HEALTH INFORMATION EXCHANGE PROBLEMS WITHIN DIFFERENT HEALTH ORGANIZATIONS

INTRODUCING SUPER CLINIC

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Title: Health Information Exchange Problems within Different Health Organizations, Introducing Super Clinic

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Abstract

The growth of e-health system has influenced the way health organizations conduct their business. Communication between these systems is one of the most significant factors since a more efficient communication system can improve an organization performance. Nowadays the health organizations make a lot of investments to deploy a suitable information and communication technology to meet their goals.

This study investigates the health information exchange within different health information systems. We first carried out a theoretical study to find out the relevant concepts by reviewing the related literature and analyzing them. As a result of our theoretical study we investigate and redesign the basic model of the "Super Clinic" as a new model for health information exchange system. Then we conducted an empirical study to validate the result from the theoretical study which helped us to narrow down our research area. We revised our proposed theoretical model by the lesson learnt from our empirical study results. Three interviews were conducted with experts and the outcomes were analyzed using comparative analysis. These interviews allowed us to outline the most important factors of successful health information exchange systems (i.e. "Super Clinic").

They also helped us to design a central hub (i.e. "health Hub") for communication and information exchange between different information systems. This revised model of Super Clinic (with the central hub) could be going under more investigation in future works.

Keywords: Health information exchange (HIE), Communication in health organization, Super clinic, Regional Health Information Organizations (RHIOs)

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1 INTRODUCTION

The introduction part will provide a background explanation of the topic, following by describing a problem and then an argument about why this area needs further study. After that it described the purpose of this study.

1.1 Background

Health information systems dated back to 1970's. It was started with nursing and medical informatics(Cesnik, 1996). World Congresses about medical informatics which is began its activity in1974 in Stockholm has lots of papers and conferences that shows the progress in health informatics till now. There has been lots of studied since then regarding healthcare practice supported by information and communication technology (ICT), however the most of them examined a specific character of the system rather than the communication between them. For instance Milton C. Weinstein conducted a study to identify the main factors of cost-effective allocation in health care organization, he assessed using of IT systems in healthcare from economical point of view (Weinstein, 1990). Few examples of e-health solutions in the organization are: health care management systems, health information systems, patient-centric e-health solutions, electronic prescribing systems and telemedicine systems.("Information Governance - e-Health - Accenture,") .

The dramatic growth of e-health system has influenced on the way which health organizations conduct their business and one of the most significant factors is the communication between these systems, therefore a proper e-health strategy and direction for more efficient communication can benefit an organization by increasing its performance. Nowadays the health organizations make much more investment to use proper information and communication technology to meet their goals. The aim is to improve the quality and accessibility of health records and health care systems for the patients, the professionals and the most of the stakeholders while considering reducing the costs. In 2002 Lappas pointed out that one of the most considerable challenges in healthcare systems is to manage the information effectively, so it may lead to have a better information exchange between different departments (Lappas E., 2002). Later Craig F. Feied and colleagues studied on the clinical information systems and concluded that there is a necessity to adopt a comprehensive information system to support the organization with proper access to all the relevant data, so it would also provide the appropriate data for future decision making (Feied et al., 2004).Although the medical information systems (MIS) have been helped the health care system a lot but still there are some deficits in communications between different information systems. In fact one of the very first steps to have an efficient communication is to have a proper health record of patients and other related issues. Burton et al discussed about the necessity for electronic health records, they stated that the systems using paper-based record, memory-based or telephone-based management were becoming ever more untrustworthy and were not well-matched for a good quality care and assessed the healthcare systems from perspective of using electronic health record (Burton, Anderson, & Kues, 2004).Also Bomba D. and colleagues conducted a study which compared the Australian and Swedish patient's attitudes toward the computerization of medical records, they concluded that generally there were positive attitudes towards the computerization in two countries, while there was a common concern in the two groups regards of the security of their information (Bomba, Svardsudd, & Kristiansson, 2004) .

1.1.1 Why information exchange is a necessary issue in health organization?

Studies show that there are some certain communication problems between different health information systems (HIS). As the specialty of health care are increasing and there are lot of health professionals are emerging, the healthcare processes of a patient will be more distributed among the different allied health care, general practitioners and other professionals and therefore it leads to improve the transfer of the patient information and also communication between different information systems. Accurate, safe and timely transmission of patients' health information in all fields such as personal details up to diagnostic findings and treatment will improve the health care systems in hospitals and also primary care (Kripalani et al., 2007) . While, delayed communication and lack of accuracy in information transfer between different HIS may lead to have substantial problems during the whole process of care, it may also decrease the patient satisfaction as well(Coleman & Berenson, 2004) .Collaborative working in health system is an essential part. Although there are lots of improvement in using ICT tools in health care systems but still there is need to do some enhancement to have efficient and effective information transferring between health professionals (Gennari, Weng, Benedetti, & McDonald, 2005).

In this study we try to evaluate the present communication procedure between GPs and other health care providers and identify the problems and deficits of patients' information exchange in a worldwide view. Patients' information includes: patients' personal information and their health history such as diagnostics and treatments. In the following section we described research design and methods. Then we carried out a literature review as a theoretical analysis on the previous study in this field about the communication deficits in health organization, we also discussed the problems regarding information exchange between different information systems. Then we tried to explain some example of current HIE systems in some countries such as Australia and US, and studied them in order to have some ideas to improve the deficits. We tried to find roots of the problems and then suggested suitable approaches for improving those issues. It may lead to introduce a very simple design for information exchange based on the new system called "Super Clinic", in Australia. Super Clinic System is a new system that is going to run soon in Australia for communication among health organization. We started to collect data and do an empirical study to assess the result proposed from the literature review (the simple design), in this phase we will conduct some in-depth interview with related experts, and try to validate the design and mapping it to the reality. Therefore the simple design for a health communication HUB would be modified through these steps.

1.2 List of Relevant Literature Sources

Relevant literatures are selected through several books, e-books, journals, and conference papers. Online databases are searched at the University of Borås, Libraries, and the Internet. Also relevant literatures are result of browsing available and related key organization webpage and also some previous related thesis. We have to mention that "Super Clinic" is a very new concept and still there is no paper or literature about that specifically so in order to study and learn from this system we tried to interview and gather information from the expert involving in "Super Clinic" project. The similar information exchange system in US "RHIO" was studied as well. RHIO stands for Regional Health Information Organization and based in USA. It is one of the best key words to search for similar studies. Another one is CDMNET which is a web-based tool for proper information sharing in health care systems. So in theoretical study we mainly conducted the study on different health information exchange

systems in different countries. The key words for searching were: communication within different information systems, health hub, super clinic, healthcare networks, information and communication tools in HIS, information transferring, organizational information flow, organizational communication, and organization structure. The main databases are: journal of the American Medical Association (JAMA), Australian Journal of Primary Healthcare; Computer Based Medical system (CBM), International Journal of Medical informatics, the American Medical Informatics Association (AMIA), Journal of Medical Internet Research, Electronic Journal of Business Research Methods 2011, Australian Health Journals and The Medical Journal of Australia.

1.3 Problem Statement

Communication behaviors between healthcare collaborators are complex, as it is mentioned earlier in most of HISs transferring information between different information systems is a vital and also possibly safety-critical part of the whole procedure which is ignored by information systems and technology usage (Gennari et al., 2005). For instance, most of the time a single user can retrieve information from the IS or decision-support system support an individual user mostly to make their health decision. Although most electronic health record (EHR) systems are intended to be used by multiple users, but they often help little in acknowledgement of the many message tasks and related decision making (Coiera & Tombs, 1998). We will discuss that there should be a proper systematic design between different HISs which can address the necessities of group communication among GPs and other allied healthcare as the users. And they can do a collaborative work and communicate with each other more efficiently.

1.4 Research Question

The main research question in this project is:

- What factors make health information exchange better among different health organizations by implementing “Super Clinic”?

The main research question is divided into some sub-questions so it can keep in-depth knowledge about the main research question.

- How this new strategy (i.e. using Health Hub) can reduce patient journey and increase their satisfaction of the care systems?
- How should be informatics policy characteristics defined about implementing HIE and accessing data in that?
- How data and health information should be categorized in order to improve the efficiency of the HIE?
- How we can improve the level of viability of the Super Clinic?
- How we can minimize the potential IT problems to the new HIE systems (i.e. Super Clinic)?

1.5 Research Purpose and Expected Result

As it is described above the process of electronic sharing patients' health information among different health providers, is called health information exchange. Although these systems is implemented in many countries specially developed countries but studies show that still the usage of HIE systems is low and it is not as high as expected(Vest, Zhao, Jaspserson, Gamm, & Ohsfeldt, 2011). One of the purposes of this study is to verify the issues associated with this phenomenon.

In addition to that this study tries to indentify some current problems and deficits in communication between different health information systems, and then tries to address some of these current problems. Actually we've tried to outline the weak points and deficits of sharing health information in current systems, in order to do so; we explored the communication problems among HIS in different countries. After that we tried our best to propose solution and finally a simple design of communication in order to improve the transferring patient's information in a health HUB between different information systems. So HIE would probably being used among HISs more effectively. The study will try to enhance and improve the efficiency usage of information and communication technology through introducing the modern healthcare which using health hub or "Super Clinic". They will hopefully demonstrate the effective use of ICT. This health hub may include different health information systems which can make patients' medical records available to the practitioners who are part of it. We will study on a model for such hub and try to do a simple design for this information transferring. It worth to mention that this study can provide health key stakeholders and the ones who make the health policies a better view and also may help patients and doctors about the benefits of a more accurate and timely information exchange and communication.

As a summary to the purpose of this study; the expected results are to:

- Determine the issues which can increase the usage of HIE among health providers.
- Identify the communication deficits in HIS and present the roots of communication problems faced during a process and their consequences.
- Develop a simple model based on the theoretical concepts, for a health hub. And identify the patient's information and massages which should be shared in that hub.

1.6 Delimitations

As it is mentioned earlier "Health hub" or "Super Clinic" are relatively new concepts in this context and it is going to implement in soon future in Australia, therefore investigating "Super Clinic" is more hypothetical rather than study a real existing one, so we as researchers faced to lack of users who already have experienced within Super Clinic and the health hub, so the empirical study in this project is limited to some interviews and discussion with some expert who has a main role in designing this health hub. It is worth to mention that "Super Clinic" is a big project in Australia; the main efforts of the authors are to investigate and analyze the similar system in order to improve the "Super Clinic" from informatics aspect. The theoretical study is bounded to the literature on the similar project in other countries, mainly RHIOs in the US, and CDMNET. We have to mention that also communication in this super clinic will be assessed based on textual analysis and there is no statistically calculation or measured.

Another important limitation in this study is the outcomes of this study will be limited in relation to generalizability. Since there are many different HIE systems and the way they are

implemented are different, therefore apparently not all kind of HIE systems are studied in this research.

1.7 Target Group

An obvious target group is researchers within health informatics area and communication strategies between HISs. The result presented in this thesis may be used as a very simple design or background for further improvement in this field and a guide to having better health information exchange within different health systems. Also another audience for this project is healthcare organizations which are using HIS. This research could be very useful for the staffs and GPs and other partners in the hub as well.

1.8 The Background of the Researcher

The background of the author is basically from informatics. The researcher finished her bachelor in software engineering, and her final bachelor dissertation's topic was: "Designing and Implementing Virtual Shopping by ASP.net". She came into information systems and business process in her master study in Boras University and her research and study about the information systems limited to her assignment and projects for modules during her master course. She immigrated to Australia after her master study in Sweden and found the "Super Clinic" an interesting and new phenomena related to her information systems academic background. Therefore the author cannot trust her own experience related to the research topic and just support her knowledge by reviewing related literatures and through theoretical study. It is good to mention that she has an experience of working in health organization project as an internship student during her bachelor and this background could be useful for her during this study.

1.9 Thesis Outline

Introduction	Introduction part is started with a background to the research scope and then the main source for textual analysis is presented. It is followed by presenting research questions and the statement of the research problems. The authors also described a little about my background in this area and the expected outcome from the study.
Research Design (Method)	In the research design part, The author explained the design which she used to conduct my study. It describes the nature of my study which is qualitative and then includes the argument for the method of collecting data, which is in-depth interview in empirical part and textual analysis in theoretical study.
Theoretical Analysis	The main concepts of this study were presented in details. In this chapter the author tried to present the framework theory for the analysis. The related papers, similar studies and research were read and written down, which is means textual analysis. In this chapter the concept of Health Information Exchange (HIE) was explained thoroughly and then the development of HIE in different industrialized countries was studied. The RHIOs (HIE system in US) was studied and then a little about others such as CDMNET. It is tried to present the current

	problems and deficits in current health information exchange systems and then analyze them to find the reasons of the problems and the possible solutions to them. As an outcome of this part we propose a simple design as a new way of thinking to the problems. Theoretical analysis was conducted in this chapter.
Empirical Study (in-depth interview)	In this chapter the outcomes and the findings from the theoretical part would be verified in interviews. Interviews were conducted in two phases, the first phase was when we studied the related literatures and concluded the problems and analysis them, so in that phase we just did a short interview with an expert involved in HIE project and verified the process of health information exchange more. It helped us to propose a simple design as new way of thinking. The second phase which is the main one was conducted after completing the theoretical study and offering a possible change to the current systems which may improve the HIE process. The findings will be verified and validated through the interviews. And we tried to map them to the real hub which will be used for new HIE process in NSW.
Results	In the first section of the result chapter, the process of knowledge creation in health communities was discussed more in details. The results were also illustrated in a model. A summary of the factors that had been identified through the study were presented in this chapter. We have to mention that the result of the theoretical study formed a base for the empirical study.
Analysis	This chapter includes an analysis of the thesis findings including the interviews outcomes and the review on the design model from theoretical study.
Final debates	In this chapter the thesis will be discussed totally and the conclusions are illustrated. We wrote a discussion about implementing of the outcomes in related areas in future. It is following with an evaluation on the chosen method and the quality of the study. And finally it is ended with some ideas for future research.

The following picture illustrates the flow work in this thesis:

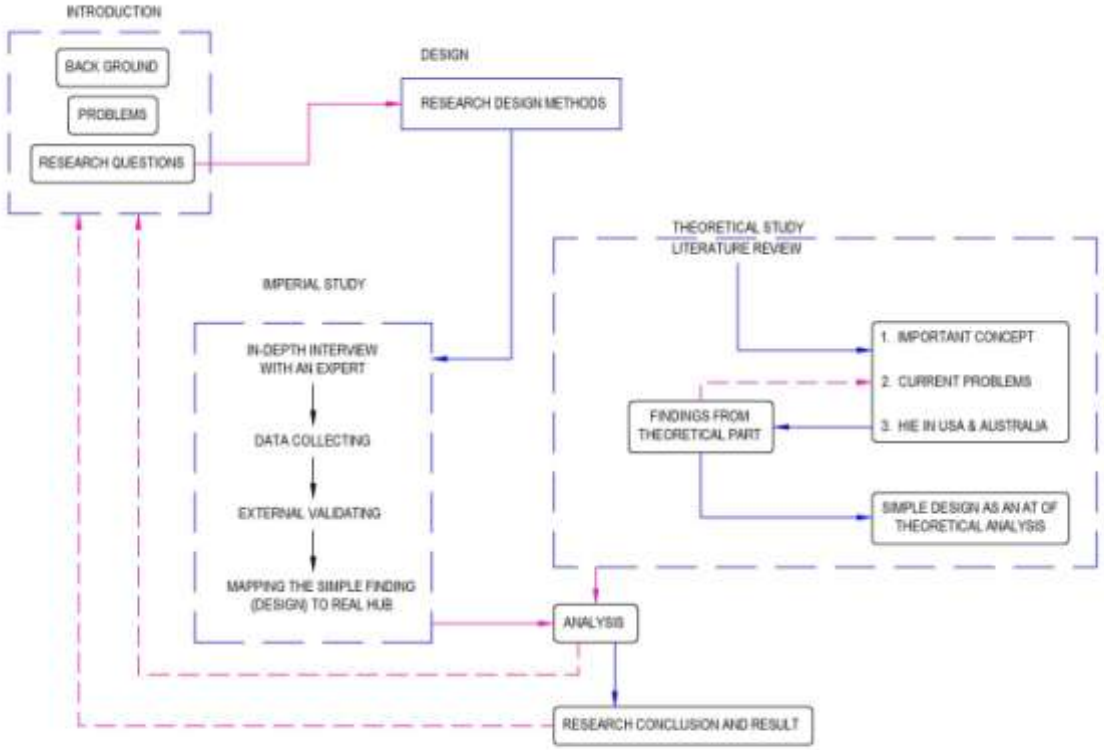

Figure 1 Thesis flow work diagram

2 RESEARCH DESIGN

John We Robbins stated out in his excellent article that " theory without practice is dead and that practice without theory is blind"(Robbins, 2005) . Following chapter outlines the scientific standpoint and epistemological position which has taken in order to design this study. Then it will give an insight into this research approach and the method which was used to collect data, analyze results, evaluate and presenting the research results.

