

THE CHALLENGES TO THE IMPLEMENTATION OF LEAN MANUFACTURING

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Abstract

The purpose of this paper is to provide a historical review for the importance of the Lean Manufacturing and its applications in the manufacturing units. It is found that during the implementation of LM the industries face various issues of LM which affects the performance of the industry. It is clearly observed that there is no suitable technique is suggested that can establish relationship between these barriers. Another issue that seems not deliberated adequately in research is the issue of a comprehensive methodology that deals with removing of these barriers. This paper begins with the subject who introduces the lean manufacturing and its objective which makes guidelines to the industries. Some of the barriers will be discussed in this paper which comes while implementing LM. A suitable technique will be suggested to find the relation between these barriers.

Index Terms: Lean Manufacturing (LM), Barriers, ISM (Interpretive Structural Modeling)

1. INTRODUCTION

Lean Manufacturing may be defined as a set of tools and techniques which are responsible for the continuous elimination of all types of waste in the production process. Lean means "Reduce the Waste". Waste in terms of industry is "defined as anything that does not add any value to the end product from customer's perspective". The goals in implementing the Lean Manufacturing are lower production costs; increased output and shorter production lead times. There are many possible failures that can occur while trying to implement lean manufacturing, these barriers fall into the following categories (Mejabi, 2003):

- Executive issues
- Cultural issues
- Management issues
- Implementation issues
- Technical issues

Mejabi (2003) stated that "each one of these categories is important

And if taken into consideration can cause possible obstacles in the Path to lean manufacturing". All these issues have correlated points with each other. For example, executive issues occur when the company executives are not totally dedicated themselves to making the conversion to lean

manufacturing and a sufficient knowledge of lean manufacturing principles. The conversion process is difficult and if upper management is not board, it becomes even more difficult; in the other hand management issues are closely related to executive issues because management needs to be dedicated to the conversion to lean manufacturing and have sufficient knowledge of lean manufacturing to bring about the change. Here we will discuss about these various issues and the barriers which comes under these categories.

1.1 Objective of Lean Manufacturing

There are certain reasons for implementing the Lean Manufacturing; some of them are explained with the help of diagram show below:

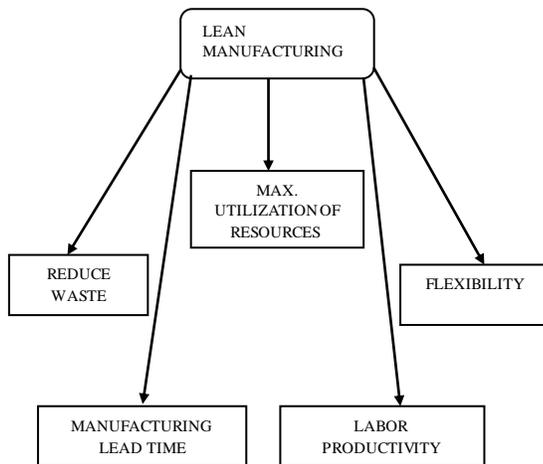


Fig: 1 Objective of lean manufacturing

- i. **Reduce Waste :** To reduce wastes and defects in any industry which includes the excess use of the raw material inputs and which are responsible for increasing the cost like overproduction , inventory and reprocessing and any unnecessary product characteristics which are not required by the customer.
- ii. **Maximum utilization of resources:** The machines and the shop floor area should be use more efficiently by removing the bottlenecks and reducing the machine time. After that the rate of production will be increased with the existing equipments.
- iii. **Flexibility:** Flexibility means ability to produce the different varieties of products with the change of the time.
- iv. **Manufacturing lead time:** Reducing the manufacturing lead times and cycle times by reducing the waiting time between the work stations as well as the process preparation time.
- v. **Labor productivity:** Improve the labor productivity, by ensuring that the workers are doing the work more effectively which is given to them in spite of walking unnecessarily on the shop floor.

1.2 Main kinds of wastes

Waste is defined as anything which added cost to the product but doesn't add any value to the product.

- Waste which are seen or calculated like machine breakdown.
- Waste which are not calculated in terms of waste like improper transportation of machines and

materials. Minor wastes include are papers in management work, due to improper working environment etc.

So to detect and remove these wastes in any industry LM is used. Mainly seven kinds of Wastes are included in the category which will be discussed below:

1. **Overproduction:** Over-production of products which are not needed at that time is considered as a waste.
2. **Rejection:** The product is not as per the requirement will be considered as a scrap and waste.
3. **Transportation:** Unnecessary movement of the parts during the production which doesn't add any value to the product will be considered as a waste.
4. **Inventory:** It may be defines as the stacks of parts waiting to be complete or finished products waiting to be shipped.
5. **Motion:** Unnecessary movement of the workers on the shop floor is considered as a waste. Only 5 % motion is useful for processing on work piece.
6. **Work in Process (WIP):** It is a direct result of over production and waiting time. It may also be termed as over processing.
7. **Waiting Time:** Unnecessary waiting by the worker to begin the next step or the product is waiting to be processed on the next work station will be considered as a waste.

