checking.

In trust routing in peer-to-peer systems using self-organizing trust model, peers are assumed to be strangers to each other at the beginning. A peer becomes an acquaintance of another peer after providing a service, e.g., uploading a file. If a peer has no acquaintance, it chooses to trust strangers. An acquaintance is always preferred over a stranger if they are equally trustworthy. Using a service of a peer is an interaction, which is evaluated based on weight (importance) and recentness of the interaction, and satisfaction of the requester. An acquaintance's feedback about a peer, recommendation, is evaluated based on recommender's trust- worthiness. It contains the recommender's own experience about the peer, information collected from the recommender's acquaintances, and the recommender's level of confidence in the recommendation. If the level of confidence is low, the recommendation has a low value inevaluation and

affects less the trustworthiness of the recommender.

In this paper structured p2p is implemented, because all the peers are organized into a clear logical overlay. Local view of trust is developed by its own based on the past interaction. Thus, good peers form dynamic trust groups in their contiguity and can isolate malignant peers. In novel trust, at the beginning of the process the peers are assumed to be strangers. Only after providing a service, a peer becomes an acquaintance of another peer e.g., file uploading. The peer chooses to trust strangers if it has no acquaintance. Each peer has a set of acquaintances, a subset of which is identified as its neighbors. Using a service of a peer is an interaction, which is evaluated based on priority, and recentness of the interaction, and contentment of the requester. An acquaintance's observation about a peer, recommendation, is calculated based on recommender's honesties. It contains the recommender's own experience about the peer, data collected from the recommender's acquaintances, and the recommender confidence level in the suggestion. If the confidence level is low, the recommendation has a low value in evaluation

## II RESEARCH ELABORATIONS

In SORT, to evaluate interactions and recommendations better, importance, recentness, and peer satisfaction parameters are considered. Recommender's trustworthiness and confidence about recommendation are considered when evaluating recommendations. Additionally, service and recommendation contexts are separated. This enabled us to measure trustworthiness in a wide variety of attack scenarios. Most trust models do not consider how interactions are rated and assume that a rating mechanism exists. In this study, we suggest an interaction rating mechanism on a file sharing application and consider many real-life parameters to make simulations more realistic.

A good peer uploads authentic files and gives fair recommendations. A malicious peer (attacker) performs both service and recommendation-based attacks. Four different attack behaviors are studied for malicious peers: naive, discriminatory, hypocritical, and oscillatory behaviors. A non-malicious network consists of only good peers. A malicious network contains both good and malicious peers. The satisfaction parameter is calculated based on following variables: The ratio of average bandwidth (AveBw) and agreed bandwidth (AgrBw) is a measure of reliability of an uploader in terms of bandwidth. The ratio of online (OnP) and offline (OffP) periods represents availability of an uploader.

Downloading a file is an interaction. A peer sharing files is called an uploader. A peer downloading a file is called a downloader. The set of peers who downloaded a file from a peer are called

downloaders of the peer. An ongoing download/ upload operation is called a session. A good peer uploads authentic files and gives fair recommendations. A malicious peer (attacker) performs both service and recommendation-based attacks. Four different attack behaviors are studied for malicious peers: naive, discriminatory, hypocritical, and oscillatory behaviors. A non malicious network consists of only good peers. A malicious network contains both good and malicious peers.

SORT defines three trust metrics. Reputation metric is calculated based on recommendations. It is important when deciding about strangers and new acquaintances. Reputation loses its importance as experience with an acquaintance increases. Service trust and recommendation trust are primary metrics to measure trustworthiness in the service and recommendation contexts, respectively. The service trust metric is used when selecting service providers. The recommendation trust metric is important when requesting recommendations. When calculating the reputation metric, recommendations are evaluated based on the recommendation trust metric. Assume that  $p_i$  wants to get a particular service.  $p_j$  is a stranger to  $p_i$  and a probable service provider. To learn  $p_j$ 's reputation,  $p_i$  requests recommendations from its acquaintances. Assume that  $p_k$  sends back a recommendation to  $p_i$ . After collecting all recommendations,  $p_i$  calculates  $r_{ij}$ . Then,  $p_i$  evaluates  $p_k$ 's recommendation, stores results in  $RH_{ik}$ , and updates  $r_{ik}$ . Assuming  $p_j$  is trustworthy enough,  $p_i$  gets the service from  $p_j$ . Then,  $p_i$  evaluates this interaction and stores the results in  $SH_{ij}$ , and updates  $st_{ij}$ . One peer is marked as trusted by SORT and if it is turned off from network, there is a possibility to another malicious peer takes its position and act as trusted peer. this can be avoided by the Auto update mechanism.

Metrics should have precision so peers can be ranked according to trustworthiness. Interactions and feedbacks of peers provide information to measure trust among peers. Interactions with a peer provide certain information about the peer but feedbacks might contain deceptive information. This makes assessment of trustworthiness a challenge.

Self-Organizing Trust model (SORT) that aims to decrease malicious activity in a P2P system by establishing trust relations among peers. Each peer develops its own local view of trust about the peers interacted in the past. In this way, good peers form dynamic trust groups in their proximity and can isolate malicious peers. In SORT, peers are assumed to be strangers to each other at the beginning. A peer becomes an acquaintance of another peer after providing a service, e.g., uploading a file. If a peer has no acquaintance, it chooses to trust strangers. SORT defines three trust metrics. Reputation metric is calculated based on recommendations. It is important when deciding about strangers and new acquaintances. Reputation loses its importance as experience with an acquaintance increases.

Algorithm Design and Implementation

Algorithm 1 GETRECOMMENDATIONS( $p_j$ )

```

1:  $\mu_{rt} \leftarrow \frac{1}{|A_i|} \sum_{p_k \in A_i} rt_{ik}$ 
2:  $\sigma_{rt} \leftarrow \frac{1}{|A_i|} \sqrt{\sum_{p_k \in A_i} (rt_{ik} - \mu_{rt})^2}$ 
3:  $th_{high} \leftarrow 1$ 
4:  $th_{low} \leftarrow \mu_{rt} + \sigma_{rt}$ 
5:  $rset \leftarrow \emptyset$ 
6: while  $\mu_{rt} - \sigma_{rt} \leq th_{low}$  and  $|rset| < \eta_{max}$  do
7:   for all  $p_k \in A_i$  do
8:     if  $th_{low} \leq rt_{ik} \leq th_{high}$  then
9:        $rec \leftarrow \text{RequestRecommendation}(p_k, p_j)$ 
10:       $rset \leftarrow rset \cup \{rec\}$ 
11:     end if
12:   end for
13:    $th_{high} \leftarrow th_{low}$ 
14:    $th_{low} \leftarrow th_{low} - \sigma_{rt}/2$ 
15: end while
16: return  $rset$ 

```

Service trust and recommendation trust are primary metrics to measure trustworthiness in the service and recommendation contexts, respectively. The service trust metric is used when selecting service providers. The recommendation trust metric is important when requesting recommendations. When calculating the reputation metric, recommendations are evaluated based on the recommendation trust metric.

Creating trust relationship is based upon two contexts of trust. They are Service Context, Recommendation Context. The service trust metric is used when selecting service providers. The recommendation trust metric is important when requesting recommendations. When pi searches for a particular service, it gets list of service providers. Considering a file sharing application, primary download a file from either one or multiple uploaders. With multiple uploaders, checking integrity is a problem since any file part downloaded from an uploader might be inauthentic.. Assume that pi wants to get a particular service. pj is a stranger to pi and a probable service provider. To learn pj's reputation, pi requests recommendations from its acquaintances. Assume that pk sends back a recommendation to pi. After collecting all recommendations, pi calculates rij. Then, pi evaluates pk's recommendation, stores results in RHik, and updates rtik. Assuming pj is trustworthy enough, pi gets the service from pj. Then, pi evaluates this interaction and stores the results in SHij, and updates stj.

III CONCLUSION

We have identified the question to be addressed when trying to and a solution to the problem of trust assessment based on reputation in a decentralized environment. SORT mitigated both service and recommendation-based attacks in most experiments. However, in extremely malicious environments such as a 50 percent malicious network, collaborators can continue to disseminate large amount of misleading recommendations. Another issue about SORT is maintaining trust all over the network. These issues might be studied as a future work to extend the trust model. Using trust information does not solve all security problems in P2P systems but can enhance security and effectiveness of systems

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AUTHORS

**First Author** –Suraj Suryawanshi has received his B.E degree in Computer Science and Engineering from STJIT College of Engineering, VTU University in 2011.he is pursuing M.Tech in Computer Science and Engineering from Rajiv Gandhi Institute of Technology, Bengaluru.  
E-mail: ss120344@gmail.com

**Second Author** – Pavan Gujjar PandurangaRao Research scholar ,CSSE Department ,Andhra university Vishakapatnam, Andhra pradesh

# ROLE PLAYED BY SACCOS IN FINANCIAL INTERMEDIATION IN THE IMPROVEMENT OF THE WELFARE OF MEMBERS, A CASE STUDY OF FUNDILIMA SACCO

**Nickson Muhaya Kadagi, Dr. Anwar Hood Ahmed and Moses Kimani Wafula**

Accountant Jomo Kenyatta University of Agriculture and Technology, Mombasa CBD Campus, P.O Box 81310-80100 Mombasa, Kenya

Lecturer Technical University of Mombasa P.O Box 90420-80100 Mombasa, Kenya

Senior Assistant Librarian Jomo Kenyatta University of Agriculture and Technology, Mombasa CBD Campus, 81310-80100 Mombasa, Kenya

**ABSTRACT:** Financial intermediation is an exciting field in the demand and supply of funds for investment, liquidity and consumption purposes. Through financial intermediation economic growth occurs and the improvement of the welfare improves: Funds are routed from the savers to borrowers who use the funds in most profitable economic activities (King and Levine 1993). The cooperative movement has been in existence since pre-independence times, they have been touted as the major ways of economic empowerment and poverty reduction. The growth of Saccos has been tremendous and thus they are now in the vision 2030 blueprint as one of the mobilizers of savings and investments. The government through the regulatory authority has seen importance of the Saccos and thus they have formed SASRA to oversee the transition from microfinance player to major finance player with focus on togetherness of the members in Kenya. The importance of the Saccos needs to be highlighted with the members at the heart of this paper. The benefits that members derive from belonging to Saccos are of importance and they need to be highlighted. This study is guided by the following objectives: To find out how Saccos are financial intermediators ; To establish the effect of low interest rates on the improvement of the members welfare; to find out the effect of dividends on the members welfare; To find out the effect of risk diversification on the improvement of members welfare. This researcher employed a survey research design in carrying this research. The target population was made up of members of Fundilima sacco who are also the staff members of JKUAT. A sample size of 234 respondents was selected with a stratum of Fundilima board members, Fundilima top management, Fundilima employees and the members. Questionnaires were used to collect data and analyzed using descriptive statistics. The study findings showed that there is a great role played by Saccos in financial intermediation in the improvement of the welfare of its members.

**Key Terms-** Financial intermediation, financial system, Sacco Members Welfare, Social intermediation

## I. INTRODUCTION

Financial intermediation can be described as the process performed by financial intermediaries of collecting savings and deposits from savers and depositors' and lending out the same to borrowers. According to Gorton, Winton (2002), financial intermediation is the root institution in the savings-investment process. According to OECD (2001), in financial intermediation a financial institution will engage in financial transactions on behalf of lenders and savers in a specialised market i.e. a financial market e.g. stock exchange market, banking sector and in the money market. The institution will therefore expose itself to the risk of losing money on behalf of the lenders/saver by lending the same to borrowers; thus the role of financial intermediaries therefore is to channel funds from lenders to borrowers by intermediating between them. According to the State University of New York (2014), financial intermediation performs the following functions:

Pooling the resources of small savers; many borrowers require large sums, while many savers offer small sums. Without intermediaries the borrowers of large credit would be disadvantaged as they would incur huge costs of looking for savers who would provide the needed amount to be borrowed.

Providing safekeeping, accounting, and payments mechanisms for resources; banks are a good example for the safekeeping of money in accounts, the records of payments, deposits and withdrawals and the use of debit/ATM cards and checks as payment mechanisms.

Providing liquidity, liquidity refers to how easily and cheaply an asset can be converted to a means of payment. Financial intermediaries make it easy to transform various assets into a means of payment through ATMs, checking accounts, and debit cards.

Diversifying risk; financial intermediaries help investors diversify in ways they would be unable to do on their own. When a financial intermediary wants to loan someone it minimises the risk by securing the debt as compared to an individual offering a loan to someone.

Collecting and processing information; financial intermediaries are experts at collecting and processing information in order to accurately gauge the risk of various investments and to price them accordingly. This can be seen in the pricing of loans, investment products and other financial products offered by the intermediaries.

According to King and Levine (1993), financial development is a good predictor of future growth; financial growth can be well described by the growth of financial intermediaries and financial innovations i.e. securitization (a process where mere assets are converted to a tradable position on the money markets) which are active in the financial intermediation process. According to Dondo (2007), SACCOs are established under the Co-operative Societies Act and are an important form of financial intermediary, which play a vital role in provision of financial services to their members. The societies accept monthly payment/savings for shares from which members may borrow an amount equivalent to two or three times their own savings if they can get other members to guarantee them. SACCOs are currently organized as workplace or agricultural based savings or an economic activity based association e.g. sculptors, traders and credit associations whereby people with a common bond, e.g. by working together in the same company or institution, save regularly thus building enough deposits for lending within the group. Some of these savings and credit societies are actually larger (in asset terms) Harambee sacco has assets of upto Kes.17.6bn. (Harambee Sacco, 2014)

Financial intermediation is closely linked to social intermediation. Members belong to a society that enhances their welfare through group linked activities e.g. financial literacy trainings, pooling of savings (SACCOS). Also members are able to access loans at lower interest rates as compared to mainstream financial institutions and members being able to share in profits for group investment and risk diversification of the group through shared guarantor ship and compulsory savings. Hans (2009) argues that social intermediation serves both as preparation for financial intermediation and for wider purposes. Hans says that social intermediation through a range of activities and capacity-building has enabled people to become good borrowers and savers, better manage their own finances or their own financial groups. It has also helped them to put whatever 'social capital' they have to more productive use and thereby improving the welfare of the group members. According to Boston University Center for Law and Policy (2014), financial institutions involved in microfinance in Kenya include formal institutions (banks, non-bank financial institutions, licensed Savings and Credit Cooperatives (SACCOS)). SACCOs are regulated by the SACCO Societies Regulatory Authority (SASRA), which began operations in 2010. Under the new SACCO regulations, all deposit-taking SACCOs are required to apply for a SASRA license by June 17, 2011.

According to Ledgerwood (1999), MFIs provide social intermediation such as group formations, development of self-confidence, and training in financial literacy and management capabilities of members of the group. This can be viewed as necessary step in the enhancement of social welfare of the members who belong to a SACCO. Also the MFIs financial activities involve: Small loans offered to members; Informal appraisal of loans and investments; Collateral substitutes such as group guarantees and or compulsory savings; Access to repeat or larger loans basing on repayment history; Streamlined loan disbursements and monitoring; secure savings.

Saccos can be touted to increase the welfare of its members through lowering the cost of investment and growth; this can be achieved through borrowing at lower lending rates and accumulation of savings which imply access to higher levels of credit to members with higher savings. Saccos also play a crucial role in smoothing of incomes of households of members, where members can borrow to increase their consumption or acquire household items that they might not be able to purchase immediately. It has also been observed that Saccos have diversified from their traditional lending to other investments including real estate, purchase of securities and other high earning revenue investments which aim in increasing the asset base of the Saccos so as to enable them match up to the demand of financial services and products they offer.

This study will focus on Fundilima Sacco Ltd. Fundilima Sacco Ltd is derived from the words 'Fundi' and 'Lima' which mean craftsmanship and cultivation. The membership is derived from the employees of JKUAT. The Sacco was established in the year 1982. The structures of leadership involve the board of directors and the employees who include management and operations employees. The main aim of forming the sacco was to create a vehicle for mobilizing savings and access to cheaper credit as compared to mainstream financial institutions. The membership as of 2014 stands at 2350 contributing members. The loan portfolio of the sacco includes: Development Loans; School Fees Loans; College Fees Loans; Emergency Loans; Yellow Loans and Pink Loans. The sacco also offers FOSA services (Front Office Services Activity).

According to a survey done by SASRA the following areas needed be strengthened so as to enhance the performance of Saccos: Governance; whereby best practices are to be enhanced in the management of Saccos through diligent management and eradication of conflicts of interests between the management ,board of directors and the members; Credit management where best credit practices are to be enhanced to reduce the exposure of the members savings to bad debts and defaults; Risk management; the risk environment of Saccos is diverse i.e. default risk, legal and political risk, having a robust risk management system can enable the Saccos perform better in the presence of risks; Management information systems, this includes integration of information technology in the operations of Saccos thus reduce the cost of information processing thereby streamlining the operations of the Saccos; Marketing and product development; this will enable the Saccos to deviate from the traditional financial and investment products to new robust and high return products that will ensure members get a favorable return on the amount saved/shares acquired in the Saccos and Human resources management, this will include hiring of competent staff in the management and operations of the Saccos so as to ensure the can match up to the other intermediaries. According to Shaw (2006), the cooperative sector as a whole remains poorly understood and its specific challenges as yet largely unexplored.

According to Cheruiyot et al (2012), the major objectives of Saccos is to promote economic interests and general welfare of members, Saccos provide members with the avenue of borrowing to enhance production and welfare purposes this in turn reflects the various loan products that Saccos have i.e. provident loans which are used to smoothen incomes of families to which the members hail from

and also loans for productive purposes e.g. investments and educational loans and also emergency loans which members can access in case of an emergency e.g. sickness, death and any mishap . Magill (1994) also further states that, cooperatives justifications arise due to maximization of profits, enhancement of financial accessibility, harnessing skills of the members, boosting social capital, enhancing advocacy and bargaining power, promoting investment, providing educational opportunities and contributing to poverty reduction.

This study will therefore undertake a critical analysis of financial intermediation and the role played by Saccos in the improvement of the welfare of the members. The study will also look at collective risk management, informal credit appraisals, easy access to cheaper credit and profit sharing (profits gotten from loans disbursed to members and investments undertaken by the Sacco) through dividends offered at the end of a financial year.

## II. OBJECTIVES OF THE STUDY

### General Objective

The main objective of this study will be to analyze the role played by Saccos in Financial Intermediation in the improvement of the welfare of members; a case study of Fundilima Sacco Ltd.

### Specific Objectives

The specific objectives will be as follows:

To find out the effect of low interest loan on the improvement of member's welfare.

To find out the effect of profit share (e.g. dividend) on the improvement of member's welfare.

To find out the effect of risk diversification (member's guaranteeing each other) on the improvement of member's welfare.

## III. LITERATURE REVIEW

Many researchers argue that financial intermediation is the oil that lubricates the wheels of economic growth and social intermediation is the labor that makes those wheels move. Due to the challenges and the opportunities that financial and social intermediation offers this chapter will explore previous researches done in respect to the above.

## IV. THEORETICAL REVIEW

### Theory of Financial Intermediation

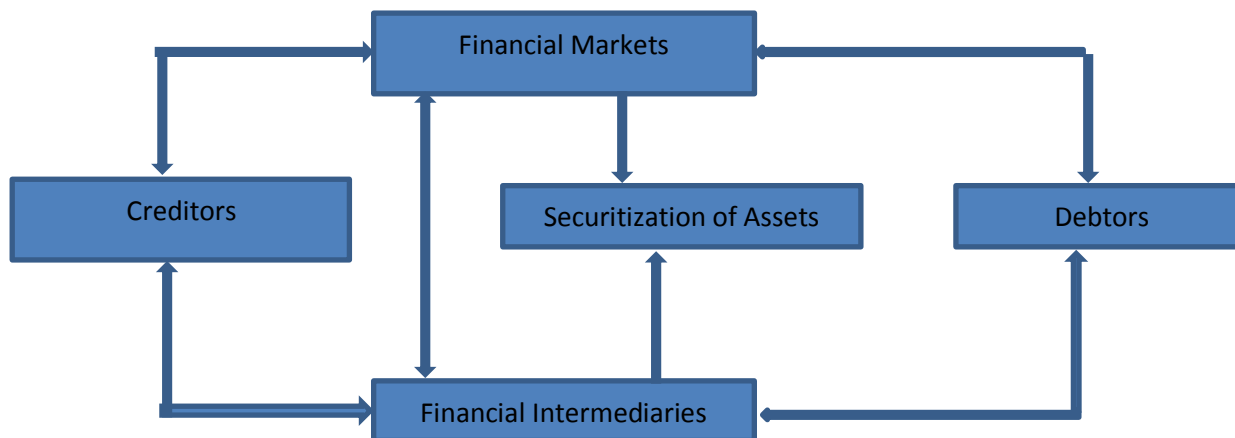


Fig 2.2.1. Process of financial Intermediation (Source Andries 2009)

The saving/investment process revolves around financial intermediation, thus financial intermediation is a powerful tool in the economy as it enables the allocation of resources to profitable/activities with a higher rate of return. The theory of financial intermediation thus analyses the main functions of financial intermediation in an economy. The major functions of financial intermediation thus include: pooling of savings; custodial services and accounting; provision of liquidity for the operations of the economy; risk sharing where the risk of loaning is distributed through secured credit and guarantee schemes; and information sharing so as to reduce the transactional costs of financial intermediation and reduce the emergence of information asymmetry.

Financial intermediaries exist due to the following; reasons high cost of transactions (the cost of marriage between the lenders and borrowers); lack of complete information (information asymmetry) and the method of regulation. According to Nayyar (1990), information asymmetries are considered to as to leading costs to both the buyers and sellers in an exchange situation. Thus the existence of information asymmetry can lead to either of the party being at an advantageous position and the other at a losing situation this will arise due to one party having access to superior information as compared to the other party and vice versa. The existence of the asymmetrical information can lead the market to break down or perform inefficiently as the information advantaged group can

take advantage of the information deprived group. Information asymmetries usually lead to higher prices in order to access the services, there's a concerted effort aiming to reduce the cost accessing such services thus the need of financial intermediation.

Problems that may arise due to information asymmetries include moral hazard, adverse selection and information monopoly. Adverse selection occurs when the wrong type of persons are selected for a transaction in the case of financial intermediation. They may be customers with bad credit risk or persons who are considered to have a low or a negative level of creditworthiness. Financial intermediaries are able to assess the credit risk that a customer brings with the loans/finances borrowed. Moral hazard arises when the borrower uses the funds borrowed for a non-profitable activity that would likely lead to a difficulty in paying. Financial intermediaries are able to mitigate the above through negotiations and binding contractual agreements so as to protect their position. Moral hazard has often hampered the flow of information between the market players thus creating inefficiencies in the market.

The current financial intermediation theory builds on the view that the existence of financial intermediaries is to reduce the transactional costs and informational asymmetries. Many of the transactional costs of financial intermediation are usually the end result of asymmetrical information. Benston and Smith (1976) interpreted transactional costs as the transportation costs, administration cost, searching, evaluation and monitoring in regard to financial transactions. Thus the financial intermediaries bear these costs on behalf of the suppliers of funds (lenders/savers). Financial intermediaries are able to reduce this cost due to the economies of scale that they have due to the large number of customers that they serve in the intermediation process.

The agency theory in financial intermediation usually relies heavily on the principal-agent relationship that exists between borrowers and lenders through the financial intermediaries. The financial intermediaries usually provide management, fiduciary and information management. Due to the agents being in the financial markets they have access to information that gives them a knowledge superior position thus the intermediary is able to reduce its costs (transactional and information costs). The agents (financial intermediaries) are usually given authority either implied or contractual to act on behalf of their clients. Their decisions have a far reaching implication regarding financial safeguard of the assets of the principals (lenders/savers) through better decision making and risk management processes. The drawback of this model is that the agent might be at a better of information level (the existence of hidden information) as compared to the principal and thus make a decision that greatly favors him at the expense of the principal.

The financial markets are very volatile as they are important to economic growth due to their resource allocation role and the financial intermediation role. Their growth is quite phenomenon thus the need for regulation as the growth in size usually brings new challenges which will stem from financial innovation and new financial products developments. These new developments thus call for the need for regulation. Regulation according to Cecchetti (2012) he views regulation as necessary for systemic stability, the reason to proscribe certain activities, to constrain certain actions, and to require certain behaviors is to not to protect individuals from facing the consequences of their own actions. But regulation is to keep the individual mistakes from affecting the whole system.

#### The theory of Delegated monitoring

Delegation is brought about by this basic question, why do savers/households give money to financial intermediaries and the intermediaries loan the same to borrowers/investors? The theory of delegated monitoring is one of the major explanations why financial intermediaries exist. The theory largely revolves around the collection of information regarding an individual or an institution before a financial transaction is done, this is done especially during the process of issuance of loans and securities. Delegated monitoring revolves to the idea that savers are professionally and time deficient to monitor institutional and individual borrowers for default risk. Default risk is the likelihood of a borrower not to honor repayment on a debt borrowed/a debt contract signed. Also borrowers are most likely to hide information thus the need for monitoring. According to Gastineau (1999) delegated monitoring is a commercial banking function that involves collecting and analyzing information about the investments and obligations of borrowers to evaluate their ongoing creditworthiness for their own risk management purposes and as a supplement to risk management by their borrowers.

Financial intermediaries reduce the degree of information imperfection and asymmetry between the ultimate suppliers and users of funds. The cost of collection of information regarding financial transactions for savers is costly and thus that function is usually delegated to the financial intermediaries. A failure to do so would expose the investor to agency costs, which relate to the risk that the owners and/or managers of the firm will take actions that are contrary to the interests of the investor. Such agency costs arise whenever economic agents enter into contracts in a situation of incomplete information and thus costly information collection. The common solution to the problem of incomplete information is for the households to pool their resources i.e. savings into a financial institution that will invest directly in another corporation/invest in activities that bring in better returns. Saccos have always pooled resources through the monthly member contributions that are used to issue loans and also invest in other economic activities.

According to Diamond (1996), Financial intermediaries are agents, or groups of agents, who are delegated the authority to invest in financial assets on behalf of households/savers. The cost of monitoring and enforcing debt contracts issued directly to investors (equity) is a reason that raising funds through an intermediary can be superior. The easiest way to lower the cost of information in the delegated theory is to acquire unmonitored debt and to disburse the same to borrowers. The unmonitored debt is usually in the form of deposits from households held by the financial intermediaries e.g. Saccos, banks and other financial institutions that provide loans/funds for the investment process. Financial intermediaries have profited from the role of collecting information that they use in disbursing private loans as compared to purchasing already securitized debts in the financial markets (the stock exchange).

One of the most important things in delegated monitoring is the analysis of benefits and costs associated with the same. Monitoring involves increasing returns to scale which implies that it will be best done by a profession i.e. an intermediary. The collection of private information by the financial intermediaries will benefit them as the information can be used in lending. Though it's usually hard to verify if the monitoring has been done or not. Delegated monitoring pays off when its cost is equal or less than the cost of contracting without monitoring and the cost of direct monitoring.



### Conceptual Framework

The conceptual framework to be used in this study discusses the idea that financial intermediation with the collaboration of social intermediation will either contribute the improvement of the welfare of the members positively or negatively.

#### Independent Variables

#### Dependent Variable

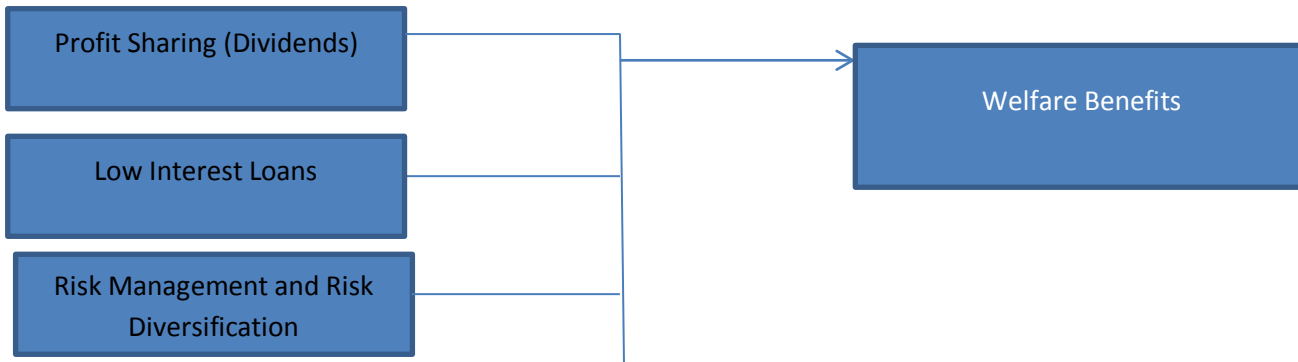


Fig. Relationship between the various aspects of financial intermediation and the operational aspects of the Sacco in respect to welfare benefits (Author 2014)

#### Low Interest Loans

Most Saccomembers (who belong to households) borrow from formal or informal lenders, and they also save in financial deposits or in real goods. Second, they also face a credit limit. Resources are lent in the present for the promise to repay in the future, so saving/borrowing choices in the present affect consumption in the future. Fourth, the members earn less for saving than they pay for borrowing. Fifth, income for the members is variable and uncertain (Besley, 1995). Second, households smooth both consumption and income, so production and consumption choices depend on each other (Morduch, 1995). The members also may save not only for precautionary motives but also for investment, speculation, and convenience. The members who are able to save more/borrow (more as the amount borrowed depends directly on the amount of savings one has) thus can engage in production and thus wealth creation.

The members' savings form a good pool of money, from which loans are made to members with fair lending interest and the interest rate is decided by members (USAID 2006). This is usually done in the context of costs management and risk management so as to ensure the growth and sustainability of the Sacco is taken care of when deciding the interest rates.

Saccos have enabled their members' access affordable credit and have also made it easier for their members to access credit due to their non-stringent policies and rules. Also Saccos cover the traditionally non bankable population that would find it hard to access banking services due to their unique needs e.g. microloans (Kes.1,000 to Kes.10,000).Saccos have experienced exponential growth; thus have attracted the attention of the financial regulators who formed SASRA (Sacco Society Regulatory Authority) which is the overseer of the activities of the Saccos. Through SASRA there's enhanced corporate governance in the operations of SACCOS, enhanced risk management and internal controls, disclosures and transparency and enhanced board of directors' roles in the management of the Saccos.

Luyirika (2010) observed that women who had accessed credit, their life had transformed greatly as they were able to pay for school fees, expanded their investments and were able to start businesses and they were able to purchase household items, confidences were improved and participation in leadership was observed. She also concluded in her study that the MFIs have greatly improved the lives of women in the area of socio-economic development. Hans (2009) also observed that MFIs were less likely to be affected by the imperfections of the financial markets where loans are inter-guaranteed among the members thereby reducing credit risk and default risk; Also MFIs are able to offer noncredit financial services e.g. savings and investments, this can also be further explained by the emergence of Saccos that engage in other income generating activities.

Ksoll (2013), observed that the access to microcredit facilities through Village Savings and Loans association (the equivalent of Saccos in Kenya) improved the welfare of its members through the following ways: improved food security and strengthened household income indicators. The research had targeted the lower income families and the financial institutions constrained families. However we can mirror the above research to the Sacco situation where the members' welfare improves with the improved access to financial institutions and financial literacy. In the research the members used the funds acquired from the loans disbursed to open enterprises and engage in food production activities that enabled them to be food secure.

