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Effect of Lean Principles on organizational efficiency

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Abstract
In India, the manufacturing sector is striving hard to generate revenues and this is ongoing for the last one decade. This aspect of generating funds is dependent on two major factors i.e. reduction in product manufacturing cost, and enhancing the product quality to satisfy the customer needs. The production cost can be reduced by improving the design and through incorporating the newest version of materials. The improved version of materials will positively add value to the product quality and thereby attract the customers. On the other hand, the product quality can increased through application of systematic and statistical data analysis tool especially Lean, Six Sigma, SCM, JIT, TPM etc. in the manufacturing sector. This may further results in high labour efficiency. The paper comprises of literature review of published paper in various reputed journals on the concept of Lean manufacturing. "Lean" is a production process which encompasses the expenditure of all the resources to accomplish a goal and creating of value to end customer through eliminate the wastes. The paper reveals that the goal of Lean is creation and maintenance of a production system, which runs repetitively, day after day, week after week in a manner identical to the precious time period. The continuous and smooth flow, earlier delivery, reduced cost and better design are the outcomes of the systems.

Introduction

In recent years, the manufacturing sector has received a great deal of attention because of the globalization of the market. The management of production planning and facility selection within manufacturing industries is a tough task as there are numerous variables which vary from industry to industry. Due to this fact, the manufacturing paradigm is shifted to lean production as earlier it was mass production type. The removal of waste with in the production facility has a long history, and as such this forms much of the basis of the philosophy now known as "Lean". Lean Principles was firstly coined by John Krafcik in an article titled, "Triumph of the Lean Production System," in 1988. The research work was extended at the International Motor Vehicle Program (IMVP) at MIT and the research concludes in a book “The Machine That Changed the World”. [20]. Toyota Company refines the concept of LEAN Manufacturing from their earlier versions which are based on efforts for efficiency enhancement only and has some hidden causes to affect the productivity and product quality. Toyota Company prepared a base for the continuous improvement in the organizational performance. The aim of Lean manufacturing is to expose problems systematically.

Lean manufacturing has the three main goals are: a). Design the manufacturing system as simple as possible and based on pull production type, b) the segregation and elimination of non-value added activities that recognizes the room for improvement, c) Build up the mindset for continuous improvement that means incremental improvement of products, processes, or services over time, with the goal of reducing waste to improve workplace functionality, customer service, or product performance. [18] Lean is the set of "tools" that assist in the identification and steady elimination of waste. The various Lean tools are Value Stream Mapping (VSM), Kanban (Pull Systems), Single minute die changing (SMDC), Flow/cellular manufacturing, Visual controls and work place organization (5S concepts), Set-up reduction, Total Preventive Maintenance (TPM), Kaizen event

facilitation and Poka-Yoke (Error-Proofing). The wastes are termed obstacles in the way of continuous flow and various kinds of wastes are shown in Fig. 1.

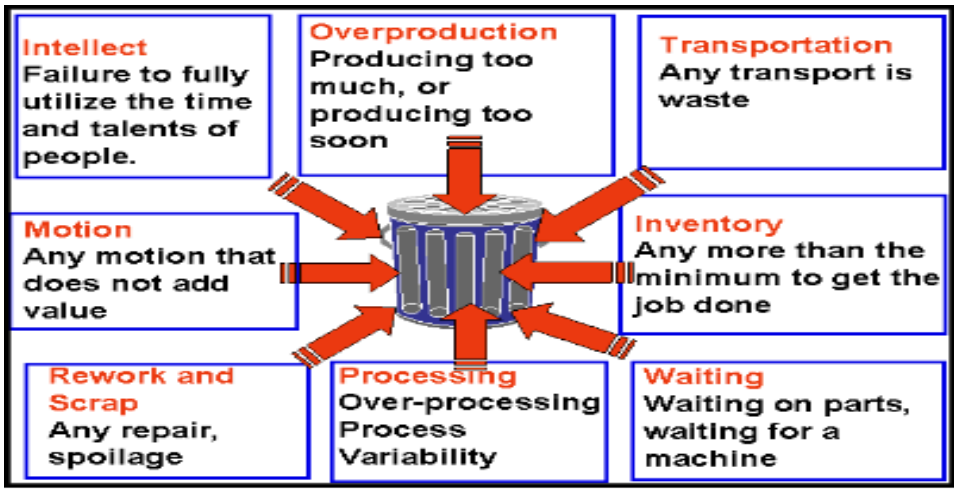

Fig. 1 Waste Elimination Philosophy of Lean [7]