Bryman defined "Research Design" as a tool to provide research a framework in order to collect and analyze data. He mentioned that research process and the priorities given to the different phase in a study is affected by the choice of research design. He also stated a simple definition for "Research Method" as a technique of collecting data, the chosen method has influenced on choosing the type of instrument for collecting data (Bryman & Bell, 2007).

In this section of research, we have to develop a logical model and design in order to do the research based on that so it will become the theory for the study against other similar research. Research question will be refining during research as well, and they will use as guides to the method for collecting data. Researchers usually choose their specific design and implement it, while considering the most proper method to meet the functional issues of a specific investigation (Rocco, Bliss, Gallagher, Pérez, & Prado, 2003).

As an abstract to the method part the below table shows the research design briefly:

Scientific approach	Inductive
Epistemological position	Interpretivism
Ontological position	Constructionism
Data collection method	In-depth interview and textual analysis
Research strategy	Case study/ interviews
Data analysis	Comparative analysis
Methodology	Qualitative

2.1 Scientific Perspective

2.1.1 Epistemological consideration:

Interpretivism and positivism are the two main scientific positions in research. Positivism is the one based on social facts, the researchers and humans have passive role during the research. The research is value-free and the researchers' own beliefs are not considered in the study (Bryman & Bell, 2007) .In the opposite side there is interpretivism where is more about pre-understanding, the researchers have to form their own opinions about the topic. So interpretivism could be an approach that makes it possible for researchers to interpret a text as the data in the best possible way according to their own viewpoints. This study is based on document research and empirical evidence that have been collected, organized and interpreted by texts. It argued for choosing interpretive perspective since this kind of view has more considerable benefits for information systems studies and research especially when it is applied to the study of organization (The SAGE encyclopedia of qualitative research methods / Lisa M. Given, editor, 2008). In addition to that, the goal of this research is to make a comprehension knowledge which may lead to deep understanding of better communication process in health information systems. The process of interpretation is a large part of this research. Thus, we assume an interpretivism position in our study.

2.1.2 Ontological consideration:

As Bryman pointed out in his book it is necessary for researchers to make their ontological position clear, because this issue has effect on the research question(s) and the performance of the study(Bryman & Bell, 2007).
The answer to the question about business and organizations survive independently from their individuals, who work in them; argues ontological position. Social ontology is about the nature of social entities. Bryman identified some sort of question which their answers discuss the ontological consideration, the questions are as below (Bryman & Bell, 2007):

- *"What sort of object exists in the social world?"*
- *"Does social entity exist separately of our perceptions of it?"*
- *"Are social realities constructed by social actors or external to them?"*

Objectivism and constructivism are two of ontology perspectives. Objectivism is the one in which the social phenomena and their definitions are seemed independently from the social actors, it entails that social categories exist separately from actors (ibid).

In the other hand we have constructivism, which in it, social phenomena and their definitions are in the process of generating continually by their actors, in constructivism position, social phenomena are generated through social interaction. The researchers' can have their own explanation of social world as constructions (ibid).

Based the thesis nature, we decided to connect our ontological view to constructionism. Although our epistemological view may include potentiality of objectivity view but we believe that it is impossible to perceive a phenomenon fully objectively by an individual. This study is about the information exchange process in health organizations; although we think the ontological position in this study does not have heavy value but since different people may recognize concepts in a different way so it is important to clarify ontological position. Accordingly we will explain the important concept related to this study in the first part of theoretical study section (see part 3.3).

2.2 Research Approaches (Qualitative or Quantitative?)

Creswell stated out three kinds of approaches in research design: Qualitative, quantitative and mixed-method approaches. He also pointed out the criteria for selecting one of these approaches, he stated out that in terms of choosing one of these approaches rather than the other we have to consider the factors such as: research problems, the research questions, the experiences of the researchers and the target group of the study (Creswell, 1994).

Research which conducted with interpretivism approach can have qualitative or quantitative data. When researchers start to study a subject which is not easily to separate into different entities or they star to observe a process and its factors dynamically rather than a static study, qualitative method are more helpful(Kaplan & Maxwell, 1994). Since we want to study the health information exchange development process dynamically and analyze it continuously to help the process improve therefore we have chosen the qualitative methods.

Qualitative data is explanatory and is more about meaning and understanding from words and concepts. In the empirical section we will conduct an in-depth interview; therefore my data collection is basically interviews and literature review. These data are in qualitative type and needs to be analyzed in qualitative way. Considering the characteristics of the interpretivism perspective and also the research purposes, it seems that the qualitative research is appropriate in order to find the answers of research questions, because the expected results of this study are mostly in the textual form. We will conduct three interviews with experts in this study area who also may take part in the Super Clinic project in Australia. This will help me as a researcher have better understandable issues of communication and information exchange. There is no numerical prove or any quantitative finding to answer the main question. Instead their research is concentrated on finding a way to enhance the communication within different HIS in a social context.

The aim of the qualitative studies is to develop concepts in the research area which lead to understand a social phenomenon in natural setting, it has more emphasis on meanings and the view of the all participants(Pope & Mays, 1995).

The other method which could be considered in my method choosing step is mixed methods; in this method the researchers mostly based their knowledge on claiming pragmatically, such as consequence-oriented or pluralistic. This method use strategies for collecting data sequentially or parallel in order to understand the problem statement in its best way. The final data in this kind of research includes both quantitative data (numeric information which gathered on instrument mainly) as well as qualitative ones (text information which gained from interviews or questionnaires or etc) (Creswell, 1994).

As a summary to this section, we assume the following features of the qualitative study as our perspective to this thesis, these features identified by Bryman:

- ✓ Interpretivism epistemology: perceiving the subjective definition held by the actors.
- ✓ Data collection methods: interviews and documents.
- ✓ Theory will be come out from data which means inductive approaches.
- ✓ Constructionism ontological position.

2.3 Research Strategy

As Bryman stated in his book there are five types of research designs to conduct a research in the qualitative methodology. These five are as following:

- Experimental: In which the researchers do their experiments on random subjects and control groups, they do a pre-testing on both groups and then variables which are independent will be influenced while the others are held stable; then there should be a post-testing and finally the differences between each group changes will be analyzed and computed based on variables changes(Bryman Alan, 2011).

- Cross-sectional: In this type of research several cases and objects are examined and investigated at only one point of time; variables also are more than one, and the objects examined on several variables to find out a pattern associated to their behavior (ibid).

- Longitudinal: One sample will be under investigation through several occasions in this kind of study. It usually used in business research to map the new changes (ibid).

- Case study: In this type of study which is very common in qualitative communication information systems studies, particular event, person, community or organization will be go under detailed analysis and investigation. We have different types of case, such as: critical, extreme, exemplifying, unique and revelatory (ibid).

- Comparative: The researchers use same methods to evaluate more than one different case. It is typically made up of several case studies. And usually used in cross-cultural

comparisons. An important point in this kind of study is about finding samples to compare and describing the research instruments (ibid).

Also Creswell reported the strategies approach connected to the qualitative research in his design research book. He pointed out that during 1990s the type and amount of approaches to qualitative researches became more clearly defined. Creswell pointed to five main strategies associated to qualitative research as followings (Creswell, 1994):

- Ethnography: it is about studying a whole cultural group in its own natural way; this strategy is conducted over an expanded period of time through gathering observational data. The procedure in this kind of research is flexible and usually contextual responses to live phenomena (ibid).

- Grounded theory: the researchers in this kind of study attempt to derive a comprehensive and conceptual theory of a process. It is usually a general theory for that process. The process can be a process of a system, process of an event, action or relation founded in the research participants. The grounded theory contains a predefined phases which are executed carefully to promise a good theory as the result (Borgatti, 2005).

- Case study: there is an in-depth investigation in an issue, process, event or etc in the case study strategies. Researchers would define boundaries to the case in terms of time and activity, and then they start to collect data through several data collection methods during a period of time (Creswell, 1994).

- Phenomenological research: in this type of study researchers focus on individuals' experiences relating to a phenomenon, these experiences described by details through the study. The main factor of this sort of study is about its "live experiences", it makes this kind of research a method as well as a philosophy, which is made up of several related small subjects studied during an extensive process in order to build up a new pattern to them (ibid).

- Narrative research: it is kind of qualitative research strategy in which the researchers gather information about persons lives. Narrative investigation employs field texts, specially stories and autobiographies of individuals, family stories and etc, to study and find out the way that the sample community builds meaning in their lives. This kind of study usually used in field of organizational study, knowledge theory and education studies. The data gathered then retold by the researchers to a narrative chorology (ibid).

2.3.1 Why case study?

Choosing case study as the research strategy basically depends on the research questions. Typically the questions which seek to explain a current issues (how? or why?) are more relevant to case study(Yin, 2008). Case study let the researchers keep the comprehensive and meaningful factors of a real event which is occurring at that moment (ibid).

According to what Yin stated about case study and since our research question which are mainly about "how" and "why" and also the nature of this study, we have chosen the case study as our research design, collecting data method will be in-depth interview and documents.
Bryman stated out that the most important issues to concern about case-study is its transferability (external validity), because it is mainly a case therefore generalization of findings would be impossible; although many researchers discuss that the point in the case-study research is to investigate one specific phenomena rather than a general one (Bryman Alan, 2011).

Our research strategy is as following, at the first step, based on the case that we are going to investigate (which is the information exchange among health organizations), we started to study the similar studies and read the related papers and literatures, we tried to analyze them and find out the week points and strength points of each system. Then review those again to collect and summarize the existents solution. Then according to the literatures review and the textual analysis and based on the advantages and disadvantages of the previous similar works, we tried to suggest a new way for communication among different HIS. We inspired this design from the first interviews and textual analysis. The result of the theoretical study would answer to the research questions to some extent. Since the theoretical study cannot cover all the points of our study and there still should be some point regards to the finding which is still conceal, so it is needed to conduct an empirical study. The empirical study includes in-depth interviews with experts to refine the findings again and validate through the interviews, so validity issues are addressed basically during gathering of data in interviews and analysis. We also tried to map the new design to the real Health Hub in NSW. Kaplan et al stated out with using qualitative methods and running in-depth interview researchers can achieve to some parts and point of views that other methods can not reached (Kaplan & Maxwell, 1994). Additionally after literature reviews and textual analysis on the similar subjects, we found that the most common method in this area of study, for the empirical part is interview with experts.

2.4 Data Collection Procedures

As it is mentioned earlier Bryman defined "research method" as simply the techniques for data collection while the research design is a kind of framework for conducting the study (Bryman & Bell, 2007). During the data collection procedure in any studies, researchers set up some boundaries for their studies. It would be helpful for the researchers to consider a wide variety of possibilities for collecting data in their research, and choose the most proper one among them. According to Bryman's book about research design, we have five types of research method for data collection in qualitative studies:

- Participant observation: which typically been used interchangeably with ethnography. Some scientist mentioned the ethnography as a research design; not a method for collecting data (Bryman Alan, 2011).

- Qualitative interview: includes structured interviews, semi-structured (in-depth interview) and un-structured interviews (ibid).

- Focus group: a group of people are chosen to ask and investigate their ideas, beliefs and perception toward a specific issue, the issue can be a product, systems, service or etc. The procedure of investigating is done through an interactive environment among the focus group which the members are free to talk together (ibid).

- Conversation/discourse analysis(CA or DA) : are two similar methods for study of social interaction ,verbal analysis, talk and communication (Wooffitt, 2005).

- Documentary analysis: or textual analysis is simply about related previous published materials and writing them down in order to analyze and present the new findings and perspectives (Bryman Alan, 2011).

So when it comes to qualitative research, we have various methods for gathering data, such as: observation, interviews, and textual analysis. Among these methods interviews and focus groups are the most common ones especially in healthcare researches (Silverman, 2009).

2.4.1 Interview (primary data)

One of the most common methods for data collection which is used in qualitative research is interview. Structured, semi-structured (in-depth as kind of it) and unstructured interviews are three basic types of research interviews.
Structured interviews are, actually a kind of questionnaires where the bunch of questions are predetermined by the researchers and will be asked verbally. These kinds of interviews are conducted with the same predefined questions and the same order. Therefore structured interviews are mostly easy and fast to manage. One of the limited points in this kind of interview is they mainly need specific participants as an interviewee to reply the questions(Gill, Stewart, Treasure, & Chadwick, 2008).

there is no pre-structured in unstructured interview and no pre-determined ideas or questions. This kind of interview are simply beginning with an opening question, and then following process would be based on the initial replies, the weak point of unstructured interview is about time. They are usually take lots of time to manage and run; they generally considered when special depth in one field is needed or when the subject area is very unknown to participant and researchers(Gill et al., 2008).

The third one is semi-structured interview that includes some main question in order to identify the scope to investigate, while it lets the participants to move away in order to provide more details and new ideas; this kind of interview is very common in health care

studies (Gill et al., 2008). Since our study needs some expert related to the subject so this kind of interview will be conducted in-deathly. In-depth interview is kind of semi-structured interviews contains intensive interview with experts to investigate their ideas and perspectives on an specific issue (Boyce & Neale, 2006).

We will ask the interviewee about their practices, knowledge and expectations associated about the findings from theoretical study and their opinion on the results from theoretical part.

2.4.2 Documents (secondary data)

Beside the primary method for collecting data, usually researchers organized a secondary method as well to support and facilitate the primary ones. Primary data is the one which gathered directly by researcher specially in order to investigate a specific purpose in the research, in the other hand we have secondary data which are gathered by someone else and it is used for other intended points; using secondary data allows the researchers achieve to their purposes in a shorter amount of time to collecting and analyzing the primary data(Windle, 2010).

Secondary data has some advantages for the researchers; it is cost effective and efficient, the researchers usually save time and money in the process of secondary data collection (ibid). It also identifies some new challenges for the researchers. The disadvantages of using secondary data are about the process of their collection which is not usually revealed to the researchers and also most of the time the data was not collected for the same intention (Boslaugh, 2007).
Through analyzing previous documents related to specific phenomena, researchers can gain historical knowledge. Using documents as a method for data collection may lead to have some advantages, although there are weak to present the individuals' ideas and beliefs but they are very useful in understanding the situation and the field of study (Marshall & Rossman, 2011).
It is important to consider the time and the context of the document in order to be related to our research field and the materials are up-to-date to some extent. Also there is need to pay attention to evaluation of the documents by others.

Creswell stated that the documents may be not accurate or incomplete, and also the ideas and points of views can be different within different people (Creswell, 1994). There is another limitation to using documents as secondary data; researchers mainly need to investigate in hard-to-find places for the key materials and information (ibid).