#### Profit Sharing



In recent times, where growth of the wealth of shareholders is a major factor in the management of enterprises and organization Saccos included. There has been a great shift from the traditional financial products to high returns investments e.g. real estate development and investment in government securities in which Saccos engage in. The vision 2030 blueprint has emphasized the role to be played by financial intermediaries in the mobilization of saving and development so as to achieve economic growth and realization of the vision. Thus Saccos have embraced other economic activities that will enable them mobilize savings from the members and be able to create investments that will have a favorable return on investment to the members.

The lending activity of the Sacco which generates income through the interest paid by the members goes back to the members as a dividend based on the capital participation/member contributions, but the competitors i.e. banks and other formal financial institutions never do this.

The leadership and the management of Saccos ought to streamline their operations and minimize their cost and maximize the earnings of the Sacco and thereby increase the wealth of members. Fischel (1981), Management does not benefit from maximizing growth; it benefits from maximizing profits and thus shareholder welfare, the dividend policy ought to maximize the welfare of the shareholders. Thus this leads to lower turnover in organizations thus the organizations can be able to grow and thus lead to the expansion of the welfare of the shareholders. Whenever the shareholders are pleased and happy with the management this in turn reduces turnover of the management and thus sustained growth. The managers are able to make better business decisions that will lead to a better bottom-line for the enterprise that will lead to higher profits and thus a better dividend policy. A dividend policy is an internal document of an organization regulating the procedure of the dividend amount determination and the procedure of its payment, aiming at raising the welfare of shareholders and provision of capitalization growth of the organization.

According to Olando, Jagongo & Mbewa (2013), the funds invested by the members of the SACCOs through monthly contributions, should generate enough surpluses to contribute to institutional capital as they provide for dividends and rebates. So, for the growth of wealth to be visible, the surpluses generated should be enough to contribute to capital levels which maintain institutional capital and provide for shareholders dividends and rebates. The increase of the shareholder/member power has always tended to reduce the animalistic behaviors of the management. This in turn has led to better management of Saccos and thus increased the dividends paid out.

Risk management through risk diversification

Hulme & Paul (1996), defined social intermediation as process that combines functions of social organization and financial linkage carried out through an NGO, local government organization, through self-help groups or through individuals. In most cases financial linkage occurs when members of a common bond e.g. employees from the same organization come together to start a group with a view of investing or saving. Thus the birth of Saccos is brought by this need of belonging and security in a group of likeminded fellows or associates. Saccos also have the nonfinancial services that are geared to the improvement of the wellbeing of their members through literacy training (financial), education, group formation and leadership training. Social intermediation can also be viewed as a facilitator in capacity building with biasness towards the lack of access of credit and saving facilities thereby creating an intermediary. Social intermediation helps create systems and structures that enable the disadvantaged access financial services that would have been farfetched in the case of banks and other major financial intermediaries

One of the major functionalities of social intermediation is the creation of social capital. The creation of such requires an intermediary and a Sacco can be viewed as an intermediary where a population with a common bond seeks to foster its growth through collectiveness and connectedness. Social capital can be described as the networks, norms and trust that enable cooperation for mutual benefit (Putnam 1993). Social capital enhances trust and through trust cooperation can be fostered and agreements can be arrived at faster that involve risks (Dusuki 2008 and Claessens 2005). Microfinance industry relies on social capital as part of its building blocks. Due to the membership of Saccos borrowers can enhance their credit worthiness as their debt is secured by their friends in the Sacco also the lack of collateral and reliance on the group for security of the loan borrowed.

Bhat and Tang (2008) argued that the moral hazard that would subsequently arise due to default is greatly reduced due to the existence of strong networks within the group. They further support this claim by emphasizing on the monitoring that would arise from the guarantee mechanisms (the members guaranteeing each other) whereby members would guarantee other members with a good repayment history and ability to secure the other parties. Social capital thus is the information asset that the financial intermediary can adopt in place of other tangible assets when approving a loan to a member of a microfinance i.e. a Sacco. Saccos have been able to embrace the benefits that beget them due to social intermediation. One of the benefits includes embraced social capital and strong ties that come with it. There's the low cost of marketing, information diffusion, low operational costs as they are likely to employ a few employees that arises from the closeness that the social intermediation brings

Persons of a same vision and unifying factors are usually encouraged to join Saccos. Saccos are the saving grace for the persons with lower incomes and are usually viewed as the stepping stone from alleviation of poverty and growth of wealth. The major reasons that may encourage people to join Saccos include: easy access to finance through cheaper and simplified borrowing processes; there's the mobilization of saving for further investments e.g. Fundilima Sacco which has an in-house investment vehicle where members save and investments and thus they get a return on investment as a dividend at the end of the financial year; Also for the interaction between members of a common bond through Sacco sanctioned activities e.g. financial literacy training; there's also the issue of insurance in numbers where members guarantee each other for loans.

Critique of existing literature

Luyirinka (2010) in her research, her paper tested the relationship that exists between Micro Finance Institutions and the socio-economic development of women in Uganda. The study was carried out regarding social intermediation and with little financial intermediation, She focused on the role played by the microfinance on the socio-economic development.

There needs to be a research undertaken to tackle the issue of financial intermediation at sacco level with biasness towards social intermediation and social capital development which is a factor of social intermediation. According to Rau (2004) in his paper, Financial Intermediation and Access to Finance in African Countries South of Sahara; He investigated the factors that lead/influenced access to finance in view of financial intermediation in sub Saharan countries. He however didn't tackle the issue of social intermediation and the benefits that accrue to members who belong to Saccos and the access to finance by the members of the same he researched on the financial products and the accessibility of the same.

**Research Gaps**

The paper will look at the Role played by Saccos in Financial intermediation in the improvement of the welfare members. Mwangi (2011) undertook a research on the role of savings and credit cooperative societies (Saccos) in financial intermediation in Nairobi County. Little has been done on the role played on the improvement of the welfare of the members of the Sacco in light of financial intermediation with biasness on social intermediation.

There exists a wide range of researches made regarding financial intermediation both from the microfinance level all the way to the macro finance level. The existing studies have tackled only the financial intermediation and few have linked financial intermediation to social intermediation. Whereby social intermediation forms the building blocks for the existence of Saccos and their activities i.e. it is the heartbeat of Saccos.

**Summary**

The major role of Saccos is to promote growth of social capital through social intermediation and thus develop each individual member to the betterment of the group. The financial intermediation role played by the Sacco is important as the pooling of resources is concurrently done with the pooling of persons to better utilize the pooled resources.

Due to the need to link financial intermediation to the welfare of the members, this has necessitated the need to carry out this research to assess and determine the role played by Saccos in financial intermediation and the improvement of the welfare of the members of Fundilima Sacco.

**V. METHODOLOGY**

**Research Design**

The study adopted descriptive design that investigated the study variables in an attempt to understand, describe and explain well the Role played by Saccos in Financial intermediation in the improvement of the welfare members.

A research design was the conceptual structure within which research was conducted. According to Mugenda et al., (1999), this design is a systematic inquiry into which the researcher does not have direct control of the independent variables because their manifestation has already occurred.

**Target population**

The population for this study constituted the membership of the Sacco. The population information will be supplied by the Sacco management. The Sacco membership stood at 2352 members.

This population was heterogeneous in terms of memberships, board composition, management composition and the Sacco employee composition.

**Sample size**

A more representative study requires that the whole population or as big as possible be studied. However, due to lack of time and resources, the research sampled 10% percentage of the population (241 Sacco members which will include the employees, board members and management). Mugenda et al, (1999) suggests that for discipline studies, 10% of the accessible population is enough for a study sample. The operations of the Sacco's are deemed to be very related hence the sampling of only 10% which will be a representative of the Sacco's whole body The main factor considered in determining the sample size is the need to keep it manageable enough (Warwick and Lininger, 1975). This was to enable the researcher to derive from it detailed data at an affordable cost in terms of time, finances and human resources.

**Sampling techniques**

The respondents will include the Sacco staff and members that the researcher will feel competent to provide relevant information. The researcher will target the board members, Sacco members, Sacco management staff and the Sacco employees. Stratified sampling will be used in selecting the sample from the population. This was due to the different nature of the population i.e. management, Sacco employees, Sacco members and the Sacco board members. In selecting the sample sizes of the strata of the board members the researcher felt that a sample size of two (2) from a population of ten (10) would be a good representation of the strata. The management of the Sacco since the Sacco has an operations manager and a general manager the researcher felt that interviewing both of them would provide complete information relevant to this study. For the employee strata the researcher felt that a sample of three (3) employees in a population of twelve (12) employees. For the membership the researcher employed the prescribed 10% by Mugenda et al (1999).

S/No	GROUP	POPULATION	SAMPLE SIZE
1	Board Members	10	2
2	Management	2	2

3	Employees	12	3
4	Members	2340	234
	Total	<b>2352</b>	<b>241</b>

**Data Collection Procedure**

A questionnaire was administered for data collection. A questionnaire is a data instrument in which a respondent is asked a variety of questions in a pre-determined order. Close ended questions will be used to guide the respondents’ responses. That was to facilitate ease of analysis. Open ended questions were also be used in cases of where more details and information was needed. The questionnaires were hand-delivered to the respondents and collected after a few days.

**3.7 Data Processing and analysis**

According to Kombo and Tromp (2011), data analysis procedure includes the process of packaging the collected information, putting in order and structuring its main components in a way that the findings can be easily and effectively communicated. After the field research was completed, all the questionnaires were adequately checked for reliability and verification.

Data was analysed qualitatively and quantitatively. After the relevant data were collected, and appropriate data selected and the next step was to check and convert the data into formats that were appropriate for analysis and interpretation. Data collected from secondary sources and from the questionnaires was tabulated because tabulation makes the data orderly and easier for presentation. After tabulation the data was analyzed and interpreted. Descriptive analysis was largely employed to analyze data presented in the form of tables. The data gathered from interviews and other secondary sources was organized thematically.

The relationship between variables was analyzed. Finally, the data was interpreted and summarized in order to draw conclusions and make recommendations.. Care was taken by the researcher to note the number of times a view was expressed and the number of respondents that expressed that view and this formed the basis for drawing the conclusions. The researcher also used statistics to analyse the data. The statistical formulae that were used in the survey questionnaire were as follows

Percentage – to determine the magnitude of the responses to the questionnaire.

$$\% = \frac{n}{N} * 100\%$$

Where n= Number of responses  
 N= Number of respondents

**Weighted Mean**

$$x = (f1x1 + f2x2 + f3x3 + f4x4)/xt$$

x = number of responses

xt = total number of responses.

SPSS software was used to come up with statistical analysis for the study.

**RESEARCH FINDINGS AND DISCUSSION**

**Response Rate**

Out of a target population of 2352 members of the Sacco, management of the Sacco ,Sacco employees and the board of directors used in the case study, this research was able to collect data from 180 respondents, giving a response rate of 74.69% which was considered adequate for this study as indicated by Monkey(2005) who reveals that response rates above 70 percent can be termed as acceptable for a given study hence can be used for generalization. The high response rate was achieved by the researcher by administering the questionnaires with the help of friends and acquaintances at the Fundilima Sacco Ltd. The questionnaires were dropped and later picked by the researcher.

**Years of Membership to the Sacco**

The Sacco being incorporated in 1982 which implies the Sacco is 32 years old. The table below entails the years of each member interviewed in the study has been in the Sacco. The bulk of the members of the Sacco who have been in the Sacco the longest range between 12-21 years which is 47%. The numbers indicate the much trust that the bulk of the group has in the Sacco, also the numbers are indicative of the university workforce which pre-dominantly has been working for between 10-20 years.

Table 4.4 the years of membership to the Sacco

Years	Frequency	Percentage	Cumulative %
2-11 years	54	30%	30
12-21 years	85	47%	77
22-31 years	41	23%	100
<b>Total</b>	<b>180</b>	<b>100%</b>	<b>100%</b>

Level of financial literacy

The respondents were asked questions regarding how well or informed they are concerning financial literacy. Financial literacy entails the ability to understand how money works i.e. how someone manages to earn or make it, how that person manages it, how he/she invests it (turn it into more) and how that person donates it to help others. More specifically, it refers to the set of skills and knowledge that allows an individual to make informed and effective decisions with all of their financial resources (Geisler & Ela, 2014).The respondents responded in the following way regarding financial literacy: 56% alluded to the fact that they are financially literate while the members with minimum or no financial literacy stood at 6% .The members with a little bit financial literacy stood at 38% thus a considerable of respondent had a little bit understanding about financial literacy i.e. at cumulative percentage of 94%.

Table 4.5 Level of financial literacy

Level of Literacy	Frequency	Percentage	Cumulative %
High	101	56%	56
Low	68	38%	94
No idea	11	6%	100
<b>Total</b>	<b>180</b>	<b>100%</b>	<b>100</b>

#### Levels of the saving culture

Though the Sacco requires all members to contribute Kes.1, 500.00 per month .The researcher chose to know if the members save more than the prescribed volume by the Sacco. The minimum amount required by the Sacco at the end of the month is Kes.1,500 that formed the basis of lukewarm savers. The large percentage of savers fall at 45% contributing minimally at Kes.10,000. The low savers are categorised at 40% and contributing between Kes.1,501 and Kes.9,999 per month.

Table 4.6 Level of saving culture

Level of Saving Culture	Frequency	Percentage	Cumulative
High (Kes.10,000 and above)	81	45%	45
Low (Between Kes.1,501 and Kes.9,999)	72	40%	85
Lukewarm	45	25%	100
<b>Total</b>	<b>180</b>	<b>100</b>	<b>100</b>

#### Reasons for Savings

The respondents were supplied with seven reasons why they were saving with the Sacco. Many members are motivated by different reasons why they are saving. The researcher came up with the common reasons that motivate people to save .The respondents responded in the following way concerning the following reasons to save. One of the major reasons that motivated members to save was to start and or expand an existing business, the members responded with 30%; The other major reasons that members save is to acquire assets (Simply stated, assets represent value of ownership that can be converted into cash (Sullivan and Sheffrin 2003)), which stood at 25%; Members also save for emergencies the number that save for emergencies stood at 15%.This was followed by members who save to accumulate funds for other purposes known to them, they stood at 12%. Another 10% saved for retirement purposes as they wanted to create a buffer security on top of the monthly pension contributions. The members who save for educational purposes i.e. for their own education and their family education stood at 5%. There is a group that save because their friends save this group stands at 3%.

Table 4.7 Reasons for saving

Reason For Saving	Frequency	Percentage	Cumulative%
Emergencies	27	15%	15
Retirement	18	10%	25
Acquire an asset	45	25%	50
Education	9	5%	55
Peer Influence	5	3%	58
Start and/ expand business	54	30%	88
Accumulate funds	22	12%	100
<b>Total</b>	<b>180</b>	<b>100%</b>	<b>100</b>

#### The favourability of lending policies

The researcher sought to find out the favourability of the lending policies at the sacco and thus be able to gauge the ease of accessing funds. The favourable lending policies of the sacco include intra-guarantees (members guaranteeing each other for loans), loans on savings, low interest rate, faster rate of disbursements and friendly repayment terms. The members responded in the following ways in the quest to find out the effect on lending policies on the uptake of loans. 39% of the members confirmed that the Sacco had good lending policies. 30% of the responded that the lending policies were fair.25% also responded that the lending policies were very good. 5% responded that the lending policies were poor and a further 1% responded that the lending policies were poor.

Table 4.8 Favourability of lending practices

Favourability	Frequency	Percentage	Cumulative
Very good	45	25%	25
Good	70	39%	64

Fair	54	30%	94
Poor	9	5%	99
Very Poor	2	1%	100
<b>Total</b>	<b>180</b>	<b>100</b>	<b>100</b>

#### 4.9 Dividend policy and growth

The researcher sought to find out if the members of the Sacco feel they are getting a better return on their savings through the dividends offered by the Sacco. The researcher combined the favourability of the dividend policy and the growth of the same as they both go hand in hand. Dividends give the members a chance to participate in the profits generated by the Sacco. The members responded in the following way: 46% members interviewed felt that the dividend policy and growth was good. 31% felt that the policy was fair. 18% felt that policy was very good. Another 5% of the respondents felt that the policy was poor.

Table 4.9 Dividend policy and growth

Policy/Growth	Frequency	Percentage	Cumulative %
Very Good	32	18%	18
Good	83	46%	64
Fair	56	31%	95
Poor	9	5%	100
Very Poor	0	0	0
<b>Total</b>	<b>180</b>	<b>100%</b>	<b>100</b>

#### Welfare Improvement

The researcher sought to find out the welfare implications derived from the membership of the Sacco. Therefore a set of questions were asked so as to find out if the welfare of the members had improved due the credit facilities offered by the Sacco. The welfare benefits derived from the Sacco was the major research variable for this study. The respondents responded in the following way when a set of questions seeking to investigate their welfare was asked. 65% of the respondents felt that their family life had improved (family life include housing conditions, dietary conditions and access to good medical care).55% respondents felt that their assets had grown. 75% respondents felt that their human capital investments had grown(Simkovic, 2013)(Human Capital is a collection of resources—all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed individually and collectively by individuals in a population (Simkovic 2013). Therefore human capital investments entail use of resources to better the skills and knowledge through training both formal (going to school, colleges and universities) and informal (apprenticeship).85% of the respondents felt that their incomes had increased due to investments done by the loans received from the sacco.

Table 4.10 Welfare Improvement

Welfare Aspect	YES%	NO%	Cumulative
Improved Family Life	65	35	100
Asset Growth	55	45	100
Human Capital Investments	75	25	100
Increased incomes due t investments	85	15	100
<b>Total</b>			

## VI. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### Summary of findings

The study found out that the respondents had a commendable 94% financial literacy thus they were able to plan for their financial future effectively. Off the cuff remarks from the respondents suggested that the Sacco had done so much in enlightening the members concerning financial literacy in their trainings.

Though the respondents save monthly the study found out that 85% saved more than the Sacco prescribed saving rate. This entails that not all members are keen savers others are saving for the reason of belonging to some collective likeminded group and others due to peer pressure.

The study also found out that most members have memberships between 2-21 years. Which stands at 77%. The membership could be attributed due to the population of the employees who form a bulk of the active working class of the university.

The study also found that most members had some sort of formal learning. The level of formal education stood at 95%. The existence of learning could be attributed to the fact the the membership was drawn from the employees of JKUAT.

The study found out the participation of women in the Sacco stood at 37.3% this was attributed to the fact the workforce is predominantly male.

The study also found out middle-ages formed the bulk of the Sacco membership which had a cumulative percentage of 59.5%.

The study found out that the Sacco greatly improved the welfare of its members. The questions asked to the respondents gave a sneak peek into the improvement of their welfare. The weighted average mean score for the welfare items was 0.5025.

#### Conclusion

This study was to investigate the impact of low interest rates members' welfare in respect to the financial intermediation role played by the Sacco. The study findings show that Sacco members' welfare improved due to access to cheaper loans.

The study also was to investigate the impact of dividends on the members' welfare in respect. The study found out that members were happy with the dividend policy and the growth of the same.

The study was to investigate the impact of risk diversification on the members' welfare. The risk diversification of the Sacco includes intra-guarantees and loans based on the level of saving that a member has with the Sacco. Most respondents responded that the risk diversification model is good as it enabled them to borrow what they can comfortably pay and thus prevented a bulk of members from getting too much credit that would make them cripple under the weight of debt.

#### Recommendation

The main objective of this study was to analyse the impact the role played by Saccos in financial intermediation in the improvement of the welfare of the members at Fundilima Sacco Ltd. From the study it is quite evident that Saccos are good financial intermediaries that focus on the holistic growth of a person as it is inclusive of social intermediation and financial intermediation. The study also found out members greatly benefit from the membership of the Sacco as it is a common ground for financial growth and inclusivity due to the intra-guarantees when accessing cheaper loans.

The study recommends that the management of the Sacco management to recruit more ladies to increase the inclusivity of all the genders as compared to the current gender setup of the membership. The study should come up with more mixed saving/loans solutions as the respondents felt that the saving products that existed were limited i.e. for the members who wanted to buy houses it took them close to fifteen years to be able to raise part of the required funds to purchase/build a home.

#### Areas of further research

The study recommends further research to be conducted to find out the key determinants of financial inclusivity of the members in the financial processes of the Sacco. There was also a need to establish the effectiveness of the training programs done by the Sacco in regards to financial literacy.

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# Effects of devolved governance on organizational performance: A case of Mombasa County Government

Peninah Mwikali and Moses Kimani Wafula

Jomo Kenyatta University of Agriculture and Technology Mombasa CBD, P.O Box 81310-80100 Mombasa  
Senior Assistant Librarian, Jomo Kenyatta University of Agriculture and Technology Mombasa CBD, P.O Box 81310-80100 Mombasa

**Abstract:** Democracy is the most suitable form of government and that it has seen many countries perform better through service provision to its citizens and thus improving their livelihood. Devolution of power can address the main challenges of underdevelopment in any government. In Kenya, the case is similar, there are 48 devolved governments and Mombasa County is one of them. This paper looks at secondary literature on the effects of devolution on the performance of an organization a case of Mombasa County. A desk analysis design was used to determine the effects of devolution on the performance of an organization. It was evident that devolution of powers, finances leads to greater performance of an organization. Employee's training, motivation and availability of funds in devolved governance improves the performance leading to provision of quality and better services to citizens.

*Key Word: Devolution, Motivation, training, Governance*

## I. INTRODUCTION

According to Porter (2001), Devolution is the transfer of political, administrative and fiscal management powers from central government to subnational (e.g. state, regional, or local) authorities. During the late 20th century, however, groups in both federal and unitary systems increasingly sought to reduce the power of central governments by devolving power to local or regional governments. For example, United States wanted to diffuse power away from Washington, D.C. towards state and local governments.

Devolution became a major political issue in the United Kingdom beginning in the early 1970s. Many people in Scotland and Wales began demanding greater control over their own affairs, a trend reflected in a rise in support for the Scottish National Party (SNP) and Plaid Cymru (Party of Wales). Devolution became one of the key issues in the build up to the 1997 election when the Labour Party promised devolution as one of its manifesto pledges and to introduce a devolved form of government for Wales, Scotland and Northern Ireland (though Stormont had already provided Northern Ireland with a degree of self-rule).

Devolution was adopted as an objective in the famous Safari Park national conferences in the 1990s. The Constitution of Kenya Review Act 2000 required the CKRC to consider people's participation through the devolution of power; respect for ethnic and regional diversity and communal rights including the right of communities to organize and participate in cultural activities.

Promulgation of the Constitution of Kenya 2010 on 27 August 2010 paved way for realization of the "dream" system of governance. Chapter Eleven (Cap 11) of COK 2010 - Devolved Government specifically provides for the setting up of the County Governments as cited by Gabriel Lubale (2012). The Constitution provided for, among others, enhanced checks and balances within the government, an enhanced role of Parliament and citizens, an independent judiciary, and a most progressive Bill of Rights. Notably, the Constitution provided for a major devolution not only of resources and functions, but also creating a whole new layer of county government.

According to the COK (2010) Article 176, elections in March 2013 marked the official launch of decentralization, as 47 new county governors and county assemblies' ward representatives were elected and began the challenging work of setting up new institutions, as well as a new national senate representing each county. Functions and funds have been transferred to the new counties, and new county institutions are gradually taking shape.

Further decentralization within Counties is mandated by County Government Act 2012 and Cities and Urban Areas Act 2012 that provide mechanisms for further decentralization within counties. The persons responsible at these units are to be appointed by the Governors and County Public Service Boards. They also need to be facilitated with enough resources to carry out their work.

The County Government of Mombasa is under the leadership of the Governor with a total of 13 departments as stipulated in the fourth schedule Part 2 of COK 2010 namely:- Executive, Treasury, Education, Health, Water, Environment & Natural Resources, Youth Gender & Sports, Transport & Infrastructure, Agriculture Livestock & Fisheries, Tourism Land Planning and Housing. Each function is under the management of an Executive Member assisted by Chief Officer, but the County Secretary heads Administration Department is the Chief Executive Officer and mandated to ensure that there is smooth operation of the County. The County Executive Committee is the executive organ of the 47 County governments. Members are nominated by the governor and vetted by the County Assembly before formal appointments. The County Assemblies/County parliaments can accept or reject the governor's nominees.

Currently the County has forty 46 Members of the County Assembly in the legislature department which acts as an oversight body and comprises of one Member being the Speaker, thirty elected and fifteen nominated by the Governor based on the Constitution of Kenya 2010. The 30 elected MCAs each are representing one of the 30 County wards (election area). Every County Assembly has a life span of five years, as explained in section 177 (4) of the Constitution.

Mombasa County Government comprises of three categories of employees, one group from Central Government, the defunct Municipal Council of Mombasa and Executive having different terms of scheme of service. The main objective of this government is to render better and quality services to the residents of Mombasa but the services have been compromised due to the fear of the unknown over their job security leading to high employee's turnover, absenteeism and low morale. According to Kirkpatrick (2001, 20-30), people may resist, welcome or have a mixed feeling towards change. This resistance is based on the fact that they might loose something (personal loss).

Kotters (1996) suggests that successful change of any magnitude should go through all the eight steps of his model. Establishing a sense of urgency is very crucial step to enable employees be driven out their comfort zones, but after the devolved system makes most of the employees tend to work in fear and anxiety because their future is unknown. According to Myrna (2009), change means acquiring new skills as well as new ways of thinking and behaving which the Government has failed to provide training and coaching to enable everyone to change effectively. Inadequate information on devolution and the roles of county governments and the elected representatives among the citizens is a worrying concern. Hence need for civic and political education is great and that could be an area of engagement too.

Despite of the National Government in conjunction with SRC efforts reviewing of allowances in the public services through several periodic circulars Ref. SRC/ADM/CIR/1/13 Vol. III, still panicking among the employees is still lingering in their minds making them to always expect the worse outcome hence leading to low performance. Most of the transferred and devolved

employees have not taken this change in a positive way because issues such organizational structures, values and cultures were not addressed appropriately by the Transition Authority to Devolved Government Act, 2012 which was mandated to spearhead this process.

According to Retirement Benefit Act No.3 of 1997 stipulates that organisations should submit both employer and employee contributions to the relevant statutory body. Mombasa County Government employees are not aware of what will happen to their contributions made towards the existing pension schemes. The newly recruited personnel are in dilemma in choosing among the existing pension schemes because the County Provident Fund is yet to be constituted.

The Public Finance Management Act 2012 is mandated to provide guidance on disbursement of revenue to the 47 counties. However, due to National Treasury delay in disbursement of funds and inadequate funding, According to the study Christopher et al 2013 the ability of counties, especially those with a weak resource base to raise enough revenues that will enable them perform the devolved functions and deliver services to the citizen. The equalization fund is likely to be so thinly spread hence the bigger burden of meeting the deficits will have to be through internal revenues. This is particularly as relates to the already weak capacities to generate and collect revenues that were witnessed in the former Local Government Units.

In a nutshell this study seeks to evaluate the effects of devolution system as a matter of offering solutions to the change dilemma witnessed through devolution in Mombasa County Government.

## **II. Objectives of the Study**

### **General Objectives**

The general objective of this study is to establish the effects of devolved governance on organizational performance.

### **Specific Objectives**

The specific objectives of this study were:-

- i) To find out the effects of employee's training in devolved governance on organizational performance.
- ii) To determine the effects of employee's motivation in devolved governance on organizational performance.
- iii) To establish the effects of availability of funds in devolved governance on organizational performance.

## **III. LITERATURE REVIEW**

### **Theoretical Review**

#### **a. Learning Theory as a Training Tool**

This theory was founded by DeSario (1994). He noted that training "refers to learning experiences designed to enhance the short-term and/or long-term job performance of individual employees". In this respect, training is viewed as part of an on-going developmental process. Training needs to be linked with the organizational mission (McConville et. al., 1999). So, when local governments plan their training activities, they need provide the link with the organizational mission and local budget and implementation.

McConville et. al., (1999), argue that training activities should be examined from the perspective of their ability to influence individual job performance, rather than isolated experiences that may or may not contribute to the organization's success. This principal appears to be implementable when it comes to devolution. Devolution requires training by motivated employees (Hall, 1998).

**b. Maslow's Hierarchy of Needs Theory**

The theory of Maslow Hierarchy of Needs Theory categorized the human needs into five levels that satisfaction of one needs leads to another level. These needs are Physiological needs- basic survival needs, such as the need for food, water, air and shelter; Safety needs- the need to feel secure at work and at home, to be safe from physical and psychological harm; Social needs- the need to be loved and love, the need for affection and belonging; Esteem needs- the need for recognition and acknowledgement from others as well as self-respect and a sense of status or importance, prestige and strength; and Self-actualization needs-the need to develop to your fullest potential, to become the best one is capable of becoming (Nickels, 1999).

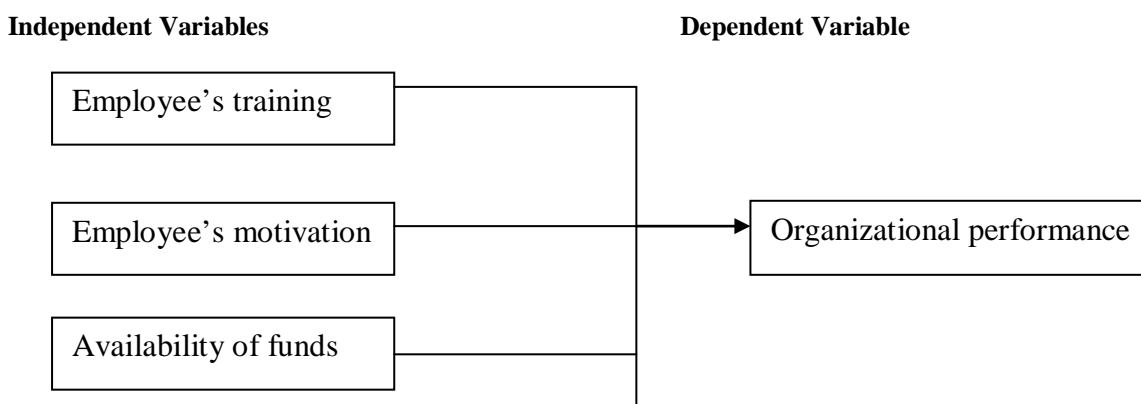
**c. Theory of Funds Rationing**

The theory of funds rationing was brought about by Keeton (1979) who argued that funds rationing has been subjective by and large. The reason for this difficulty can be articulated using a basic demand-supply framework. Quite simply, if there is an excess demand for bank funds (ie more firms want loans than banks are currently prepared to supply at the governing market price) then theory implies that banks should raise loan price (the interest rate) to equate demand for loans with supply, thus increasing profits.

This argument is used by Lown (2006) who parallels Keeton's (1979) model to organisational or government related funds. He sees no difference in argument between the two and emphasizes on similar platform implementation. In devolved governance, funds rationing may be necessitated given the pressure of limited funds. This could like affect organizational performance.

**Conceptual Framework**

**Figure 1.1**



**Source: Researcher 2015**

The independent variables employees training, motivation and availability of funds affect organizational performance which is dependent variable. The Management of County needs to ensure that the independent variables are addressed so that the working conditions of the employees are improved hence quality service delivery.