Lean principles aims to make the work simple enough to understand, do and manage easily. Womack and Jones, states the five key principles of lean thinking i.e.1) Define value from the customer perspective, 2) Identify the value stream, 3) Make the process flow, 4) Pull from the customer and 5) Head toward perfection. [21]

The present paper justifies the concept and need of customer value as revealed by several authors; and also states the way to manage the value stream of the business as demanded by customer. The identification of customer value is very crucial while working on production floor because at this stage the main focus on productivity. Lean manufacturing approach helps to enhance the customer value by adding product/service features while eliminating wasteful activities. The planning regarding the production is done based on the customer order to minimize demand uncertainty. [22]

Literature Review

Lean manufacturing concept is also known as the flexible mass production which is based on two pillars of TPS i.e. Just-in-time (JIT) or "flow", and "autonomation" (smart automation). [3] Toyota Production System defines Lean as a management philosophy used for reduction in three types of waste i.e. a) Muda (Non-value-adding work), b) Muri (Overburden), and c) Mura (unevenness). Anything that doesn't add value in the process or product is termed as waste. During production the value adding activities are simply only those things the customer is willing to pay for, everything else is waste, and should be eliminated, simplified, reduced, or integrated. [14] The implementation of lean production was only one component of a corporate transformation to lean. The initiation of lean begins from the product development to the after sale services to the end customers through chain of supply of material and shop floor management etc. [19] It will helps in developing the capabilities in workman to work in flow production or "pull" mechanisms to support flow of materials at constrained operations. Further, the aspects of organization practices like standardization, discipline, and control, training program, participation and empowerment, zero defect, devotion and contribution of management, cross functional team and compensation including rewards that successfully follow lean production principles. [2,12]

More than hundreds of surveys have been done on lean manufacturing approach since today and reveals that the lean practices were further categorized in no of groups on the basis of

indicators/key-tasks which is used to accomplish the desired goal. These are Elimination of zero value activities (Non Value Added Items Removal), Continuous improvement, Multifunctional taskforces, Manufacturer-supplier's integration, JIT production and delivery System (Inventory Management) and Flexible Manufacturing system (Flow of Material and information), Total Productive Maintenance, Total Quality Management, and Human Resource Management to assess manufacturing changes towards lean production. The survey reports also analyze the application of these practices and examines the factors that are affects the Lean organization Performance. [3,16,17]

In Indian context, some manufacturing industries have misapplied lean tools and techniques during the conversion to a lean organization from non lean. The incorrect application of lean tools results in a waste of time and money including the reduction in confidence level of employees of an organization. [11] The organization culture and maintenance were reported as the factor while converting the non lean organization to lean. The organization culture affects the planning and directing horizon of management while the unwanted breakdowns and poor maintenance policies affects the organization performance.. This may further leads to affects the clarity of vision, leadership capability of worker and poor sequencing of project. [1,4,6,9]

Value Stream Mapping and 5's is the most beneficial and easy tools of Lean manufacturing. It is helpful in determining the beliefs, behaviors, and competencies possessed by business leaders and with the help of current and future states map, highlighted the ineffectiveness of most senior managers as well as traditional leadership development programs. [5,8,10,15]

Defining problem

Manufacturing sector faces crises in the production system because cost has become an important factor. In Indian working conditions, most of the work is carried out manually because of which production system has become complex. Since, no two men's are same and work at the same efficiency. Further, the existence in fast moving global market is to address the customer's requirement and make changes in production system to suit that required competitive advantage. This facilitates the rapid changes in product design which is need of the hour to cater to customer demand. The research objectives are as follows:

- To study and identify the areas which don't add value to product and eliminate such areas through principles of LM.
- Ascertain the existing capacity of the plant and suggest ways to improve full capacity by balancing the production system and utilizing the capabilities of man and machine to the maximum level.
- To investigate the unaddressed system of maintenance system to improve the plant efficiency.
- To investigate about application the worker rotation principle to achieve flexibility in the system.

A framework is required to design these elements into a coherent system of manufacturing. Hence, it is essential to rely on the principles of LM for overall improvement in working environment also to enhance the services to the customers.