As summary to this part, in-depth interviews are proper one for data collection on individual's point of views and experiences (Liamputtong & Ezzy, 2006). In our study according to the topic and the research design, we have chosen the in-depth interview as our main method to collecting our primary data and external validation of the findings would be done through the interview with the experts as well. Our secondary data is document analysis.

2.5 Data Analysis Procedure

Procedure of data analysing may include several elements; Creswell discussed the qualitative data analysing in his "Research Design" book, the researchers try to make sense out of the qualitative data, text images and words; the data are prepared for analysing which means to investigate each of them deeper and deeper and then try to interpret larger amount of them; despite existence of different analytical procedures but Creswell defined the following steps as a set of generic steps to analyse the qualitative data (Creswell, 1994):

Step 1: Organizing and preparing data, this step includes transcribing interviews, reviewing materials, field notes, categorizing and organizing data based on their source (ibid).

Step 2: In this step researchers gain the first general sense of data and reveal their first overall meaning. The question such as "What common ideas are contributors saying? What is the tone of the thoughts?" will be answered during this step (ibid).

Step 3: Starting the process of coding while analysing in details; As Rossman and Rallis defined the process of coding, it includes, sorting out materials into "chjunks" before it trigger to meaning of them to "Chunks" (Rossman & Rallis, 2011). This process also includes categorizing text data, images and etc and allocating a term to each one (ibid).

Step 4: In this step the coding process is used to create a definition for the settings and categories in order to analyse. The definition includes detailed interpretation about each data settings. Researchers make codes for this explanation (ibid).

Step 5: Enhancing the explanations' manner and arguments are demonstrated in qualitative information form. Sharing the findings of the study through using a narrative passage is the most common tactic used. This might be the start of the debate that outlines a chronology of events and examination of numerous themes (achieved with sub-themes, explicit examples, several individual viewpoints, and estimations), or analysis with linked themes. As an addition to the arguments, a lot of qualitative researchers also make use of graphs, figures or tables. They portray a process model i.e. grounded theory, they use a representation of a specific research site i.e. ethnography, or they suggest descriptive information of each member in a table i.e. case studies and ethnographies (ibid).

Step 6: Interpretation of the data is the final stage of data analysis. According to Lincoln and Guba 1985, lessons learnt are the main outcome of this step (Lincoln & Guba, 1985). Lessons learnt may include researchers' own interpretation, expressed in the individual knowledge impacted by their own culture, history and experiences. It can also involve any results achieved from comparing the finding with any information that is extracted from the text or existing theories (ibid).

Thus, authors propose the findings either verify former knowledge or deviate from it. This can also raise new questions triggered by the data and analysis i.e. questions that have not been predicted at the early stages of the study. According to Wolcott, asking extra questions is one way of ending a study for an ethnographer. Questioning methods can also be useful for advocacy and participatory approaches when doing qualitative research. Furthermore, qualitative researchers make use of theoretical approach in generating action plans that result in reform and modifications. Therefore, analysis and results derived from qualitative research can be: interpreted in various forms, tailored for a variety of design types or flexible in demonstrating personal, research-based and action meanings (Creswell, 1994).

The following are summarized guidelines on how to analyse interview responses:

- Extracting patterns or hypothesis via skimming through the responses.
- It is recommended to categorize the responses if more than one pattern is found. For instance grouping the participants by type i.e. female and male as they can think differently about a particular subject.

- Responses can also be distinguished through the level of enthusiasm. For example, complete answers vs. short answers (Boyce & Neale, 2006).

A data analysis procedure should be applied during a research study in order to emphasize the key issues related to the topic. A structured method is used for qualitative data analyzing. In the first step the relevant data is extracted and then the first data analyzing starts in which the quality of the data will be assessed. After that the main data analysis will be done where is tried to answer the research questions by the proper data, and finally there will be finishing data analysis which take out the conclusion from the whole process of data analyzing. In this study the textual qualitative data analysis have the heaviest weight of the data analysis.

2.5.1 Comparative Analysis

The comparative analysis will be applied in this research in order to identify the distinctions between the finding and results from theoretical study and empirical study. It will be done through the addressing to the research questions and sub-questions. In the theoretical study a logic model and framework will be develop (L.T. Kohn, 1997) in order to measure the empirical study findings and determine the data related to the case and valid through that framework based on the main and sub research questions in this study.

2.6 Method for Findings Presentation

The result from empirical study and theoretical study will be illustrated in textual format; we as the researchers address the research sub-questions in text as the result of the empirical and theoretical studies. Also findings from theoretical study will be presented in a diagram and tables in some parts; this diagram will be revised through the empirical part then. Also the outcomes from comparative analysis are presented through answering the sub-questions in textual format.

2.7 Strategies for Validating Findings

The method used for evaluating data generated in this study is triangulation ad also informant feedback. While findings validation basically is happen through the whole research process, the following steps single it out with the purpose of highlighting its significance. Steps taken in verification of the reliability and correctness of the finding need to be outlined by proposal developers. The validating of the findings does match the consistency or generalizability in quantitative research.

On the other hand, qualitative researchers are partially able to make use of reliability issues in order to discover steady patterns when developing themes as a group with other examiners. This can also include simplifying features between several case analyses. Nonetheless reliability and generalizability do not play a great part in qualitative research.

Conversely, validity is considered to be a strong point of qualitative inquiry. On the contrary, it is used to establish how accurate the findings are from the researcher, the participant or reader's points of view(Creswell & Miller, 2000).

According to Creswell book, one practical perception is to identify and examine one or more schemes in order to verify the accuracy level of the findings; the following outlines the eight

primary strategies from most common and easiest application to ones that are rarely used or are difficult to put into an action:

1. Triangulation: Analyzing the data based on their resources helps the researchers triangulating various data sources and generating logical explanation for themes. We have chosen this strategy to apply to our data generated for evaluation(Creswell, 1994).
2. Member-checking: Conducting use member checking in qualitative studies helps researchers to improve the validity and accuracy of the results. It is also called "informant feedback" or somewhere it is known as "respondent validation". It is mainly done during the interview process when it comes to the conclusion.
3. Expressing the findings using solid descriptions. It can cause the readers enjoying the discussion that is represented as a shared experience (ibid).
4. Making clear what values the researchers bring to the study. A sincere description that reverberates nicely with the readers is created by this self reflection (ibid).
5. Furthermore, represent discrepant or negative knowledge that argues against the themes. This is due to the fact that real life is made up discrete perspectives that do not come together at all times. Including a discussion of opposing information will add to the credibility of the report for the readers (ibid).
6. Spend extended time in that field. This will lead the researchers to have a better understanding of the facts being studied resulting in a credible paper (ibid).
7. The accuracy of the story can be improved by the means of peer debriefing. This means questions are asked by a peer debrief during the qualitative study which means the involvement of people other than the researchers in the study (ibid).
8. Evaluation of the whole project by an external auditor. This may result in an assessment of the project as a whole as well as the conclusions of the study (Lincoln & Guba, 1985).

2.7.1 Credibility (Internal Validity)

Credibility is guaranteed through implementing the following tactics (Creswell, 1994):

1. Interviews, observations and documents analysis are included in data gathered from numerous resources. This is referred to as triangulation of data.
2. Member checking is also done during the analysis process. It is a kind of continuing conversation about researchers' interpretations of the data in order to make sure the accuracy level of data.
3. Continuous and long-term examinations of similar facts and settings need to be performed on research site.
4. Peer assessment.
5. Participatory modes of research which means the involvement of the informer in majority of the stages of the study such as design, verification of the analysis and conclusions.
6. Making clear the researchers' bias - "The Researcher's Role." Clarifying the researchers' point of view.

2.7.2 Transferability (External Validity):

As Merriam stated out in 1988, to make sure of external validity, detailed explanation is a must. This will lead to having a concrete structure for evaluation for anyone who is involved in transferability. The following three techniques guarantee the credibility of the study:

1. Detailed outline of the focus of the study provided by the researchers i.e. their role, the informant's standing, selection criteria and the context for the gathered data (KeCompte & Goetz, 1984).
2. Increasing the reliability of the study by using triangulation or multiple methods for collection of data and its analysis (Merriam, 1988).
3. To create a transparent and precise method of data analysis and collection strategies should be conveyed in detail. All stages of this project will be under inspection by an external auditor is qualified in qualitative research methods.

As summarized to this part it is good to mention that in order to do the validation of our findings we used the criteria which Lincoln & Guba stated in 1985 as followings: credibility, transferability, dependability and confirm ability (Lincoln & Guba, 1985). In the section 6.2 this part will be presented in more details based on the validating of the results.

3 Theoretical study

3.1 What Was Studied

We did several documents systematic review to get through the understanding of the Health Information Systems "HIS" background, therefore various situations was studied. But since We concentrate to introduce a health hub which will be used in a suburb in Australia, and this system is relatively new in this area of studying therefore we mostly focus to investigating in similar works in HIS such as RHIOs in USA.
First, a general understanding of health information exchange was presented. Then, the status of communication level and usage of information exchange systems were studied. Then we tried to present the previous accomplishments in this field and illustrate the strong and weak points of the previous studies.
Then the current information exchange systems in Australia will be reviewed as well as RHIOs in USA and we tried to propose a new way based on the textual analysis in order to exchange the health information among the different systems.

3.2 Criteria for Selecting Materials

We initially searched "information exchange within health information systems", and tried to focus on the new approaches in this area. Following to that we started to investigate more on the health network or health hub such as RHIOs in USA and SUPER CLINIC in Australia. We searched in Boras university database of systematic reviews and hand searched bibliographies of relevant articles. Using the Boolean term "and" we combined the following three groups of key words in informatics and medical in our searching: (1) health information systems, health information exchange between different information systems "IS" (2) current procedure of health information exchange between different part of health care systems in developed countries (3) reviews and critiques on the current and the old designs for accessing and retrieving data of a patient in health information systems.

Also an online search was performed through Google scholar to identify what e-health strategies are currently available in developed countries. The keywords used in the search included: health information exchange, e-health strategies, communication between different information systems. As this paper's focus was on e-health strategies for enhancing information exchange and improving quality of the care in term of communication so We exclude such e-health term like tele health, telemedicine or etc.

3.3 Motivation

Evidences show that large number of patients go to GP regarding to their chronic illness. These patients require long-term and systematic care which needs a proper communication among different healthcare professionals. These healthcare professionals need to access to the patients' health information, such as the previous diagnostics, treatments, laboratory tests and etc at the same time and continuously in order to make a good decision. Such this process may lead to place a big load of work on the health participant if the information exchange system was not implemented properly enough. In addition to there is not sufficient time, while the bureaucracy and paperwork has considerable weight in terms of time ("Precedence Healthcare,").

For instance health care system is very complex in US and sporadic because of using different information technology in different areas which lead to have different standards in their health care systems. Despite of the considerable expenses in health care systems in US in compare to other developed countries, still there is some evidence shows the lack of efficiency in their healthcare systems; the medical errors and lots of duplicated tests. Institute of Medicine in US estimated the number of death caused by medical errors between 44,000 to 98,000 (Linda T Kohn, Corrigan, & Donaldson, 2000). Many possible reasons for this issue are existing; such as: lots of wasting (e.g., duplicating process in tests) and medical fault (e.g., undesirable medicine reactions). Most of these reasons have roots in lack of ability of healthcare providers to access patients' health records in a well-timed manner when required. Therefore we think improvement in health information technology have definitely impressive influence in human life quality.

One of the most important aspects of a good patient care is to meet the needs of sharing patients' information and management all these information among different health individuals and health organizations. Consequently there is a dramatic increase in usage of information and communication technologies to support a qualified health services.

The following picture illustrates a summary of the necessity of implementing a good e-health strategy in order to improve the efficiency in communication between different health information systems.

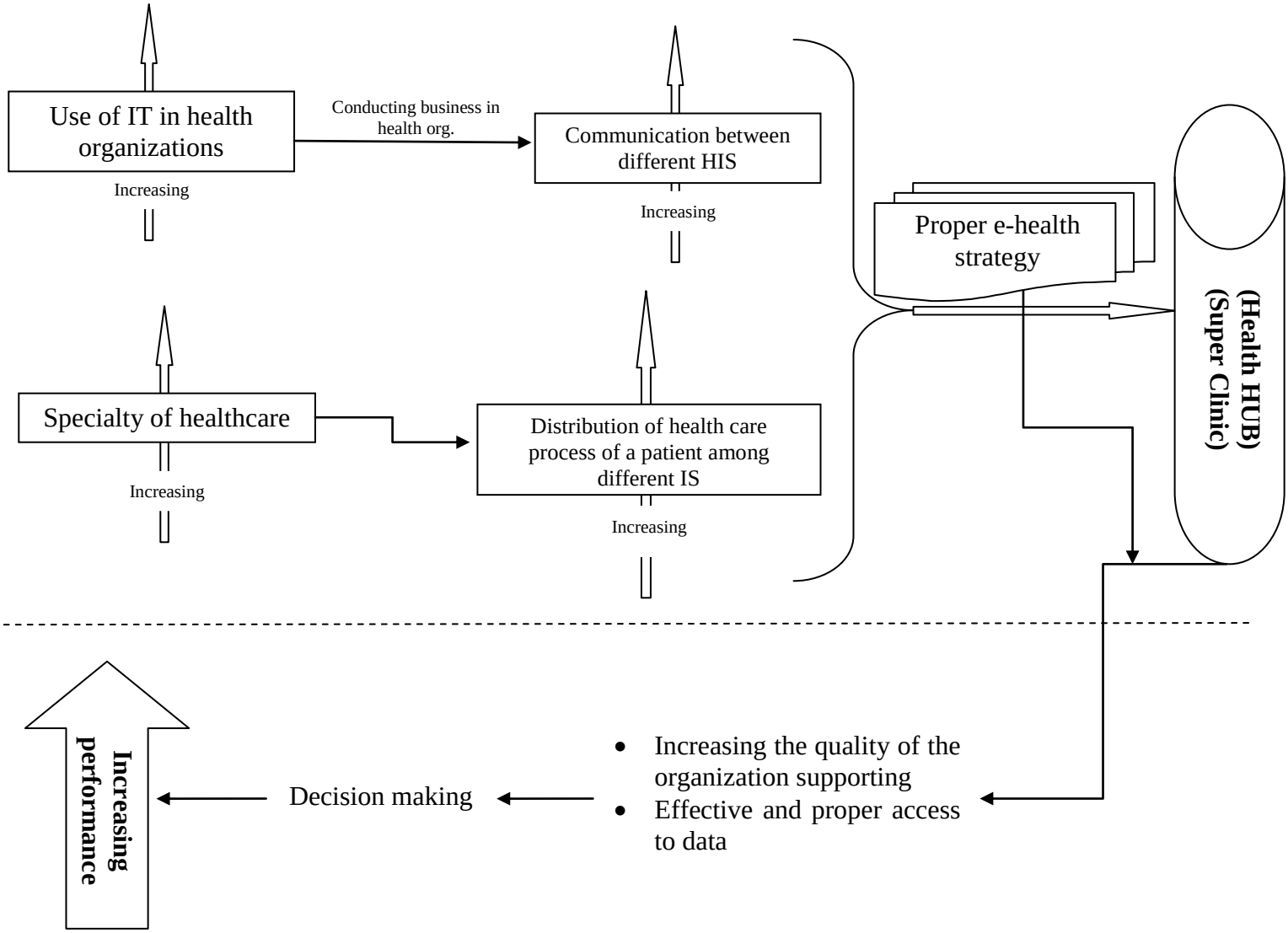

Figure 2 Importance of Proper HIE strategy

3.4 Key Concepts

In this section we provide the readers with the definition of some important key concepts related to this thesis.