### **Employees Training**

Training and Development has a direct relationship with effectiveness of the devolution of counties in Kenya. When the county Executive and Assembly are well trained and thoroughly developed they will deliver the agenda of their respective County Governments and hence there exists this kind of relationship. Training may however be defined as the action of teaching a person or animal a particular or type of behaviour or may be defined as a learning process that involves acquisition of knowledge, sharpening of skills, concept, rules, or changing of attitude and behaviour to enhance the performance of employees. According to Kurt (2004) an individual's behavior is a function of the group environment, or 'field'. The field produces forces, tensions, emanating from group pressures on its members. According to the Group Dynamics School, the focus of change must be at a group level and should concentrate on influencing and changing the group's norms, roles and values.

Myrna (2009) says effective training is not an isolated event in an organisation. Training must be strategic in that it is designed to improve the knowledge, skills and abilities and abilities of employees to help them achieve the organisation's strategic plan. Effective training is therefore can't be designed until there is full understanding of the organisation. Training is an important tool of Human Resource Management to control the attrition rate because it helps in motivating employees achieving their professional and personal goals, increasing the level of job satisfaction thus leads to increased productivity. He further reiterates that it can only be achieved through SWOT Analysis and a proper understanding of the organisation's vision and hence creating a competitive advantage. Training Needs Analysis is also very important to know the training gaps between the employee's current performance and desired performance level

According to Sean (2010), training on the other side helps to identify and grow the personality and performance strengths that will make the organization's employees better and getting right person in the right job. Continuous training keeps employees at the cutting edge of industry developments.

### **Employees Motivation**

Among financial, economic and human resources, the latest are more essential and have the capability to endow a company with competitive edge as compared to others cites Rizwan et al (2010). Employee Performance fundamentally depend on many factors like performance appraisals, employee motivation, Employee satisfaction, compensation, Training and development, job security, Organizational structure and other, but the area of study is focused only on employee motivation as this factor highly influence the performance of employees.

Employee motivation is one of the policies of managers to increase effectual job management amongst employees in organizations (Shadare et al, 2009). A motivated employee is responsive of the definite goals and objectives he/she must achieve, therefore he/she directs its efforts in that direction. Rutherford (1990) reported that motivation formulates an organization more successful because provoked employees are constantly looking for improved practices to do a work, so it is essential for organizations to persuade motivation of their employees (Kalimullah et al, 2010).

Kalimullah et al (2010) further cites that research that reward causes satisfaction of the employee which directly influences performance of the employee Rewards are management tools that hopefully contribute to firm's effectiveness by influencing individual or group behavior. All businesses use pay, promotion, bonuses or other types of rewards to motivate and encourage high level performances of employees quotes Reena et al (2009).

To use salaries as a motivator effectively, managers must consider salary structures which should include importance organization attach to each job, payment according to performance, personal or special allowances, fringe benefits; pensions and so on suggest Adeyinka et al (2007).

### **Availability of Funds**

Fiscal decentralization involves the transfer of financial resources from the Central Government to autonomous local agencies. Hall and Torrington (1998) observed HR specialists were split both for and against financial devolution. At one hand some participants stated the importance of devolving both operational tasks and financial aspects to line, while many others were against devolving any budgetary controls. Both Keen (1994) and McConville and Holden (1999) argue that if line managers are not given budgetary control along with the responsibilities, this then becomes nothing but 'liability' for them. However, the counter argument is that, if line managers own budgetary control, then HR issues perhaps will be a likely causality of line manager short-termism, Marginson et al (1993).

According to Illes and Sutherland (2001) says that a large literature shows that, depending on circumstances, implementation can be frustrated by any of the following: internal conflicts and informal organisational process; occupational groups deflecting or obstructing the intended activities; attempting to introduce over-complex techniques too fast; lack of sufficient or correct resources; failure to motivate the actual implementers; and failure to communicate the knowledge and instructions necessary.

According to Jensen (2000), payment in form of fair remuneration is an important aspect of motivation of employees. This is because it helps them to meet their physiological, security and egoistic needs. In many organizations there exists persistent grievances concerning non-payment, underpayment and delayed payment

## **IV. Empirical Review**

Empirical evidence on the impact of devolution depicts mixed results and in some cases it is inconclusive. For example, a study of the federal state of India suggests that decentralisation promotes government responsiveness in service delivery, especially if the media is very active at the local level cites Besley et al (2002).

Another study of Italy indicates that devolution may exacerbate regional disparities in public spending and economic outcomes, Calamai (2009). Azfar et al (2001) finds that local officials have limited authority to influence service delivery while citizens' influence at the local levels is hampered by limited resources.

### **Critique of existing literature**

Barrett et al (2007), argues that if devolved systems are not properly designed and implemented it leads to translation of central government bureaucracies, inefficient utilization of resources and lack of accountability in any organisation. Other scholars such as Kimenyi (2002), argue that devolution could undermine national unity and could inflate ethnic, religious, cultural diversities

and greater marginalization thus affecting organizational performance. This seminar paper hence focussed on performance of Mombasa county government from the point of view of personnel training, staff motivation and funds availability.

## V. METHODOLOGY

The researcher used secondary sources to obtain information for the study. These consisted of written accounts of phenomena produced by others and cited in sources such as magazines, articles, government press release or circulars, newspapers, internet and books. A desk analysis design was used due to the nature of the research.

## VI. CONCLUSION

The training affects employee productivity and through the respondents they suggested that it refers to instruction and practice for acquiring skills and knowledge of rules, concepts, or attitudes necessary to function effectively and could also provide workers with ways to obtain added information about potential hazards and their control. Most of the County officers lack training both Technical and experiential since most of them have been brought on board as politically correct individuals hence it becomes hard to apprehend them in the event of failure to perform. (GoK 2012)

The motivated employees' works best in the interest of the organizations which leads them towards growth, prosperity and productivity. Thus the employee motivation and organizational effectiveness are directly related. This is also proven by the study conducted by Muhammad (2011) (0.287). So the organizations should work out and make such policies and organizational structures that support employee recognition and empowerment. A motivated and qualified workforce is essential for any company that wants to increase productivity and customer satisfaction.

Devolution of government is a new phenomenon in Kenya; the Government shall, therefore, need to take into consideration a number of factors in determining the basis for allocating among the counties the share of national revenue through a resolution every 5 years. People seek security and the underlying needs are fundamental to people's existence. After these needs are satisfied, people will focus more on job performance

## VII. RECOMMENDATION

1. Mombasa county government should consider job enlargement, job rotation, job enrichment, good quality training focusing on quality of communications. In devolved governance, these must preferably be given preference. Training and development needs to be administered to every staff in the county especially in the prevalence of the new devolved governance system. Relationship between the Mombasa county government as a devolved system of governance needs to be enhanced with the central government for organizations to better perform and services better delivered.
2. The role of County Government, relations with the national government is in delivering services to the county residents. It is therefore recommended that establishing training programs, employers must clearly define the employees to be trained and what subjects are to be covered in their training. Employers in setting up their training program will need to clearly establish the goals and objectives they wish to achieve with the training that they provide to their employees. The learning goals or objectives should be written in clear measurable terms before the training begins.

3. According to Hala (2011) also suggest that it's very important to adopt the right management strategies. These strategies are integrated, process-oriented conceptual framework consisting of three phases namely knowledge formulation, strategy implementation and status evaluation to overcome resistance.

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# Tobacco, oxidative stress and protein carbonyl content

Chavan RP,\* IngoleSM\*\*, Patil VW\*\*\*, Dalvi SM\*\*\*

\*Department of Otorhinolaryngology, Grant Medical College and Sir J. J. Group of Hospitals Byculla, Mumbai-08.

\*\*Department of Radiology, Grant Medical College and Sir J. J. Group of Hospitals Byculla, Mumbai-08.

\*\*\*Department of Biochemistry ,GGMC and J.J Hospital,Mumbai-08.

**Abstract-** The highest risks of exposure of tobacco for both adults and adolescents, the major concern is that tobacco consumption is associated with certain other behaviors, long range consequences and show characteristic facial changes. Definite role for reactive oxygen species (ROS) in the tissue destruction that characterizes in tobacco addicts and protein carbonyl is the most widely used biomarker for oxidative damage to proteins, and reflects cellular damage induced by multiple forms of ROS. The purpose of this study is to determine malondialdehyde and protein carbonyl content in tobacco addicts with Otorhinological manifestations and to find an association between them.

**Material and Methods :-** Total 300 subjects were selected. 150 were healthy control group and 150 patients were presented with one or more otorhinolaryngological manifestations. In addition to demographic data, information regarding tobacco use was documented in the subjects.

**Results :-** Both benign and malignant conditions of ENT were common in male patients. MDA, marker of oxidative stress and protein carbonyl content were increased in both benign and malignant conditions of otorhinolaryngological. Both values were higher in malignant lesions than benign lesions. There was significant positive correlation between MDA and protein carbonyl levels in cancer patients.

**Conclusion :-** Increase in the oxidative stress (MDA) to such an extent that damages the DNA and increase in the protein carbonyl content would leads to cancerous condition. Protein Carbonyl estimation can be done in the unknown primary lesions and dysplastic lesions.

## I. INTRODUCTION

The most widely distributed and commonly used drug in the world is 'Tobacco'. Tobacco is the most easily accessible legally available addictive substance which contributes significantly to premature death and long term suffering, being a major risk factor for cardiovascular diseases, chronic obstructive pulmonary diseases, cancers, reproductive outcomes and oral diseases (Sauvaget et al., 2008; Zarocotas, 2011; Sarkar and Reddy, 2012). In addition, one third of the global burden of oral cancer is predominantly attributed to high prevalence of tobacco consumption within India (Byakodi et al., 2012; Gupta et al., 2013).

Tobacco addiction is leading preventable cause of deaths both in the India and the World. Tobacco addiction includes addiction to tobacco and tobacco related products like cigarettes, bidis, gutkas, pan masalas. Reactive oxygen species were generated by tobacco smoke (1) leads to increase in the oxidative stress. Tobacco causes increase in oxidative stress which is

duration dependent (2). Diagnosis of the Benign and malignant head and neck conditions has been based upon clinical, pathological and radiographic examination of the lesion. These parameters are of limited use in prognosis and prevention of lesions. Increase in oxidative stress leads to free radical damages genome, membranes and macromolecules of macrophage cells to increased carbonyl contents of proteins which affect their biological functions as enzymes, hormones, transport proteins and immune proteins etc.

This clinico-biochemical study was undertaken to estimate the protein content levels in benign and malignant head and neck conditions and to assess the role of MDA as a marker of oxidative stress in cancer patients

## II. AIMS AND OBJECTIVES

The present project was designed so as to study carbonyl content and oxidative stress. Our aim was to study whether there is correlation development between ENT diseases like oral sub mucus fibrosis, stomatitis, and gingivitis, leukoplakia, erythroplakia, carcinoma and the biochemical parameters.

1) To study the oxidative stress in the different tobacco consumption pattern.

2) To study incidence of benign and malignant conditions in male and female population.

3) To study whether there is significant correlation between biochemical parameters and ENT diseased states.

## III. MATERIALS AND METHODS

In this study tobacco consuming patients were selected with tobacco consumption in the form of tobacco, tobacco with lime, tobacco consumption in the pan(quit), tobacco mishari application on teeth, tobacco smoking in the form of bidis and cigarettes, ghutka, mawa, jerda, tobacco used as snuff, etc. all were included. Patients included in this study population consumed tobacco products daily for more than 2 yrs duration. The selection of patients was done at random. Clinical examination of patients was done which included ear, nose, and throat examinations. Informed consent was taken before the blood investigations. Healthy control group who had balanced diet and not having addiction to tobacco, alcohol, etc. Equal male and female population was selected in the control group. MDA by Buege and Aust, and Protein carbonyl by Levine assay using spectrophotometer JASCO 670.

## Inclusion criteria-

1. Tobacco consumers with benign and malignant ear, nose, throat lesions between the age group 15 yrs to 60 yrs.
2. Non tobacco consumers without ear, nose, throat diseases between the age group 15 yrs to 60 yrs.
3. Age group selected was 15 to 60 yrs and both sexes.
4. Patients using tobacco in the chewing form such as ghutka, pan, tobacco, tobacco and lime, mawa, etc on daily basis for more than 2 yrs with benign or malignant lesion
5. Patients using tobacco in the smoking form such as shisha smoking, cigarette smoking, bidis smoking, sinus, etc on daily basis for more than 2 yrs with benign or malignant lesion.
6. Patients using tobacco in the smoking and or chewing form with occasional alcohol drinker.

**Exclusion criteria:-**

1. Patients with diabetes mellitus, hypertension, pancreatic diseases, liver diseases, kidney diseases, heart diseases and H.I.V positive patients.
2. Patients with upper and lower respiratory tract infection and known genetic disorders..

**Blood collection**

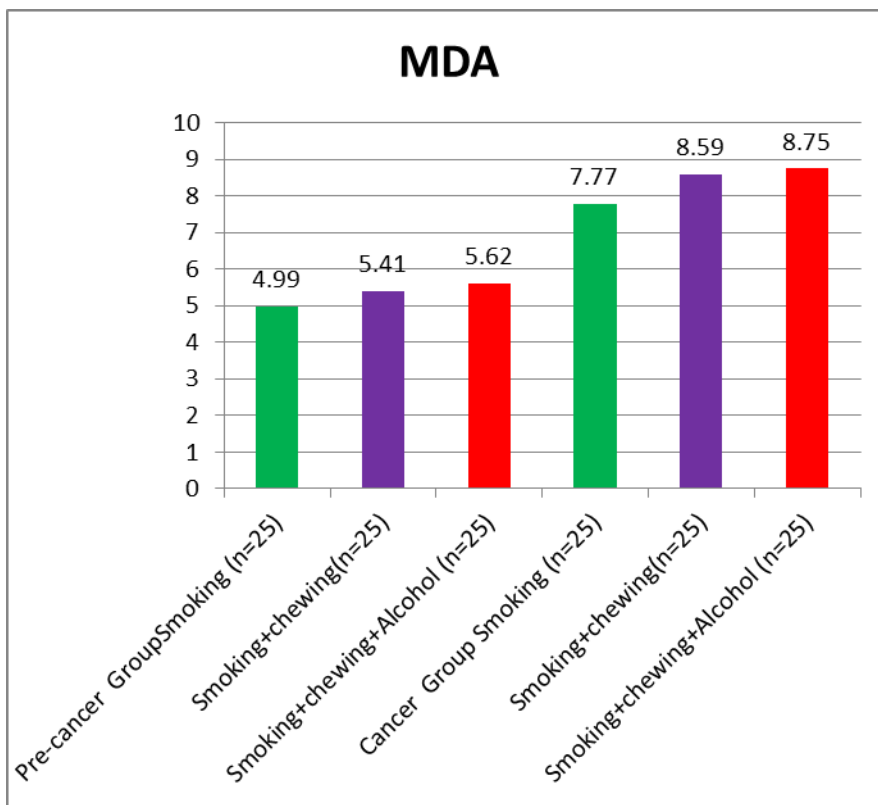
Venous Blood samples were collected after overnight fasting from the antecubital fossa by venipuncture using a 20-gauge needle and immediately transferred to the laboratory. The blood sample was allowed to clot at room temperature and after 1 hour serum was separated from blood by centrifuging at 3000rpm for 5 min. All samples were stored in deep freezer under -70<sup>0</sup> C temperature and the estimations were carried out.

**Results**

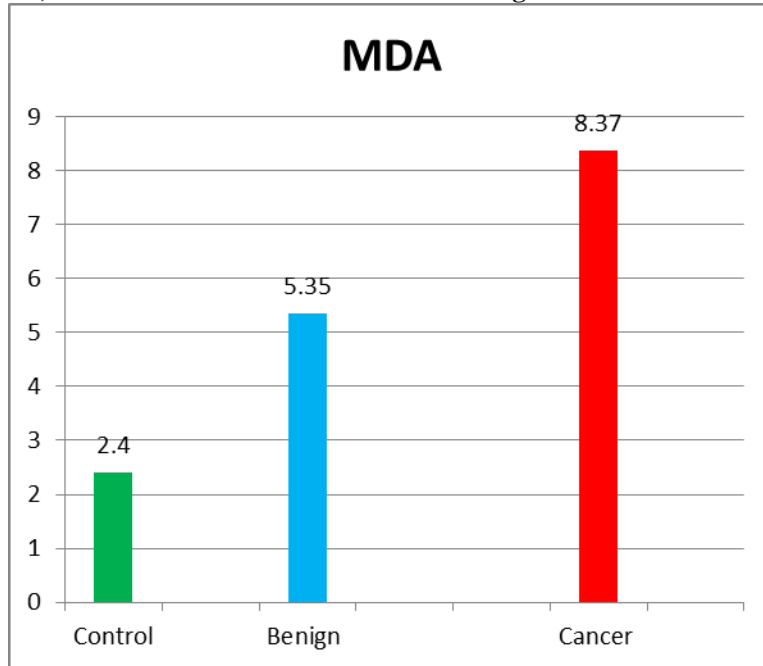
**Table 1 Male and Female Distribution in Study Population-**

Sex	Benign	Malignant	Control
Male	64	66	38
Female	11	09	37

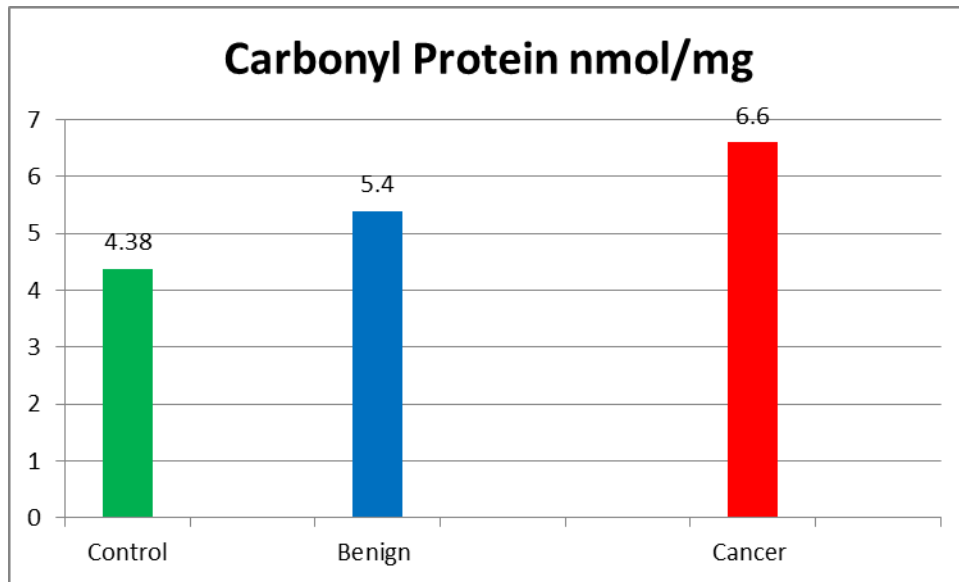
**I) Malondialdehyde (MDA ) in the different Tobacco consumption pattern-**



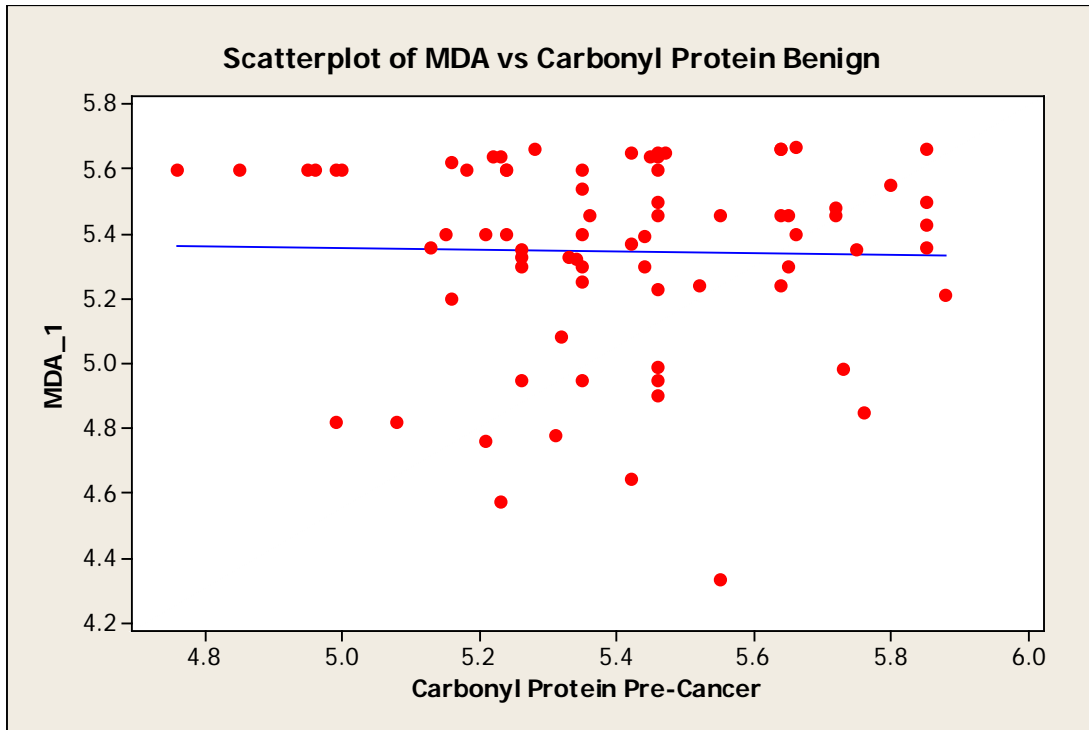
**II) MDA in control and different categories of ENT lesions-**



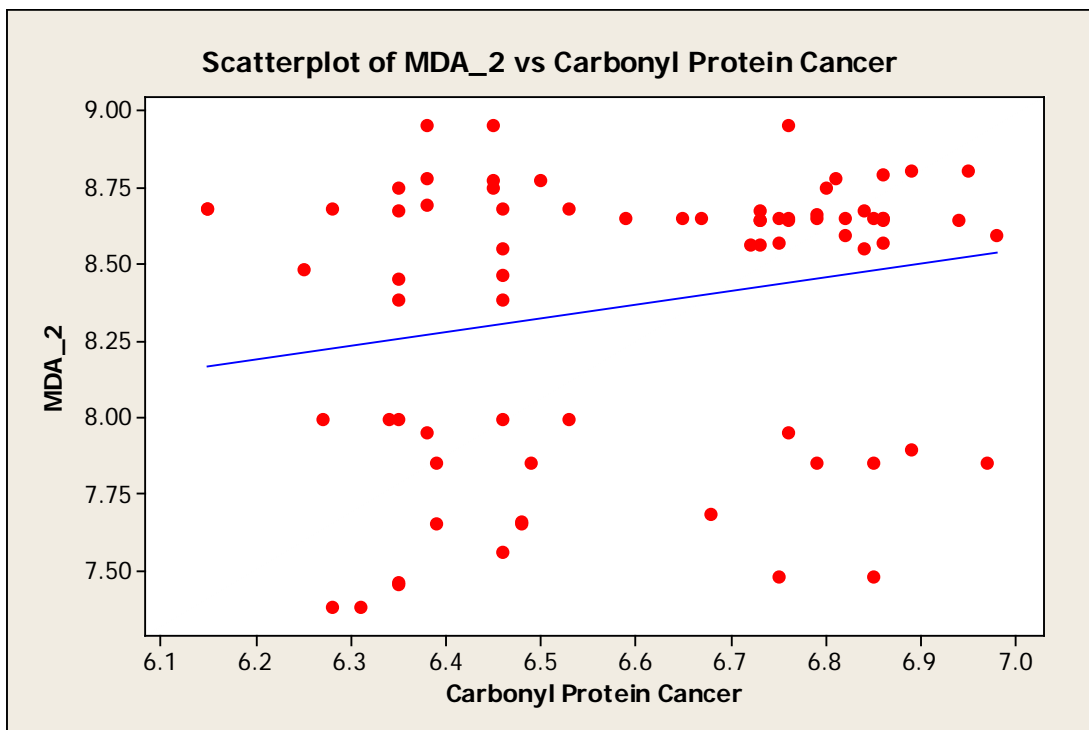
**III) Protein carbonyl content in control and different categories of ENT lesions-**



Graph I



GraphII



#### IV. DISCUSSION

Oxidative stress is indicative of physiological disequilibrium within a cell or tissue or organ. Oxidative stress is increased when there is disequilibrium between the levels of free radicals in a cell and its antioxidant defenses (3). Near about 1-3 billion reactive oxygen species (ROS) are generated per cell per day. ROS includes the superoxide radical, hydroxyl radical, and nitric oxide radical species, and non-radical derivatives of oxygen, such as hydrogen peroxide and hypochlorous acid. ROS can react directly with the protein or they can react with molecules such as sugars and lipids leading to the production of reactive carbonyl species which then react with the protein. Direct oxidation of proteins by ROS produces highly reactive carbonyl derivatives (4). Protein carbonyl is the most widely used biomarker for oxidative damage to proteins (5). Excess productions of ROS are responsible for increase in oxidative stress. In present study, MDA and protein carbonyl was estimated in the different tobacco consumption pattern in both benign and malignant conditions with common ENT problem in male patients. Males had a higher prevalence and comprised 86.6% of the sample. That may be because of increased quantity of tobacco consumption in multiple forms and more exposure of tobacco to males. Similar study by Sujatha D, Hebbar PB, Pai A in 2012 (6).

Malondialdehyde (MDA) is the marker of oxidative stress. MDA estimation was done in control group (Group I), patients with benign conditions such as stomatitis, submucosal fibrosis, leukoplakia, erythroplakia, gingivitis (Group II) and patients with malignancy (Group III). MDA level was significantly high in both benign and malignant group with lesions of ENT as compared to control group. Maximum increase in the MDA levels in the patients with addiction to tobacco chewing and smoking and habit of alcohol intake followed by patients with combined habit of smoking and chewing. Smokers have higher levels of MDA seen in both benign and malignant conditions as compared to control group i.e. Dhouha Haj Mouhamed et al, Kashinakunti SV in 2011, Lykkesfeldt J, in 2004, Mahdavi R, in 2009 (6,7,8,9).

MDA and protein carbonyl shows significant positive correlation in the cancer patients. It indicates that increase in the oxidative stress increases to such an extent that damages the DNA and increase in the protein carbonyl content would lead to cancerous condition. In the patient with benign lesions there was not significant correlation between MDA levels and protein carbonyl content. Study done by Megson IL, et al in 2013 had shown the effect of passive smoking on the elevated levels of MDA and protein carbonyl content (10).

#### Conclusion-

Both benign and malignant conditions of ENT were common in male patients. MDA marker of oxidative stress and protein carbonyl was increased in both benign and malignant lesions of otorhinolaryngology. MDA levels were higher in malignant lesions than benign lesions. In the patient with benign

lesions there was not significant correlation between MDA and protein carbonyl content. But in patients with the malignant ENT lesions there was significant positive correlation between MDA levels and protein carbonyl content. Increase in the oxidative stress to such an extent that damages the DNA and increase in the protein carbonyl content would lead to cancerous condition. Protein Carbonyl is helpful in the unknown primary lesions and dysplastic lesions.

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#### AUTHORS

**First Author** – Dr Reshma Prakash Chavan, MS, (Otorhinolaryngology), Assistant professor, Department of Otorhinolaryngology, Grant Medical College and Sir J. J. Group of Hospitals Byculla, Mumbai-08.

**Second Author** – Dr. Shivraj Marotirao Ingole, MD DNB, MNAMS FRCR (London), Associate professor, Department of Radiology, Grant Medical College and Sir J. J. Group of Hospitals Byculla, Mumbai-08.

**Third Author** – Dr. V. W. Patil, M.Sc Ph.D, Professor and Head, Department of Biochemistry, GGMC and J.J Hospital, Mumbai-08.

# Monitoring the TEC variation using pattern matching method during earthquakes as determined from ground based TEC measurement and satellite data

**S. Kalita**

Department of Computer Application  
Mahapurusha Srimanta Sankaradeva Viswavidyalaya  
Nagaon, Assam, India  
Email: santanu.kalita@rediffmail.com

**Abstract-** Total electron content (TEC) data, obtained from GPS satellites can be used as a tool for extracting earthquake precursor. In this paper, a pattern matching technique is used for monitoring TEC variation during and prior to the earthquake. For the experiment two major earthquake events i.e. Bhutan earthquake on 21st September 2009 and Nepal earthquake on 25th April 2015 are considered for analysis. Work is based on TEC data collected from GPS at Gauhati (26° 10' N, 91° 45' E) and National Oceanic and Atmospheric Administration (NOAA) satellite data.

**Index Terms-** Total electron content, earthquake, pattern matching

## I. INTRODUCTION

The ionosphere has a major role in the propagation of electromagnetic radio waves. Due to large variability of ionosphere these propagation are widely affected. Such variability occurs mostly under the influence of some geophysical phenomenon mainly the sunspot number, solar flares and magnetic storms. Many of the researchers have been reported that the ionosphere shows anomalous variations prior to large magnitude impending earthquake. The study of ionospheric variations during seismic activities becomes an interesting field of earthquake prediction. These studies are being carried out by analyzing different parameters such as foF2, foEs, TEC etc.

Total Electron Content (TEC) obtained from satellites has now been adopted as one of the tools for identifying earthquake induced characteristics to utilizing these as precursory parameters [Kalita et al 2012, Devi et al 2001]. However earthquake induced effects on the ionosphere are inherently complex in nature because even at normal times the ionosphere is influenced by solar geomagnetic ambience. In addition to this, in latitudes like Guwahati (26° 10' N, 91° 45' E) the effect of a special phenomenon known as Equatorial Anomaly make such analysis difficult.

In this paper, the two major earthquakes i.e. Bhutan earthquake on 21st September 2009 of magnitude 6.1 and Nepal earthquake on 25th April 2015 of magnitude 7.8 are considered for analyzing ionospheric TEC variation using dynamic time warping method during and prior to the earthquake.

## II. DATA AND ANALYSIS

TEC data used in the research work are mainly collected from National Oceanic and Atmospheric Administration (NOAA) satellite data and the GPS receiver of Guwahati. The TEC measurement from GPS is based on Faraday Rotations, measured through two different L band frequencies. From the slant TEC data, matrix inversion and smoothing techniques are used for vertical TEC measurement. At Gauhati laboratory, a GPS receiving set up is used for collection of TEC data. The system consists of a GPS antenna with a low noise oven controlled crystal oscillator which can track up to 11 GPS signals at L1 frequency (1575.42 MHz) and L2 frequency (1227.6 MHz).

Earthquake induced features on TEC are often examined by taking the TEC peak value as an parameter (Devi et al. 2010b). But the TEC peak alone is not exclusive as it cannot offer electron content magnitudes especially at post sunset hours in situations when abnormally high TEC variation is detected. Such enhancements in electron density, leading to changes in shape of the TEC profile, are often observed on pre-earthquake days (Depueva and Ruzhin 1993, Devi et al. 2004). Therefore, the TEC peak may not be a sufficient predictive parameter for an earthquake thus necessitating using the TEC profile shape in a technique that brings the entire TEC profile period to the ambit of earthquake prediction analysis. For this approach a dynamic programming technique known as Dynamic Time Warping (DTW) is used to identify dissimilarity between two time series and to determine the deviation between the two. Here, one of the time series is framed from quiet day average of TEC profiles while the second series is for any other day. The two series are compared by calculating the magnitude of 'like-to-like' matches. Based on this matching, a parameter called the 'certainty factor' is defined to identify earthquake cursors. However, before applying the DTW technique, it is essential to examine TEC variations due to seismic and other non seismic factors. The work is based on the previous research work of Kalita et al, 2012.