Methodology

In the present era, the industries must investigate beyond the shop-floor to ascertain the opportunities to improving overall cost and performance. The challenge to move with Lean principles facilitates inventory controls material flow, labour efficiency and overall improvement in

the working environment. The strategic elements of Lean are quite complex, and comprise of multiple facets of manufacturing systems. The various strategically aspects may be as follow:

1. Plan Lean as a fixed goal
2. Implementation of Lean by using various tools like VSM and 5'S, SMDC etc.
3. Maintain continuous improve program
4. Sustain the Lean as a philosophy

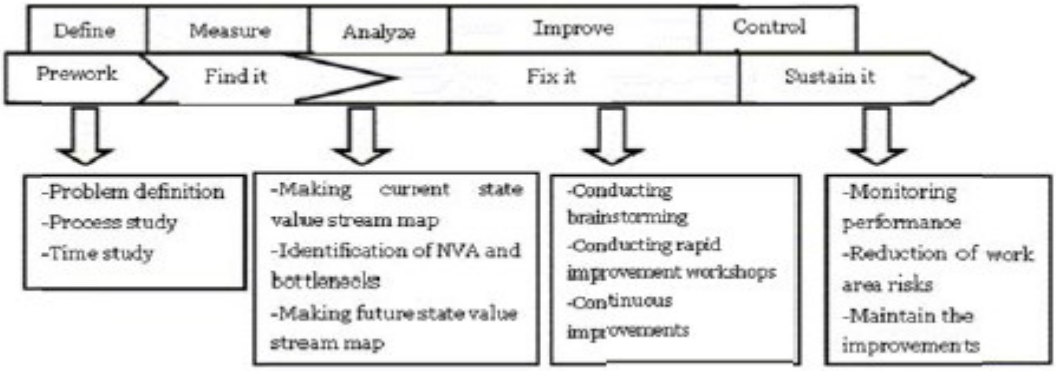

Fig. 2 Methodology for lean implementation [13]

Despite of above, it remains the case that the direct manufacturing examples of 'techniques' or 'tools' need to be better 'translated' into a service context to support the more prominent approaches of implementation, which has not yet received the level of work or publicity. The methodology for Lean Manufacturing can be worked out by pausing questions. So-that, they can be answered through the proposed methodology.

- Does the product answers to the customer and his needs?
- Is the existing system suitable for material flow, machine utilization, setup changes and occupancy of the existing manpower?
- Is the system adequate enough to have pull system of production?
- How to improve the lead-time to serve the customer in best a deter way?
- Does organization has total team work or each is looking as per own goals and ambitions.

Based on above questionnaire the methodology can be worked out in following way:

1. Access the existing plant capacity vis-à-vis available plant capacity through sampling survey.
2. Access the performance level of men and machine through work sampling.
3. Apply the Lean Principles to reduce the wastage.
4. Apply VSM for smooth flow of material.
5. Apply the principles of 5'S for uninterrupted flow of material and also improve the plant efficiency.
6. Access the inventory and suggest the ways to improve upon either through lean application or JIT.

Conclusion

Lean is about cutting costs in the production system of an organization so-that, the product becomes competitive in the global scenario. One crucial insight is that most costs are assigned when a product is designed, (see Genichi Taguchi). Generally the designers rely on customary materials and design specifications so-that product stands the shelf life. Therefore, the designers must rely on

the newer materials with reduced cost and enhanced properties so-that product becomes more acceptable on quality front and cost front. After having gone through the literature available on the lean manufacturing, it has been concluded that major manufacturing industries in the developed countries have been trying to adopt lean initiatives in order to stay alive in the competitive market. LM focuses on cost reduction by identifying and eliminating non-value added activities. The application of lean is quite scares in context to Indian working environment. Though, almost each organization needs the help of lean to improve the working strategies and earn more profits. The people in the organizations look upon thinks on daily basis yet, they don't realize the implications of the processes as followed.

Table 2 Characteristics of Lean Organization to achieve globalization

Sr. No.	**Characteristics**	Outcomes of Lean Principles
1	Knowledge management and development	1. Freedom to express 2. Knowledge about customer demand and service requirements 3. Innovation and Creativity in production process 4. Continuous development of knowledge about work and workforce.
2	Coordination and co-operation among workforce	1. Enhancement in co-operation and coordination among departments and employees. 2. Enhancement in vendor supplier relations 3. Increase the co-operation to customer for getting better results. 4. More cohesiveness among employees.
3.	Customer satisfaction	1. New product innovation for the customers. 2. Timely delivery of goods to customers. 3. Reduced the cost to customer. 4. Enhance the usage value to the customer.
4.	Culture and behaviour of organization	1. Continuous updating the business plans. 2. Shift Push Production proce4ss to Pull production process. 3. Invites changes in internal and external working environment. 4. Invites opportunities to extend business or globalization of business. 5. Increase in morale and output.

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