Health information exchange (HIE):

The Healthcare Information and Management Systems Society (HIMSS) defines the phrase "Health Information Exchange (HIE)" as sharing action among two or more organizations that have deployed common agreed standards and technology with an executed legal arrangement between them in order to share and exchange the health data and information electronically (HIMSS Dictionary of Healthcare Information Technology Terms Acronyms and Organizations, 2nd Ed. 2010).

E-health:

WHO (World Health Organization) describes e-Health as the combination of using information technology and electronic communication in the health sector ("WHO | World Health Organization,").

Also we can define e-health as an emerging area in the junction of health informatics systems, healthcare systems and business systems, in which it is referring to medical services and information distributed and improvement through the internet and other associated technologies. In a wider perspective, the term "e-health" characterizes a technical growth as well as attitude, state of mind and global thinking toward enhancing the health care locally up to worldwide through information and communication technology (Eysenbach, 2001).

Electronic Health Record (EHR):

International Organization for standardization (ISO) has defined the EHR as a data base which digitally stores patients' data and exchanges them in a secure manner among several authorized stakeholders as users; it also includes showing current information of patients simultaneously and potential future information to provide health care providers with ongoing and well-organized health care (Häyrinen, Saranto, & Nykänen, 2008).

RHIO:

RHIO which stands for Regional Health Information Organization composed of three or more organizations within a particular area that is aimed to share the health related information according to the HIT standards accepted by them. RHIO usually monitors the way of the health information exchange among the organizations and other partner of that, such as payers, patients, laboratories or some governments' agencies as a setting provider.

Hub:

Hub became a much known concept in IT after networks emerging. It is basically a device that connects other network devices or systems together in a one single point. It is worth to mention that usually hubs do not do any processing and it is simply a place to connect other systems together which are connected individually to the hub. In this thesis we will propose a "Health Hub" as a very basic possible alternative exchange system among different information systems. This health hub simply connects the related health information systems together in a single hub as a central point.

Super Clinic:

In order to improve the communication between general practitioners (GPs) and another health allied and professionals, a new model of health care system is going to developed in Australia which is now undertakes and the main factor of it is using a health hub in which GPs and other allied health practitioners will share patients' information among different information systems. The basic concept of this Super Clinic is about enhancing communication and information exchange between different information systems, therefore in this project we will study problems in health information exchange and also some points of Super Clinic project and try to come to a basic simple design as a conclusion for new way of communication among different HIS. If we want to define "super clinic" briefly we have to say that these GP Super Clinics will act as a super hub which will called "Health Hub" and intend to bring together GPs, practice nurses , allied health professionals and other health care providers in order to facilitate and improve the quality of primary health care services.GP Super Clinics or "Health Hub" will also support primary health care providers to approve and

adopt the new model of care that is concentrated on best practice incorporated multi-disciplinary team based approaches and well-organized and effective use of technology ("Department of Health and Ageing - GP Super Clinics National Program Guide 2010," 2010).

Health Literacy:

The World Health Organization (WHO) defines the Health Literacy as a tool that represents social and intellectual skill level which specified the ability and motivation of each patient to get accessibility to, realize and use information in order to enhance and retain good health ("WHO," 2013).Also the National Library of Medicines presented the meaning of health literacy as : "*The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions* (Howard, Gazmararian, & Parker, 2005)."

3.5 Overview of Health Information System and Information Exchange within Different Health Organizations (from an IT aspect)

Health Information Exchange is an essential issue for health care providers and patients. HIE will let providers to exchange information by electronic means to support the partner systems with fast, safe and reliable access to patients' health records. By using the HIE systems duplication in testing will be reduce and accessibility to the result for each health care partners will be more facilitated. Therefore decision making and other patients' care issues will be assisted via these HIE systems. Studies show that nowadays the society needs to have a quick access to critical health information and health data. With HIE systems there would be no dependency on time used up waiting on faxed, telephone or any other non-electronic communication. The patients and healthcare providers can get information at their request, with the click of a button.

In order to have accurate diagnoses and treat the patients, health care providers require patient information. Usually the patients' medical records are distributed among different health care providers therefore through a proper health information exchange systems they can access the other parts' result more quickly. Like accessibility to the lab information, or test results. It leads to reduce the number of test for the patients and save money and time as well.

Although the mission of HIE systems is to improving health care systems for patients and citizens but documents show that it is historically employed for few confrontation and few patients and mostly utilized by few amount of clinicians (Vest et al., 2011). Studies show that by using HIE more inaccessible health data would be obtainable which results in having more comprehensive clinical information and more potential enhancement along the health care organization functions (Vest et al., 2011).

Vet et al also mentioned that, although the Centers for Medicare & Medicare Services' in USA explain the necessity for improving exchange capacity on health information records, but still there is more to know about motivations of the health care providers on employment of HIE systems (Vest et al., 2011). Although there is many political, technological and managerial obstacles to expanding of HIE establishment, considering why individual healthcare professionals truly develop HIE is vital to guarantee its success and endorse further

acceptance (Vest et al., 2011). Researchers found that despite large amount of money spending on health care systems and while the cost of healthcare systems are increasing in developed countries, but the quality and effectiveness of care are not optimized to level of expectations (Jha, Doolan, Grandt, Scott, & Bates, 2008). This study, conducted by information-seeking theory and in-depth interview with related professionals tried to address the current weak points by investigating the main factors related to actual HIE usage.

Wu et al. stated out that the important key to enhance and improve the safety, effectiveness and quality of healthcare is using health information technology (HIT) in general and electronic health records (EHR)s as main part of HIT.(Wu et al., 2006). Using a proper HIT can lead to support the healthcare providers and organizations with immediate decision support, making health information available and decreasing the cost of unnecessary tests (Wang et al., 2003). Moreover, there are lots of models which proposed that HIT would lead us to have considerable financial profit. There are challenges related to adopting EHRs but the possible benefits of them cause decreasing the future related costs and having considerable interest on policy makers section to adopt HIT more rapidly and use it across the world (Jha et al., 2008).

We believe that nowadays society need to improve the way they exchange health information and each indivisual needs to know about its health situation, this issues requires to focus more on health informatics. Health providers try more to support people with a proper health literacy and also a proper communication system to provide the related health data for the patient mean while the safety and security of the whole data is considered. For example as it is mentioned earlier one of the main reason which caused the health care organizations think more about implementing more efficient and proper HIE systems was the patient with chronic diseases, like diabetes. Mean while it is good to mention that some kind of these diseases like Diabetes mellitus type2 (T2DM) has the health literacy (HL) for its patients, this HL in its extremes can lead to exacerbate or either mitigate the complexity of the care systems, also it definitely has influence on Patient-Practitioner Interview Encounter (PPIE) efficiency and resulting outcomes(Forbes, Sidhu, & Singh, 2010).

3.6 Overview to Simple Communication System in Health Care:

Given the lack of proper information exchange within different health information systems, this paper will be step backward to review the health communication system generally and its basic components such as communication channel, device, and service and interface mode.

Communication systems usually consist of people, the message which they want to convey, the technologies that mediate conversations, and the organizational structures that define and constrain the conversations that are allowed to occur. Elements of communication systems include:
Communication channel: it is a kind of pipe along, in which the message is conveyed. It can be basic face-to-face to computational channels such as medical records networks. Communication channels have features such as noise and capacity, and based on these attributes, their suitability for making different tasks will be determined. If two parties exchange the information at the same time across the channel, it is known as synchronous communication, while in asynchronous communication the two parties just leave their message in time. Telephone is one of the commonest synchronous channels. Synchronous communication is interruptive which may lead to effect negatively on the whole organization. For instance, a busy general practitioner can forget to carry out a medical task because he has

been interrupted. In contrast, since there is no simultaneous conversation in asynchronous communication, the parties may communicate to each other through a series of message exchanges in different times. This can vary from Post-it™ notes left on a co-worker's desk, to sophisticated electronic messaging systems and it is obviously not interruptive for individuals, they can put them in pending while it is not urgent. In our proposed health hub the protocol for communication will be asynchronous, because the health stakeholders connected to the hub are too many to carry out synchronous communication. The details will be explained more in the result part.

The information which is exchanged in healthcare organizations can be consider as a developing 'space' in the whole system (Coiera, 2000). Therefore the whole communication space will be the sum of the spaces which information transaction occurs. For instance, telephone conversations or e-mail or even face-to-face ones would lead to generating a communication space. There is a capacity for communication spaces in every organizations, a small health organization such as a small clinic to a very large and complex health organizations(Coiera, 2006). Theoretically, the number of parties who may wish to convey a message will be define the number of different communication or 'information exchange' which could be occur(Lang & Dickie, 1978).
For example if we have three allied health care in a team, there could be three separate conversations between any two parts. And if we add two more individual to the team then the possible conversations between each two will be rise to ten (See figure 3).

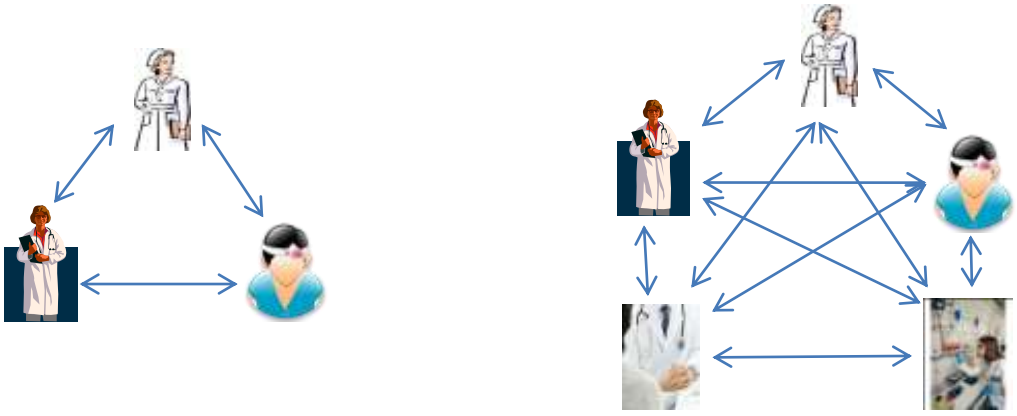

Figure 3 potential amounts of communications in health organization

The result actually is calculated with a combinational formula:
Number of possible conversation = n! /(r! (n−r)!
Where n is the number of total individuals and r is the number of parties who involved in one conversation.

There are couples of studies which have tried to measure the real amount of these communication spaces in health care quantifiably. In this study we are not going to measure anything in term of quantity but related to our research area there were some studies which showed the way of communication in health organization. For instance Covell et all conducted a study in this regard and concluded that colleagues meet about 50% of information needs in a clinic face-to-face with no record, instead of document sources(Covell, Uman, & Manning, 1985). Tang et al. reported that more than 60% of clinician time is spent to face-to-face or by telephone communication in an organization(Tang et al., 1996). In a similar study, Safran et al. assessed the information exchange within a different part of a hospital equipped with a proper computer-based record system; they stated that there is

approximately 50% face-to-face communication, and 25% e-mail and voice-mail communication and finally just 10% is happened via electronic medical records(Safran, Sands, & Rind, 1999) .

To summarize, as it was mention the systems using paper-based record, memory-based or telephone-based management are becoming ever more untrustworthy and are not well-matched for a good quality care. Delayed or inaccurate communication between hospital-based and primary care physicians at hospital discharge may negatively affect continuity of care and contribute to adverse events.

3.7 HIE in Developed Countries:

EHR is a main component of any health information exchange systems becuase they need to have electronically recorded health information, therefore we can estimate the usig of HIE in each country by usage of EHR or its technology, although it is not the only factor but its infrastructures and the percentage of using EHR act a main role in HIE systems.

Ashish K. Jha and his collegues had conducted a study researched on usage of HIE in four developed countries (UK, Netherlands, Australia and NZ), they reported out that the all four nations use the electronic health recors (EHRs) as an important main of HIE, among GPs in nearly universal rate which is above 90% (Jha et al., 2008). This rate is about 40-80% in Germany and the US and Canad even had much less in rate of 10-30% in their ambulatory care physicians; they also stated out that there were no high quality data setting in hospitals and only a small part of hospitals in Australia was provided by main component of the EHR systems (Jha et al., 2008). Efforts to establish a better HIE system were in high priority in Australia same as other 3 countries (ibid). In these countries health information technology (HIT) have accomplished to high level of EHR adoption specially in primary care section but still legged with the EHR and HIE of inpatient sectors, they concluded that increased attempts would be required if interoperable EHRs covered the whole systems (Jha et al., 2008).

The below table summarized the major attempt toward HIE systems in some industrialized countries, figure 4 reproduced from (Jha et al., 2008):

	Australia	United States	Canada	United Kingdom	Germany	Netherland
Major Policy	NEHTA	RHIOs	Health Informatics way	National Programme for IT	D2D, smart cards	National Switch Point
State of HIE by 2008	• Early pilot project • Little actual HIE • Great focus on Telemedicine • Planning for greater HIE	• <12 organization sharing any health data • Total patient involved in <<1% of the population of US	• National program developing. • <5% of prescription are exchangeable	• Programs are underway	• Most Germans have smartcards with administrative data but would allow to access more clinical data in future	• Full implementation by end of 2008

Figure 4 HIE achievement in developed countries(reproduced from (Jha et al., 2008))

In following sections WEam going to investigate the curret HIE in USA, which is called RHIOs and Australia which is called NEHTA and then try to propse the new model called as "Health Hub" and examining wether it would be more effective and reduce patient jourey.

3.8 HIE in USA :

According to our litreture review WEfound out that the most similar project to the "Super Clinic" or 'Health Hub" is RHIOs in USA. Therefore WEdecided to review the HIE development in USA first and analyze the weak and strong points during its HIE improvment.

3.8.1 VTMEDNET:

In 1995's, VTMEDNET was starting to lunch in US, while there was a legacy of supporting any residential areas which is less than ten thousand square miles and has fewer than six hundred thousand population, with reasonable and high quality of health care; VTMEDNET was starting to design and found in about 20 years ago in Vermont, the most rural state in the nation (J. McGowan, Evans, & Michl, 1995), and later in 2006, VTMEDNET became the first extensive state-wide health information network in the country, it was very basic version of HIE , and used the simple web-based technology to support health decision making and access to EHRs, but after a while this state went under development of RHIOs (J. J. McGowan, Jordan, Sims, & Overhage, 2007).

Since health care system in US was very fragmented across providers and care settings, reinstructuring health care system in US became notable by 2006. There were many factors influencing this fragmentation. For instance American clinicians faced to limitation of the scope to their practices in special area of care or even a single setting (Wilcox et al., 2006) .

In USA launching RHIOs (as an achievement in HIE systems) in different states allows the citizens to benefit from more qualified health care. The patients and the health care providers can access to their clinical data anytime or anywhere in a state-wide range. Walker and his colleagues reported out of roughly a billions saving financially in HIE employment in US (Walker et al., 2005).

By 2010 great efforts on smoothing the progress of HIE have existed for over two decades in USA but still there is need to improve it more, therefore in recent federal policies and actions for health informatics, developing a proper HIE) would be addressing fragmented personal health information and increase the level of quality in healthcare, new methods of strategies are essential to eliminate and overcome the barriers, obstcales, and challenges associated with technology (Vest & Gamm, 2010).

Commonwealth Fund (CMWF) carried out a survey and stated out that 81% of GPs in US do prescribing electronically while 79% using complete EHRs in their health process from prescribing to diagnosing and any othere related health information (Schoen et al., 2006).

3.8.2 RHIOs:

In this part we are going to study about the similar project to our study and the most similar health care systems to "Super Clinics", It is called RHIO and implemented in the US.

What is RHIO?

After implementation of health information technology (HIT) in different hospitals and healthcare centres, the concept of their communication is beginning to rise and the information exchange among different health information systems is becoming a new issue to improve the quality of the health care systems. RHIO is the systems in US which carries this goal and help different HIS to exchange their information efficiently.