III. RESULT AND DISCUSSION

The 2009 Bhutan earthquake with  $M=6.1$  magnitude occurred at 14:43 (82.5 EMT), on September 21, 2009 in the eastern region of Bhutan. The epicenter was at 180 kilometers (radius =445.85 km) east of the capital Thimphu and thus the receiving station at G.U. is within the earthquake preparatory zone. As DTW technique demands framing of the template from ten quiet days (Q-days) of this month for finding out ‘‘certainty’’ parameter, we present in figure 1a the Q-day TEC feature along with one of the pre- earthquake day to highlight the differences between the two. The modification in shape of TEC before the earthquake day (see figure 1b) is significant compared to that for Q-day one. And it is expected that the certainty factor should be low before this event. Thus from a number of quiet day TEC profiles a template for this particular month is created to measure distance of deviation between template and time series of other days of this month and the certainty factor is calculated .

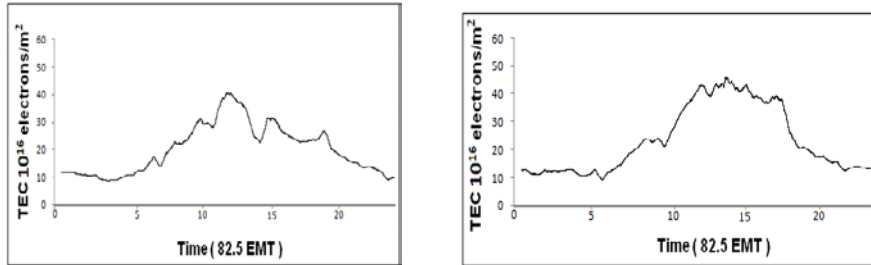


Fig 1: TEC profile for (a) Q-day and (b) pre earthquake day of 20.9 .2009

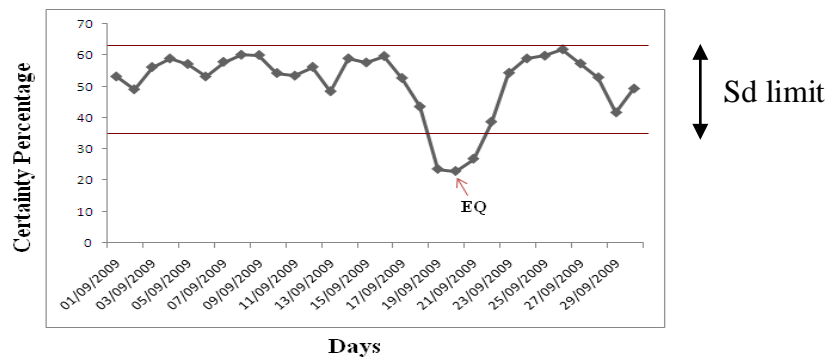


Fig 2: Certainty factor for the month of September 2009. Note the depletion of this factor during earthquake time; earthquake occurred on 21.9.2009.

The certainty percentage is plotted (figure 2) against day for the entire month and it is clearly observed that the magnitude of this parameter has gone down below the sd limits (shown by red lines) from 19th Sep 2009 i.e two days prior to the earthquake and the parameter revives to its original value from 22nd Sep 2009. This indicates that it is possible to identify an earthquake day by calculating the certainty factor using the method.

The above approach is now applied for identifying the recent earthquakes of 25 April 2015 Nepal earthquake which is also referred to as the Himalayan earthquake with  $M=7.8$  magnitude occurred at 11.56 NST. The epicenter was approximately 34 km (21 mi) east-southeast of Lamjung, Nepal, and its hypocenter was at a depth of approximately 15 km (9.3 mi) and Guwahati lies well within the earthquake preparatory zone, offering a rare occasion to examine the reliability of the DTW technique for a case like this. The Q-day template has been made and the ‘certainty factor’ between the template and the other days of this month is calculated and presented in figure 3. Here too, a clear drop of this factor prior to the earthquake is seen. Low values of the ‘certainty factor’, even after the earthquake events, are interesting because such a factor may be associated with aftershocks.

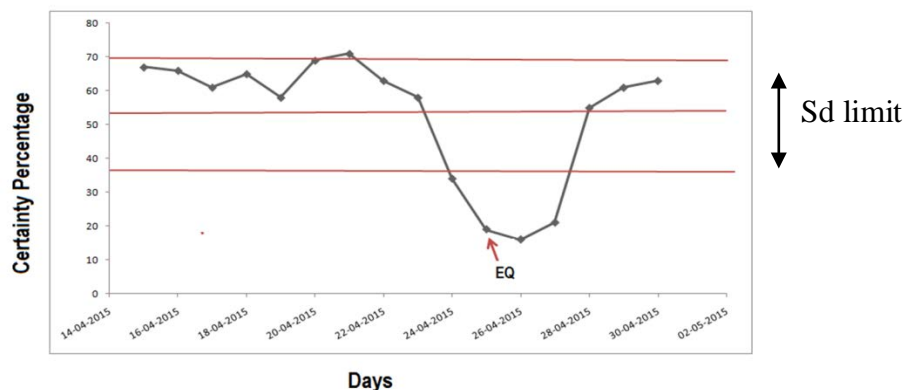


Fig 3: Certainty factor for the month of April 2015. Note the decrease in the certainty factor prior to the earthquake day, marked by arrow head in the figure.

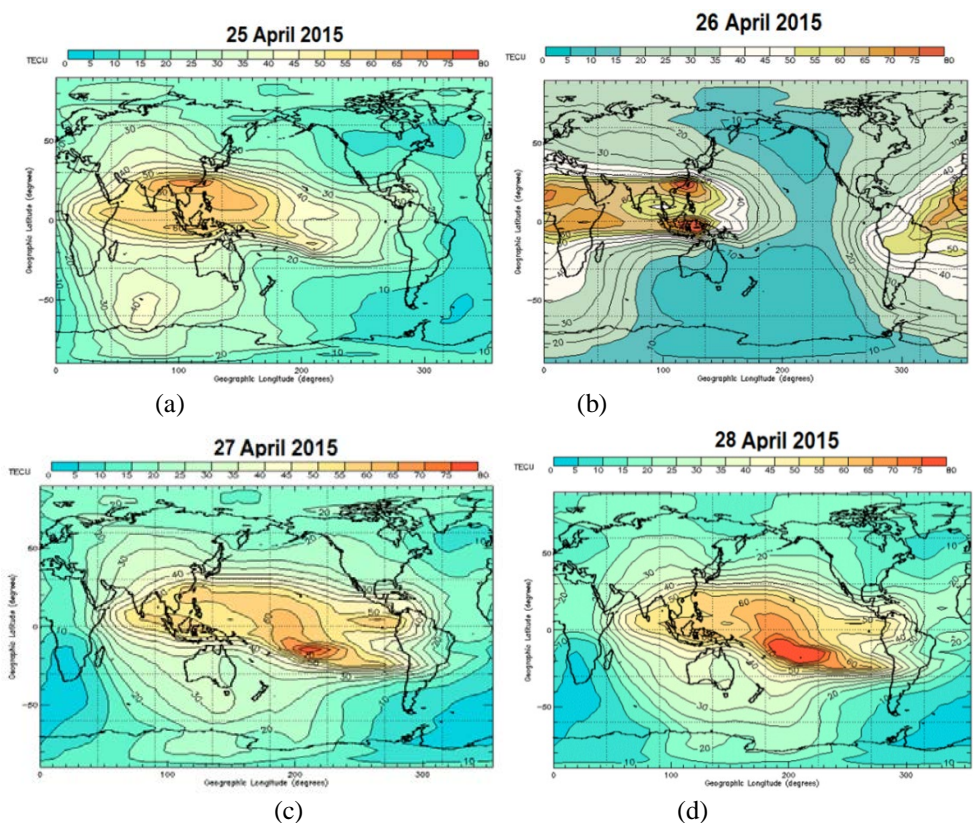


Fig 4: Displaying abnormal growth of TEC during April 25, 2014 and April 26, 2014 at 22°-30° Latitude and 80°-120° Longitude Zone.

By analyzing global TEC data (figure 4) during strong earthquake events of Nepal, it can be clearly observed that there is strong ionization density at off 22°-30° Latitude and 80°-120° Longitude on 25<sup>th</sup> April 2015 gets extended as reflected in the global TEC plot of Figure 3, which is a suggestive cursor to a very strong earthquake in this sector. Such abnormal behavior can be identified while comparing the normal day TEC map.

Past studies on the analysis of TEC features that appear prior to an impending earthquake have shown that precursors at low-latitudes manifest themselves as a kind of Appleton type ExB charge movement when the epicentre lies near to the equator (Depueva and Ruzhin 1995, Devi et al. 2001, Hayakawa 2004, Depueva et al. 2007), imparting a mark in the TEC value (Depueva and Rotanova 2001, Devi et al. 2004, 2010b). It is shown by Devi et al. (2010b) that low-latitude earthquakes also force similar changes on profiles of electron density, though the modifications may extend to beyond the day peak. Thus, modifications to electron content imposed by an equatorial earthquake may not be similar to that of a low latitude one, when shifts of the anomaly crest may lead to either an increase or decrease of TEC, depending in a complex way on magnitude of the earthquake, proximity of the epicentre to the observing station and the simultaneous presence of an equatorial earthquake (Devi et al. 2010b).

#### IV. CONCLUSION

We have here adopted a new approach for monitoring TEC variation during and prior to the strong earthquake day profile from Q-day one by pattern reorganization. This is the first step for utilizing this approach for monitoring the behavior of TEC during and prior to an impending earthquake. However the limitation is that it cannot resolve fine structure (like changes in hours) because the enormous increase in size of the necessary matrix for computation such changes. However, there is an improvement on DTW algorithm (FDTW) for preparing large matrices and large number of distance calculation. Our next step will be to designing a model using  $f_oF_2$  and other important data as a parameter for extraction of earthquake precursors and to adopt the new algorithm for identification of epicenter position through use of multiple features of TEC as discussed by Devi et al. (2010a).

#### ACKNOWLEDGMENT

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# AREA AND POWER EFFICIENT CMOS ADDER DESIGN BY HYBRIDIZING PTL AND GDI TECHNIQUE

SUVASINI SB<sup>1</sup>, JAYARAM M V<sup>2</sup>

<sup>1</sup>PG SCHOLAR, DIGITAL ELECTRONICS, ([suhasini345@gmail.com](mailto:suhasini345@gmail.com))  
Department of Electronics and Communication Engineering, Karavali Institute of Technology, Mangalore  
Pin Code-575 029 State Karnataka- INDIA Contact: (+91-8197309789)

<sup>2</sup>ASISSTANT PROFESSOR, ([jayaram\\_mv@yahoo.co.in](mailto:jayaram_mv@yahoo.co.in))  
Department of Electronics and Communication Engineering, Karavali Institute of Technology, Mangalore  
Pin Code-575 029 State Karnataka- INDIA Contact: (+91-9739977733)

**Abstract-** In CMOS integrated circuit design there is a trade-off between static power consumption and technology scaling factors. Leakage power accounts for an increasingly larger portion of total power consumption in deep submicron technologies. Recently, in technology the power density has increased due to combination of higher clock speed, smaller process geometries and scaling factors, layout structure and greater functional integration. As results static power consumption is becoming more dominant state. This is a challenge for the CMOS integrated circuit designers. However the integrated CMOS designers do have a few methods which they can use to reduce this static power consumption. Since, these methods have some drawbacks. To attain lowest static power consumption one has to sacrifice design area and circuit performance. In this paper we proposed a new method to reduce static power in the CMOS VLSI circuit using dual stack approach without being penalized in area requirement and circuit performance.

**Index Terms-** dual stack approach, static power saving technique, stack effect, static power reduction.

## 1. INTRODUCTION

A large proportion of digital functional blocks are only active for a small fraction of time. When the functional block is not operated leakage still occurs. In submicron technology such a phenomenon is aggravated due to the reduced threshold voltage from scaling. Leakage power occurs 40% of total power consumption in today's high performance microprocessors. Leakage power reduction becomes the key to a low power design. CMOS technology features size, scaling factors and threshold voltage have been scaling down for decades for achieving high density and high performance. Because of this technology trending transistors leakage power has increased exponentially. As the features size becomes smaller, shorter channel lengthened result increased Sub-threshold leakage current through a transistor when it is off.

Low threshold voltage also results in increased sub-threshold leakage current because transistors cannot be turned off completely. For these reasons the static power consumption that is leakage power dissipation has become a significant portion of total power consumption for current and future silicon technologies. There are several VLSI techniques to reduce leakage power. Each technique provided an efficient way to reduce leakage power but disadvantages of each technique limit the application of each technique. We propose a new approach providing a new choice to low-leakage power VLSI designers. The previous techniques were summarized and compared with our new approach presented in this paper.

## II. FULL ADDER CIRCUITS

Static logic style gives robustness against noise effect automatically provides reliable operation immediately. The Pseudo NMOS and Pass-transistor logic can reduce the number of transistors required to implement a given logic function. It also suffers from static power dissipation. Implementation of enlarged multiplexers and XOR based circuits are advantageous in pass transistor logic.

The dynamic logic implementation of complex function requires a small silicon area but charge leakage and charge refreshing are required which reduces the frequency of operation. In general all the mentioned styles cannot compete with CMOS style in robustness and stability. The conventional CMOS 28 transistors adder circuit design shown in Figure 1. Figure 1 it is considered as base case throughout this paper. The comparison with base case. Transistor sizes are specified as a ratio of Width/Length (W/L).

It is observed that the conventional adder circuit that the transistors ratio of PMOS to NMOS is 2 for an inverter. Further power gating technique is used to reduce the leakage power where a sleep transistor is connected between actual ground rail and circuit ground. Ground bounce noise is being estimated when the circuits are connected with a sleep transistor. The sizing of each block is based on the following basis. The sizing will reduce the standby leakage current greatly because sub-threshold current is directly proportional to the Width/Length ratio of transistor. The reduced sizes reduce the area occupied by the circuit. This will reduce the silicon chip area and in term reduction in the cost.

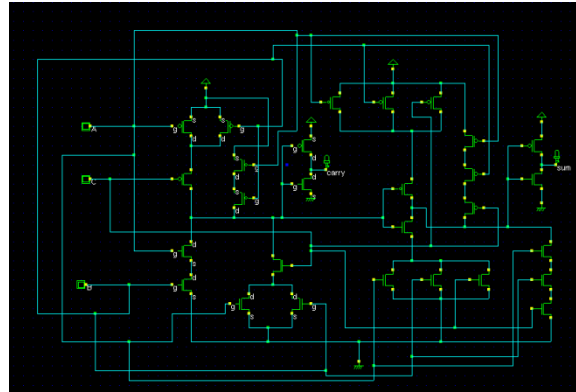


Figure 1. Conventional CMOS full adder (Base case).

Modified adder circuit of Design 2 is shown in Figure 3 of 90nm technology. The W/L (width/length) ratio of PMOS is 1.5 times than of W/L (width/length) ratio of NMOS. Each block has been treated as an equivalent inverter. The aim of this design is to reduce the standby leakage power. Further compare to the Base case with both (90nm technology) Design 1 and (70nm technology) Design 2. The ground bounce noise produced when a circuit is connected to sleep transistor is reduced.

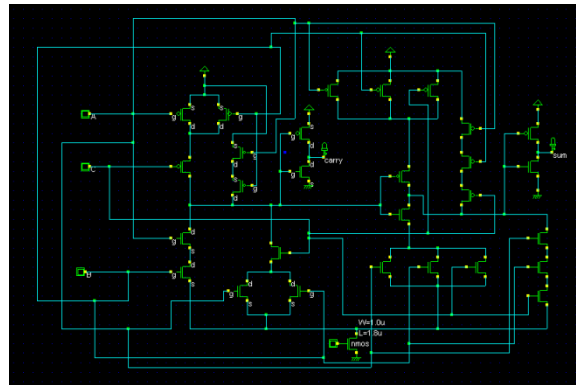


Figure 2. (Design 1) Full adder circuit with sleep transistor (90nm technology).

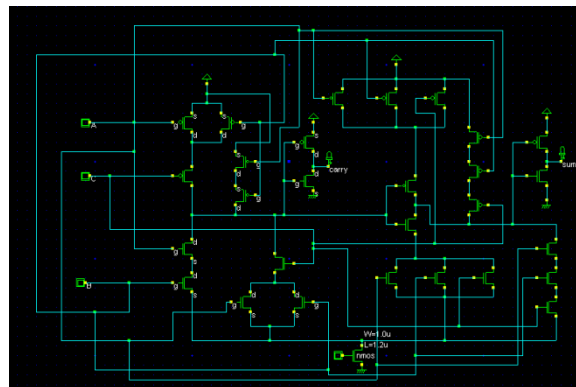


Figure 3. (Design 2) Full adder circuit with sleep transistor (70nm technology).

### III. PERFORMANCE ANALYSIS

#### A. Active Power.

Power dissipated by the circuit when the circuit is in active state is termed as Active power. Input vectors are fed into the circuit and the average power dissipation is measured. All of the input combinations are considered for simulation. The same input vectors combination have been given to the all three designs- Base case, Design 1 and Design 2 a comparison has been made for the same in both 90nm and 70nm technologies.

#### B. Standby leakage power.

Standby leakage power is measured when the circuit is in standby mode. Sleep transistors are connected to the pull down network of 1-bit full adder circuit. Sleep transistor is off by asserting an input 0v. Size of a sleep transistor is equal to the size of largest transistor in the network (pull up or pull down) connected to the sleep transistor. The sleep transistor size in (90nm technology) Design 1 and Design 2 (70nm technology) is reduced due to the resizing of the adder cells in proposed circuit. Standby leakage power is measured by giving different input combinations to the circuit. Standby leakage is greatly reduced in both Design 1 and Design 2 for both 90nm and 70nm technologies.

#### C. Four bit adder active and standby power.

Full adder cells shown in figure 1, figure 2 and figure 3 are used to design 4-bit ripple carry adder. Four-bit adders are in all three designs Conventional, Design 1 and Design 2. For both 90nm and 65nm technologies are constructed. The active power and standby power are calculated. An active power is calculated by setting the select terminal of the adder to logic high and standby power is calculated by setting the Select terminal to 0V. Compare of active and standby power of all the designs in both 90nm and 70nm technologies as shown in figure 4 and figure 5.

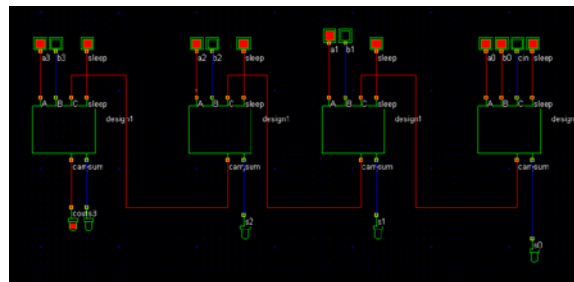


Figure 4. Four-bit full adder (Design 1) 90nm technology.

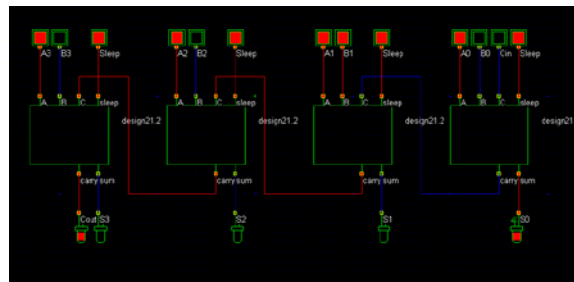


Figure 5. Four-bit full adder (Design 2) 70nm technology.



#### IV. PROPOSED DESIGN

We review proposed circuit level approaches for sub-threshold leakage power reduction.

##### Dual Sleep Approach

Dual sleep approach use the advantage of using two extra pull-up and two extra pull-down transistors in sleep mode either in OFF state or in ON state. The dual sleep portion can be made common to all logic circuitry less number of transistors is needed to apply a certain logic circuit.

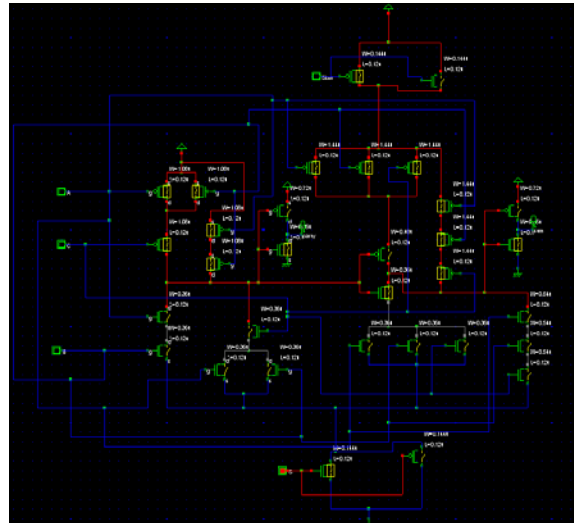


Figure 6: One-bit full adder using dual sleep approach.

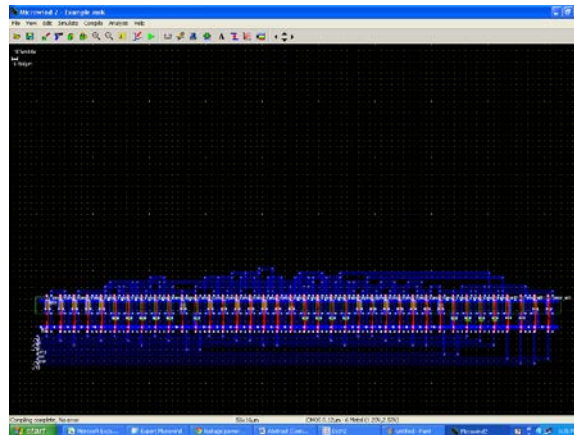


Figure 7: Layout for one-bit full adder using dual sleep approach.

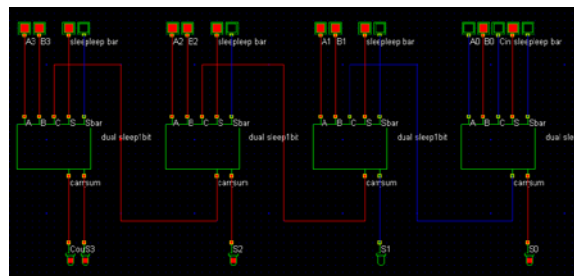


Figure 8: Four-bit full adder design using dual sleep approach.

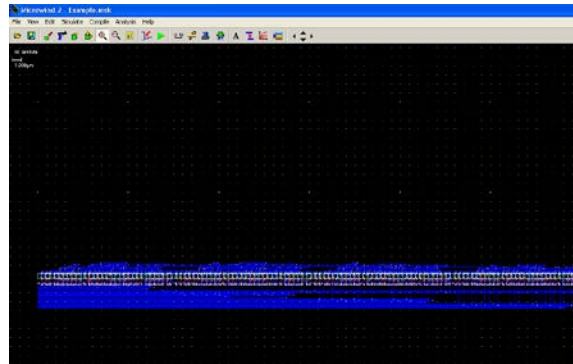


Figure 9: Layout for four-bit full adder design using dual sleep approach.

## V. SIMULATION METHODOLOGY

We compare the dual sleep techniques with previous approaches explained earlier namely: conventional CMOS with sleep transistor and ripple carry adder. We compare these designs approaches in terms of dynamic and static power consumption and analysis of delay as well as area.

## VI. CONCLUSION

Miniaturization of CMOS technology achieving high performance has resulted in increase of leakage power dissipation. In this paper we present an efficient methodology for reducing leakage power in VLSI design. The Variable Body Biasing approach shows improved results in terms of static and dynamic power and delay power analysis product. It gives the CMOS circuit designers another option in designing integrated circuits more efficiently.

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# Recent Trends and Techniques in Image Segmentation using Particle Swarm Optimization-a Survey

Abhay Sharma, Rekha Chaturvedi, Dr. Umesh Kr. Dwivedi

Faculty in ASET, Amity University Rajasthan, India

**Abstract-** Particle swarm optimization is the nature inspired computational search and optimization approach which was developed on the basis of behaviour of swarm. Recently each and every field of research is utilizing the properties of PSO. One of the popular field of research is image segmentation which is also fastest growing field. Taking the advantages of combining PSO with different image segmentation technique many researchers has proposed various research papers with enhancement of various parameter. In this paper we surveyed some paper and try to provide recent trends and techniques involved in image segmentation with PSO.

**Index Terms-** Particle swarm optimization, Image segmentation, Thresholding, Contrast Enhancement, Fuzzy system, Clustering, Genetic Algorithm.

## I. INTRODUCTION

With the continuous development of computer science and technology, research in the field of image processing gradually increased. New trend are getting turned on using Nature inspired computing in the area of image processing. One of the emerging techniques are image segmentation based on swarm intelligence.

Image segmentation is a process of partitioning an image into homogeneous regions which are more meaningful and easier to analyse. The outcome of image segmentation is an image separated in a set of regions or a set of interest extracted from the image. Pixels in each region are coordinated with respect to some specific or computed property such as color, intensity or texture.

Some of Image segmentation methods are thresholding, Edge based segmentation, Region growing, Clustering, Region splitting, and Fuzzy set image thresholding and so on. Most popular image segmentation method is Thresholding among all the existing segmentation techniques, due to its simplicity, robustness, and accuracy [2], [3]. Edge based detection is based on the discontinuity in an image. It is easily effected by the presence of noise and may lead to un-correct segmentation, Region growing overcomes the drawbacks of early image segmentation techniques. Another method is clustering which groups the data into different clusters. Fuzzy set image segmentation is the rule based segmentation and takes into account the uncertainty and fuzziness in an image

Recently, swarm intelligence (SI) is new emerging area in various fields including optimization. One of very popular SI methods is particle swarm optimization (PSO) for finding optimized solution. PSO is a stochastic search method that was developed in 1995 [1] by Kennedy and Eberhard. PSO was

based on the sociological behaviour of bird flocking. It initializes a population of particles that simulates a flock of birds. The algorithm of PSO is very easy and fast to obtain solution so that it can be applied to solve a wide range of optimization problems in many fields such as image processing fields including image segmentation. The goal of this paper is to provide a state of art survey of image segmentation method based on the idea of PSO.

## II. PARTICLE SWARM OPTIMIZATION (PSO)

PSO is population based stochastic optimization algorithm to find out optimized solution. Each particle in population is represented as a solution and are randomly distributed in the search space. Each particle is having its position and velocity in current population, which shows the current solution available in search space.

During flight a particle move or adjust its position to find optimum solution based on own personal best position and distance from global best particle position. At each iteration of the algorithm, particles update their current positions are weighed through fitness function.

The swarm is initialized with random particles known as candidate solution and it then searches for optima by updating its position through iterations. Two optimum values define the fitness of objective function first one is the best solution of each particle achieved so far. This value is called as "pbest" solution. Another one is the, best solution tracked by any particle among the whole population. This best value is known as "gbest" solution.[6.2013]

$$V_i(t+1) = w V_i(t) + c1.r1 (Pbest,i(t) - X_i(t)) + c2.r2 (Gbest,i(t) - X_i(t))$$

$$X_i(t+1) = X_i(t) + V_i(t+1)$$

Where  $X_i(t)$ ,  $V_i(t)$  indicate the position the velocity of ith particle .

$Pbest,i$  indicate the personal best position of ith particle.

$Gbest,I$  indicates the global best position achieved so far.

$c1$  and  $c2$  position acceleration constant  $r1$  and  $r2$  are random values generated between  $[0, 1]$ .

$w$  is inertia weight used to provide balance between local and global search

## III. LITERATURE REVIEW

Nakib *et. al.* [4] proposed a brain MRI segmentation method which was based on two-dimensional survival exponential entropy and particle swarm optimization. Introduced method

took the advantage of spatial information using the 2D-histogram. The problem of increased computational time was further solved by PSO algorithm which makes the method more suitable for real time applications with advantage of low cost. Apurba *et. al.* [5] proposed a new approach for image enhancement based on PSO which mainly works using optimization of intensity transformation function. Intensity transformation function was fine-tuned by using local and global information of the image. Proposed method was compared with different enhancement techniques.

A new idea came to use PSO in lower-resolution multispectral images, Han *et. al.* [6] proposed a technique to solve the pan sharpening problem for remote sensing images. In proposed method the fusion parameters were optimized using the particle swarm optimization (PSO) algorithm. Fusion results of the proposed approach were compared with fused images produced by some classical pan sharpening approaches.

Gao *et. al.* [7] proposed a multilevel thresholding technique which was based on the optimization based algorithm (CQPSO). This method maintains the fast convergence rate of PSO. The quantum-behaved PSO employing the cooperative method (CQPSO) was proposed to save computation time and to overcome the profanity of dimensionality. OTSU method was used to evaluate the performance of proposed method and result showed the effectiveness in terms of less computational time of the traditional OTSU method.

Zhiweid *et. al.* [8] proposed an image Segmentation technique based on 2-D Fisher and Chaos Particle Swarm Optimization Algorithm. According to the experiment, proposed method was able to improve the efficiency and accuracy of 2-D fisher method based on traditional PSO.

Milad *et. al.* [9] proposed a Image thresholding technique for segmentation of magnetic resonance images. Proposed method was combination of the multilevel thresholding algorithm and the hierarchical evolutionary algorithm (HEA) result showed that the proposed method was efficient and accurate.

Broilo *et. al.* [10] proposed an image retrieval technique Using Relevance Feedback and Particle Swarm optimization. In the paper semantic gap problem is solved through optimized iterative learning. Method was implemented in the investigation of the solution space towards the cluster of relevant images and to dynamically modify the feature space by appropriately weighting the descriptive features according to the users' perception of relevance. Results showed the efficiency and effectiveness of proposed method.

Speckle and low contrast is the main cause for degradation of image result in less detectability of targets which restricts investigation of synthetic aperture radar (SAR) images. Ying *et. al.* [11] proposed a mirror-extended Curvelet (ME-Curvelet) transform and particle swarm optimization (PSO) to solve the problem. Author had proposed a improved enhancement function which was nonlinearly shrink and stretch the Curvelet coefficients. An objective evaluation criterion was introduced to adaptively obtain the optimal parameters in the enhancement function. Experimental results showed that the proposed method can reduce the speckle and enhance the edge features and the contrast of SAR images better with comparison to the wavelet-based and curvelet-based on-adaptive enhancement methods.

Nazareth *et. al.* [12] proposed a new image segmentation method based on Contrast-Limited Adaptive Histogram Equalization (CLAHE) and Enhanced Convergence Particle Swarm Optimization (ECPSO). Selection of multiple thresholding is used as optimization problem and was solved by ECPSO. Experimental result showed the effectiveness of the method which outperforms Genetic Algorithm (GA), Particle Swarm Optimization (PSO) and Bacterial Foraging (BF) Algorithms.

Qinqing *et. al.* [13] proposed image enhancement method based on improved PSO (Particle Swarm Optimization). In proposed method parameterized transformation function is used, which uses global and local information of the image which takes the advantages of the entropy of the image and edge information. The method, which was quiet simple and effective and compared with HE (Histogram Equalization), LCS (Linear Contrast Stretching) and GAIE (Genetic Algorithm based on Image Enhancement).

Apurba *et. al.* [14] proposed a hue preserving color image enhancement technique which was based on PSO to find optimized solution for image enhancement. In proposed method the quality of the intensity image is improved by a parameterized transformation function which was similar quiet to what Gao Qinqing [13] had proposed. In addition gamut problem is also solved by rescaling method was then compared with other techniques like hue-preserving color image enhancement without gamut problem (HPCIE) and a genetic algorithm based approach to color image enhancement (GACIE). Algorithm was very efficient and provided better results compared to other two methods.