RHIO is one of the ways to achieve the purpose of the National Health Information Network (NHIN) in the United States. Also Thielst and Jones described RHIO as network of different entities within a specific geographical region with different stakeholders which the aim is to enhance the health information exchange in order to have more effective and efficient delivery of health care (Thielst, 2007).

3.8.3 Why RHIOs is created?

Stead et al stated out the main components of a health IT infrastructure as:

- ✓ Electronic Medical Record Systems (EMRSs) (Stead, Kelly, & Kolodner, 2005).
- ✓ Electronic Health Records (EHRs), which is mainly for healthcare professionals (ibid).
- ✓ Personal Health Records (PHRs), which is for individuals mostly (ibid).
- ✓ Standards and data interchange capabilities which are about health information exchange to facilitate communication among all units involved (ibid).
- ✓ And a system like RHIO to organize the standards and oversee participating in HIE in a specific area(Stead et al., 2005).

In July 2004, United States Department of Health and Human Services described their vision regarding the American's healthcare system restructured. Following to it, the Office of the

National Coordinator for Health Information Technology was created and the main goal of that is to assist the development of RHIOs (Thompson & Brailer, 2004). So federal started to enterprise supports, and then it is turn to adopt wide forms of HIT, such as EHRs and health information exchange systems in order to improve the quality of care and reduce costs.

Since then there are more than 100 RHIOs developed or currently developing in US. Some of them became an important and fundamental part of the NHIN and some of them could not develop well enough; the Agency for Healthcare Research and Quality reported out statement as summary of the health information exchange (HIE) activities in United States by 2006, it shows that, there were about 101 state-based projects (J. J. McGowan et al., 2007). These HIE activities included from basically connecting different EHRs together, e-prescribing to fully functional RHIOs, by that time there were just three states that achieving mature RHIOs: North Carolina, Utah and Indiana (J. J. McGowan et al., 2007) .

3.8.4 Why some RHIOs are successfully implemented while others not?

RHIOs hold one of the main achievements toward improvement in health information exchange, it plays an important role in US attempts to activate broad HIE; but the point is, still there are lots of questions regarding successful efforts and failure ones in RHIO projects (Adler-Milstein, Landefeld, & Jha, 2010). Therefore the issues which have influence in developing a RHIO and its viability should be studied in order to analyze the future similar one such as Super Clinic.

Studies shows the most of the successful RHIOs contain some main distinctive factors, these factors are: they founded on mixture of federated architectures; they collected frequent fees from their participant to keep on their viability financially; the third one is the exchange of the health information are narrow between them while the type of stakeholders are relatively wide and finally they were provided with very formal management(Ng, 2012) .

Alder Milstein and his colleagues also pointed out RHIOs would be more feasible and operational if they communicate in narrow group of data and benefit from wide range of stakeholders; in order to have on time funding on RHIOs so RHIOs would be more potential to keep on financially; these stakeholders can be hospitals and ambulatories and other health providers; they mentioned that in most of the case the RHIOs which supported with early grants instead of ongoing funding from its participants have less probability of financial feasibility (Adler-Milstein et al., 2010).

McGowan et al studied about the common issues which are influence on the development of RHIO in two states, they classified five main issues as:

- ✓ Organizations
- ✓ Untimely planning
- ✓ Advertising and education on RHIO
- ✓ Technology,
- ✓ And financial fixity

They concluded that there are many shared features and attributes in all RHIOs but also more distinctions based on location, in order to have successful RHIO, the whole system must continue in a dynamic mode and being in touch with others to stay efficient (J. J. McGowan et al., 2007). They conducted a study in 2006 which shows that RHIO developments in

metropolitan area were more successful than in rural area (ibid). Although using HIT in rural areas would have much greater impact but there were several factors which caused this issue, the main one is financial issues, creating a health information exchange system needs an ongoing income to run it and furthermore there are more providers in metropolitan areas which lead to spread the cost further (ibid). In addition to, it may face to lack of HIT professionals in rural areas or health IT training to help those areas with new systems, another obstacle in developing RHIOs in rural area was lack of wide-spread access to high-speed internet(J. J. McGowan et al., 2007).

It is predictable that while they started to develop RHIOs in the different states which previously used an older version of HIE systems, like Vermont used VTMEDNET, some issues had been encountered. These kinds of issues and strategically solutions for them lead the team to have some major guidelines in developing RHIOs. These set of issues and responses to them can help NHIN vision as well. Therefore another main disadvantages in developing RHIOs is matching them with previous HIE systems. We need to minimize the cost of the restructuring and increase the quality of the health care delivery.

As McGowan and his team concluded, creation of RHIOs caused fostering in health information exchange within different organizations and systems, although the main goal of RHIOs is virtually the same, which is improving the health care quality and reducing the cost, but they can be very challenging to develop and launch, based on their locality (J. J. McGowan et al., 2007). Sometimes they even do have conflict and different mission and lead to face different situation and obstacle to create them. The learning point of these RHIOs is about realization of the Nationwide Health Information Network vision and the importance of ongoing communication between these systems to survive them(J. J. McGowan et al., 2007).

To summarize the RHIOs disadvantages, we have to mention that there are two main disadvantages:

- ✓ One is that most of the RHIOs were not easy to implement in rural areas
- ✓ And the second one is that RHIOs should have an ongoing communications with other HIE systems to survive so it should be implemented in way that the cost of maintaining or up to dating it with other new HIE systems would be minimized.

The below illustration present the main factors influencing on implementing RHIOs in rural:

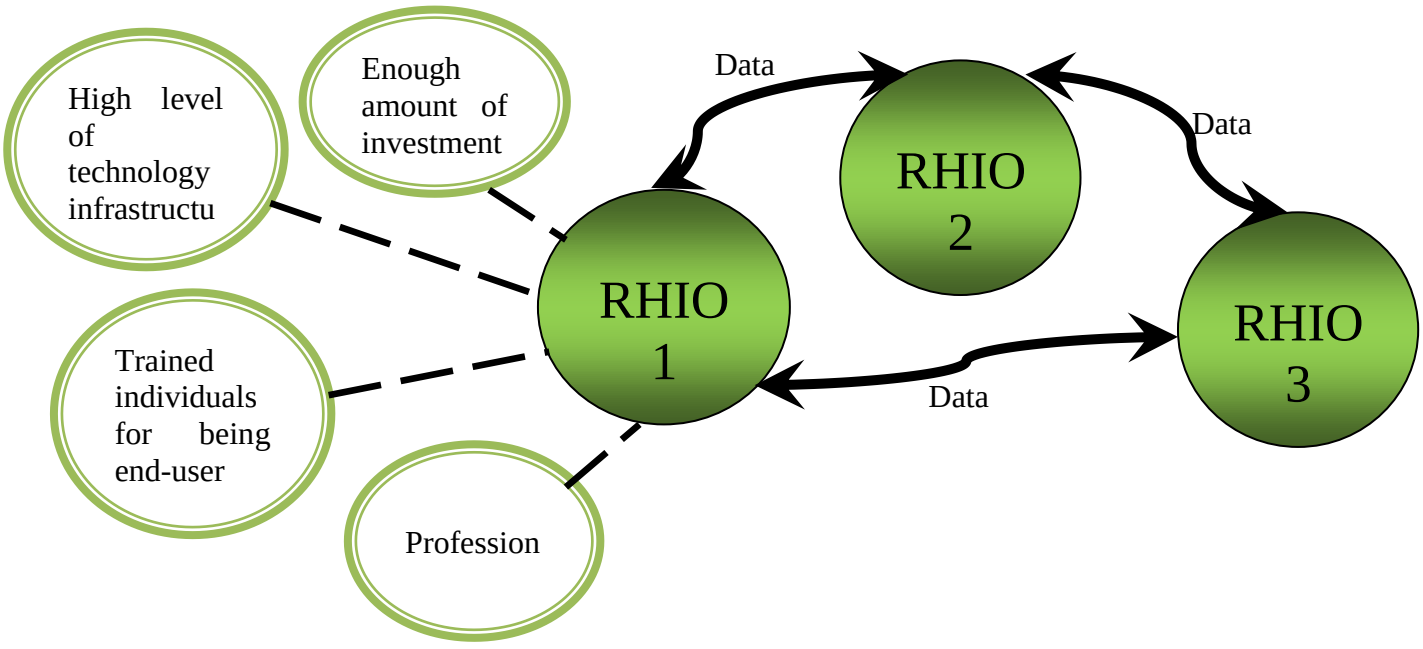

Figure 5 RHIO [29] factors for viability

3.9 HIE in Australia:

Australia's Health Informatics Conference (HIC) annual reports reflect exactly how Australian health information society (HISA) is contributing and impacting on world health informatcs scene through outlining the progress of health informatics in theory and practice, in different aspects including software development, evaluation, standards, policy development and education (Hansen, Schaper, & Maeder, 2011). HIC 2011 covers the fundamental aspects of health informatics such as demonstrating innovation which is the ability of the practices and processes within healthcare; this revolution outlines a variety of topics on different sectors from primary and acute care to public health (ibid).

Till 2003 the main application of ICT in healthcare was: telemedicine, e-health(telehealth) and home telecare. Telemedicine is a system to deliver health care services through the examination of patients by using telecommunication technology; in Australia telemedicine was developed well by that time (Celler, Lovell, & Basilakis, 2003).

There were some old obstacles to implementing a proper HIE systems in Australia. In about ten years ago one of the main obstacles to improving the health communication systems among the providers and patients in Australia was weak communication infrastructure, like high speed internet connectivity, access to computer and the most important one is using it by indigenous people who needs more access to technology to have more opportunity to challenge with ICT and learn it (Forbes et al., 2010). Dayson conducted a study in 2004 to investigate the effects of the western technology values on low adoption of information communication technology by indigenous Australians, he concluded that instead of the western values in technology it was the excitingly passionate response to technology by school children and also the potentials was limited just by economic issues related to difficulties in access to computers and poor infrastructures and low IT skills (Dyson, 2004).

McInnes et al stated out that 98% of GPs in Australia use the EHR systems , they print out the prescription and hand it out to the patient so they do the prescription electronically, and it is good to mention that 80% of their systems supported by high level of decision making tools(McInnes, Saltman, & Kidd, 2006) . If we want to move further it would be more efficient if they could support with the necessary health data of a patient, from any section to make the decision better. We mean to have a more proper system to exchange the health information not only between GPs but the whole health care section eg. laboratories, primary care, hospitals and etc.

Australia have already computerized their administration part which is the first step for the patient to enter to the health centre, also many of the laboratories do their result reporting electronically as well, however in order to convert the documents to electronic version we would face to limitation to computerized discharge reviews which are mainly sent from hospitals to GPs and there is mostly no electronic prescribing settled in hospitals(Jha et al., 2008).

Australia has implemented HIE systems over a decade ago, the National E-health Transition Authority (NEHTA) has commenced extensive planings of HIE systems implementation, besides that there is a pilot project in New South Wales(NSW) which is trying to persuade hospitals and other health centers to exchange their health data for about 50,000 patient in a small suburb (Jha et al., 2008). In 2008 the GPs who supported by comprehensive EHRs can

automatically download other section's result, eg. pathobiology or imaging reports (Jha et al., 2008).

One of the main problem in Australia is lack of a unique national identifier which caused to hinder HIE systems, the process of building a national HIE could be easier if there is a single health identifier; . Regarding this issue there is a service in Australia operated by Medicare called health identifier service (HI Service). It is run by the governance authority, NEHTA as the main operator. It allocates a unique 16 digit number to each individual, healthcare organizations and healthcare providers. Although the federal, state and territory governments in Australia build up a common healthcare identifiers service(HI service), but this unique identifier is limited in state wide only and in addition to that the identifier from one public organization like Medicare may be the same as a private one like Medibank. Therefore it is necessary to have a national unique identifier to facilate the information exchange systems.

Australia has already founded a considerable project toward active health information exchange in order to effectively share clinical data and information. Australia has national immunization and cervical register; these two national registries are accessed and served electronically. Since about 4 years ago hospitals starting to increase the process of sending the discharge summaries to GPs, GPs inturns send the referrals and other documents to the hospitals or other specialist electronically (Jha et al., 2008).

3.9.1 CDMNET:

Another accomplishment in field of health information exchange is creating cdmNet. Since the patients with chronic diseases need to have systematic care and treatment, there should be an effective communication among the health care professionals so it led to apply a proper information communication technology to health care system in order to enhance their care as in a long time life of their disease(Celler et al., 2003). In order to have more qualified care to chronic diseases and a better health outcome; Chronic Disease Management Network (CDM-Net) project was created. Its aim is to use information technology (IT) to optimally support the patients with these kinds of disease; it is basically an online web-based system that is mainly created to help the patients with chronic diseases ("Precedence Healthcare,"). It helps the health professionals and patients to have systematic and manageable information; it is one of the software systems which support the users with the complete process of care (ibid). GPs, nurses and other health care members can also benefit through this software. It makes sharing and exchanging health information across the health team easier and more manageable, also provides them with comprehensive information to make a better health decision, or the documentation. CdmNet is based on world best practice for the cure of chronic disease specially (ibid). The health care team do planning, collaborating, monitoring and reviewing in team manner with online communication and sharing information among them ("Precedence Healthcare,").

A new project that assesses the efficiency and collaborative care for chronic disease with the help of a web based technology (Precedence Health Care's cdmNet) has been confirmed to be successful and is on the line to be offered across the nation ("cdmNet to go national with collaborative care plan,"). The Collaborative Care Cluster Australia (CCCA) is a project set to examine cdmNet as a platform in order to advance managing of chronic disease among few healthcare providers in Victoria, Southern Health and the South Eastern Melbourne Medicare Local as well as for 1000 general practitioners and 3000 associate health professionals (ibid). This system has been measured by Monash University to be an effective way in administering

patients particularly diabetic patients (ibid). Pro vice-chancellor of Monash University Leon Piterman has revealed the project had been trialed with diabetic patients in Geelong, he has also stated that it has been tested in Melbourne's south east with inclusion of seven to eight other chronic diseases, he also said "*Monash University's role has been to evaluate it, we are now able to demonstrate that it improves adherence to the care plan and follow up of the plan. This leads to definite improvements in the control of diabetes, blood pressure, blood sugar, blood lipids and so on. We are seeing improvements in the clinical condition of diabetes patients and cardiovascular risk factors associated with diabetes.*"("cdmNet to go national with collaborative care plan,")

The purposed for CCCA project as stated by Jon Hilton, Precedence Health Care's programs manager, was to enhance the quality of service and care with the help of cdmNet platform. He has also said "*We are declaring this cluster a success and it is now self-sustaining and it's going national, the organizations collectively have agreed to continue to work together on a national basis* (ibid)."
According to Mr. Hilton the initial aim for trial of this project was to make sure that all these groups work collaboratively and benefiting from cdmNet. Training information for Medicare locals who have desire to establish a similar facility is now being developed by Precedence Health Care (ibid).

cdmNet is a GP based platform that is utilized through web-based tools that enables the users to generate general practice management plans (GPMPs) for chronic illness (ibid). The information on the care plan and records of patients is shared across the network with the care team and patients (ibid). It also involves distribution of the records, creating reminders for patients and checking the progress of the patients compared to the plan, automatic scheduling and follow ups as well as compliance management of Medicare (ibid). GPs, associated health professionals and patients can access the records over a secure encrypted login over the internet as well as communicating all the above through emails and text messages (ibid). According to Mr. Hilton this system is "self-sustaining". GPs are offered a fee funded by Medicare part of chronic disease management for adoption of this system. Precedence Health Care also obtains payments for using this system in order to produce care plans for patients (ibid). According to Precedence the cdmNet system has increased the efficiency of GPs and their productivity by 25%. It also has resulted in revenue of $35,000 per annum per GP when used by regular users (ibid).
Cameron Profitt, a GP from Bannockburn Surgery in Geelong is one of the GPs that have been involved with the system from the pilot project; he finds this system valuable just for the fact that in simplifies managing of chronic illnesses, he also states that although it would be more expensive to use cdmNet but it definitely is worth cause there is much more time saved. , he also referred to the amount of time saved on manual communication using cdmNet system (ibid). According to Dr. Profitt the cdmNet has had major impact on inclusion of allied health teams. Referrals are now emailing away which results in less paper and time consumption (ibid). These emails containing an approved plan sent off to the health team have made methods such as faxing and documenting the responses redundant (ibid).

3.9.2 HIE systems in recent time in Australi :

Computer use by Australian is rapidly expanding , this is result of need, financial inducements, software accessibility due to reasonable prices, relatively low hardware costs and support by the means of classifications of general practice (Pearce & Haikerwal, 2010).

General practices have been taking advantages of computers on desktop which had resulted in Australia's biggest electronic database of clinical information; there is also potential high financial savings and higher quality level of practices as a result of adapting them to e-health, on the other hand, there is no official means for communicating the data among different systems although the PIP e-Health proposes public key for information encryption (ibid). Additionally, there is no method to back up the use of available, precise and complete data for quality purposes although there are lots of grounds for the effectiveness of e-Health (ibid). The main setback of hospital procedures is generally the extent of the disconnections between the clients taking advantage of electronic means for patient care, planning, measuring, evaluating and ones that offer local, regional, state and federal funding (ibid). No compatilibility in hospital systems in region and across borders and complex need for national synchronization result in less beneficial use of data and knowledge throughout the nation (ibid). The cost that lies within the change management when adapting e-health is generally underestimated; there are also short comings with the infrastructure and existing technologies within the hospital systems (ibid). Existence of processes such as computerized entries, advancement in safety and decreasing usage of medicine will result in higher efficiency with only one setting; nonetheless, this may cause the "point of care" staff to perform more work due to computer-regulated protocols (ibid).
The whole care process will result in better health services as well as considerable savings due to more efficient use of resources. On the contrary, in order to succeed, training in technology needs to be benefit from though (http://www.ehealthnt.nt.gov.au) in Northern Territory and (http://www.barwonhealth.org.au) in Victoria. The problems associated with the transformation are different in government level as they need to assess the funding expenditures alongside the needs of an electorate or stakeholders (ibid). They also need to consider the communication between health care providers (ibid). On the basis of importance of team work in modern health care this connectivity may have benefits that are not accounted for in a single sector (ibid). These benefits are as a result of large, less unpleasant outcomes and less tests (ibid).
Using electronic health records (EHRs) also boosts the efficiency and quality of all the services involved. The challenge for the government is the primary funding they need to provide to increase the gain for the future (ibid).
Funding for equipments such as beds might seem of an immediate value but using e-health care system by the means of modern technology will have a long term positive impact by reducing the claims for new beds and overall expenses; this will result in a more sustainable system for the future (ibid).

3.9.3 Current NEHTA System :

It has been more than a decade that Australian government has been trying to create a national e-health system. Many evaluations have been conducted and also investing about $5 billion on several e-health schemes. However, no major outcome has been derived from all these and the focus still remains on local and regional prospects (Anonymous, 2010).
The subjects of matter involved with implementing a sustainable e-health system are as follows (ibid):

- To have a clear picture of a national e-health system
- The extent of the Australian health division at the national level
- The e-health scheme
- Two notions to focus on – progress and individual healthcare identifiers
- Disappointment of The Council of Australian Governments(COAG)

- National Broadband Network (NBN) does not seem to be speeding up the e-health which results in this sector to stay at a national level for the near future
- The health sector structure in Australia
- Funding and expenses associated
- Governance system
- Government guidelines and national e-health policies
- Recommendations put forward by the national health and hospitals reform Commission in relation to e-health
- NEHTA and its role in the e-health strategy
- NEHTAs proposed role
- Path to implementation
- Electronic health records that are managed by both the health practitioner and patients
- Unique personal identifier is necessary
- e-health and NBN
- Council of Australian Governments meeting

On July 5th 2005, the national e-health transition authority (NEHTA) was established by commonwealth, state and territory governments, this organisation was responsible to improve the means data that is collected electronically over may secure networks (Bramley, Richards, Cordell, Richardson, & Guo, 2009). NEHTA with the help of its National Clinical Terminology and Information Service (NCTIS) was in charge of producing, maintaining and presenting standard terms in order to describe the contents of health domain as well as less ambiguous and more meaningful results derived from data, therefore data will be exchanged in a more effective and efficient manner within the health sectors (ibid).

Methods that are used to obtain and share healthcare data play an important role in success of e-health system in Australia in future; the core element for such software is Systematized Nomenclature of Medicine -- Clinical Terms (SNOMED CT) (ibid). This will result in modern, electronic system replacing the paper-based documentation of the records by clinicians (ibid).

Health care system in Australia is less advanced when it comes to computerized systems in comparison to any other economy sector, although the practices and community pharmacies benefit from highly computerised systems, but the same thing does not apply to hospitals (Pearce & Haikerwal, 2010).

Adapting a proper e-health will result in more quality in health practices but there is need for a system to ensure that the data is shared securely between the general practices(GPs) and hospitals, there is no national management system to implement e-health strategies in a coordinated manner (ibid). The development of e-health systems has been delayed due to lack of funds and jurisdictions as well as poor implementation strategies; the costs involved with change management and training for the technology has also been underestimated by the government (ibid). There is no clear understanding of responsibilities within the management to make sure all the health providers are connected over the developing system and everyone will benefit from it in near future (ibid). For instance, personally controlled electronic health record (PCEHR) system is funded by the government whereas NEHTA is not; it is also unclear how the information will be flowing and what roles the state governments will have in it (ibid).

It also needs technical capacity and guidance professionals in order to make sure relevance, utility, safety and acceptability is provided through e-health system; although the implementation of e-health has benefited from formation of NEHTA and concept of national open-access, multiple flow of funds and control and poor implementation approach as well as common defence phrase "it's not my problem", has slowed down the whole process of execution of e-health (ibid).

The main reason for health reform is to provide better quality health care and e-health certainly will offer such a service, one of the main challenges involved in doing so, is to make governments recognise the necessary investments for the purchase, implementation, training and maintaining the e-health technologies (ibid).

Choosing the top-down process to implement e-health is complicated, rigid and likely to fail. On the other hand bottom-up approach is unsystematic and has lack of national standards and combined endeavour can make this approach waste of time and effort; it appears that middle-out is the most effective tactic which involves constructing on existing working legacy systems in conjunction with building fundamental blocks for the future i.e. individual EHRs,e-health services, e-Health solutions and national infrastructure modules (ibid).

The issue is the fact that the advantages are only going to emerge when the computerised systems are fully implemented. Introducing the health personal identifiers was the first step taken by the National Health and Hospitals Reform Commission(NHHRC) in their final report. Currently this is legislated at a federal level and involves strict privacy rules with rigorous consequences for any violations (Pearce & Haikerwal, 2010).

In order for e-health to be beneficial for all the partners involved with its implementation it needs to work in coordination across states, territories and private providers (ibid). Commencement of crucial infrastructures such as NEHTA's project and National Broadcasting Network (NBN) are a great kick start for such achievements (ibid).

3.9.4 Future "Super Clinic":

GP super clinic was founded recently in Australia while Australian Government commitment of $275 million in about 4 years in order to develop 31 General Practice Super Clinics (GPSCs) around Australia. The main goal to this big project is to decrease primary care workforce in future and facilitate the information exchange between different health information systems while providing high quality education and training opportunities(Vickery, Dodd, & Emery, 2009).

The planning steps for Super Clinic involve:
Recognition of common motivation
Building up a governance foundation
Identifying the required technology and IT infrastructure
Clarifying the protocols and standards for communication and data exchanging
And planning the business strategy and confirming its feasibility

Super Clinic will be represented more in the next part as a result to the theoretical study and in empirical study.

3.10 Result From Theoretical Study (Super Clinic)

According to the theoretical study there are abundance of health information for each patient and also very wide range of health providers. As the theoretical findings show one of the best way to facilitate and increase the viability of this Super Clinic is to making narrow data set exchange and have more variety of stakeholders connected to the "Health Hub". It should be consider that information exchange and communication in any field needs interaction among people ad these people may have different perception of concepts. Therefore the main concepts also should be predefined to avoid misunderstanding. And some protocols and standards also could be applied in order to do this.

The outcomes from the theoretical study is basically a very fundamental design for "Super Clinic", and the way that involved entities in the super clinic could exchange the information, therefor it is very basic design for its IT infrustructure. In theoretical study part, THE AUTHORinvestigated similar systems and it helped me to understand the "Supe Clinic" with below basic structure as a potentially good address to the current deficits of HIE sytems in Australia.

In this design the main different point is the using a central hub, which several stakeholders such as GPs, hospitals, ambulatories, referrals, laboratories and other health provider connected to that directly, instead of having several hubs in each part. In this way the amount of direct stakeholders increased and it could be a good motivation for them to implement this system more. The point with this hub which makes it very different and outstanding in HIE systems, is the unique protocol that would be used among the all enteties in this new system. This is the main reason of using a central hub, so the stake holders provided with unique protocol to share the data. In the old systems it may exist various standards and protocols to connect to the data bases and access the data, so the possibility of the systems viability was low because one of the main important reason to keep these system active is their communication with other systems, so they may need revising in future and if the protocol and standards are unique and are not various it can be much easier to keep it up to date.

It is good to mention that as it is trying to optimize the communication and information exchange systems among the health partners, it is assumed that the data are all computerized, therefore in this study we limited our perspective to the sharing of these computerized health data.

In the below picure I was tryig to illustrate HIE strategies in Australia to peresent the diffrences betwee the old HIE systme in Australia which drawn in black as legancy HIE system, current which is the NEHTA and drawn in blue and finally the future way of HIE or "Super Clinic" draw in pink.

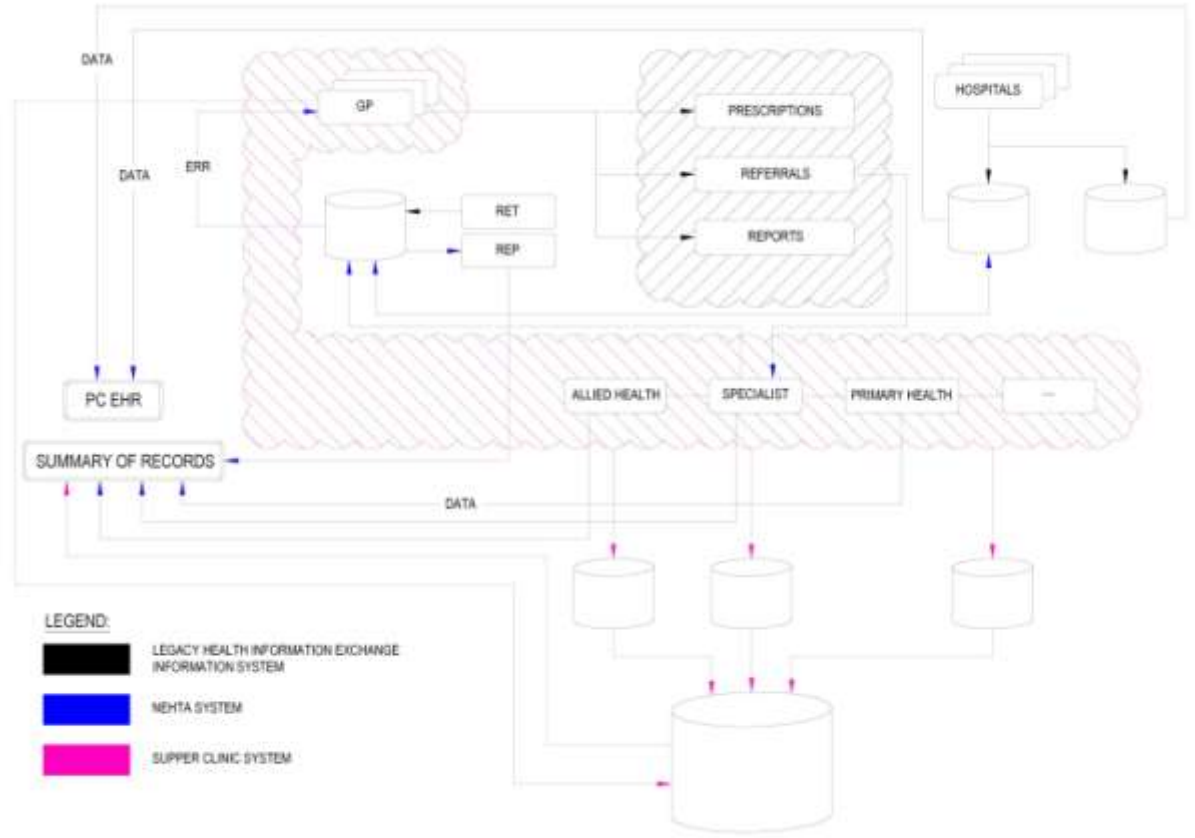

Figure 6 HIE strategies in Australia

This picture (figure 6) shows the data exchanging flow and the basic structures of the HIE strategies in Australia, as it is presented in the "Super Clinic" strategy, the main differenc is using a central hub.

3.10.1 Why Health Hub?

According to the theoretical study part and investigating similar strategies, this health hub should address some weak points that was outlined in theoretical part. The first one is accessibility and sharing process in this hub. In order to access the data through this hub there should be some fixed standards and protocols for this purpose, these protocols and standars should be set in a way that facilitate the maintainance of the hub and furure matchig it with other systems, so it probably should be simple and uniqe. In the other hand the amount of stakeholders should have the possibility to be increased in any phase of the project,without restructuring the system's basis, and since the stakeholders would connect to the hub directly, instead of connect to each other, it wouldn't face seriouse problem in this field. Stakeholders in this hub needs unique identifier and also patients need the same.

In the emperical study this hub and its performance will be go under more investigating through the interviews.

3.11 Proposition for an Empirical Study

Theoretical study was not adequate to address the research questions, in addition to I as researcher believe that there should be some covered points that can be revealed through an emperical study. Sowe need to conduct an empirical study to reveal the covered point related to the research phenomena. Therefore interview with the experts conducted in order to investigate more about the research questions. The combination of data generated from empirical study and theoretical study will be anaylse then to achieve more appropriate outcome from this study.

4 Empirical Study

The method that we decided to apply in this study for collecting data is informal interview with experts. Australia has the middle range in e-health systems ranking among other developed countries (Pearce & Haikerwal, 2010). Australia are going to implement new perspective of HIE (i.e. Super Clinic). The authors are resident Sydney. These reasons caused the authors decided to choose NSW as the case and investigating the Super Clinic which is going to develop in NSW, in order to see if it is feasible to adopt it to other nations as well.

4.1 Why In-depth Interview?

Our data collection method is in-depth interview which is a sort of semi-structured interviews. Usually researchers choose this method of data collection for two main reasons, first these kind of interviews are well matched for exploring the interviewees' perceptions and ideas about complex concepts and also it let the interviewer question more in order to clarify the answers (Barriball & While, 1994). Second, wide-range of experts, professional and personal histories of sample collections are not permitted to involve in standardized interview schedules to share their private information (ibid).

The data collection techniques which is used in this study is basically interviews and reviewing published materials related to the topic of the research, so we had used data gathered from interviews that we conducted myself and related documents in a same research concept to provide better understanding of the phenomenon. We had chosen in-depth interview which is unstructured interview because in this case free responses may help researchers to have wider point of view. Usually in interview with experts there are some points that may not covers in questions so if the interview is going unstructured and in-depth these points can be revealed more. Also during in-depth interview the participant and the interviewer have the time to empathy which leads to have longer and more complete discussion. We also gained some visual cues during our interviews and that is another good point of interview although it is time consuming and somehow expensive; because in order to do an interview with experts you may need to study several interviews and materials to achieve to a logic level of skills to interview them and also there could be some travels involved; but the results of it made me happy to chose in-depth interview as our method for collecting data.