The basic and most commonly used technique for contrast adjustment in the image is Histogram Equalization (HE), Masra *et. al.* [15] introduced a HE technique with Particle Swarm Optimization (PSO) algorithm for enhancing distorted image naturally. PSO was used for different channels (RGB) for optimization to generate best fitness value.

Enhancement of low resolution images is always a priority field of digital image processing, many algorithm and method had proposed from several years. Zhang *et. al.* [16] introduced a chaotic particle swarm optimization (CPSO) with contourlet transform for multi-scale image enhancement. In proposed method low frequency sub-bands was enhanced using contourlet transform with the help of local mean and standard deviation which enhances the overall contrast of image while high frequency band was enhanced by nonlinear gain function which enhances the local contrast of weak details. The main utilization of chaotic particle swarm optimization was to search the optimal parameters. Proposed method showed the efficiency of algorithm with different methods like histogram double equalization method, second-generation wavelet transform method. This method was good to enhance image details and suppress noise better.

Quraishi *et. al.* [17] had proposed new approach based on discrete wavelet transform (DWT) and particle swarm optimization (PSO). In addition DWT was used to decompose the input low resolution image into different sub bands. Each of the interpolated high frequency sub band (LH, HL, HH) is then summed up with the interpolated output image of the frequency domain.

PSO clustering algorithm is widely used in pattern recognition methods such as image segmentation, Raghotham *et. al.* [18] presented a new efficient algorithm which was based on PSO optimization and clustering method. Proposed algorithm was compared with KFCM and another clustering algorithm. Result showed the effectiveness of algorithm like fast convergence with good accuracy.

Shelda *et. al.* [19] proposed an image enhancement algorithm which uses the PSO as tuning the enhancement parameter of Contrast Limited Adaptive Histogram Equalization (CLAHE) which was based on Local Contrast Modification (LCM). Result was compared with other enhancement techniques such as histogram equalization, unsharpmasking and shows the effectiveness of the algorithm.

Hanmadlu *et. al.* [20] proposed a new approach which was used for enhancement of global intensification operator used in HSV color model. Author had used PSO for optimization of contrast information factor. This paper was concern of performance parameter like entropy, visual quality factor, contrast information and index of fuzziness. Evaluated result shows the improvement in quality of image, preservation of color and specific image features.

The fuzzy c-partition entropy approach was proposed by Ouarda *et. al.* [21] for threshold selection in image segmentation. In this paper complex problem of selecting threshold was solved by PSO and DE algorithms. Result showed that performance of

PSO and de is equal when numbers of threshold is less but when it is more PSO outperforms DE. PSO provides better effect in terms of precision, robustness and execution time.

Pedram *et. al.* [22] introduced a new multilevel thresholding method for segmentation of hyper spectral and multispectral images. Proposed method was based on fractional-order Darwinian particle swarm optimization (FODPSO). In contrast the concept of fractional derivative was utilized to control convergence rate of particles. Experimental results showed that FODPSO was outperform other nature inspired algorithm such as PSO and DPSO. The FODPSO presents a statistically significant improvement in terms of both CPU time and fitness value.

Ravindra *et. al.* [23] proposed a approaches to enhance contrast of image using genetic algorithm and PSO. They had used these algorithms for optimization in spatial domain and frequency domain.

Zhang *et. al.* [24] had proposed a new algorithm based on asynchronous and inertia adaptive particle swarm optimization for digital image segmentation. It was enhancement of what Quraishi [17] had proposed. In this algorithm, Adaptive threshold was gained using inertia factor into the algorithm. Obtained Result was further compared with other particle swarm optimization algorithm showed the effectiveness of algorithm in terms of stability, simplicity and easy to find optimum solution. One of the advantage of this algorithm was high segmentation speed.

**TABLE 1: PSO AND OTHER HYBRID APPROACH**

S N	Image processing area	PSO variant and other method	Author, year	Application, Advantages	Experiment Parameter
1	Image segmentation	Asynchronous PSO	Zhang <i>et. al.</i> , 2015.	1. Stable 2. Easy to converge for the optimal solution 3. High segmentation speed	Swarm size :10, Maximum number of iterations : 50, Inertia weight W: 0.9 , learning factor C1=1.4324, C2=1.59612 ;
2	Thresholding (Image Segmentation)	PSO &DE Fuzzy tri-partition based PSO algorithm	Ouarda <i>et. al.</i> , 2014.	1. Reduced time complexity 2. Execution time	swarm size :20, learning factor C1=C2=1.5, Inertia weight W=0.5;
3	Multilevel Thresholding (Image segmentation)	Support Vector Machine(SVM) and Fractional-order Darwinian PSO (FODPSO)	Pedram <i>et. al.</i> , 2014.	1. Improved CPU time 2. Good fitness value	
5	Contrast Enhancement	PSO & Genetic Algorithm	Ravindra <i>et. al.</i> , 2014.	1. Can be used in spatial domain and frequency domain.	
6	Image Enhancement	Contrast Limited Adaptive Histogram Equalization(CLAHE ) & PSO	Shelda <i>et. al.</i> ,2013	1. Optimum contrast enhancement. 2. Detection of breast cancer	swarm size :50, Inertia weight Wmax=2, Wmin=0.
7	Contrast	(HSV) HE & PSO	Hanmadlu <i>et.</i>	1. Quality of image	

	Enhancement		al. ,2013	2. Preservation of color and specific image features	
8	Image Segmentation	PSO Clustering	Raghotham et. al., 2012	1. Great Accuracy 2. Fast Convergence	
9	Infrared Image Enhancement	Contourlet transform and chaotic PSO (CPSO)	Zhang et. al., 2012	1. Performance better than double histogram Equalization	$c1=c2=0.2$ , $w_{max}=0.95$ , $W_{min}=0.4$
10	Contrast Enhancement (Image Enhancement)	HE & PSO	Masra et. al., 2012	1. Better quality 2. Preserving the Brightness	Population 40, Maximum iterations =200, $c1=c2=1$ , $W_{max}=0.8$ , $W_{min}=0.2$
11	Image Enhancement	DWT & PSO	Quraishi et. al. , 2012	1. Efficient 2. Able to enhance low resolution image	
12	Image Segmentation	CLAHE & Enhanced PSO	Nazareth et. al. ,2011	1. Improved Convergence rate 2. Better than Genetic Algo. (GA) and Bacterial Foraging (BF)	
13	Image Enhancement	Simulated Annealing & PSO	Qinqing et. al., 2011	1. Improved convergence speed and accuracy	swarm size 40 leaning parameter : $c1=c2=2$ ,
14	Image Enhancement	PSO	Apurba et. al. , 2011	1. Removal of gamut problem	
15	Remote Sensing Image Enhancement)	Intensity Hue Saturation(IHS) & PSO	Han et. al., 2010	1. Outstanding spectral quality for fused images 2. Outperform HIS, GIHS	
16	Image Enhancement(Multilevel thresholding)	Co-operative Quantum Behaved PSO (CQPSO)	Hao et. al. , 2010	1. Less Computation time	
17	Image Segmentation	Chaos Particle Swarm Optimization (CPSO)	Zhiwei et. al. , 2010	1. Improved Efficiency and Accuracy.	Swarm size is: 10, $c1=c2=2$ , $W_{min}=0.4$ to $W_{max}=1$ .
18	Image Segmentation for MRI Images	Hierarchical Evolutionary Algorithm (HEA) & PSO	Milad et. al., 2010	1. Accuracy gained 96%. 2. MRI image segmentation	
19	Content-Based Image Retrieval	PSO & Relevance Feedback (RF)	Broilo et. al. ,2010	1. Better Exploration of complex, nonlinear, and High dimensional solution spaces.	$c1=c2=2$
20	Image Enhancement	PSO	Apurba et. al., 2009	1. Some improvements required such as fine tuning of parameters	
21	Adaptive Enhancement Method for	Mirror-Extended Curvelet Transform and PSO	Ying et. al. , 2010	1. Reduced Speckle 2. Enhanced edge features and contrast of	

	(SAR) Images			SAR images	
22	MRI Image Segmentation	2D Survival Exponential Entropy (2DSEE) and PSO	Nakib et. al. ,2007	1. Satisfactory Segmentation with a low computation cost.	

#### IV. CONCLUSION

In this paper we have surveyed several paper and came to conclusion that the field of PSO fastest growing field in every area. When we combined PSO with other image segmentation technique such as thresholding, fuzzy sets, histogram equalization etc performance of the method is significantly increased. In short we can say PSO is very powerful technique which can be utilized efficiently in the field of image processing.

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#### AUTHORS

**First Author** – Abhay Sharma, M.Tech, PhD\*, Assistant Professor, Amity University Rajasthan, asharma2@jpr.amity.edu.

**Second Author** – Rekha Chaturvedi, M.Tech, PhD\*, Assistant Professor, Amity University Rajasthan, [rchaturvedi@jpr.amity.edu](mailto:rchaturvedi@jpr.amity.edu).

**Third Author** – Dr. Umesh kumar Dwivedi, PhD, Associate Professor, Amity University Rajasthan, [ukdwivedi@jpr.amity.edu](mailto:ukdwivedi@jpr.amity.edu).



# Compensation as Legal Protection for the Suspect, Defendant and Convict in the Criminal Case

Haeranah\*, M. Said Karim\*\*, Aswanto\*\*\*, Oky Deviani Burhamzah\*\*\*\*

\*Doctorate Programme of Law Faculty, Post graduate, Hasanuddin University, Makassar

\*\*Criminal Law Department, Law Faculty, Hasanuddin University, Makassar

\*\*\*Criminal Law Department, Law Faculty, Hasanuddin University, Makassar

\*\*\*\*Civil Law Department, Law Faculty, Hasanuddin University, Makassar

**Abstract :** Declaration of principles justice for the victim of crime and misused of power on point B of the misused power number 19 stated that the states must be consider to put under the national law, norms that have forbidden to misused it. Spesifically, the restoration must cover the restitution and/or compensation, together with the help and support on materiil, medical, psicology and social but in the case of implementation is often the legal officers conduct the wrongact in order to enforced the law, like to arrest and detention the suspect witouht a proper procedure that mentioned under the Penal Code of procedural law, The wrongful act under the law implementation so the suspect is free, have found the error in persona so need to have a right for compensation. Furthermore, it is need to analysis about the right of compensation for the suspect, defendant and convicted. The purposed of this study is to know the essence of compensation for the suspect, defendant and convicted under the criminal case. Type of this study is normative research with legal approach, philosophy approach, case approach and concept approach. The result of this research have shown one basical things that included in the penal code of procedural law which is the consideration of human rights for suspect and defendant as a guarantee for the protection of honor and dignity. The rights of the suspect or defendant are the constitutional right that given since they were born or given by the law. The right is given by the law related of its status as a suspect or defendant, one of the principle which under the penal code procedural law is the principle of the right for compensation for the suspect, defendant and convicted under the criminal court system as mentioned under point d of the general explanation of penal code of procedural criminal law which stated that to whom that to be arrested, to be accused or being prosecuted without any reason according to the law or due to any mistakes must get the compensationor rehabilitation since in the level of investigation. Therefore, it should be if the examination of pre court of the compensation demanding is going, the investigator should not in a rush to bestow main case to the court, it shall wait until all the investigation process have finishes due the short time that judge only have a week to finish the examination and decide the application.

**Index Term :** Compensation, Legal Protection, Suspect, Defendant, Convicted.

## I. INTRODUCTION

The Constutution of the Republik of Indonesia Year 1945 on the third amendment Year 2001 which is on article 1 point (3) asserted that Indonesia is a legal state (*rechtstaat*), and not based on power (*machtsstaat*). It means that each citizen must act as the existing law. *Rechtstaat* concept have posited the human rights as one of the identity. There are two big tradition of legal opinion of the state in the world, which is the state of law under European Continental tradition and State law under Anglo Saxon which is called *Rule of Law*.

Along together with those above, one of the scholar that often as referenced whne tall about state law (*Rechtsstaat*) under European Continental tradition is *Friedrich Julius Stahl*. on his view, *Rechtsstaat* is the restoration from the opinion from *Immanuel Kant*. According to him, there are four elements that must be have and became the characteristic of the state law, they are human rights (*grondrechten*); separation of power (*scheiding van machten*); The government based on the law (*wetmatigheid van het bestuur*); and administration court (*administratieve rechtspraak*).

Those statement is along well with Hans Kelsen statement as mentioned by M. Hatta, that one of indication to be called state of law, like human rights (H. A. Mashyur Effendi, 1994). For Indonesian Nation, the definition of human right protection is can be seen under the constitutional law of 1945 (Fourth amendment year 2002) on the article 28 A to article 28 J. While the article 28 D point (1) set that everyone have the right for recognition, guarantee, protection and justice legal certainty also equal treatment before the law. The protection of human right is described by the law under the constitutional 1945. One of the rules of law that have described human rights is law number Nomor 8 Tahun 1981 on Book of procedural criminal law.

Declaration for principles of justice for the victim of crime and misused power on point B of the misused of power number 19 that mentioned “states must consider to involve it under national law of norms that forbid the misused of power” Spesifically, the restoration must be cover the restitution and/or the compensation, also supported on materiel, medical, psikology and social demand. Although in fact, is often the legal officer under conduct their duty have done the wrongful act as mentioned

under the law, like the investigator conduct the forceful measures like arrested and accused which is not along with the procedure that mentioned under the criminal law procedural or due to the error in Persona which is not that person who conduct the crime and get punishment.

Case of example that well known to the error in persona is Sengkon and Karta cased that happened in. Court of Bekasi and high Court of Bandung have stipulated the Sengkon bin Yakin with punishment of 12 years of jail and Karta or known as Karung known as Encep bin Salam with the punishment of 7 years of jail due to assumed that proved to rob and kill Sulaiman bin Nasir and his wife Siti Haya binti Abu. While in other case, have proven that the robber and killer the couples of Sulaiman are Gunel, Siih and warsita (Adami Chazawi, 2010). Another case is the case of the death of Marsinah, where nine of defendants was on jail for 5 months to 2 years, before proved unguilty by the supreme court and Mohammad Arif Budi who defendat as hold-up of taxi driver that was in jail for 166 days before released by the judge of the court in North Jakarta (Leden Marpaung, 1997).

In the court of North Jakarta, Pre court application that applied by Hermin which advocated to O.C Kaligis. The applicant is brother from suspect Sudarto (almarhum) that have arrested on 25 April 1985 by the police officers from Resort of Police North Jakarta with the reason that have involved in the stealing case with torture in the village of Mauk Tangerang on 24 April 1985. Under the arrested, the legal officers has not shown the letter of duty and didn't give the letter of arrest to Sudarto and sent the copy to his family. The applicant has applied in order the judge of pre court decide that the arrested was no legal and compensated the lost around Rp. 3.000.000,- (3 millions rupiah). Moreover, the judge decision stipulated that application was rejected with the reason that suspected was caught under hand (O.C. Kaligis, 1997).

According to those above, the issue of this research is the legal officer often to have the wrongful act in order to conduct the law, like to arrest and to accused of the suspect that not among with the criminal procedural law, error in persona, so need to get compensation for its lost.

## II. RESEARCH METHOD

### *Type and Reasearch Approach*

The type of this research is normative research by using the legal approach, philoshophy approach, cases approach and conceptual approach.

### *Type of Material Law*

Type of of materiel law in this research is primary and secondary material law.

### *Data Analisis*

The primary and secondary material that have analysis by used the qualitative analysis with Statute Approach method, analysis the legal material that direct collected in order to get the description of the material substance that will discuss in this study.

## III. RESULT

### *The Essential Of Compensation For Tthe Suspect, Defendant and Convicted in The Case of Criminal Law*

The suspect, defendant and the convicted is the person who assumed to conduct the criminal act and have prosecuted, examined and judged in the court. A person who have broken the law, person who disturbing the public order and caused damaged to other people. By conduct the act against the law, he/she have caused the damage to other people than become a victim from his/her act.

Human rights is a gift from the almighty God to human since he was born. Since the God created the human being on this earth, God had given the human with human rights. Human rights in general means the right that adhere to human being characteristic, while without it, a human being can't alive. Human right is given directly from the God. So there is no any power beyond of it. Human rights is not given by the other human being, the government or constitution. Its only the honority and enforce the right, so human being is able to live with their honor and dignity.

Human rights is a given from God as the consequence of the existing of human being as created from the God. These rights is natural. In the Al-Qur'an, one of the clause that mentioned about human rights is not only willing the human being or any nation to make a relationship, but asserted the human being to be free as well and have same position as mentioned in the Al-Qur'an Surat Al-Hujurat point 13. According to the meaning of Surat Al-Hujurat point 13 is so the human being is connected eachother and help eachother. There is impossible the good relationship if the equal right and freedom is not preserved. How do we



have a relation with other if there is pressure on an equal position under this relationship. So it necessary to have equal position first then have good relation between human being, the respect other people rights.

Article 1 point (1) The Law Number 39 Year 1999 of human rights have defined the right as a right that adhere on the essential and existing of human being as the creatures of God and it's a gift that must be respect, put in upheld and to be protected by the State, law and government and everyone for the respect and protect of the honor and dignity as human being. As the state of law, Indonesia is respect the law and rule of law, means that the satte in conduct anything should be based on law and able to responsible. Culture of law that have developed in the whole of society in order to create the willingness and meet legal compliance in the law supreme framework and in the case of law enforced.

The definition of the human rights protection under the Constitution of the Republic of Indonesia the fourth amendment found in chapter XA article 28A to article 28J, the implemented to the law under the constitution, one of them is Law Number 8 Year 1981 of criminal procedural law.

The provision of article 1 point (1) penal code arranged that an action can not be conviction, except based on the law of criminal act that have existed before. Those definition included the unsure that criminal law must be source on the law, this is called legality principle due the authority under conduct its duty binded by the law, so prevent from arbitrariness. It means there is a ceritanty law for the justice seeker. Second unsure is the provision of criminal law under the law may not retroactive, this principle is to protect the people from the arbitrariness of the authority trough the legislative institution that have repressive characteristic so take a rectroactive law is against the law and violation the human rights.

On the general description on criminal procedural law point 2 mentioned that the state of the Republik of Indonesia is the state of law based on Pancasila and Constitution 1945, respect human rights and guarantee the whole citizen in order to get equal position under the law and the government and obliged to respect the law and government without any exception. Further more still on point 2 the general description that the development in legal aspect of criminal law have purposed that people are able to will their right and obligation so increased the attitude of law enforcement along with the fungtion and authority of each in order to get the public order and for the legal enforcement in Republik Indonesia as a state law that along well with Pancasila and Constitution 1945.

Criminal Law Procedural is created to replace the criminal law procedural under HIR (*Het Herziene Inlands Reglemen*) or Reglemen of Indonesia that made it up again, the making process is purpose to make the process of criminal court based on the due process of law, where is the rights of the suspect, defendants and convicted are protected as part of the civil right and its part of human rights.

The function of criminal law procedural is to restrict the state power in order to protect all the people who involved in the criminal procedural court, so it expected the guarantee of the protect for the suspect and defendant from legal officers abused. One of the basically idea that included under the procedural criminal law is posited the human rights for the suspects and defendants. The rights of the suspects and defendant is the constitutional rights that have given since they were born either given by the law.

The guarantee and protect to Human rights under the criminal procedural law that have the important meaning, due to most of the process from criminal law procedural to lead to the restrict of human rights like arrest, accused, detained and punishment.

Morevar the protected means is along with the criminal procedural law purposed which is in the implementation level need balance between the interest of justice seeker as individual with the public interest/ state interest or others interest with some of the investigation. Therefore, under the criminal procedural law, the case of investigating must be conduct by understanding human being that obliged to be protected their honor and dignity. Although the purpose of law enforcement is to keep and protect the people interest, the law enforcement is not allowed to sacrifice the right and dignity of the suspect and defendant. In contrary, the protection of honor and dignity of the suspect and defendant can not sacrifice the people interest. The legal officer is must able to posited the balance principle that mentioned under the criminal procedural law so not to sacrifice both of the interest.

One of the principle that mentioned in the criminal procedural law is the compensation principle for the suspect, defendant and the convicted on their criminal court process as found in point D the general explanation of criminal procedural law that stated to everyone who get arressed, accused, prosecuted or judged without any reason refer to the law or due to the error in persona must be get compensation or rehabilitation since in the investigating level and the legal officers that alleged negligence on purpose or because of their negligence broke the law should sentenced or get administration punishment.

The principle of compensation for the suspect, defendant or convicted first time arranged under article 9 Law Number 14 Year 1970 (Now is Law Number. 48 Year 2009 of judicial power which is stated :

- (1) Everyone who is arrested, accused, prosecuted or being judged without the law or because of the negligence of law, have the right to apply for compensation and rehabilitation;
- (2) The officer whom alleged negligence on purposed as mentione on point (1) would be punishment as mentioned on provision of the existing law;
- (3) The provision concerning the procedural of compensation, rehabilitation and the imposition of the compesantion is governed by the law.

The principle of compensation for the suspect and defendant that have arrested or accused which is not found under ICCPR, Article 9 point (5) : Anyone who has been the victim the victim of unlawful arrest or detention shall have an enforceable right to compensation. Further more on the article 14 point (6) ICCPR stated if the person stipulated punishment with legally binding decision, and if then decided contrary or get pardoned according to new fact or just found the evidence that there is a wrongful act on enforced the justice. So the person who is suffered from that punishment must be get compensation according to the existing law.

Before the law of judicial power has existed, in Indonesia has no regulation about the compensation, except through the civil procedural based on the *onrechtmatige daad* on article 1365 or the abuse of law by the authority (*onrechtmatige overheidsdaad*).

The principle of compensation is then implemented to the article 68 of criminal law procedural that mentioned the suspect or defendant have the right for compensation and rehabilitation as mentioned under article 95. Beside of those two article, article 77 point b of criminal procedural law is given the right for compensation for the suspect and defendant that the case is stop on the investigating level or in the level of prosecution.

When it concerned, to the article 68, the rights of compensation is only restrict to the suspect and defendant, but on article 95 point (1) on criminal procedural law, the rights of compensation is extended, is not only for the suspect and defendant but also for the convicted.

Compensation is the right of everyone to get fulfillment for the demand like compensation in financial due to the arrested, accused, prosecuted or being judged without any reason based on law or because of the negligence of the person or regulation that mentioned under this law (article 1 point 22 KUHAP). What is mentioned on article 1 number 22 same purposed with article 95 point (1). The differentiate between those two definition is on the additional unsure for the reason of compensation, while article 95 point (1) is due to the wrongful act without refer to the existing law.

To get the right of compensation for the suspect, defendant, must be conduct the evaluation first whether in the process of the investigating is there is a mistake or error while use the authority to conduct the legal enforcement. Criminal procedural law have given the authority to the new institution under the first court to evaluate it, which it called the precourt institution. The compensation is through the pre court process is the way to rehabilitate the right of the suspect and defendant with financial compensation.

#### IV. DISCUSSION

##### ***Human Rights Protection and Protection Right of The Suspect, Defendant and Convicted.***

Human nature created by God as the individual who have sense and freedom of willingness, this number of value in order the human being is not allowed to used as a tool or being forced to conduct against their conscience. (Hyronimus Rheti, 2011). The right of everyone to be recognized for all people, all level, institution, government and belief. Those right have not dependent to the law protection and able to protect by anyone and whenever. (Anton Sujata, 2000). According to H. A. Mansyur Effendy (1994), human rights is the basic right/ absolute right for human being, given by god since born and till death. While in the implementation conduct with the obligation and responsibility. In some of the existing law, person who has no born yet is given certain of right as well as after the death.

Along with those above, Arief Budiman stated that human rights is the right of human nature, when she/he born directly have the human right as human being, in this case human rights is standing out from the law, so it must be separate between the right of the citizen and human rights (O.C. Kaligis, 2006).

Basically, human rights signed by two characteristic. First is the balance between the rights and obligation, second is the individual interest and the people interest. So the protection of human rights is cover the two unsure, which are the personal right and the people rights. The balance between humanity aspect and the society aspect is contain the meaning of rights between the individual rights in one side and the social rights in other side. In other words, the law is must be manifested and also protected the human rights both for individual and social right. It is means that human rights is not only the characteristic and identity of law but also the substance and soul from the law itself. Law in substantive way is not given the guarantee of protection the human rights (H. Soeharto, 2007).

The question is often come up, is the mentioned of rights is necessary must be together with obligation, so become the human right and obligation. This view is started from the understanding, that the right and obligation is simetris. It is truth, but need to remember the simetris does not exist under the same individu. For example, if A have the rights of X, then B has the right that related to X, or if A has an obligation Y, then B has the right that related to Y. This definition under human rights is stick to the human being and only own by the individu, while the obligation is part of the simetris one that found on the state due the state has the authority to protect the rights of individu. So if willing to use the right and obligation, so the understandable is there is a right for individu and the obligation for the government to protect the individu to all the violation possibility, included the violation from the government officers. (Mardjono Reksodipuro, 1994).

Moh. Kusnadi and Bintang Saragih (1983) have opinion that the characteristic of the rule of law that based on the state law, like:

1. The recognition and protection of human rights that have equality under the politic, law, social, culture and education aspect;
2. The neutral and freedom court, not involved by any power or anything;
3. The legality of law in the whole menaing and shaped.

On the national Conference III of Persahi in 1966 provide that the principle of state law Pancasila must involved the principle as following:

1. The recognition and protection of human rights that have equality under the politic, law, social, culture and education aspect.;
2. The neutral and freedom court, not involved by any power or anything;
3. The guarantee of certainty law in all matter (Miriam Budiarjo, 1988).

The human rights enforcement in state of law according to Pancasila as mentioned by Marzuki Darusman, like :

1. The understable of human right and Pancasila, there is no conceptual contrary about the essential of human dignity and the value of individu that must be protect;
2. The requirement that the implementation of the government must be based on the constitutional system that recognized, protect and guarantee the rights of the citizens;
3. The asserted that the essential distinguish between the idea of state law with the definition of the state law according to Pancasila (H. Soeharto, 2007).

Kelsen (1995) in his positivism view based the efforts of forcibly use (*dwang middelen*) as a legality that given by the law or positive law. The effort forcibly use (*dwang middelen*) to the crime is a paradox. The sanction given as the characteristic of special law that given to the damaged in order to reach the real purposed that must be get from the treath of revocation life, freedom or someone property. In other words, enforcement is used to prevent the forcibly in the society.

Criminal procedural law according to the philosophy of the nation because underneath is arranged by the protection of principle of the dignity of human being that already mentioned under the Law Number 14 Year 1970 of the main provision of judicial power. There are ten principles that asserted under the number 3 of general explanation of criminal procedural law. The ten of those principles, divided into 7 general principles and 3 special principles by Mardjono Reksodiputro (Mardjono Reksodiputro, 1994) :

1. General Principles :
  - a. The equal treatment before the law without any discrimination;
  - b. Presumption of innocence;
  - c. The Rights of compensation;
  - d. The Right to have legal aid;
  - e. The right of fair trial for the defendant on the court;
  - f. Fast and easy court with low cost;
  - g. The court is open for public;
2. Special Principles :
  - a. Violation of individual rights (arrest, accused, investigate, prosecuted ) must be conduct according to the existing law and by written commanded.
  - b. The right of the defendant to be told of their conjecture and charged;
  - c. The obligation of the court to conduct the monitoring of the execution of

The right of compensation for the suspect, defendant and convicted is the effort of protectection of the human right for them. As mentioned by Martiman Prodjohamidjojo (1982) the compensation principle is the guarantee of rights for the suspect, defendant, and convicted due to against the law or wrongful act or the action without refre to the existing law about error in persona or the abused of law and implicated the damaged to them. Further more Martiman Prodjohamidjojo (1982) stated on article 95 basically have given the protection of rights to individual rights and or his/her property from the wrongful act that against the law of misused the power (*onrechtmatige overheidsdaad, misbruik van bevoegheidsorgaan, misbruik van macht; detournement de pouvoir*).

Along with that, Andi Sofyan (2013) stated that claim for compensation is conduct by the suspect or its heirs is the effort of protection of human rights and human dignity when the suspect and defendant get the unlawful act. This is also mentioned by Ansorie Sabuan, dkk (1990), the provision of compensate under the criminal procedural law is a guarantee for human rights protection of the suspect, defendant and convicted that have arrested and accused without consider the existing law.

As same as what Djoko Prakoso (1988) Stated that it is the right to get compensation as the consequence of the release of the personal rights for those people mentioned above without considering the law. Also M. Yahya harahap (1993) said that the

claim of compensation for those people mentioned above or their heirs is the created of protection human rights and dignity of human being from unlawful act.

Pre Court institution has existed from inspiration of the rights on *habeas corpus* under court system *Anglo Saxon*, that guarantee the fundamental human right, specially right for freedom. *Habeas corpus act* is given the right to ap person trough the witten command letter of the court that claim the officer to conduct the arrest and accused of himself. This is guarantee that the restriction of person freedom is already fulfill the law provision. (Loebby Loqman, 1987). The function of pre court is the created of monitoring to the human rights protection, and the monitoring is conduct by the judges.

The pre court institution is became of central point and give new spirit, specially to the guarantee of rights for the suspect, due to the tranparance and public accountability characteristic which is the requirement of the legal enforcement. (O.C. Kaligis, 2006). The control of the forcibly use that conduct trough the pre court is purposed to enforcer the law and to protect the rights of suspect/defendant on the investigation and prosecution level. In order to conduct the investigation, the investigator is not allowed to conduct the forcibly act, like arrest and/or accused. Neither the prosecutor, may conduct the forcibly act for the interest of arrested. Basicly the forcibly act that conducted by the investigator and prosecutor is violation the human rights, morevar the criminal procedural law is permit it with the certain requirement that provided by the criminal procedural law.

Due to its character that human rights violation, so the law maker assumed to have a correction or monitor to the implementation. The monitoring is conduct by the suspect, defendant and investigator, prosecutor and other third party that have interest on it. The existing of pre court as the control of tool, so may be prevent the forcibly use on the investigation level. The restriction of this forceful measure is more prtect the rights of the suspect and defendant.

From article 1number 10, article 77 and article 95 point (2) of criminal procedural law can be mentioned that one of the authority of precourt is to investigate and decide the claim of compensation both the compensation of criminal case is not go to the court due to the discontinuance prosecuted or the compensation for the suspect, defendant or convicted due to arrested, accused, prosecuted, judged or stipulated other action without considering the existed law or because of the wrongful act. Come with question, how if the case is already go to the court or event have been punished while the defendant or convicted felt to have lost of those process? Article 95 point (3) Criminal procedural law have arranged that claim for compensation of the case that have brought to the court, so the application of the comeensation is need to investigate and decide by the judge who prosecuted the case. And the investigation will be followed by the criminal procedural law as mentioned on article 95 point (4) Criminal procedural law/ KUHAP.

## V. CONCLUSION AND SUGGESTION

One of the basic point that concluded under the criminal pceural law is posited the human rights of suspect and defendant as a guarantee to the human right protection. The rights of the suspect and defendant is the constitutional rights that given since they were born or given by the law. The rights is given by the law is related to his status as a suspect or defendant, one of the principle that included under the criminal procedural law is the compensation principles as mentioned on article d general explanation of criminal procedural law that everyone who arrest, accuse, prosecutes without considering the existing law or due to wrongful act, so the legal officer who negligence would be punishment or administration sanction. The the investigator should be work carefully on the investigation process and not rush to bring the case into the court, while judge only have one week to finish the investigation and decide that application.

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#### AUTHORS

- First Author** : Haeranah, Doctorate Programme of Law Faculty, Post graduate, Hasanuddin University, Makassar, Email: haeranah.unhas@yahoo.co.id
- Second Author** : M. Said Karim, Criminal Law Department, Law Faculty, Hasanuddin University, Makassar
- Third Author** : Aswanto, Criminal Law Department, Law Faculty, Hasanuddin University, Makassar
- Four Author** : Oky Deviani Burhamzah, Civil Law Department, Law Faculty, Hasanuddin University, Makassar

# The Effect Of Different Doses Snails As A Source Of Protein Feed On The Growth And Eel Fish Survival (*Anguilla sp.*)

Andi Puspa Sari Idris\*, Achmar Mallawa\*\*, Haryati\*\*\*, Edison Saade\*\*\*\*

\*Andi Puspa Sari Idris, *Doctorate Programme of Agricultural Sciences, Postgraduate, Hasanuddin University, Makassar Indonesia.*

\*\*Achmar Mallawa, *Faculty of Marine Science and Fishery, Hasanuddin University, Makassar Indonesia*

\*\*\*Haryati, *Faculty of Marine Science and Fishery, Hasanuddin, Makassar Indonesia*

\*\*\*\*Edison Saade, *Faculty of Marine Science and Fishery, Hasanuddin, Makassar Indonesia*

**Abstract:** This study aims to determine the effect of the use of snails as a source of protein on the growth of eels and feed FCR values. The study lasted for 6 months in rearing eel in State Agricultural Polytechnic Pangkep. The study design used a completely randomized design and consists of three treatments and three replications that treatment A 100% 0% fish meal and snails; treatment B 75% fishmeal and 25% snails; and C 50% fishmeal and 50% snails. Fish samples used are eel with sizes ranging from 20-30 g weight were maintained at a density of 20 fish per tub. Variables measured covers growth, survival rate and FCR. The data collected are then analyzed by analysis of variance. The results showed that all treatments in this study provide a 100% survival rate. The highest growth was obtained in treatment C (50% fishmeal and 50% snails), followed by treatment B (75% fishmeal and 25% snails) and treatment A (100% and 0% fish meal snails). Instead highest feed FCR values obtained in treatment A, following treatment B and treatment C.

**Index Term:** *Snails, eels, feeding, growth, and survival*

## I. INTRODUCTION

Eel fish farming has grown in several regions in Indonesia, including South Sulawesi. Eel (*Anguilla bicolor*) it serves as the type of fish that have high economic value and the export of fishery commodities (Purwanto, 2007).

Problems faced by farmers include eel relatively slow growth (size of 600-800 g consumption reached within 16-18 months) (Tanaka, 2006). Eel aquaculture production rate is determined by the rate of growth and survival of fish (Handoyo, *et al.*, 2012). Eel is purely carnivorous fish that require another form of feed animals (Matsui, 1970). In the spur growth, high-protein feeding is one alternative.

Until now, the main protein source and the best in the production of artificial fish feed is fish meal. The problem is the availability of fish meal fluctuate and the price is relatively expensive, it is because Indonesia is still importing fish meal (Director General of the Ministry of Maritime Affairs and Fisheries, 2010). Therefore, it is necessary to find a new protein source material that has the quality and quantity as well as fish meal. To replace fish meal must have requirements that are high in protein, have similar amino acid fishmeal, abundant and cheaper than fish meal. According Suprayudi (2010), a condition that must be met as a raw material is fish contain nutrients needed for growth, not compete with humans, abundance, and does not contain a material hazard.

Eel is a group of farmed fish belonging to carnivorous fish. This fish group using fish meal in amounts higher than the group of herbivorous fish. One way to overcome this problem is to substitute fish meal with other protein sources that are cheaper and good quality. Alternative feed given to the fish should be of good quality according to the needs of fish, is available at all times, and it's cheap (Suprayudi 2010).

## II. RESEARCH PURPOSES

This study aims to determine the effect of the use of snails as a source of protein to the growth of eels and feed FCR values.

## III. RESEARCH METHOD

The study lasted for 6 months ie November 2013 to May 2014 in a rearing eel in State Agricultural Polytechnic Pangkep. Manufacture of feed, feed nutrient content analysis carried out in the State Agricultural Polytechnic Pangkep. The study design used a completely randomized design and consists of three treatments and three replications that treatment A 100% 0% fish meal and snails; treatment B 75% fishmeal and 25% snails; and C 50% fishmeal and 50% snails.

Fish samples used are eel with sizes ranging from 20-30 g weight were obtained from the district of Poso, Central Sulawesi. Test fish reared at a density of 20 fish per tub. Container maintenance using 15 liter tub with a volume of 1 ton which is equipped with aeration and water circulation system. The fish were sampled adapted for 10 days before being given a test feed.

During the maintenance period fish were fed according to treatment and were satisfied (at satiation) twice a day is at 06.00, and 18.00. Weight measurements performed at the beginning and end of the study. At the time of weighing, the fish first anesthetized using 2-phenoxy ethanol 0.5 mg / liter to reduce the stress on the fish. Before weighing is done, the fish first fasted for 24 hours. Weight measurement is performed to determine the growth rate of growth measured by using the formula (Huisman,1976) :

$$\alpha = \left( \sqrt{\frac{W_t}{W_o}} - 1 \right) \times 100\%$$

Remarks:

- $\alpha$  = Daily growth rate (%)
- t = experiment time (day)
- $W_t$  = The mean weight of the individual at the end of the experiment (g)
- $W_o$  = The mean weight of the individual at the beginning of the experiment (g)

Survival rate is calculated based on the equation (Effendie, 2002) :

$$SR = \frac{N_t}{N_o} \times 100\%$$

Remarks :

- SR = The survival of fish
  - $N_t$  = The number of fish at the end of experiment
  - $N_o$  = The number of fish in the early experiment
- The amount of feed given during the study was calculated to determine the level of feed intake (FCR) using the formula proposed by the NRC (1983) as follows :

$$FCR = \frac{F}{(W_t + D) - W_o}$$

Remarks :

- FCR = Feed conversion
- F = Weight of feed given during the experiment (g)
- $W_t$  = The weight of the fish at the end of the study (g)
- $W_o$  = The weight of the fish at the start of the study (g)
- D = Total weight of fish that died during the study (g)

#### IV. RESULTS AND DISCUSSION

##### Growth

The results showed the highest growth was obtained in treatment C (50% fishmeal and 50% snails) which is an average of 913.44 after treatment B (75% fishmeal and 25% snails) and final treatment A (100% flour 0% fish and snails). This suggests that higher doses of snails as a protein source providing the best growth compared with lower doses and without snails (Table 1). Lovel (1989) mentions the growth or formation of new tissue most affected by the energy balance of protein and protein feed.

Table 1. Growth of fish eel during the study (g)

Time Measurement	A	B	C
1	764,48	784,90	840,21
2	843,05	874,38	931,92
3	849,37	899,97	968,18
Average	818,97	853,08	913,44

The high growth rate in treatment C eel allegedly caused by the high content of protein feed, which serves as a building block of proteins that form new tissue for growth, replacement of damaged tissues, reproduction, as regulators in the formation of enzymes and hormones as well as guards and regulatory processes metabolism in the body and serves as oxygen for carbon element therein can be used as a source of energy when energy needs are not met by carbohydrates and fats (Sahwan, 2003).

Protein feed can be used efficiently for the formation of new tissue and fat while karbihidrat used as an energy source (Mahi, 2000). Shimeno *et al.*, (1995) stated that the increase in energy due to the use of the fat feed the more will hit the catabolism of amino acids so that less amino acids are used as an energy source. While Nematipour *et al.*, (1992) stated the high energy in the feed led to the accumulation or high fat deposits in the body of the fish anyway. The high accumulation of fat in the fish's body is expected to affect the metabolism of amino acids (Lovell, 1989).

### Survival

In this study the survival rate obtained was 100% for all treatments, treatment treatment A (100% and 0% fish meal snails), treatment B (75% fishmeal and 25% snails) and treatment C (50% fish meal and 50% snails).

This is presumably due to the quality and quantity of feed given enough to sustain the basic needs of the fish and the environment is well preserved during maintenance (Sabariah, 2010).

### Food Conversion Ratio (FCR)

FCR values associated with the parameters of the successful management of eel feeding program also indirectly related to the management of water quality and condition / quality eel. While the financial value of FCR will affect the level of profits in a period of cultivation because of eel feed is the largest contributor to the cost in an eel farming.

The results showed that feeding on the morning of FCR value lower than feeding at night for all treatments. Furthermore, the lowest FCR values obtained in treatment A (100% and 0% fish meal snails) by an average of 3.75, followed by treatment B (75% fishmeal and 25% snails) average of 4.17 and FCR highest in treatment C (50% fishmeal and 50% snails) by an average of 4.32.

Sarwono (2003) states that the highest eel feeding activity occurs at night because it is nocturnal. Protein is a nutrient that is essential for normal tissue function, for body maintenance, replacement of body tissues are damaged and for growth. Fish protein needs are influenced by various factors such as fish size, water temperature, feeding rate, quantity and quality of natural food, feed energy content and quality of protein (Watanabe, 1988).

Table 2. Value Food Conversion Ratio (FCR)

Treatment	Morning	Night	Average
A	3,34	4,17	3,75
B	3,55	4,79	4,17
C	3,67	4,97	4,32

The high feed intake indicates the more protein feed consumed, causing excess protein in the body. Excess protein is thought to stimulate the metabolic system eels to synthesize proteins in the body into ammonia. The more proteins are synthesized by the body, the more energy is used (Yudiarto *et al.*, 2007). This leads to a protein that should be saved will more be converted into energy to synthesize excess protein into ammonia. This is in line with the results Prawesti (2011) which states that excess protein will feed catabolized which eventually excreted into ammonia. According to Lan and Pan (1993) when the excess protein in the feed, the fish will experience 'excessive protein syndrome', so that the protein is not used for growth but will be disposed of in the form of ammonia.

It is indicated that the energy content of the feed consumed mostly from protein causing the stored energy should however be used to help synthesize excess protein in the body. This is in line with the opinions Prawesti (2011) which states that the more protein catabolized it will increase the energy to oxidize excess amino acids that will ultimately improve the ammonia produced. Villeg and Barnes (1988) in Prawesti (2011) also states that the stored energy is used in the synthesis of cell components and used as fuel in the production of cellular energy.

### V. CONCLUSION

The results showed that all treatments in this study provide a 100% survival rate. The highest growth was obtained in treatment C (50% fishmeal and 50% snails), followed by treatment B (75% fishmeal and 25% snails) and treatment A (100% and 0% fish meal snails). Instead highest feed FCR values obtained in treatment A, following treatment B and treatment C.

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#### AUTHORS

- First Author** : Andi Puspa Sari Idris, Doctorate Programme of Agricultural Sciences, Postgraduate, Hasanuddin University, Makassar. State Agricultural Polytechnic Pangkep.  
Email : andipuspa\_sariidris@yahoo.co.id
- Second Author** : Achmar Mallawa, Faculty of Marine Science and Fishery, Hasanuddin, Makassar Indonesia
- Third Author** : Haryati, Faculty of Marine Science and Fishery, Hasanuddin, Makassar Indonesia
- Four Author** : Edison Saade, Faculty of Marine Science and Fishery, Hasanuddin, Makassar Indonesia

# Skin depth and Permeability measurements of $\text{Co}_{1-x}\text{Sb}_x$ alloys

M. S. Patki\* and S. V. Salvi\*\*

\* Department of Physics, D.G.Ruparel College, Mumbai

\*\* Department of Physics, Institute Of Science, Mumbai

**Abstract** - By adding cobalt to CoSb, different  $\text{Co}_{1-x}\text{Sb}_x$  ( $0.17 \leq x \leq 0.44$ ) alloys have been synthesized to study the ac characteristics of the material. The ac measurements such as permeability and skin depth are calculated using high frequency and dc resistance of samples. It is observed that the permeability of the sample decreases with decreasing frequency of ac input signal and skin depth increases with decreasing frequency of ac input signal. The skin depth is observed to be sensitive to cell parameters. The results are discussed using microscopic as well as macroscopic models.

**Index Terms** – skin depth, permeability, high frequency,  $\text{Co}_{1-x}\text{Sb}_x$  system

## I. INTRODUCTION

The frequency variation of the signal through the substance gives rise to the skin effect. Therefore it is necessary to study ac characteristics of the material along with its dc resistivity. The high frequency resistance  $R_f$  of a conductor in a series form is given as equation [1]

$$R_f = R_0 \left[ 1 + \frac{1}{12} a^4 - \frac{1}{180} a^8 + \dots \right] \Omega \quad \text{_____ (1)}$$

Where  $a^2 = \frac{2\pi^2 r^2 f \mu}{10^9 \rho}$  ... for cylindrical conductor, \_\_\_\_\_ (2)

$R_0$  is steady current resistance,  $r$  is radius of conductor in cm,  $\rho$  is dc specific resistance of conductor material in  $\Omega/\text{cm}^3$ ,  $f$  is frequency in Hz and  $\mu$  is permeability of material of conductor.

When frequency is sufficiently high, substantial quantity of current in a conductor is confined to a region very close to the surface. The current density then falls off with depth 'z' from the surface in accordance with the relation[2] (3)  $z$  and  $\delta$  are in the same units and  $\delta$  is called skin depth [2,3] given by equation (4).

$$\frac{\text{current at depth } z}{\text{current at surface}} = e^{-z/\delta} \quad \text{_____ (3)}$$

$$\delta = 5033 \sqrt{\frac{\rho}{\mu f}} \quad \text{_____ (4)}$$

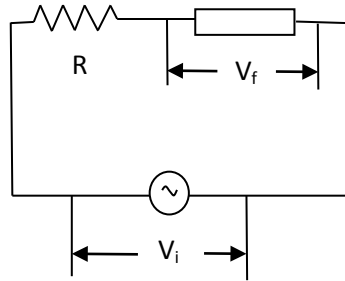
## II. EXPERIMENTAL

The samples of  $\text{Co}_{1-x}\text{Sb}_x$  were synthesized by first preparing CoSb in induction furnace and annealing. Then cobalt was added to it in appropriate weight proportion and again melted in induction furnace. The samples then were again annealed. To confirm the formation of  $\text{Co}_{1-x}\text{Sb}_x$  samples produced by above mentioned CoSb route [4], XRD patterns were obtained by using the D500 Siemens, Germany and the Rigaku, Japan diffractometers (both use Copper target).

The high frequency resistance is obtained using a simple set up (Fig. 1). The output of a high frequency sine wave generator is applied to a series combination of resistance  $R$  of suitable value and the sample of cylindrical shape. The potential drop  $V_f$  across the sample is measured with the help of high frequency cathode ray oscilloscope. The high frequency  $R_f$  is determined by using the formula,

$$R_f = \frac{V_f \times R}{V_R} \quad \text{_____ (5)}$$

Similarly a dc resistance  $R_0$  is obtained from the same set up replacing the signal generator by dc power supply.



**Figure 1: Skin Depth Measurement**

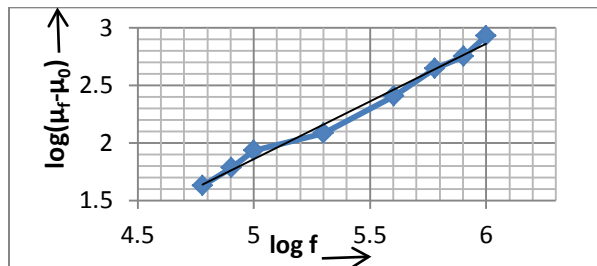
III. RESULTS

Permeability and skin depth are calculated using equation (1), (2) and (4) [5]. Thus calculated  $\mu$  and  $\delta$  are recorded in a Table 1 and Table 2. The permeability increases nonlinearly with frequency. Assuming the simple relation (6), a graph of  $\log(\mu_f - \mu_0)$  Vs  $\log f$  is plotted in Figure 2 for  $x=0.17$  which is a straight line with slope  $m = 1.0006$ .

$$\mu_f = Af^m + \mu_0 \tag{6}$$

**Table 1: Permeability and Skin depth of System  $Co_{1-x}Sb_x$ ,  $x = 0.17, 0.20, 0.25, 0.33$ .**

Frequency	X=0.17		X=0.20		X=0.25		X=0.33	
	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm
1MHz	847.81	0.000038	566	0.005421	192.48	0.005254	942.86	0.003344
800KHz	565.9	0.00524	406.65	0.007151	181.23	0.006054	874.08	0.003833
600KHz	441.81	0.006849	252.22	0.01048	147.89	0.007738	633.6	0.005266
400KHz	254.37	0.01105	139.96	0.01723	76.5	0.01317	292.09	0.0095
200KHz	120.49	0.02271	73.39	0.03366	54.43	0.02209	165.63	0.01784
100KHz	85.63	0.0381	60.91	0.05226	31.35	0.04117	57.33	0.04288
80KHz	61.08	0.05044	36.28	0.07571	21.51	0.05557	35.85	0.06063
60KHz	42.41	0.0699	48.38	0.07571	14.64	0.07778	24.97	0.08389



**Figure 2:  $\log(\mu_f - \mu_0)$  Vs  $\log f$  corresponding to  $Co_{1-x}Sb_x$  with  $x= 0.17$**

**Table 2: Permeability and Skin depth of System  $Co_{1-x}Sb_x$ ,  $x = 0.36, 0.40, 0.44$ .**

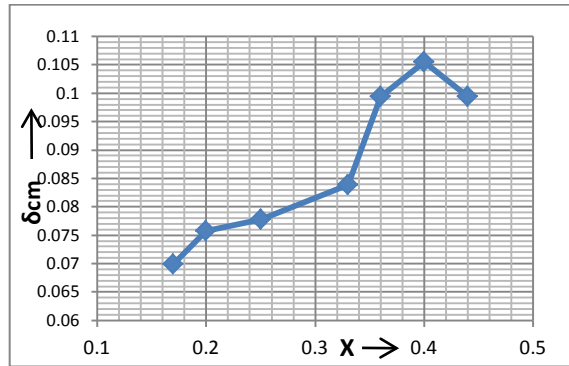
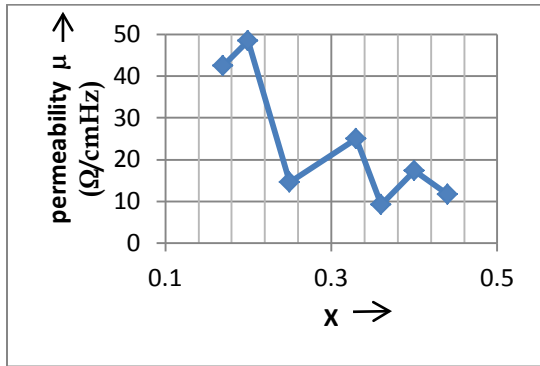
Frequency	X=0.36		X=0.40		X=0.44	
	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm	$\mu$ ( $\Omega/cmHz$ )	$\delta$ cm
1MHz	130.41	0.006447	257.84	0.006708	215.77	0.005648
800KHz	114.13	0.007705	216.17	0.008191	196.8	0.006612
600KHz	81.07	0.01055	173.62	0.01055	143.5	0.008942
400KHz	43.34	0.01768	91.25	0.01783	90.4	0.01379
200KHz	25.32	0.03271	49.8	0.03413	52.38	0.02563

100KHz	11.1	0.06988	22.16	0.07236	23.33	0.05213
80KHz	6.86	0.09938	13.03	0.1055	17.34	0.07045
60KHz	9.15	0.09936	17.38	0.1055	11.61	0.09941

The slopes  $m$  corresponding to the remaining  $Co_{1-x}Sb_x$  samples are shown in Table (3). These values vary in narrow range and average slope is 1.04. Hence frequency dependence of permeability in  $Co_{1-x}Sb_x$  samples is given by

$$\mu_f = Af^{1.04} + \mu_0 \quad \text{_____}(7)$$

It is interesting to compare variation in the permeability and in the skin depth at a single frequency with antimony concentration  $x$  (Fig.3, 4) and the corresponding dc resistivity [6] (Table 3).



**Figure 3: Permeability Vs Antimony concentration X**      **Figure 4: Skin depth Vs Antimony concentration X**

**Table 3: Permeability, skin depth and dc resistivity of  $Co_{1-x}Sb_x$**

x	dc Resistivity at Room Temperature $10^{-3} x \Omega.cm$	Slope m	$\mu$ $\Omega/cmHz$ at 60 KHz	$\delta$ cm at 60 KHz	Particle size A.U.
0.25	0.21	0.895857	15	0.078	5.2
0.36	0.21	1.055316	9	0.099	2
0.44	0.27	1.034111	12	0.099	4.4
0.33	0.42	1.318514	25	0.084	1.5
0.4	0.46	1.072317	17	0.106	4.7
0.17	0.49	1.000683	42	0.07	1.3
0.2	0.66	0.904702	48	0.076	6.1

#### IV. DISCUSSION

As the composition changes the permeability of these materials may depend upon following factors. 1) The magnetic nature of impurity, 2) distribution and size of clusters of interstitial impurity, 3) defects, 4) density of states of d electrons near Fermi energy.

In these materials excess cobalt acts as the interstitial impurity. Cobalt occupying interstitial as well as lattice sites is magnetic and density of states of d electrons is high and sharply varying near Fermi energy. Hence it may exhibit ferromagnetic behaviour. The systematic change in magnetic moment[4] corresponding to the sample is due to cobalt occupying lattice sites. Hence the unsystematic changes in permeability with composition may be due to formation of ferromagnetic clusters[7] of magnetic and interstitial cobalt, the size and distribution of which is likely to be sensitive to the method of synthesis. It is interesting to note that similar trend is observed in room temperature dc resistivity where the increase in the internal magnetic fields may fluctuate with the size and distribution of ferromagnetic clusters.

Hence the values of permeability, skin depth may give us valuable information about the ferromagnetic clusters and their dependence on the method of synthesis.

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#### AUTHORS

**First Author** - M. S. Patki, M. Sc. Ph.D., D.G. Ruparel College and email address – [mugdha.patki@ruparel.edu](mailto:mugdha.patki@ruparel.edu)

**Second Author** - S. V. Salvi, M.Sc. Ph.D.. Institute of Science and email address – [sadanadsalvi@hotmail.com](mailto:sadanadsalvi@hotmail.com)

**Correspondence Author** – M. S. Patki email address – [mugdha.patki@ruparel.edu](mailto:mugdha.patki@ruparel.edu)

# Comparative Analysis of Manual and Aspen Plus Design for Crude Distillation Unit (CDU)

Adoyi Oche, Ibrahim Ali Mohammed-Dabo and Abdulhamid Hamza

Department of Chemical Engineering, Ahmadu Bello University Zaria, Nigeria

**Abstract-** Nigeria is faced with high import of petroleum products, incessant shortage of the product and poor petroleum refining states. There is therefore the need to develop local technology in petroleum refining as a sustainable solution to these problems (Oche 2014). This paper focus on effective designing of crude distillation unit which is one of the basis for local petroleum refining development.

The CDU was designed to process 1bbl/day of Escravos crude. The unit consist of the following components; atmospheric distillation column, crude heater, condenser, reflux drum, heat exchanger and strippers. Both manual and Aspen plus was used to carry out the design separately and the results were compared to ascertain most acceptable technique for the design of CDU.

Although Aspen plus gave better design results, the design results of the manual calculation had narrow variation to Aspen plus design results. The manual design technique used was therefore effective. Therefore for CDU design, Aspen plus gives better results than manual calculation but in absence of the software a good manual technique such as that used can serve.

**Index Terms-** Crude oil, Aspen plus, Crude distillation Unit, Escravos crude

## I. INTRODUCTION

Crude oil is a complex mixture. There exit about 1000 distinguishable components with boiling temperatures varying from room temperature to over 550<sup>0</sup>C. Crude distillation yields mixtures called naphtha, kerosene, diesel and gas oil. These products are specified by ASTM D86 distillation temperatures (Bagajewicz 2001). Yield of refinery products from a refinery depends on the effectiveness of the processes and the petroleum feedstock. Light crude such as Escravos yields high amount of light product such as petrol. Approximately 65% of the crude oil produced in Nigeria is light (35<sup>0</sup> API or higher) and sweet (low Sulphur content).

Distillation is probably the most widely used separation process in the chemical and allied industries; its applications ranging from the rectification of alcohol, which has been practiced since antiquity, to the fractionation of crude oil. The separation of liquid mixtures by distillation depends on differences in volatility between the components (Sinnott 2006).

The basis of refinery distillation design rest completely on True Boiling Point (TBP) tests. Distillation of crude mainly takes place in two stages. First stage distillation is carried out at atmospheric pressure hence the name 'Atmospheric Distillation Unit (ADU)' also commonly called Crude Distillation Unit

(CDU). The undistilled portion of crude, called reduced crude is further distilled under reduced pressure in a second unit known as 'Vacuum Distillation Unit (VDU)' (Rao 1990).

CDU comprising of an atmospheric distillation column, side strippers, heat exchanger network, feed desalter and furnace as main process technologies enables the separation of the crude into its various products. Usually, five products are generated from the unit namely gas + naphtha, kerosene, light gas oil, heavy gas oil and atmospheric residue. In some refinery configurations, terminologies such as gasoline, jet fuel and diesel are used to represent the CDU products which are usually fractions emanating as portions of naphtha, kerosene and gas oil (Uppaluri 2010).

## II. PROCEDURE

### A. PROCEDURE FOR MANUAL DESIGN

The procedure used for the manual design is a trial and error method whereby design architecture is taken, conditions (flow rate, temperature and pressure) at selected points are solved by mass and energy balances. Then design conditions were tested for fractionation efficiency by the following standard ASTM gaps;

Naphtha – Kerosene: 25<sup>0</sup>F

Kerosene – LGO: - 10<sup>0</sup>F

LGO – HGO: - 35<sup>0</sup>F (Uppaluri 2010)

Subsequently, further changes in the design architecture were carried out using trial and error approach to yield the best design architecture.

This procedure was carried out by the following series of calculations:

- I. Mass balance across the ADU as well as its flash zone.
- II. Determination of flash zone temperature.
- III. Estimation of draw off temperatures.
- IV. Estimation of tower top temperature.
- V. Estimation of residue product stream temperature.
- VI. Estimation of side stream stripper product temperatures.
- VII. Overall tower energy balance and estimate condenser + Bottom Pump Around + Top Pump Around duties.
- VIII. Estimation of condenser duties.
- IX. Column hydraulics (I e estimation of overflow from top tray, verification of fractionation criteria and estimation of flash zone liquid reflux rate).
- X. Determination of column diameter.

### B. PROCEDURE FOR ASPEN PLUS DESIGN

Procedure for Aspen Plus design involves drawing flowsheet for process, entering input parameters for the units and running simulation. Output of simulation run is then compared with desired output. The input parameters are re-specified where simulation outputs do not meet desired outputs. Input parameters that give desired simulation outputs are accepted for process design and operation.

For our CDU design, input parameters are Crude Assay, crude input conditions (temperature, flow rate and pressure),

steam input conditions, column, stripper and heat exchanger specifications. Output parameters are product yields and conditions which are results of simulation run. The product yields and conditions from simulation were compared with Crude Assay yield. With unacceptable variation, input parameters were adjusted until an acceptable variance was gotten.

### III. RESULTS

**Table 1: Results of Manual Calculation and Aspen Plus Simulation Design for ADU**

	Manual Calculation Result	Aspen Simulation Result	Difference
Condenser duty, Btu/hr	3237.76	3426.82	189.06
Reflux ratio	4	4.19	0.19
No of trays	20	20	0
Tray spacing, cm	25.4	15.2	-10.2
Column diameter, cm	6.1	7.5	1.4
Feed stage	19	18	-1
AGO drawoff stage	16	17	1
Kerosene drawoff stage	11	13	2
Heavy Naphtha drawoff stage	5	6	1

### IV. DISCUSSION OF RESULTS

Aspen Plus gave a more optimal sizing of column than manual design with tray spacing reduction of 40%. Column size from manual design will therefore cost more to fabricate than that from Aspen plus.

The differences in feed and product draw-off stages for the two techniques of design are  $\pm 1$ , except for kerosene drawoff stage which is 2. Product draw-off stage has direct impact on product quality. Since most products of CDU are intermediary products, the deference from these narrow ranges can be augmented in other units of a refinery.

The differences in condenser duty and reflux ratio are 5.8% and 4.75% respectively. The higher the condenser duty and reflux ratio, the higher the cost of operating condenser. Therefore manual design results indicate slightly lower cost of operating condenser.

### V. CONCLUSION

Although Aspen Plus gave better design results, the design results of the manual calculation had narrow variation to Aspen

plus design results. The manual design technique used was therefore effective.

In conclusion, for CDU design, Aspen plus gives better results than manual calculation but in absence of the software a good manual technique such as that used can serve.

### ACKNOWLEDGMENT

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#### AUTHORS

**First Author** – Adoyi Oche, M. Sc, Mini Refinery Development Research, Ahmadu Bello University Zaria.  
[adoyi\\_oches@yahoo.com](mailto:adoyi_oches@yahoo.com).

**Second Author** – Ibrahim Ali Mohammed-Dabo, PhD, Ahmadu Bello University Zaria. [iroali@mail.ru](mailto:iroali@mail.ru).

**Third Author** - Abdulhamid Hamza, PhD, Ahmadu Bello University Zaria.

**Correspondence Author** – Adoyi Oche,  
[adoyi\\_oches@yahoo.com](mailto:adoyi_oches@yahoo.com). +2347035594723.



# The Experience of Community Cereal Banks in Food – Deficit Areas of Semi-Arid Tanzania

Mwamfupe Davis, G.

P.O Box 395 Dodoma Tanzania, Department of Geography, University of Dodoma

**Abstract-** Community cereal banks have long been acknowledged to have the potential for improving food security in food-deficit areas of Africa. However, the evaluation of their performance reveals that these institutions are not viable in every context. Drawing on the experiences from the food-deficit areas of Kongwa and Chamwino Districts in the semi-arid Tanzania, this paper examines the extent to which the cereal banks have contributed in improving food security in these areas. Data pertaining to villagers' views on the performance of the banks were collected through household surveys, in-depth interviews and focus group discussions in three villages of Banyibanyi, Manchali and Makoja. The findings revealed that contrary to the expectations of improving food security the performance of the cereal banks was dismal. The poor performance is largely attributed to inadequate deposits of cereals, stock decapitalization caused by delays and non-payment of loans, lack of business acumen on the part of the leaders and attitudes of members towards donor assistance. Lessons learnt from the operation of the banks have shown that strategies to address the problem of food insecurity should be demand rather than supply-driven. This is important for ensuring commitments towards the implementation and an overall sustainability of the course. Furthermore, community cereal banks in food-deficit areas that operate as a service to the rural poor have very limited chances of succeeding unless they also adopt a business approach.