4.2 Purposes

The main purpose of the empirical study is to add some empirical data to existing knowledge which are gathered from literatures review and analysis of them. We planned to conducted interviews in a way to address the research questions in mainly informatics perspectives from the related experts in this area. Three interview was conducted in this study, the first one happened immediately after theoretical study and literature reviewing, when we have concluded that HIE in Australia needs more investigating and found out about "Super Clinic" the big project which is under developing in NSW, so we conducted an informal interview with a related expert involved in that project and as a summarized to that interview we have to say that "Super Clinic" which mainly use a hub known as the "Health Hub" still needs more investigating in order to develop properly. Therefore the theoretical study was reviewed again and we tried to outline the weak and strong point of each similar system that we have already

reviewed them, in order to have clue from their strategies. We discussed the outcomes from reviewing theoretical study with experts in three informal interviews.

Also the aim is to get insight into deeper characteristics that support effective information exchange within health organizations for the purpose of investigating and developing the new Super Clinic model through the experts' point of views.

4.3 Sampling

When researchers start to conduct their empirical study, they need to define their sampling methods, because there is no need to do an empirical study such as interview with everyone in the case study community in order to gain more valid answers, researchers select only a sample from the population in each study (Mack, Woodsong, Macqueen, Guest, & Namey, 2005). The purposes of the study, research questions and also case study's characteristics usually appoint who should be interviewed with (ibid).

Purposive sampling which used in this study is very common strategy in qualitative research for sampling; the participants are selected based on the research questions mainly and according to their professions (ibid). The following interviewees are selected based on their professions and according to the research questions. They have rich background in health informatics.

Throughout oursearching and studying we found the Sonic Healthcare Limited Company which has strong history in e-health and recently provides IT related issues to most of the medical and healthcare organizations in NSW. The e-health team leader in Sonic Healthcare Limited Company was highlighted to our study as one of the interviewee. In view of the fact that Sonic Healthcare Limited Company holds a strong history in e-health therefore it fits the preferred study objective in terms of being a characteristic example.

Another sample for interviewing is an expert in "Super Clinic" project in one of the suburb in NSW, based on his role and his background on this and similar projects he also became our highlighted sample for collecting empirical data. We could arrange interview session with him as well. He has a main role in the "Super Clinic" project. He is also highlighted in our research based on our sampling strategy.

These two cases were chosen through the purposive sampling procedure because of their background in e-health project and especially in health informatics field. The sampling process for selecting identified by the following factors mainly: Communication among health organizations, health information exchange, goals of the Health Hub and the Super Clinic.

We have done the basic step of sampling through searching in internet and collected several candidates but due to lack of responses or either their locality most of them were not practical for our study.
Also as the main case study in this project is "Super Clinic" strategy in NSW, therefore We also started to limit our searching in Sydney and tried to find the related experts in who would be possible more helpful to our study.

Searching “Super Clinic” and “Sonic Healthcare Limited Company” web pages in Australia let us access contact details of the related experts to interview. At the first step it gave us around 20 candidates who had positions from different level of management in health only or in e-health, so we decided to chosen the e-health ones, which had more rich informatics perspectives. We also collected some informal data from some patients and GPs in order to address our research question more in details and accurate and prove the necessity for existence of the “Health Hub”.

4.4 The Interviews

According to our research strategy, we set up the interviews procedure. During this setting up for the interview, we faced many situations which decision needs to be made based on our research design. These situations involved choosing a site or faction to study, nature of data generated, extent of the research, interviews arrangement, and also interview documentations.

According to the interview techniques, we have designed sets of questions for the interview guide. We first identified relevant key concepts and then built up the structure of the questions and finally formulated the interview questions. This process is the same as the procedure of generating research questions therefore it is necessary that informants to feel free in expressing all their experiences and points of views.

We started arranging an interview appointment with selected participants, we contacted with interviewees to allocate time and a place. This is a criterion in arranging semi-structured interview.

Our data collection method is in-depth interview which is considered a kind of semi-structured interviews.
Usually researchers choose this method of data collection for two main reasons, first these kind of interviews are well matched for exploring the interviewees’ perceptions and ideas about complex concepts and also it let the interviewer question more in order to clarify the answers (Barriball & While, 1994). Second, wide-range of experts, professional and personal histories of sample collections are not permitted to involve in standardized interview schedules to share their private information (ibid).

During our theoretical study key concept related to our research questions has been described. As it has been mentioned earlier, the procedure of the research question influenced on the setting up the interview question directly.
We tried our best to design the question structure in an appropriate order so they can be comprehensive. Originally 15 questions have been designed; they have been reduced down to 7 after evaluation. Three experts were asked to answer these seven questions. We conducted the evaluation procedure as below:
First we re-read and assessed them and see if they pertinent collecting data effectively in scope of health information exchange , sharing problems and viability of the new Super Clinic from defied aspect such as commercial an technological, current HIE deficits and see if new Health Hub can reduce these problems. So the unrelated or duplicated questions were omitted in this stage.
Second we discussed remain questions with our classmates and other participants to see if they could be misinterpreted because of wrong structured or order.

Open-ended questions were chosen because they let the interviewee the chance to involve much more opinions in the answers.

We presented our open-ended questions as a guided structure, they moved forward to more details. We tried to make the informants feel more relax and favorable to share their opinions and perceptions about the questions.

In the other hand interviewer in semi-structured interview should be skilled in active listening in order to reproduce from revealed information which needs more inquiries.
The level of extracting rich data during interview sessions is directly depended on interviewer skills in interpreting, listening and sharing the information (Hall, 2011).

During the first minutes of each interview, interviewer provided the informants with the overview of research intentions and the purpose of the interview, so informants has the time to know and assess the interviewer. This is the first informal conversation in the interview session and it is essential to establish a mutual reliance and respect between the interviewer and informants, it helps to have a comfortable session for interview (Lewis-Beck, Bryman, & Liao, 2004).

Interviewers may use audio recording in order to document the information extract from interview session. the text from transcribing the audio file could help researchers to have more organized and categorized data which make the validating and evaluating easier and more accurate (Hall, 2011).

Interviewers were asked the following questions. These interviews are informal interviews. The below questions play the guide role rather that fixed questions:

1. What do you think this strategy i.e. Health Hub may cause information exchange problem?

This question is designed to investigate their experiences and opinions about the communication obstacles among different similar systems globally.

2. How do you think about the messages and information which is needed to be shared in the Health Hub, any special flow for them or any condition?

As the theoretical study findings show if we make the data sharing in narrow sets in each transaction and increase the number of partners' access to them the systems may be operate more effectively in terms of time and cost. So we asked this question from the interviewee to confirm our perceptions and see their idea about that.

3. Do you think using this "Health Hub" will reduce patient journey in an outstanding scales?

Since one of the main purpose of this study is to investigate on how we can reduce patient journey and increase the level of their satisfaction, so we as researchers wonder if the implementing of such a new system like "Super Clinic" in suburbs is reducing patient journey in compare to its cost ? And if not what are the other side benefits of that?

4. In your opinion what are the key characteristics related to the viability of Super Clinic?

Super Clinic will probably play an important role in Australian Government, Department of Health and Ageing attempts to improve health information exchange. There were some previous efforts in this area which the outcomes were not as well as it was expected so we think investigating the factors related to Super Clinic viability will be necessary in our study.

5. What are the possible informatics barriers in operating and implementing "Super Clinic", do you think we can minimize these barriers with changing the IT structure of the "Super Clinic"?

This question is designed to ask in order to get some clues to optimize the design of the Health Hub and also see if the barriers are the same as the previous systems so may be similar solution can be applicable to them.

6. Do you think this system with using Health Hub can minimize the current problems of data sharing among hospitals and GPs?

Since one of the main current problems in HIE is sharing the patients' information between GPs and hospitals, so we try our best to analyze this new "Health Hub" and see if it can diminish this issue to some highlighted extent and if it is not then what is the main reason.

7. What other IT issues and factors are required to be considered in this system in order to have an effective health information exchange?

Through our investigating we found out that there are some important IT issues namely as: security of the data, level of accessibility for each stakeholder and pattern of information flow; they should be more clarified and studied in implemented similar systems; therefore we decided to ask this question to find out their perceptions of the most important factors in this regard.

It is good to mention that these questions were designed to ask in order to analyze and evaluate the design for the Super Clinic and the Health Hub as outcomes from the theoretical part, but since there are some aspects that need to be addressed by a physician so decided to include a physician in our interviews as well.

4.5 Interview 1

Sonic Healthcare is an international medical company, it provides extensive medical and health informatics services from laboratory medicine, and radiology up to other IT related infrastructures to health communities. The structure of the company is decentralized federation of health, health informatics and medical diagnostic practices and the head office is located in Sydney, Australia. It is the main and parent organization of various operating parties in different locations of the world. It is categorized as one of the Australian's top 100 organizations among Australian Securities Exchange list. This public company has formed since 1987, at that time it just practiced first pathology practices. This company employed around 25,000 staffs around the world, in Australia, the USA, Germany, New Zealand, the

United Kingdom, Ireland, Switzerland and Belgium ("Sonic HealthCare," 2013). The first interviewee has been selected from this company based on his rich experiences in e-health in past 5 years; he holds the position of e-health manager at the time of the interview.

4.6 Interview2

St Vincent's hospital located in Sydney, Australia is a world-class public hospital offering best-in-class services, conveniences, and proficiencies; they have an international standing for innovation and is known as a centre of excellence for clinical care, research, teaching and medical leadership.
This hospital is one of the hospitals in NSW which employed a mature health information exchange system among GPs and other health care providers, they can either send the discharge letter to the GPs or handed it to the patient, also this hospital is connected to the laboratories and other allied health care. But still some deficits include in their communication systems. The second informant is a physician from this hospital and his assistant, they have been involved in EHR systems implementing and health informatics technology in past two years and shared their perceptions in this case with us.

4.7 Interview 3:

GP Super Clinic is a new system in Australia which is providing health care organizations with new informatics services and excellent sites in order to improve the quality of health care services delivery. It will be implemented in several local communities; one of the main goals of Super Clinic is bringing GPs, practice nurses, hospitals, medical specialist, allied health professional and other health providers together in order to increase primary health care and decision making procedure ("Department of Health and Ageing - GP Super Clinics National Program Guide 2010," 2010).

Participants in Super Clinic will benefit from effective use of information technology because they can adopt forms of care that focussing on the proper practices which is an outcome of multi-disciplinary entities; also it has focused on chronic disease care and managing the financial aspect and quality of the life time care to these sorts of patients. This service which is provided by Super Clinics will be based on the ordinary fee for the same services; another mission of Super Clinic is to decreasing the level of inefficiency, unnecessary procedures and duplications which is relatively high in the current health systems (ibid). It is planned to achieve to these goals through integration of related participants as stakeholders of the Super Clinic; finally Super Clinic provide training environment for the entities as well to improve its viability ("Department of Health and Aging-GP Super Clinic National Program Guid ", 2010).

Third interview was conducted with an expert who has a main role in the one of the SUPER CLINIC project in a suburb in Sydney. He has held the position of research director at e-health research centre in Commonwealth Scientific & Industrial Research Organization (CSIRO).

4.8 Results from the Empirical Study

The following results were generated from our empirical study. We disregarded the unrelated data to the research topic. Our vision gained through theoretical study helped us in empirical study.

1. What do you think which information exchange problems this strategy (i.e. Health Hub) may cause in health organizations?

Information exchange method which is defined in any system has direct impact on communication efficiency. One of the basic probable issue which may rise during this new strategy (i.e. implementing health hub), is creating informatics standards and protocols. In order to maintain the communication among HIE systems they usually need simple and similar IT standards and protocols.

Nowadays health organizations are becoming bigger. They need to have similar standards in order to exchange their information properly. If the HIE systems used in an organization needs restructuring, the IT standards and protocols should stay unchanged in order to keep the communication with other systems. For instance a unique standard and protocol is defined for similar systems, it could allow the participants and stakeholders in these systems to exchange the information according to those standards. Restructuring and updating the systems could be much easier by creating common standards for different systems.

The Health Hub may also include a data base with a processor. The Super Clinic is provided with an intelligent hub rather than a normal hub. Therefore the Health Hub probably has some kind of processors to manage the data entered by the participants of the Super Clinic. Main departments of each health organizations will be connected together through the Health hub.

2. Do you think using the "Health Hub" will reduce patients' journey?

One of the main issues which cause the patients have some unnecessary journeys is the number of GPs, pathologies and other health provider in on health information exchange system. By implementing this new strategy, the number of health care providers, GPs, pathologies and etc would be increased. They would connect to the Health Hub directly therefore they could access to other's health information through the Hub. The patients' journey would be reduced. Currently hospitals exchange patients' health information with pathologies, laboratories and some GPs. "Super Clinic" is going to improve the healthcare quality so its ultimate goal is increase the level of satisfaction, maybe at first steps the reducing in patient journey would not be tangible, but when the number of stakeholders reach to an expected level, patients journey would decrease down.

3. What are the key informatics characteristics relevant to the viability of the Super Clinic?

According to the outcomes from the interviews, in order to examine the viability of this new strategy (i.e. Super Clinic) we need to investigate the following issues:

Linking the current HIE systems as one complete package to the new Health Hub. Each entity in the package should be benefited from the Hub independently. The IT infrastructures of the current systems in health organizations should be matched with the new strategy. Financial concerns for restructuring the IT structure in each organization is an important issue. One of the possible ways is estimating capital costs and operating costs. The level of dependency to the stakeholders could be estimated.

Information systems in different health organization need to be linked together. The whole "Super Clinic" will act as a network of networks. The sub-networks are included the

information systems in health organizations. We should attempt to reduce down data packages exchanging between any two networks. With increasing the sub-networks the possibility of the new systems viability will be increased directly.

4. What are the possible informatics barriers in operating and implementing "Super Clinic", do you think we can minimize these barriers with changing the IT structure of the "Super Clinic"?

The answers showed the most important barriers are IT issues. The leadership of each organization should take the responsibility to implement the new health information system in the organization in order to link to the Health Hub. Adopting current IT infrastructure and informatics protocols, with the new strategy (i.e. HIS in Super Clinic) is an important issue. It needs IT professionals to adopt and apply these new systems.

The other barrier is the concern about the security of the data. Security and privacy concerns are mainly from researchers' and patients' side. The informatics protocols addressed these concerns.

They are some unknown barriers to impellent new systems such as motivation for health providers to adopt a new information system. Based on the results from interviews one of the best ways to minimize these barriers is investigate the current information systems in a health organization first and try to apply a very similar IS. Also another possible way is to involve stakeholders much more in implementing phase.

5. What other IT issues and factors are required to be considered in new HIE system in order to have effective health information exchange?

Answers from interviews showed there are many IT issues influencing on effective information exchange. In the first phase of implementing new HIE system; we have to focus on the key IT factors. One of the most important one is the system flexibility from an IT aspect. Information exchange systems need flexibility in order to become a member in a wide network. Having a standard for information exchange and some rules to access the data is necessary in order to have a comprehensive system in nationwide.

6. How do you think about the messages and information which needs to be shared in the Health Hub, any special flow for them or any condition?

As it implies in other questions, one of the best way to survive the new HIE system through different situations, is manage the health information. They should be categorized in various groups. Each group of information should be set as narrow as it can. Each category of health information is labeled for specific participants. Therefore in each transaction less amount of data exchanged. Unnecessary data won't be exchanged. There will be much more information exchange in each time through the Hub. Information is in narrow settings with different destinations. Also in this way we will find different groups of stakeholders to access different class of data and the security and safety may increase as well.