**Index Terms-** Community cereal banks, food security, semi-arid lands, Tanzania

## I. INTRODUCTION

Improved food security around the world is one of the main issues articulated nationally and internationally as a top priority for a sustainable development (Witsenburg, 2012). One of the issues of growing concern for the international community is the devastating effects of food price volatility on the most vulnerable populations, which have caused over 300 million people to fall under the poverty line. The other challenge is the recurrence of acute food crises that continue to reverse positive development trends in sub-Saharan Africa (Cortès and Carrasco, 2012). Improving food reserves is among the many initiatives with the potential to improve food security especially in chronically food-deficit areas. It is on the basis of this consideration that cereal banks are being heralded as key instruments for improving food security in developing countries and sub-Saharan Africa in particular.

Despite their widely acknowledged potential as key instruments against food insecurity community cereal banks are

not viable in every context and require certain conditions to adequately function. Indeed, nearly throughout much of sub-Saharan Africa the history of the cereal banks to date is marked by reports of uneven performance records (Cortès and Carrasco, 2012). It is from this realization that this study finds its justification. That is, much as the objectives of establishing such banks are generally related to each other, the actual experiences are both geographic and historic specific, meaning that they differ across both space and time. Therefore, drawing on the experience from semi-arid Tanzania this paper seeks to examine the contribution of community cereal banks in improving food security in these areas.

## II. LITERATURE REVIEW: AN OVERVIEW OF CEREAL BANKS IN SUB-SAHARAN AFRICA

The importance of community cereal banks in improving food security in semi-arid areas of sub-Saharan Africa is widely documented (World Bank, 2011) and needs no further emphasis. These banks can take different forms according to their context but they range from commercial/economic to social objectives (Moise and Bauer, 2013). According to Jatta (2014), the main purposes of cereal banking are in three folds: First, they provide food to food deficit households during the lean period, which also coincides with the farming period. Secondly, cereal banks preserve purchasing power of participating households due to high food prices during lean periods by providing loans food to the participating households. Third, cereal banks act as first-to-reach emergency buffer stocks when disasters occur. There is now a widely held view that, cereal banks act as a community social safety net employed by communities in most arid and semi-arid regions of the world, especially in food-deficit countries or regions (Bosu and Wong, 2012). The establishment of a community cereal banking system has been identified as the most appropriate strategy to break the cycle of food scarcity, soaring market prices, chronic malnutrition, and dependency on food distribution programs. In food-surplus areas on the other hand, cereal banks provide an alternative outlet for farmers who market their grain at harvest time when prices are low. In this way, cereal banks have a dual function: providing food security at the village level and regulating the market (FAO, 1992).

Moussa (2010) and SOS FAIM (2009) reveal that the evolution and practice of cereal banks in sub-Saharan Africa are closely linked to the drought that hit most of the region in the 1960s to the 1990s. Therefore, it is hardly surprising that community cereal banks are a common feature in areas where unreliable rainfall aggravates the problem of food insecurity and the semi-arid areas of Central Tanzania are not an exception. On

the one hand, most of the objectives of cereal banks relate to providing better marketing services for farmers and consumers at the village level (Dramane Mariko et.al, 2012). On the other, cereal banks are thought to have the potential to contribute to commodity-price stabilization (Deaton and Laroque, 1996). In this way, decentralized storage of cereals has a profound advantage in the sense that it offers poor people access to food and it links them to the cereal market, and thus, enhances livelihoods. In areas where membership to the cereal banks is voluntary, these institutions may be conceived as part of participatory community development approaches for responding to chronic problems of food shortage in rural areas.

Despite their importance, the establishment and operation of cereal banks are not without challenges. For example, beginning the 1990's, most of cereal banks that had been established in the 1980s in many Sahel countries had stopped their activities due to management problems, embezzlement or a certain ambiguity of their social role (SOS-FAIM, (2009). Poor performance of the cereal banks have sparked an intense debate which have led some people to question the relevance of these institutions. For example, according to Kent (1998) some of the assumptions that justify the creation of cereal banks are false and that in the context of the market economy cereal banks do not have a global advantage over the private commercial sector to guarantee the distribution of cereals in the absence of structured subsidies. As a result, many cereal banks have not succeeded to displace private traders. This observation is perhaps most relevant to cereal banks established in food-deficit areas where such instruments operate more as a service than a business venture. In the absence of subsidies such cereal banks have not managed to supply villages with cereals at prices lower than the price fixed by traders because stockpiling cereals is costly.

Dramane Mariko et.al, (2012) also argues that many cereal banks failed because they lacked adequate warehouses for storing grains, limited operating capital and lacked of sufficient training for managers. The problem of limited operating capital is further exacerbated by the fact that most cereal banks sold or lent grain to their clients below the prevailing market prices. However, while cereal banks provided an easy access to grains at low prices to clients, such convenient services appeared to eventually compromise the sustainability of these cereal banks. This problem is more pronounced in chronically food-deficit areas and has been one of the issues which compromise the sustainability and cost-effectiveness of most community cereal banks.

### III. METHODS

This study was conducted in Chamwino and Kongwa Districts located in Dodoma Region in Central Tanzania. A total of three cereal banks were selected the first being Banyibanyi village which was selected from Kongwa District, and the other banks in Makoja and Manchali villages which were selected from Chamwino District. The basis of the selection was the different management approaches which, to a greater extent, have an influence on their performance.

A combination of data collection methods was employed and these included in-depth interviews, focus group discussions and household surveys. In-depth interviews had involved leaders of the cereal banks and other 18 members were conducted to obtain

information on members' experiences in using the cereal banks. In addition, two more in-depth interviews were conducted with staff of INADES Formation, - a non-governmental organization which sponsored the establishment of several cereal banks in Dodoma Region. Besides the in-depth interviews, six focus group discussions were held with members of the cereal banks who were picked purposefully based on their knowledge of the history and performance of these institutions. Focus group discussions were used to solicit information on the contribution of cereal banks in improving food security in their respective villages. Each group ranged from eight to twelve members of both sex.

A household survey involving 180 respondents was also conducted for the whole study. From each village 60 households were randomly selected to form the total number of respondents for the survey. In total female respondents were 104 (57.8%) while males were 76 (42.2%). A household questionnaire was designed to collect opinions on the extent to which the cereal banks had contributed to the improvement of food security in their respective villages. Household survey results were used to cross-check and validate the findings of the in-depth interviews and focus group discussions.

### IV. FOOD INSECURITY IN SEMI-ARID TANZANIA

Agriculture is the main economic activity in Chamwino and Kongwa Districts and provides households with food and cash income. Major crops grown include maize, sunflowers, sorghum, millet, sesame, banbara groundnuts, cow peas, sunflower, pigeon peas, cucumbers and water melons. The scale of production of all these crops is highly determined by the amount and pattern of rainfall which is mostly unreliable and inadequate for agricultural production. Chamwino and Kongwa Districts are characterized by semi-arid conditions with an annual rainfall ranging between 500-650mm. The rainy season is from November to May. In addition to crop cultivation, the inhabitants of the two districts keep livestock which have both socio-cultural and economic significance. Livestock, especially cattle, is a symbol of wealth and a source of prestige and for this reason may not be freely exchanged for cash income or food items even during times of food shortages. Other economic activities undertaken in the study villages include making and selling charcoal, weaving, petty trading, and bee keeping. Food supply to some households is also supplemented by the seasonal migration to neighbouring urban centres and some productive rural enclaves. Mascarenhas (1977) underscores this and argues that mobility, both spatial and social, has been a key feature in the livelihood adaptation among the inhabitants of Chamwino and Kongwa Districts.

Chamwino and Kongwa Districts are among the highly food insecure areas in the country and this partly explains the prevalence of incidences of poverty which are considered higher than the national average. Food insecurity is thus a developmental challenge contributing to rural poverty among agro-pastoral communities. Seasonality with respect to production and availability of food is very pronounced in the two districts. In addition, during the rainy season food is available for most villages but the quantities are not large enough to take the producers into another season. In extreme cases of food shortages, some communities depend on government and donor

assistance for food reliefs. This is also an area where the involvement of local and international non-government organizations is very conspicuous as they engage in promotion of marketing, food security cereal banks and women empowerment. Food insecurity in semi-arid Tanzania is largely a manifestation of low availability of food stuffs caused by a low production and poor management of post harvest crops. In such situations where food production is far below the average household requirement and many other components of food insecurity, especially food nutrition is affected. In addition, with low levels of production problems related to inaccessibility and affordability of food become almost inevitable. Therefore, low food production is a fundamental problem to food insecurity. The causes of food insecurity in these ecologically fragile semi-arid areas are well documented (refer to Liwenga, 2003). Factors such as low agricultural productivity of land caused by low and unreliable rainfall, an inadequate supply of farm labour in the production of food have been highlighted as among the major causes of food insecurity. Land degradation due to a continuous utilization of resource poor lands is another contributory factor for food insecurity. Opportunities for the development of non-farm activities are also severely limited by poor transport infrastructure, and this means that livelihoods of the majority of the people are largely tied on working on land resources.

To some households in the study areas food insecurity is contributed by the inadequate labour allocated to food production. In a semi-arid environment farmers are caught in a problematic situation of shortage of farm labour during critical moments. Plowing, just like planting, is sensitive to moisture and neither should be done when soil is either too wet or dry. It is common in the arid and semi-arid areas for proper moisture conditions to occur only at the beginning of the rainy season and planting should be done on the same day (Creswell and Martin, 1993). The planting period begins when most households face the problem of food shortages. Such households become trapped in a dilemma of having to choose between working on their farms and selling their labour in an exchange of the much needed food for their households. By opting to sell their labour as means of survival, it deprives their farms of the much needed and critical farm labour input. This is actually what leads to low production and crop failure among the already food deficit households. Therefore, the problem of food insecurity in these parts of the country is exacerbated by a combined effect of poor timing of tillage and planting, unavailability of household farm labour, shortage of food at the household level during the farming season.

In the past, traditional security systems had provided a cushion for the food insecure and starving households. Such households were able to benefit from the strong social ties established with both their families and community members. These systems, which were sustained through reciprocity provided cover to the poor during the times of difficulties amongst other obligations. Recently however, and following the mix of ethnic groups these traditional mechanisms have almost disappeared and have now been replaced by more commercial oriented networks, thus, exposing the communities to incidences of food insecurity.

The extent of food insecurity differs from one household to another and the concept of food gap was used to measure food

availability in the study villages. A food gap or commonly known as the lean period represents the number of months in the year in which a household face difficulty in providing an adequate food or money to purchase food for consumption (Bosu and Wong, 2012). Table 1 shows the percentage distribution of respondents by extent of food gap.

**Table 1: Percentage Distribution of Respondents by Food Gap (months)**

Village	8 months (Oct-May)	6 months (Dec - May)	4 months (Feb - May)	2 months (Apr - May)
Manchali	10	22	30	38
Makoja	15	20	25	40
Banyibanyi	5	8	25	62
<b>Average</b>	<b>10</b>	<b>16.7</b>	<b>26.7</b>	<b>46.6</b>

The problem of food insecurity is also not felt uniformly between and within villages. Instead, there is a wide variation in the number of months with adequate food at household level. Nearly all households would have some food from the beginning of the harvest period in June which takes them into October when food availability begins to fall short. This is a group of farmers whose production of foods is low due to their engagement in selling farm labour to obtain food and others who usually sell all their food crops to obtain cash for household's requirements including food. Another 16.7% and 26.7% of the respondents had a food gap of 6 months and 4 months respectively.

On average, nearly half of the households (46.6%) had a food gap of two months, that is, they faced food shortages only in the last two months of April and May before the next crop harvest in June (Table 1). Among these, there are also those who purchase food from other villagers and stock it either for future use or immediate sale. The difference in food gaps among villagers also means that they have different expectations from the cereal banks for the supply of foods. This is an indication that the food situation is relatively better than in the other two villages. The main reason for the difference is that Banyibanyi village is endowed with good soils and abundant rainfall compared with the other two villages and food production is relatively higher than the other two villages. This partly explains why Banyibanyi village has a successful community cereal bank compared to the other two villages.

Apart from household level strategies to cope with the problem of food shortages, the government and some local and international organizations have put in place programmes to address the same. In particular, the World Vision, Inades Formation, Rural Livelihood Development Company, World Food Programme and other religious based organizations have been involved in providing food reliefs, community empowerment, and capacity building services for the production and marketing of agricultural goods. Perhaps a more notable initiative for addressing food insecurity has been the establishment of community cereal banks.

## V. ESTABLISHMENT AND OPERATIONS OF CEREAL BANKS IN SEMI-ARID TANZANIA

Community cereal banks in Chamwino and Kongwa districts were established as part of the response to the problem of food insecurity in the area. The three banks covered by this study were established between 2006 and 2009 with the assistance from INADES Formation and Intermon Oxfam who provided seed money for the construction of the warehouses and initial stock of cereals. According to officials of INADES Formation, the major objective for the establishment of the banks was to improve food security for the rural communities in the two districts. It was envisaged that, by storing foods during the harvest period the prices of the major cereals, especially maize would be stabilized, and thus, allow farmers to purchase it at relatively affordable prices during the lean period.

In addition, stock-pilling of cereals was meant to contribute to the reduction of the overuse of such foods during traditional ceremonies on the start of the harvest period. Traditionally, like throughout much of sub-Saharan Africa, the pattern of ceremonial festivities such as weddings and puberty rites among the communities in semi-arid Tanzania revolve around the farming cycle. Such ceremonies are mostly accompanied by the consumption of large quantities of cereals especially maize and millet (in the form of solid foods and beer). Preparation of alcohol during these festivities is considered as a form of giving of thanks to the ancestors for successful grain harvest. These are kind of ceremonies that even the food insecure households find themselves obliged to perform. All in all, these practices have been associated with food insecurity because of what may be argued as unnecessary use of large quantities of cereals within a very short period of time. Therefore, in order to address the problem of excessive use of cereals and the need to stabilize the prices of cereals community, cereal banks were deemed necessary.

### *Cereal deposits*

The basic principles of operating community cereal banks require members to deposit cereals when they are in abundance and with the prices at their lowest. Such deposits are made in anticipation that members will buy them during difficult times, but certainly, at lower prices than what the opportunistic middlemen would have demanded. In situations where the banks have enough stock, members are allowed to borrow cereals and payback with a small interest during the harvest season. Again, the margin of profit is kept to affordable levels so that many more people can be accommodated. When this cycle of "purchase-store-sell" has been completed, automatically the prices of cereals will have stabilized between seasons. Therefore, once the initial investment is made in the form of start-up stock or capital to purchase stock, the banks become self supporting of the interest of the members.

Community cereal banks in food-deficit areas like those in Chamwino and Kongwa Districts face a dilemma in attracting cereals deposits. On one hand, the entry shares of 1-5 bags of any cereal is kept deliberately at low mark just to attract as many food-insecure households as possible, but then this has not attracted large enough quantities to stockpile the banks. On the other hand however, there is a well founded fear of few members dominating the banks with their large deposits. In effect, such a

dilemma contributes to the problem of stock capitalization. Low stock deposits are further exacerbated by a growing number of defaulters who either take long to repay the loans or do not pay back altogether.

### *Management of cereal banks*

Each of the three cereal banks in the study area presents different management approach. To some extent these approaches have an influence on the efficiency of the banks. In Manchali village, for example, membership to the bank is limited to only 27 farmers. By any consideration this is a small group (interest group) of people but they have demonstrated a great deal of commitment in making sure that the bank stands. These are the same people who participated actively in the construction of the bank (with assistance from Inades Formation) right from the initial stages. Since then, they have been enjoying a full monopoly of the bank and have set a very high entry fee of Tshs 150,000 (about US\$ 100) which is well beyond the reach of the majority of the villagers. This has been made deliberately high to keep off more people from joining the bank. The lesson that can be picked from such an experience is that the bank has very committed members who work hard to contribute to the development of the bank. Indeed, this partly explains why this bank is fairing relatively well compared with other banks in Chamwino District.

The cereal bank in Makoja village has not been successful to any appreciable degree. The main reasons for the dismal performance lie in the manner in which the bank was established and the subsequent management approach. Intermon Oxfam gave cereals to the village community as start-up capital for the cereal bank. Therefore, the bank was operated by the village community which chose leaders to manage the institution. The basic qualification was simply for one to be hardworking, trustful, and able to read and write, unless business skills were not considered as being very important. The cereal bank in this village was conceived to belong to the whole community and for this reason it did not invite any individual commitment. Intermon Oxfam who provided the seed money was looked upon as lifeblood for the prosperity of the bank. After the withdrawal of Intermon Oxfam, the cereal bank began to face difficulties of inadequate funds to purchase cereals and persistent defaulters among members began to emerge. Members of the bank still feel that they can get more cereals from sponsoring agencies. Therefore, at the root of the problem facing cereal bank is that there simply not enough cereals to deposit. This is further compounded by the attitudes of community members on the role of sponsoring agencies. There is very little that the villagers gain from the bank because the prices are nearly the same as those at the wider market.

The cereal bank in Banyibanyi village operates on business principles but also provides services to the poorer households. On the one hand the bank invites well-off farmers to store their cereals in the banks' warehouse by charging them some fee. This system generates some revenue which is ploughed back into the bank. Allowing villagers to store their cereals serves two purposes. First, it stores cereals for the poor households who do not have dependable storage facilities at their homesteads. Second, having their cereals stored at the bank keeps the owners away from the unnecessary diversion of foods (sale, or donation

of social nature, celebrations). In this way the bank is making some money by storing cereals of individual farmers. On the other hand the bank purchases cereals which are later loaned to the needy households on an agreement that they repay during the harvest period. An average of 30% of the deposited amount is charged as interest. Operating under Cooperative Law the cereal bank in Banyibanyi has a governing board; a manager and the rest of the members form the members' council. The experience from Banyibanyi cereal bank clearly shows the importance of combining business and service which are important components for the sustainability of the institution.

**Perceived importance of cereal banks to the communities**

An overall assessment of the contribution of cereal banks in improving food security in semi-arid areas of Tanzania shows that these institutions are plagued with host of constraints which make them to fail to achieve their intended objectives. This situation in Chamwino and Kongwa Districts is a true reflection of what is taking place in most parts of sub-Saharan Africa. Cereal banks in most parts of Africa have received mixed reviews. Some scholars (e.g. Kent, 1998) believe that these banks have failed to improve food security while others (e.g. Msaki, et al. 2014) argue that the banks have made some contribution in cushioning smallholder producers from extreme food shortages.

A well-functioning cereal bank must have stocks of commodities which members can access at times of food shortages. Alternatively the bank must have enough cash to purchase cereals to be sold to bank members whenever the needs arise. Availability of such stock is dependent on members depositing cereals either from own production or purchase. It also depends on the borrowers honouring the loan agreements by paying back the cereals together with the small profit. The findings of this study reveal that, on average, the majority of the farmers can hardly harvest more than 10 bags of maize per growing season. In effect, it means there is very little or virtually nothing to deposit in the cereal banks. The banks, especially those in Manchali and Makoja villages experience long periods

of inactivity largely because of low supply of deposits and at the same time others failing to repay the loans.

The lean period in the study area coincides with the farming season and this is the season when farmers rely on markets for their food supply. In the absence of food during this period, the poorer households become bonded labourers and forced to offer their own labour to work in other people's farms in exchange for food, credit or money to buy food. In this way, the smallholder producers find themselves disengaged from their own production resulting into a vicious cycles of indebtedness, low production and poverty. Therefore, having cereal banks for the purpose of fighting food insecurity is a novel idea. However, this seems to work better in situations where there is a certain level of production. A member of the cereal bank in Makoja village wondered "*how can one think of banking the cereals when there is not even enough to eat?*"

On the basis of evidences obtained through household surveys, in-depth interviews, and focus group discussions, community cereal banks face a number of constraints. These include, for example, inadequacy of deposits from farmers, dependency syndrome among villagers, delays in payment of loans, and management problems. Sanfo, (2011) offers an insightful caution that cereal banks are not business ventures and should as well therefore be judged based on their social role they play in society. This however does not negate the fact that the main objective of cereal banks is to improve food security and it is on this basis that the banks should largely be judged on.

The majority of the members of the cereal banks perceive these institutions to have failed to achieve their intended goals. Some 90 per cent of the respondents reported that cereal banks had been unsuccessful in improving food security in their households (Table 2). None of the members reported any appreciable level of success of the banks in improving food security and this is primarily because of the fact that there are not enough cereals to bank.

**Table 2: Perceived Importance of Community Cereal Banks to member**

Attributes of success	Highly successful	Successful	Neither Successful nor unsuccessful	Not successful	Completely unsuccessful
Food security	0	0	10	80	10
Price stabilization	0	6	8	82	4
Social capital formation	0	26	65	7	2

As for price stabilization, only 6% of the respondents reported that the cereal banks were successful. Another 82% were of the opinion that the cereal banks had not succeeded in stabilizing the price of cereals between seasons. Without enough stock to take the farmers to the next season, it means at some point they will be forced to purchase additional foods for their household requirements outside the system of cereal banks. Actually, all the three banks have never had deposits that equal the start-up stock given by sponsoring agencies. Without enough cereals to the banks, the food-insecure households are forced to seek solutions outside the cereal bank system which in fact leads them to succumb to the opportunistic middlemen.

In some ways however, the community cereal banks were reported to have contributed to the formation of social capital among the members. There was a feeling among respondents that bank members were likely to help each other than non members in some social matters, including food exchange (though not through the bank channels). Some 26% of the respondents appreciated this contribution (Table 2).

An extreme case of Makoja village is taken to get deeper insights on the opinions of different wealth categories. Table 3 presents the views of respondents on food security by wealth categories. Households suffer in varying degrees from the problem of food insecurity, and hence, adopt different strategies

to address the situation. Overall, a total of 80% of the respondents in the three wealth categories reported that the cereal banks had not been successful in the improvement of food security.

**Table 3: Opinions on the contribution of cereal banks to food security by wealth categories in Makoja village**

Wealth Categories	Highly successful	Successful	Neither Successful nor unsuccessful	Not successful	Completely unsuccessful
Well-off (6%)	0	0	4	2	0
Better-off (22%)	0	0	6	16	0
Poor (48%)	0	0	0	46	2
Very poor (24%)	0	0	0	16	8
<b>Total</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>80</b>	<b>10</b>

Undoubtedly, Table 3 shows that the cereal banks were only marginally successful for the well-off and the better-off. This is perhaps hardly surprising because these wealth categories have the ability to bank considerable amount of cereals compared to the poorer members. Having enough to bank also means they expect some profits when the cereals are resold. In fact, none of the members in these two wealth categories had rated the banks as completely unsuccessful. As for the ‘poor’ and ‘very poor’ respondents these rated the cereal banks as not successful (46%). This is perhaps an expected opinion especially in situations where members in these wealth categories had not enough cereals to bank. In addition, being poor also means that their purchasing power is also limited. In this way, it is not surprising that they rated the cereal banks as unsuccessful in addressing the problem of food insecurity in their localities.

**Lessons from the cereal banks in semi-arid Tanzania**

Four important lessons can be learnt from the experience of cereal banks in semi-arid Tanzania. First, the results from focus group discussions in Makoja village revealed that the idea of cereal banks as a strategy of improving food security was not the villagers’ choice. For this reason, the banks were bound to fail because they lacked sustainability elements in terms of commitment and support from the local communities. Therefore, unless the establishment of a cereal bank is based on a commonly felt need in the village, these tools stand little chance of success.

Second, like elsewhere in sub-Saharan Africa, cereal banks which were established in the poorest and chronically deficit areas are more likely to collapse than those in areas where there is ample production. In the former case, the low purchasing power among the food –insecure households and the consequent social pressures to extend credit undermine the banks. Actually, the failure to deposit adequate amount of cereals and the consequent effects of being unable to borrow is a result of a trap in the cycle of food poverty in which most farmers find themselves into. This is the trap which the cereal banks in semi-arid Tanzania have failed to break.

The condition of farmers and indeed the motives for the establishment of cereal banks in semi-arid Tanzania are in stark contrast to those in Western Kenya. In the latter case the cereal banks are located in areas where there is production of substantial crop surpluses but with farmers trapped within a “good season, poor market” dilemma. With large quantities of cereals the prices are extremely low and few facilities are available to smallholder farmers to store their crops for several

months. This is a difficult environment for farmers who lack capital, access to market information and transport (Coulter et al, 2000). Therefore, in order to shield the farmers from opportunistic middlemen who pay extremely low gate prices, community cereal banks become inevitable Mukhwana (2003). In semi-arid Tanzania on the other hand, the good seasons are spaced too far apart to generate enough cereals for sustaining the banks, let alone cereals for household consumption. This accounts for the differences in performance of the banks.

Third, the importance of managerial skills in successful operation of cereal banks cannot be overemphasized. Although there are arguments that such banks are not business ventures, they cannot however be run like charity organizations; instead, they have to generate some profits to cover the operational costs. Unless they do so they will run into the problem of stock decapitalization. This further underscores the need for cereal bank managers with business acumen. Furthermore, leaders with managerial skills are necessary to arrest stock decapitalization caused by delays in recovering or non-payment of the debts. Experience has also shown that where cereal banks are operated by “interest groups”, they have a higher chance of succeeding. This is also experienced in Chad (Dramane Mariko et.al, 2012) where profit oriented cereal banks operated by “interest groups” registered success than those banks run by communal leadership. Fourth, part of the reasons for the failure of the cereal banks is the dependency attitude which villagers have developed towards donor assistance. This attitude is in the form of dependency syndrome, a concept used to refer to a condition where members of a community modify their social and economic behavior in anticipation of some aid, in this case food aid, (Lind and Jalleta, 2005). The effect becomes more noted where beneficiary households depend on external assistance to the extent that they reduce engagement in other livelihood activities that could enable them to become food self-sufficient. When such food is given nearly for free, it breeds reluctance to participate in community projects even if this is for their own benefits. Linking this phenomenon to the situation in the study area, we note that the cereal banks in semi-arid areas of Tanzania were established in communities where people were used to receive food reliefs from the government and donor agencies during times of difficulties. As a result, some form of dependency syndrome has developed and still persist among the people and this has contributed to perception of the cereal banks as a form of social charity from which food may be obtained with ease.

As part of the donors' strategy to create a sense of ownership of the community cereal banks, the members were required to contribute to the construction of the warehouses. This contribution was only in the form of labour (for collecting building materials and making bricks). To date, some members in Makoja village still harbor arguments presented by one villager that .... *'If they (the sponsoring agencies) were able to provide seed money to buy the cereals, and expensive building materials, definitely, they cannot fail to do the same in paying for labour and giving us more cereals to our ailing banks. Had the donors met all the expenses, it wouldn't have been possible for few volunteers (villagers) to monopolize the bank as we see today'*. The cereal bank in Makoja village which is managed communally faces difficulties in recovering the loans because some members do not feel obliged to pay back their loans for what they consider assistance from donors.

Therefore, an overall lesson for community cereal banks is their failure to perform due to lack of sustainability. Indeed, this is not uncommon, elsewhere Kent (1998) reports that the track record of cereal banks regarding sustainability is poor because over 80% of the 1,500 cereal banks created in Burkina Faso before 1991 went bankrupt within five years of their creation, and estimates from Niger indicate a 90% failure rate for cereal banks.

## VI. CONCLUSION

Cereal banks remain potentially important instruments for improving food security and market stabilization in food-deficit areas. However, evidence from the study area shows that most of these banks remain unsustainable and have dismal performance largely due to inadequate supply of cereals. With low level of deposits coupled with delays or non-payment of the loans, the banks frequently experience the problem of stock decapitalization thus remaining inactive for long periods of time. This partly explains why most respondents felt that the cereal banks had not helped in improving food security in their areas. Indeed, this is a typical problem of most cereal banks in food-deficit area where they operate as a service to the communities. Unless these cereal banks adopt a business approach, they will remain white elephants in their areas.

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## AUTHORS

**First Author** – Mwamfupe Davis, G., P.O Box 395 Dodoma Tanzania, Department of Geography, University of Dodoma, dmwamfupe@hotmail.com



# Identifying Problems Associated with Studying of Chemistry in Anambra State, Nigeria

Emendu, N.B. PhD\*, Okoye, C.M\*\*

\* Chemistry Department, School of Sciences, Nwafor Orizu College of Education Nsugbe, Anambra State.

\*\* Chemistry Department, School of Science Nwafor Orizu College of Education Nsugbe, Anambra State, Nigeria

**Abstract-** The study identifies various problems associated with studying of chemistry in Anambra State, Nigeria. A questionnaire was distributed to secondary schools students and undergraduates in the department of Chemistry, Nwafor Orizu College of Education Nsugbe, Anambra State and Anambra State University Igbariam curriculum, Anambra State. Thirty secondary schools were selected which were in the same education zones of the higher institutions. Hundred and fifty students were selected from secondary schools and hundred chemistry students were selected from the higher institutions. Most of the challenges are from the infrastructure, curriculum, funding, textbooks, teachers, students. Some recommendations were made.

## I. INTRODUCTION

The word Chemistry usually bring up a mental picture of the many synthetic substances that we see around us. We may think of dyes, plastics, fibres and drugs are manufactured by chemical processes. The study of these processes would not answer the question. Each new discovery in the field of chemistry depends upon either discourages, sometimes in other fields such as physics and biology. During the science subjects, what then sets chemistry apart from physics and biology? It is still convenient, to associate chemistry primarily with the study of matter – its composition, the changes is undergoes, and the energy exchanges involved in these charges.

Probably, the best way to seek an answer to the question is to trace the development of some particular chemical discovery. Chemistry is the study of the properties and composition of matter and the changes with matter undergoes. It is far more than that. We shall see it as concern with the energy exchanges that accompany all changes in matter. Chemical knowledge derived from this study is based on experiments in which very careful observations are made usually a particular question.

A chemist is always on the workout for a regular pattern of behavior. The more scientist seek answers to their questions, the more they realize that absolute answers are rarely if ever.

Chemistry as a course of study is perceived generally to be very interesting, vast mathematical and experimental. Almost all aspect of life science, both living and non-living has something to do with chemistry ranging from Physical to Biological sciences. Chemistry is one of the pre-requisite subjects for the study of engineering, technological, medical and other applied science courses in the university.

Chemistry is the study of laws of nature that govern the behavior of the universe, from the very smallest scales of sub-

atomic particles to the very largest scales of cosmology. Chemistry is becoming increasingly interdisciplinary, as chemistry work with engineers, physics and biologists in order to understand and solve a wide rage of problems confronting society.

Chemistry is a challenging and rewarding subject. Its study instructs a person in the art of critical thinking, how to pose questions and how to solve problems. It also equips graduates with process skills.

Chemistry is at the heart of almost every facet of modern life. Chemistry provides training for a vast range of careers. Consequently a vast range of career options are available, options which might not directly use chemistry. Chemistry faces the world with confidence and knows where to obtain the information they need to complete a task. Hence, Ababio (2013) enumerated some careers in chemistry such as teaching service, health service, food processing, petroleum and photochemical seminars, manufacturing industry, extractive industry, Agriculture and Forestry.

There are many problems associated with the study of chemistry. Tarrant (1981) had already indicated that environmental factors affect remembering. For example, it is very difficult to learn efficiently if your attention is distracted or worries affect your concentration or circumstances prevent practice and revision. Ogunsaju (1981) made it clear that in most cases a school will jump into the teaching of various inter-related sciences without either having concrete objectives in mind or knowing how to achieve their stated objectives. The pressure becomes more complicated by lack of manpower and finance to purchase science equipments. This has made it difficult for secondary schools in Nigeria to have effective science programmes.

Ndu (1991) discovered that the most important problems of teaching and learning science in the rule environment are inadequate equipment to science teachers, inadequate equipment to science teachers, inadequate facilities for students to study at home and insufficient number of science laboratories.

Furthermore, Alonge (1981) made it clear that suitable materials and local material are not available in schools and the few available ones are not in the recent textbooks. Chemistry is thus employed in an extensive range of activities, both within and outside the discipline itself. If these aims are not met in the little available existing time, the challenge faced as a result of these obstacle need to be tacked. The aim of this study is to identify problems associated with studying of chemistry in Anambra State Nigeria.



## II. AREA OF STUDY

This study covers the entire Anambra State. The State has one College of Education and one University with many senior secondary schools. The Nwafor Orizu College of Education, Nsugbe and Anambra State University Igbariam campus are situated in Otuocha zone of Anambra State, Nigeria, and the selected secondary schools for the research are in Otuocha Education zone in Anambra State.

### Statement of the problem

Chemistry is a subject that requires continuous practice, especially now it is getting across the boundary line among other subjects such as physics and biology. The discoveries in chemistry is endless and the channels involve need to research in a conducive environment.

The rate at which students are dropping the chemistry shows that there is a problem. The problem associated with the study of chemistry are numerous, hence it is necessary to identify these problems and suggest possible ways it can be solved.

### Purpose of the Study.

The purpose of the include

1. To identify the problems associated with study of chemistry in secondary schools.
2. To identify the problems associated with studying of chemistry in higher institutions
3. Compare the problems associated with the study of chemistry in secondary schools and higher institutions.

### POPULATION OF THE STUDY

The population for the research consists of all the second and third year senior secondary school students in secondary schools in Otuocha Education zone Anambra State, and the undergraduates' students in Department of Chemistry, school of sciences of Nwafor Orizu College of Education Nsugbe, Anambra State and in Anambra State University, Igbariam campus.

### VALIDATION OF THE INSTRUMENT.

To ensure the validity of the instrument, the instrument was submitted to experts in measurement and evaluations Federal College of Technical Education Umunze. The lectures subjected the item to their expert scrutiny on the basis of which the researchers made modification that saw the instrument on its present form.

### RELIABILITY OF THE INSTRUMENT.

The reliabilities instrument was tested using test-retest method. Using schools in Aguata zone with lecturers from Federal College of Technical Education Umunze Education Umunze and federal Polythenic Oko, Anambra State. To

ascertain the internal reliability of the instrument, Perason product moment correlation coefficient was found to be 0.78.

### SAMPLE SIZE

The researchers used simple random sample without replacement to select 150 chemistry students in Otuocha Education zone in their senior secondary schools and 100 chemistry students from Nwafor Orizu College of Education Nsugbe and Anambra State University, Igbariam Campus.

### METHOD OF DATA COLLECTION.

The researcher used on the sport inter –personal method of administration. Each of the respondents was given a copy of questionnaire to complete, and thereafter all the questionnaires were collected back.

### INSTRUMENT FOR DATA COLLECTION

Structured questionnaire which addressed the problems associated with studying chemistry in schools where used. The questionnaire has three sections; Section A covered personal data, of the respondents, while section B covered problems associated with studying chemistry in schools and C covered solution to the problems. The items will cover Yes or No response.

### RESEARCH QUESTIONS

The following research questions are in the course of carrying out this work.

1. What are the problems associated with the studying of chemistry in secondary schools of Anambra State?
2. What are the problems associated with the studying of chemistry in higher institution?
3. What are the possible solutions to the problem associated with the study of chemistry in schools?

### RESEARCH DESIGN

This study adopted a descriptive design. A survey research is one which a group of people or items are studied by collecting and analyzing data from only a few people or items considered being representative of the entire group.

### METHOD OF DATA ANALYSIS

Percentage was used to analysis the result which was used to answer the research questions.

**Research Question 1:** What are the problems associated with the studying of chemistry in secondary schools of Anambra State?

The research question 1 is answered in table 1.

**Table 1: Problems associated with studying of chemistry in secondary school.**

A	Problem of Infrastructure	Yes %	No %
1	There is inadequate classrooms in schools	70	30
2	The schools lack laboratory	80	20
3	There is no enough equipment for teaching and learning chemistry.	90	10
4	The environment is not conducive for learning.	85	15
5	There is poor power supply	95	05

6	The school lack water	90	10
	Mean	85	15
<b>B</b>	<b>Problem from the curriculum</b>		
7	The school curriculum is not stable	20	80
8	The syllabus is over loaded	85	15
9	The chemistry subject does not inspire the students.	75	25
10	ICT is not involve in studying of chemistry	84	16
11	The chemistry curriculum does not engage the students to do practical work	64	36
12	Time for studying chemistry is not enough	58	42
	Mean	65	35
<b>C</b>	<b>Problem of Funding</b>		
13	There is poor funding of chemistry subject in schools	72	28
14	Many school heads are not paying attention to the study of chemistry.	69	31
15	The students of chemistry require special allowance for the course.	55	45
16	Due to the risks taken in studying chemistry, the students suppose to study with scholarship.	84	16
	Mean	70	30
<b>D</b>	<b>Problem of Textbooks</b>		
17	The chemistry textbooks are too costly	77	23
18	There are few chemistry textbooks in the market.	66	34
19	The chemistry textbooks are too old to be used now	42	58
20	There is no chemistry library in schools	20	80
	Mean	52	48
<b>E</b>	<b>Problem from the Teachers</b>		
21	There is lack of qualified chemistry teacher in schools	73	27
22	There is no chemistry laboratory assistant in schools.	88	12
23	There is no chemistry laboratory attendant in the school.	88	12
24	The chemistry teachers lack experience	23	77
25	The chemistry teachers are not happy with their job	63	37
26	There is no incentive for chemistry teachers in schools.	74	26
	Mean	69	31
<b>F</b>	<b>Problem from the Students.</b>		
27	The peer group affect the students negatively	54	46
28	The parents are forcing the students to study chemistry.	44	56
29	The students' future career has no link with the study of chemistry.	64	36
30	The students hate the chemistry teacher.	60	40
	Mean	56	44

From table 1, it shows that the problems associated with study of chemistry in secondary school include: problem of infrastructure 85%, curriculum 65%, funding 70%, Textbooks 52%, teachers 69% and students 56%.

**Research Question 2: What are the problems associated with the studying of chemistry in higher institutions.**  
The research question 2 is answered in table 2.

**Table 2: Problems associated with studying of chemistry in higher institution.**

<b>A</b>	<b>Problem of Infrastructure</b>	<b>Yes%</b>	<b>No%</b>
1	There is inadequate classrooms in schools	40	60
2	The schools lack laboratory	26	74
3	There is no enough equipment for teaching and learning chemistry.	32	68
4	The environment is not conducive for learning.	05	95
5	There is poor power supply	42	58
6	The school lack water	38	62
	Mean	31	69
<b>B</b>	<b>Problem from the curriculum</b>		
7	The school curriculum is not stable	30	70
8	The syllabus is over loaded	60	40
9	The chemistry subject does not inspire the students.	62	38
10	ICT is not involved in studying of chemistry	92	08
11	The chemistry curriculum does not engage the students to do practical work	72	28
12	Term/session is too short to cover the scheme	63	27
	Mean	64	36
<b>C</b>	<b>Problem of Funding</b>		
13	There is poor funding of chemistry subject in schools	83	17
14	Head of school does not encourage the students and staff in studying of chemistry.	86	14
15	The students of chemistry require special allowance for the course.	96	04
16	Due to the risks taken in studying chemistry, the students suppose to study with scholarship.	95	05
	Mean	68	32
<b>D</b>	<b>Problem of Textbooks</b>		
17	The chemistry textbooks are too costly	82	28
18	There are few chemistry textbooks in the market.	73	27
19	The chemistry textbooks are too old to be used now	34	66
20	There is no chemistry library in schools	82	28
	Mean	68	32
<b>E</b>	<b>Problem from the Teachers</b>		
21	There is lack of qualified chemistry teacher in schools	98	02
22	There is no chemistry laboratory assistant in schools.	04	96
23	There is no chemistry laboratory attendant in the school.	03	97
24	The chemistry teachers lack experience	13	87
25	The chemistry teachers are not happy with their job	56	44
26	There is no incentive for chemistry teachers in schools.	96	04
	Mean	45	55
<b>F</b>	<b>Problem from the Students.</b>		
27	The peer group affect the students negatively	58	42
28	The parents are forcing the students to study chemistry.	12	88
29	The students' future career has no link with the study of chemistry.	02	98
30	The students hate the chemistry teacher.	13	87
	Mean	22	78

From table 2, it shows that the problems associated with the study of chemistry in higher institutions include:- curriculum 64%, funding 66%, and textbooks 68%.

**Research Question 3: What are the possible solutions to the problems associated with the study of chemistry in schools?**  
The research question 3 is answered in table 3.

**Table 3: solutions to the problems associated with the study of chemistry in schools.**

<b>A</b>	<b>Solution to the problem of infrastructure</b>	<b>Yes%</b>	<b>No%</b>
1	More classrooms are needed in schools	58	42
2	Enough equipment is needed in schools	90	10
3	Teachers should improve where the equipment is not there	95	05
4	There should be constant power supply	98	02
5	Water should be supplied in schools	95	05
	Mean	88	22
<b>B</b>	<b>Solution to the problem o curriculum</b>		
6	The policy makers should provide stable curriculum	52	48
7	The syllabus should not be over loaded	56	44
8	The chemistry subjects should inspire the students	70	30
9	The ICT usage should be incorporated into the chemistry curriculum	80	20
	Mean	65	35
<b>C</b>	<b>Solution to the problem of funding</b>		
10	More money should be provided for the study of chemistry	40	70
11	Government should support the school in funding chemistry subject	80	20
12	Special ward should be given to students of chemistry.	90	10
	Mean	70	30
<b>D</b>	<b>Solution to the problem of textbooks</b>		
13	The government should subside the cost of textbooks	85	15
14	More authors should be encouraged to write more textbooks	30	20
15	Standard library should be build in schools	60	40
	Mean	59	41
<b>E</b>	<b>Solution to the problem of teachers</b>		
16	Qualified teachers should be employed in schools	70	50
17	Chemistry laboratory assistant should be employed in schools	80	20
18	Chemistry laboratory attendant should be employed in schools	50	20
19	More incentives will be given to chemistry teachers	65	35
20	Chemistry teachers should be encouraged to attend in-science training	75	15
	Mean	68	32
<b>F</b>	<b>Solution to the problem from the students</b>		
21	The Guidance Counselor should held to counsel the students	90	10
22	The students should be advised to do chemistry	95	35
	Mean	93	07

From table 3, it shows the solution to the problems associated with the study of chemistry in schools cover infrastructure curriculum, funding, textbooks, teachers and students.

**Summary of the work:- This is summarized as follows**

**A. The problems associated with the study of chemistry in secondary schools include:-**

- Infrastructure: The schools have inadequate classroom, they lack laboratory, there is no enough equipment, the

environment is not conducive, there is poor power supply and no water.

- Curriculum:- The school curriculum is not stable, the syllabus is overloaded, the scheme does not inspire the students, ICT is not involved in the studying of chemistry, students are not engaged in practical work.
- Term / session is too short to cover the scheme.
- Funding:- There is poor funding of chemistry in schools, head of schools does not incentive given to students or teachers of chemistry.
- Textbooks:- The availability textbooks are too costly to purchase, the chemistry textbooks in the market are few. The old chemistry textbooks are many and there is no chemistry library in schools.
- Teachers:- There are few qualified chemistry teachers in school, no laboratory assistant and attendant, the staff are not happy.
- Students:- Peer group affect the students in doing chemistry, the students are studying chemistry under pressure from their parents, the students future career has no link with chemistry and the students hate their teachers.

#### **B. The problems associated with the studying of chemistry in higher institutions include:-**

- Curriculum:- The syllabus or scheme is over load, the subject does not inspire the students Non implementation of ICT in chemistry teaching and learning, and the curriculum does not engage the students to do more exercises.
- Funding:- The department experience poor funding, the head of the institution are not paying attention to the department, the incentives to the staff and students.
- Textbooks:- The chemistry textbooks are too costly, and only few chemistry textbooks are available in the market.
- Teacher:- The chemistry personnel are not happy with their work and there is no incentive for them.
- Students:- The peer group are affecting the students.

#### **C. Solution to the problems. The solution include:-**

- Infrastructure:- More infrastructure should be provided.
- Curriculum:- The curriculum should be stable and the use of ICT be introduced in studying chemistry.
- Funding:- The government and head of institutions should supervisor the chemistry department more.
- Textbooks: The chemistry authors should be encouraged to write more. Library will be provided and government should subside the cost o textbooks in schools.
- Teachers:- Qualified teachers should be employed in schools. More incentives should be given to the teachers.
- Students:- The students should be encouraged to study chemistry through given them allowance.

### III. CONCLUSION

I believe that attracting more students into the study of chemistry requires action at all levels: school, university,

industry, government and the learned societies. Also implementing most of the recommendations will serve as a aid in solving most of the challenges face by the students in secondary and higher institution. Chemistry is a powerful tool for dealing with the present. It drives economic growth. It creates our options for the future. It is the key to our global competitiveness.

### IV. RECOMMENDATIONS

- Laboratories should be furnished with necessary equipments for practical and research work.
- Provision of generator for supply of electricity.
- prompt release of academic results, students should be notify of their examination results at the end of each semester.
- A well structured building to contain lecturers and equipments. There will be an upgrading of equipments by replacing worn outs and buying of new modern equipment.
- There should be an introduction of student industrial working experience scheme; this will broaden the knowledge and widening the scope of their learning.
- Provision of level coordinator and counseling unit in the department.
- Seminar on crucial topics and academics standing of all students should be done.
- The Teachers/Lecturers and student should have cordial relationship between them.
- Chemistry practical should be conducted along with teaching theory.
- A bursary scheme should be available to undergraduates studies chemistry level is relevant to the employment opportunities of the future – a science degree should develop the core skills, such as communication and the ability to work as part of larger team, that graduates will need whatever they go on to do.
- Yet it is clear that an inspiring teacher engaged with and motivated by their subject, is the springboard for many pupils' future choices. There should be a teacher training for chemistry graduates.
- Increase the attractiveness of career in chemistry teaching. For chemistry teachers to remain both inspired and inspiring they need to be given the support and opportunity to remain up to date.
- Developing student's interest and curiosity in chemistry by merely teaching them facts. We need to make chemistry relevant to their lives. One way of doing this, is talking about recent scientific developments and tracing these back to scientific principles and historical discoveries.
- Also chemistry could be taught through 'explanatory stories' which not only attach a contemporary relevance to teachings, but also place them within a historical and cultural context.
- There should be an online chemistry tutorial written for secondary school chemistry students.
- Teaching facilities are modern and interaction between student and teacher encouraged.

- Teaching should encompass a combination of lectures, accompanied by multimedia and practical demonstrations, tutorials and a range of laboratories.
- The school should be well equipped with computing facilities, and all chemistry undergraduates are given their own accounts, with full access to e-library.
- A number of schools of science scholarships should be available for students. The school also offers prizes at the end of each year for the best performance in various undergraduate Chemistry courses.
- Vacation Scholarships must be available for students who wish to spend some of their vacations gaining research experience.

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#### AUTHORS

**First Author** – Emendu, N.B. PhD, Chemistry Department, School Of Sciences, Nwafor Orizu College Of Education Nsugbe, Anambra State., e-mail: emendunnamdi@yahoo.com, 08036681472

**Second Author** – Okoye, C.M., Chemistry Department, School Of Science Nwafor Orizu College Of Education Nsugbe, Anambra State, Nigeria.

# Superior Traceability Machine for Shared Data in the Cloud

Mr.Rasal Kedar Jayesh \*, Dr. Gumaste S.V\*\*, Prof. Kahate S.A \*\*\*

\* Computer Engineering, Pune University, SPCOE, Otur, Pune, Maharashtra, India

\*\* Professor And Head, Department of Computer Engineering, SPCOE, Otur, Pune, Maharashtra, India.

\*\*\* SPCOE, Otur, Pune, Maharashtra, India

**Abstract-** Cloud is regular area to store information and imparted to different users. Yet, some framework issue or human lapse creates more issues about respectability of cloud data. Couple of systems has been intended to allow both information supervisors and public verifiers to effectively reviewing cloud information managers without getting to the whole information from the cloud server. Particularly, proposed system consider the undertaking of allowing an third party auditor (TPA), for the advantage of the information owner, to examine the reliability of the information/data put away in the cloud. Furthermore, this technique has the capacity perform a few inspecting undertaking in the meantime as opposed to verifying them one by one. This proposed algorithm utilize ring signatures to gage affirmation meta-information anticipated that would review the rightness of allocated data, likewise the Key Distribution Center (KDC) which is a piece of a cryptosystem planned to diminish the dangers characteristic in trading keys. With this technique, the ID of the signer on every block in dispersed data is kept private from Third party auditors, who have the capacity to successfully examine the appropriated data consistency without recovering the entire document. The system helps development, modification, and perusing information put away in the cloud, and it likewise bolsters traceability (following the fake user).

**Index Terms-** Cloud Computing, Public Auditing, Shared Data, Key Distribution Center, Traceability

## I. INTRODUCTION

CLOUD support manages enterprise-class facilities that provide a scalable, protected and efficient environment for users, at a significantly reduced minor cost due to the discussing nature of resources. It is routine for users to utilization cloud storage space services to work together with others in a team, as information discussing gets a conventional feature in most cloud storage space promotions, such as drop box and Google documents.

The reliability of information in cloud storage space, on the other hand, is subject to uncertainty and analysis, as information saved in an untrusted cloud can simply be missing or damaged, due to hardware problems and human mistakes [1]. To secure the reliability of cloud information, it is best to execute community audit by presenting a third party auditor (TPA), who provides its audit support with additional highly effective calculations and interaction capabilities than regular users. The initial provable data possession (PDP) procedure to execute community audit is

intended to examine the correctness of information saved in an untrusted server, without accessing the entire information.

For example, Alice and Bob perform together as a team and discuss a computer file in the cloud. The distributed computer file is separated into a variety of little blocks, which are individually finalized by customers. Once a block in this distributed computer file is customized by a customer, this customer needs to sign the new prevent using her public/private key couple. The TPA requires knowing the identification of the signer on each block in this shared computer file, so that it is capable to review the reliability of the whole file depending on demands from Alice or Bob.

Cloud Computing creates these benefits more desirable than ever, it also delivers new and complicated protection risks towards users' outsourced details. Since cloud service providers (CSP) are individual management organizations, information freelancing is actually relinquishing user's greatest control over the destiny of their information. As a outcome, the correctness of the information in the cloud is being put at risk due to the following factors. Initial of all, even though the infrastructures under the cloud are much more highly effective and efficient than personal computers, they are still experiencing the wide range of both inner and exterior risks for information reliability. Illustrations of failures and protection breaches of popular cloud services appear every now and then. Secondly, there do exist numerous inspirations for CSP some thing unfaithfully towards the cloud users regarding the position of their outsourced information. For illustrations, CSP could possibly recover storage space for financial factors by removing information that has not been or is hardly ever utilized, or even cover up data loss occurrences so as to maintain popularity [4]. In brief, although freelancing information to the cloud is financially eye-catching for long-term large-scale information storage space, it does not instantly offer any assurance on information reliability and accessibility. This issue, if not properly resolved, may prevent the successful implementation of the cloud structure.

## II. LITERATURE SURVEY

With cloud storage administrations, it is ordinary for information to be put away in the cloud, as well as shared over various users. Notwithstanding, public inspecting for such shared information, while safeguarding personality protection stays to be an open test. This paper [1], proposes the initially security safeguarding component that permits open inspecting on shared information put away in the cloud. Specifically, manipulating

ring signatures to figure the confirmation data expected to review the reliability of shared information. With this technique, the identification of the manipulate on every square in shared information is kept private from an third party auditor (TPA), who is still ready to openly check the reliability of shared information without recovering the whole file. This tests outcomes show the adequacy and performance of proposed scheme instrument when evaluating shared information.

Cong Wang [4], recommend a privacy-preserving public review system for information storage protection in Cloud Computing. Author implemented the homomorphic linear authenticator and random masking to assurance that the TPA would not understand any knowledge about the information content saved on the cloud server throughout the effective review process, which not only removes the pressure of cloud user from the boring and possibly expensive review process, but also relieves the users' worry of their contracted information leak. Considering TPA may possibly simultaneously handle several review sessions from various users for their contracted information, also additional increase this privacy-preserving group review method into a multi-user establishing, where the TPA can execute several review projects in a batch approach for superior performance. Comprehensive research reveals that this techniques are provably protected and highly powerful.

G. Ateniese, R. Burns, R. Curtmola, J. Herring, L. Kissner, Z. Peterson, and D. Song [6], targeted on the issue of validating if an untrusted server save client's information. Author(s) presented a design for provable information ownership, in which it is suitable to reduce the data file prevent accesses, the calculations on the server, and the client-server interaction. These scheme alternatives for PDP fit this design: They have a low (or even constant) expense at the server and need a tiny, continuous amount of interaction per task. Key elements of this technique are the homomorphic proven tags. They allow confirming information ownership without having access to the actual computer data file. Tests display that these techniques, which offer a probabilistic ownership assurance by testing the server's storage space, develop it realistic to confirm ownership of huge information sets. Past techniques that do not allow testing are not practical when PDP is applied to confirm ownership of considerable amounts of information. These experiments display that such techniques also encourage a significant I/O and computational pressure on the server.

R.L. Rivest, A. Shamir, and L. Adleman [7], have recommended a system for executing a public key cryptosystem whose protection lies to a limited extent on the difficulty of considering substantial numbers. In the event that the protection of this system ends up being sufficient, it allows secure interchanges to be set up without the utilization of dispatches to convey keys, and it likewise allows one to "sign" digitized records.

The protection of this framework requires to be inspected in more aspect. Specifically, the difficulty of considering extensive numbers really needs to be inspected nearly. The reader is asked to discover an approach to "break" the framework. Once the strategy has withstood all assaults for a sufficient time span it might be utilized with a sensible measure of confidence.

As storage-outsourcing services and resource-sharing systems have become well-known, the issue of effectively

showing the reliability of information saved at untrusted web servers has obtained improved awareness. In the provable data possession (PDP) design, the consumer preprocesses the information and then delivers it to an untrusted server for storage space, while maintaining a bit of meta-data. The customer later requests the server to confirm that the saved information has not been interfered with or removed (without installing the actual data). Nevertheless, the unique PDP system is applicable only to fixed (or append-only) data files.

C. Chris Erway, Charalampos Papamanthou [8], present a definitional structure and effective designs for powerful provable information ownership (DPDP), which expands the PDP design to assistance provable updates to saved information. Used a new edition of authenticated dictionaries based on position information. This research display that this slowdown is very minimal in exercise (e.g., 415KB evidence size and 30ms computational expense for a 1GB file). Proposed methodology also demonstrate how to implement this DPDP plan to contracted data file techniques and version control systems (e.g., CVS).

Dan Boneh, Craig Gentry [12], resented the idea of total signatures and developed a proficient total signatures plan taking into account bilinear maps. Key era, total, and confirmation oblige no cooperation. Author's demonstrated security of the framework in a model that gives the foe his decision of open keys and messages to fashion. For security, the extra limitation that a total signature is substantial just in the event that it is a conglomeration of signatures on particular messages is presented. This limitation is fulfilled normally for the applications as a main priority. All the for the most part, the imperative can be fulfilled by prep finishing general society key to the message before signing. Few applications for total signatures also discussed. Case in point, they can be utilized to diminish the span of declaration chains and decrease correspondence data transfer capacity in protocols, for example, SBGP.

### III. IMPLEMENTATION DETAILS

This paper also proposes Traceability Oruta, a privacy-preserving public evaluating component for imparted information in the cloud. Utilization of ring marks to fabricate homomorphic authenticators is considered, so that a Third party auditor (TPA) has the ability to review whole data respectability without recovering the entire data, yet it can't perceive who the signer on every one block is. Further utilized key distribution center (KDC) which is a piece of a cryptosystem expected to decrease the risk during key exchange. The subtle elements public auditing mechanism is presented. Every customer in the group has the ability to perform different operations, for example, insert, update and delete on a block, and figure the new ring signature on this new block in Modify. A verifier has ability to check whether a given block is marked by a group part in RingVerify. In RingVerify, people in general verifier reviews the accuracy of shared data by checking the proofs. Traceability performs following the fake users from getting to the information from the cloud.

In this system three parties are included: the cloud server, a number of users and a public verifier. The single user and various team users are the two types of users in the group. The first client initially makes distributed data in the thinking, and shares it with



team users. Both the unique customer and group users are partners of the team. Each member of the participants is allowed to availability and change circulated information. Shared information to its confirmation meta-information (i.e., signatures) is put away at cloud server. At the point when public verifier goals to analyze the dependability of shared data, it first conveys a audit task to the cloud server. In the wake of getting the audit task, the cloud server responds to the group verifier with an auditing evidence of the ownership of the responsibility for data. At that point, the group verifier checks the accuracy of the whole information by confirming the rightness of audit proof. Basically, the strategy of community audit is a challenge and-response method between a community verifier and the cloud server.

**(a). Design Objective:**

This system should be intended to attain to the following properties:

1)Public Auditing: A Third party Auditor (TPA) has the capacity freely check the correctness of shared information without downloading or recovering the whole information from the cloud, in the interest of users request.

2) Correctness: A Third Party Auditor can effectively confirm shared information integrity.

3) Traceability: Tracking the fake users, this is attempting get to the information from the cloud.

4) Identity Privacy: A public verifier can't perceive the identity of the signer on every one block in imparted information during the auditing procedure.

5) Key Distribution Center (KDC): It is utilized to reduce the risks during key exchange.

**(b). Traceability (Tracking the fake user):**

1) All the attributes and points of interest of the general customer are kept up in the log files, by verifier.

2) When the client login; the verifier checks the log files with the existing log files. If the details matches with existing records then it allow the users, and if the detail does not coordinate with existing files then some security questions are asked.

3) If the answer of security questions is right, then it permits the users and if the answer isn't right, it is considered as fake users and it block that users from getting to the information from the cloud.

**IV. HOMOMORPHIC AUTHENTICABLE RING SIGNATURES (HARS)**

**1. Construction of HARS:**

HARS contains KeyGen, RingSign and RingVerify algorithm. Every client/user in the group creates his/her public key and private key combines in KeyGen. In RingSign, a user signs a block with his/her private key and all the gathering group members ' public keys.In RingVerify, an public verifier has the capacity check whether a given block is marked by a gathering part or not.

**2. Scheme Details:**

Let Consider G1, G2, GT are the multiplicative cyclic groups of order p. g1, g2 are the generators of G1 and G2 respectively. Let bilinear map as e: G1 × G2 → GT, and ψ: G2

→ G1 be a computable isomorphism with ψ (g2) = g1. There is a public map-to-point hash function H1: {0, 1} \* → G1.

(e, ψ, p, G1, G2, GT, g1, g2, H1) these are the global parameters. d be the total numbers of users in group. Let U denote the group which contains all the d users.

**3. Security Analysis of HARS:**

Here, this scheme studied some important properties of HARS which including the correctness, unforgeability, block less verification, non-malleability and identity privacy.

Theorem: Given any block and its ring signature, a verifier is able to correctly check the integrity of this block under HARS.

Proof: Taking into account the properties of bilinear maps, correctness of this equation can be demonstrated as follows.

$$\begin{aligned} & \prod_{i=1}^d e(\sigma_i, w_i) = e(\sigma_s, w_s) \cdot \prod_{i \neq s} e(\sigma_i, w_i) \\ & = e((\beta \div \psi(\prod_{i \neq s} w_i^{a_i})) 1/x^2, g_2^{x_2}) \cdot \prod_{i \neq s} e(g_1^{a_i}, g_2^{x_i}) \\ & = e(\beta \div \psi(\prod_{i \neq s} g_2^{x_i a_i}), g_2) \cdot \prod_{i \neq s} e(g_1^{a_i x_i}, g_2) \\ & = e(\beta \div (\prod_{i \neq s} g_2^{x_i a_i}), g_2) \cdot \prod_{i \neq s} e(g_1^{a_i x_i}, g_2) \\ & = e(((\beta \div (\prod_{i \neq s} g_2^{x_i a_i})), \prod_{i \neq s} (g_1^{a_i x_i}, g_2))) \\ & = e(\beta, g_2) \end{aligned}$$

**V. RESULT AND DISCUSSION**

Efficiency of Traceability Oruta is evaluated in the below experiments:

(i). Performance of Batch Auditing: at the point when there are different auditing verifications, public in general verifier can enhance the efficiency of confirmation by performing batch auditing. The following Table I shows the comparison between separate auditing and batch auditing and the Figure 2 shows the graphical representation of Table I.

(ii).Traceability Oruta: Table II shows the comparison between Provable Data Possession (PDP), Oruta and Traceability Oruta techniques.

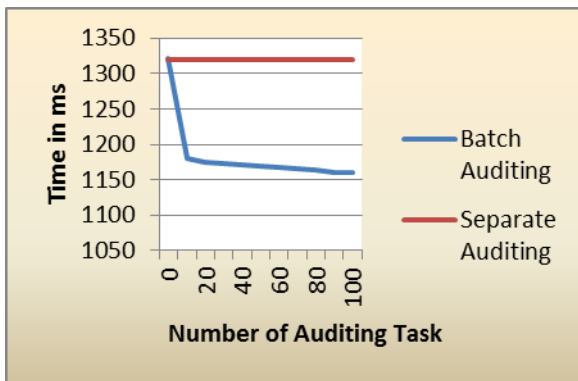
**Table II. Comparison among Different Mechanism**

Number of Auditing Task	Batch Auditing	Separate Auditing
0	1322	1320
10	1180	1320
20	1175	1320
30	1173	1320
40	1172	1320
50	1170	1320
60	1168	1320
70	1165	1320

80	1163	1320
90	1160	1320
100	1160	1320

**Table I. Impact of auditing task on batch auditing**

	PDP[9]	Oruta	Traceability Oruta
Public Auditing	✓	✓	✓
Data Privacy	✗	✓	✓
Identity Privacy	✗	✓	✓
Traceability	✗	✗	✓



**Figure 2. Shows Comparison of Separate Auditing and batch auditing.**

**VI. CONCLUSION AND FUTURESCOPE**

This paper suggests Traceability Oruta, a protection saving public auditing strategy for appropriated information. Ring signatures are used to make homomorphic authenticators, so that a community verifier has the capacity audit circulated data integrity without getting to the whole information, yet it can't perceive who is the signer on every block moreover it has the ability to audit shared information integrity without recovering the whole data. To improve the execution of affirming a several review projects, it further augment this Oruta with key distribution center (KDC), which reduces the risk inborn in exchanging keys furthermore proposed traceability over Oruta (tracking the fake users), because of this data security in cloud is improved. Data freshness is one of them; exhibit the cloud has the latest version of shared information while up till now preserving identity privacy.

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**AUTHORS**

**First Author** – Mr.Rasal Kedar Jayesh, Computer Engineering, Pune University, SPCOE, Otur, Pune, Maharashtra, India, [kdr.rasal@rediffmail.com](mailto:kdr.rasal@rediffmail.com)  
**Second Author** – Dr. Gumaste S.V, Professor And Head, Department of Computer Engineering, SPCOE, Otur, Pune, Maharashtra, India., [svgumaste@gmail.com](mailto:svgumaste@gmail.com)

**Third Author** – Prof. Kahate S., SPCOE, Otur, Pune,  
Maharashtra, India, sandip.kahate@gmail.com