5 Analysis and Result

In this part we are going to analyze and compare the results from theoretical and empirical studies. Advantages and disadvantages of the systems will be presented as an outcome

through analysis of the theoretical and empirical results and the dissimilarities and match points of these two results will also be presented.

The set of criteria that is recommended for comparative analysis is appropriate to the research sub questions which strengthen the main research question. These sub questions have been answered through the theoretical and empirical study and we will compare them together in this part.

We will try to identify and recognize consistency and inconsistency in results from theoretical and empirical studies.

5.1 Comparative Analysis

In analyzing chapter we prepared the collected data for analysis. We categorized the data into two main groups. First group is relevant data to the research topic and second is the irrelevant data. The irrelevant data was disregarded. Among the relevant data to the research topic we selected the data related to the research questions. These data were used in comparative analysis.

Sub Questions:

- How can we minimize the potential IT problems of "Super Clinic"?

One way to minimize IT problems after using the "Super Clinic" and other new HIE systems in health information exchange is create a list of IT standards and protocols as a kind of certificate for each HIE system. The stakeholders and each component in that system are considered while this certificate is creating(Adler-Milstein et al., 2010).

Fontaine and his colleagues pointed out that informatics obstacles could be minimized through development of IT protocols which includes standards, implementing fixed terms, and criteria certificate for using IT in health organizations (Fontaine, Ross, Zink, & Schilling, 2010).

According to the empirical results, while it is necessary to have an informatics framework, the new HIE systems should consider the flexibility in some aspects. The interviewees mentioned that informatics and technological standards should be set during implementing the new HIE systems. It may avoid many potential IT problems like security of data or accessibility to data. There are some common standards for sharing and exchanging data currently used by most of the HIE systems such as HL7. The new HIE systems can be inspired from these existing standards to save time. Geographical expanding is another important IT issues. Usually in expanding a system geographically many technical problems may rise.

It is necessary to have a comprehensive framework in terms of data categorizing and standards for transferring these data sets. By using such a framework the process of transformation and normalization of data will be optimized.

- How the IT characteristics and policies should be defined in terms of implementing the new Super Clinic and accessing the data in the Health Hub?

The results from empirical study showed that the IT characteristics should address the stakeholders' concern about privacy. They have also stated that new HIE systems need to revise the current informatics, security and privacy policies instead of building up new ones. The best way is to review mature and successful HIE in terms of information exchange, financial and operational feasibility.

Theoretical study results showed the most of HIE grants funding encouraged development in health information systems (Adler-Milstein, Bates, & Jha, 2009). Also wide-range of stakeholders had an outstanding influence in increasing applying new HIE systems, the new HIE systems could benefit from broader resources financially(Adler-Milstein et al., 2010). In 2011 Alder and his colleagues conducted another study and concluded that the main policy characteristic is large amount of grants to different states to implement a new health information exchange system. This is to improve the data security in nationwide and increase the usage of HIE new systems in more organizations (Adler-Milstein, DesRoches, & Jha, 2011).

- How data and health information should be categorized in order to improve the efficiency of the HIE?

According to the results from the theoretical study, different health data needs to be exchanged among different participants. Some data should be available to the whole participant in the Hub and some had much stronger security to access. Alder et al believed sharing the test results, medication list and inpatient data in the Health Hub with easy accessibility is more important than personal information of each entity in systems (Adler-Milstein et al., 2009). The health data are categorized according to many factors. This classification of data should product various data packages. There is another study that concluded that the average sort of health data in first levels of categorizing should be about 3 in order to have effective HIE (Adler-Milstein et al., 2010). The HIE systems were growing and supporting more areas, they included more data types such as: pathology results, inpatient and outpatient information, medication lists, hospital discharge summaries and demographics of the patients (Adler-Milstein, Bates, & Jha, 2011). Finnell and Overhage have also highlighted that the following data categories should be included in any HIE systems: laboratory results, diagnoses histories, procedure histories, inpatient data and demographics (Finnell & Overhage, 2010).

Results from empirical studies also confirmed the outcomes from theoretical study. In order to have more successful HIE systems, they had to make each data package narrow and increase the number of the packages. Results from interviews illustrated omitting unnecessary data in each transaction helped HIE systems to save more costs. With including narrow groups of data, technical informatics challenges would be simplified consequently. They also mentioned that the most important set of data based on the past experiences are the test results, inpatient records, and discharge letters from hospitals, clinical notes and medication procedure.

- How can we improve the level of viability of the Super Clinic?

Results from theoretical studies showed that one of the most important factors that influenced viability directly, is the income from stakeholders, this income could cover the ongoing costs of IT restructuring (Adler-Milstein et al., 2009). In another study conducted by Alder and his colleagues in 2010, they mentioned four main IT factors which cause improving the feasibility of the HIE systems. These factors are: setting narrow groups of data to exchange,

including hospitals as the main data receivers in Hub, receiving fees from each stakeholder in HIE systems during the planning time, and the grants for each stakeholder should be matched with their level of contribution thoughtfully (Adler-Milstein et al., 2010).

The informatics nature of the information exchanged in the Hub is another factor that affects the viability of the system. In some case sharing and exchanging the health information could be very critical. For instance patients usually cannot transfer their health records scientifically and in an accurate manner, therefore exchanging patients' health records should be considered more in terms of accuracy and time. It helps improve the viability of the HIE systems(Finnell & Overhage, 2010).

Also having a strong business model can influence on HIE's feasibility and succeed in long-term. A proper business model can address the financial barriers to viability of the systems (Fontaine et al., 2010).

Results from empirical study and theoretical study are similar in terms informatics. the interviewees suggested to having a strong business model which involves fixed registration process for becoming a member in the "Super Clinic".

5.2 Result Summary

Main characteristics of the Supper Clinic as a very new HIE system, were gained through investigating similar HIE systems like RHIOs. The important informatics factors for viability of the new system are IT infrastructure and data managing issues. Data managing issues include categorizing data, security of data packs, and accessibility to the data. Reducing the size of data packages and increasing the number of stakeholders, would help the new systems to facilitate its data managing and IT structuring process. Additionally, systems may achieve an early succeed in their first phase which leads to have more likelihood of viability in future.

Adopting an inclusive framework with hybrid construction, data consistency and message protocols, can help the Super Clinic and other new HIE systems to have better IT infrastructure. To address security and privacy concerns, systems need to apply comprehensive policies.

The comparative analysis of sub-questions showed some informatics challenges in implementing the Super Clinic. These challenges are mostly happened in nationwide implementing. The challenges include different internal policies, different level of privacy concerns among different participants, competition, motivations and suspicions about the viability and liability of the system, difficulty on achieving to a base agreement for exchanging the current HIE system.

It is concluded that one of the most important factor in order to have a successful Super Clinic is focusing on providing the clinicians with relevant health data in a timely manner. It leads to help them in decision making and standardization of healthcare to save time and expenses.

In the next section the Super Clinic basic structure which used the central Health Hub will be revised according to the comparative analysis and results.

5.3 Revised Health Hub, Revised Super Clinic Model

The revised of the Super Clinic Model should illustrate the following factors to ensure its viability and feasibility:

- The whole system presented as network of networks.
- The main stakeholders should be presented.
- The technical informatics standards to meet the security concern should be identified.
- The continuous communication with other HIE systems should be considered.
- The main data categories should be explained.
- The funds from stakeholder during the operating phase of the Super Clinic should be determined.

6 Discussion

6.1 Conclusion

In this research we found three similarities among various health information exchange systems. These similarities are informatics aspects, financial aspects and technological aspects. They helped us to explore the basic structural design of the Super Clinic as a new solution to improve the weak points of the old systems.

Although most of the participants in different HIE systems believed that each system has its own unique functions and implementations, but our research concluded that it is possible to generalize a set of IT strategies to address their technical, implementional and organizational requirements. Therefore their communication with each other would be more optimized and the viability of these systems would increase.

Studying similar systems such as RHIOs showed that the progress of implementing RHIOs is time consuming while the rate of the failures is high (Ng, 2012). We investigated the RHIOs which is similar to Super Clinic and extracted strong and weak points of it. It helped us to revise the Super Clinic model.

Lack of protocols and principals which lead to have information exchange problems are very common in the existing HIE systems. The new Health Hub needs more informatics more policies and agreements to mitigate these issues. Increasing a number of stakeholders lead to the increase of the different levels of privacy to access the data. It is worth to mention that another key factor to have successful Super Clinic is to define a proper sustainable business model, so the new system seems more liable to the organizations.

6.2 Method Evaluation

In the theoretical study we reviewed the literatures and documents related to our research area. The related concepts helped us to construct the theoretical clues in searching text and analyse them. We used the text materials through the sampling process. Text materials were selected from literatures published in academic journals, scientific journals, textbooks and other related published papers. Through the theoretical study and reviewing text materials, we found that this part can serve our study purpose sufficiently and address the sub-questions to a

satisfactory level. But during analysis of the theoretical study we found out that there can be various interpretations in the analysis phase, it depends on the researchers' point of views and also the analysis standpoints. We could have very different and complicated interpretations according to the different theoretical framework applied, different time that the text materials published and different perception from concepts. During theoretical study we as researchers gathered different perceptions of the health information exchange. And the reality is that if we repeated this procedure again we could gain more efficient themes for our research area.

We collected our empirical data through interviews with experts. It was a proper method for us to generate our primary data. The findings from theoretical study were validated externally through the interview with related experts. During the interviews we are gained more details about the functionality of the Super Clinic and other similar HIE systems. Our empirical study included three interviews with experts. These three interviews were conducted almost better than what was expected although there were some professionals phrases in our interview sessions which needed more time to get the right concept of it.

During the second and third interview, we as interviewer had more related knowledge so the interview session was more effective; also we had more chance to validate our result externally through third interview. Because by the third interview, we had already done two interviews and achieved to a big portion of the results.

According to data collected from interviews, we concluded that choosing interview method as collecting qualitative data is very helpful, because other methods are weak in terms of abundance. Also in face-to-face interview the interviewer can gain clues from emotions, which is a weak point in other methods.

6.3 Result Evaluation

As it is discussed in part 2.7, the triangulation strategy had been chosen for evaluating the results. In-depth interview as method for collecting data and also literature reviews and the analysis from text materials, build up the triangulation strategy. This strategy for evaluating the result has the advantages of consistency and reliability for validating.

In order to evaluate the credibility of the results, Lincoln and Guba proposed a set of criteria (Lincoln & Guba, 1985).

- Credibility (parallels internal validity in quantitative studies)

This criterion assesses the level of trustworthy. Since the authors have knowledge in informatics systems and also had conducted several informal meetings related to the research area, they collected the data with confident. The established strategy in order to generating our data and interpreting them is selected as below:

- ✓ Case study as research strategy
- ✓ Purposive sampling for sampling technique
- ✓ Semi-structured, using open-ended questions interview as method for data collection
- ✓ Comparative analysis of theoretical study and empirical study as analysis technique

According to the literatures which are reviewed in theoretical study and the text and diagram outcomes, we as researchers can hardly find inconsistency with the existing related theories and themes. Selecting similar HIE systems (RHIOs), was well-matched with the similar case in Australia (i.e. Super Clinic) and the informants who were interviewed had strong knowledge and related experiences to our research area.

- Transferability (parallels external validity in quantitative studies)

Transferability is a concept that assesses the level to which the qualitative study outcomes can be transferred or generalized to other settings or context. Some researchers believe that transferability is the initiative response to do the generalizing ("qualitative validity ", 2008). We as researchers improved the transferability by explaining our research concepts and describing the main assumptions.

Sampling strategy can explore the proposition for the generalization. In order to define a frame for sampling, using purposive sampling could be very helpful. In our study, two important HIE systems which hold lots of experience among developed countries were explained as our main data sources. HIE systems in US (RHIOs) and also in Australia (Super Clinic, NEHTA) selected as the main cases. Some other HIE systems were reviewed. These systems were mature to some extent. They used similar strategies from other old systems and adapted to other old systems for exchanging information. Therefore the results from this study can be strong in term of transferability to other HIE systems.

It is worth to mention that due to the differences between these systems further descriptions of context was required in this case. The selected samples size was not large enough bat it has capability of being transferable. Establishing HIE systems has been started to improve over a decade ago therefore it is difficult to define a population size for them especially for the very new Super Clinic. According to our research methods and the qualitative interviews, the case study in our research is small in size because it focuses on Super Clinic in Australia, but results from empirical and theoretical studies shows that data generated from this study can be transferable to other similar HIEs. The main attempt of this study is to investigate RHIOs and Super Clinic in order to minimize the potential problems of health information exchange in Super Clinic and other similar HIE systems.

In choosing our interviewees, we considered the external validity procedure; the informants told us their comments about the validity of the results.

- Dependability (parallels reliability in quantitative studies)

If the study were repeated, with same strategy, design, same context and same informant, similar outcomes would be gained. This is about dependability. It should be recorded that how the study is done therefore another researcher can trace the same steps to reach the outcomes of the study. Qualitative studies usually have an important challenge in dependability term. It can change the situations and strategies of the research.

During the literature review and theoretical study the probability to change the research strategy is high in qualitative research. During each chapter the research questions are revised, therefore it is very important for the researcher to record all these changes. Other researchers can trace the study in the same steps and the research can be richer in terms of dependability. Researchers should record any modifying in research design accurately therefore theoretical

and methodological basics are associated to data revealed. The research design in our study includes case study as research strategy, interview as data collection method, comparative analysis as qualitative analysis techniques. The selected case was Super Clinic in Australia although the similar systems in US were investigating as well. Interviewees were an e-health team manager in an international e-health company, an expert who was HIE supervisor in one of the Super Clinic project and a physicians who used this systems in their hospital.

The main guide document retrieved from internet was: "GPSC National Program Guide" published in Australian Health Government website. We have to mentioned that since "Super Clinic" in Australia is a new project so there was not adequate literatures and material published about it, therefore we as researchers searched for similar systems in USA, called RHIOs and previous documents about Australian HIE strategies, such as: "National E-Health and Information Principal Committee / National E-Health Strategy".

The method for generating data is from the related documents and the interviews. And then results from the literature review went under cross-referencing with outcome from empirical studies and following with comparative analysis.

6.4 Ideas for Continued Research

The study of health information exchange has been an ongoing research for more than a decade. There are several research which were conducted on a specific area of this phenomenon. But Super Clinic is a new project. It should need more analysis study in future especially after it is applied. Suggested areas for future works could involve: accessibility policies, security of the health information in Super Clinic and information systems used in them. Future works in Super Clinic may investigate the health information managements' affects on the Super Clinic systems. It would help improve the development of the current HIE systems.

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University of Borås is a modern university in the city center. We give courses in business administration and informatics, library and information science, fashion and textiles, behavioral sciences and teacher education, engineering and health sciences.

In the **School of Business and IT (HIT),** we have focused on the students' future needs. Therefore we have created programs in which employability is a key word. Subject integration and contextualization are other important concepts. The department has a closeness, both between students and teachers as well as between industry and education.

Our **courses in business administration** give students the opportunity to learn more about different businesses and governments and how governance and organization of these activities take place. They may also learn about society development and organizations' adaptation to the outside world. They have the opportunity to improve their ability to analyze, develop and control activities, whether they want to engage in auditing, management or marketing.

Among our **IT courses**, there's always something for those who want to design the future of IT-based communications, analyze the needs and demands on organizations' information to design their content structures, integrating IT and business development, developing their ability to analyze and design business processes or focus on programming and development of good use of IT in enterprises and organizations.

The **research** in the school is well recognized and oriented towards professionalism as well as design and development. The overall research profile is Business-IT-Services which combine knowledge and skills in informatics as well as in business administration. The research is profession-oriented, which is reflected in the research, in many cases conducted on action research-based grounds, with businesses and government organizations at local, national and international arenas. The research design and professional orientation is manifested also in InnovationLab, which is the department's and university's unit for research-supporting system development.

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