2. LITERATURE REVIEW

The global industry in 21st century has forced most of the leaders in several sectors to implement more competitive manufacturing system. The main suitable answer to all these problems is Lean Manufacturing (LM). The origin of the lean thinking can be found from the Toyota Production System (TPS), over a period of several decades and is considered to eliminate the wastes and improve the performance. During the 1950s, the emerging post war Japanese Industrialists began to challenge some of the precepts of this management approach and amongst the foremost of the pioneers were Toyota, Lean is a philosophy of manufacturing that incorporates the collection of principles, tools and techniques in to the industrial process to optimize time, human resources and productivity Many of the concepts in Lean Manufacturing originate from the Toyota Production System (TPS) and have been implemented gradually throughout Toyota's operations beginning in the 1950's. By the 1980's Toyota had increasingly become known for the effectiveness with which it had implemented Just-In-Time (JIT) manufacturing systems.

Today, Toyota is often considered one of the most efficient manufacturing companies in the world and the company that sets the standard for best practices in Lean Manufacturing. The term "Lean Manufacturing" or "Lean Production" first appeared in the 1990 book *The Machine that Changed the World*. Lean Manufacturing has increasingly been applied by leading manufacturing companies throughout the world, lead by the major automobile manufactures and their equipment suppliers. Lean Manufacturing is becoming an increasingly important topic for manufacturing companies in developed countries as they try to find ways to compete more effectively against competition from Asia. Toyota's management system is variously referred to as "Toyota production System" (Ohno, 2008), "Toyota Management system" (Monden, 2008), "Lean Production" or "Lean Management"(Emiliani, 2003); It is also commonly referred to as "Lean manufacturing" due to its origins in production and operations management (Ohno, 2008). Lean production evolved from the TPS over a period of several decades and it is considered to improve the industrial performance by eliminating the wastes. LM is a management philosophy derived from the TPS to address their specific needs in a restricted market in times of economic trouble. It is one of the popular concepts which has been studied and practiced in many companies. Lean production can be described at different levels of abstraction. It is defined as a philosophy as a set of principles and a bundle of practices. The major difficulty while implementing LM is the typical behavior exhibited by people in the workplace [Ciarniene R.et al. (2012)]. [Hines P.et al. (2004) the application of lean thinking has made a significant impact in academic as well as the industrial circles over a last decade. In spite of the successful lean applications many of the barriers are also come in way while implementing LM like Lack of contingency, Human aspects, lack of strategic perspective and coping with variability. For the successful implementation of LM we have to overcome these kinds of barriers which will help us to improve the performance of the organization. [Esfondyari et al. (2011)] explains some of the barriers which are find out during the implementation of lean manufacturing in an industry. The role of management in implementing LM is very important. Although researchers have found some barriers to the LM and it is clearly observed that there is no suitable technique is suggested that can establish relationship between these barriers. Another issue that seems not deliberated adequately in research is the issue of a comprehensive methodology that deals with removing of these barriers. Lean implementation is a systematic and continual effort so, it is important to identify and understand the barriers for a smooth transition. The barriers are found out while implementing the LM by two different approaches like quantitative and qualitative study. The quantitative study showed the main barrier like lack of top management commitment, lack of understanding of Lean concept while the qualitative study showed the barriers like inadequate training and communication, employee's attitude etc. [Nordin N. & Deros B.MD].

3 RESEARCH GAPS

During the research about the lean manufacturing we had already known about the tools and techniques of LM. The procedure to Implementation of the LM is also an important thing, during implementation we get to know about some obstacles that come while implementing LM. Many researchers found some barriers to LM. Teleghani Mohammad (2010) describes the various issues which can come while implementing the lean manufacturing technique in any industry through his research paper. He also explains some barriers of lean manufacturing. He has not provided the inter relationship between these kind of barriers and not suggested any idea to overcome these barriers. [Esfondyari et al. (2011)] explain some of the barriers which are find out during the implementation of lean manufacturing in an industry. The relationship between these barriers in not defined by them.[A.Yang et al. (2010)] gives the brief description of some of the barriers that come in view while implementing the lean manufacturing technique in Small & Medium Enterprises (SME'S). No suitable technique is suggested by them which provide us the relation between these barriers.

4. METHODOLOGY

After the literature survey, some barriers were found. But to confirm these barriers a survey instrument should be developed which contain certain questions. As discussed below.

4.1 Development of Survey- Instrument

The main objective of the questionnaire-based survey was to facilitate experts in developing a relationship between barriers. This survey instrument had a wide range of research objectives and involved many questions. In this survey the respondents were asked to indicate the importance of some listed enablers on a five-point Linker scale. On this scale, 1 and 5 correspond to 'very low importance' to 'very high importance', respectively. The questionnaire was administered to companies from Indian manufacturing industries especially in Delhi NCR region. In total, about 30 industries are analyzed and on the basis of that the following barriers are find out.

Lean thinking issues are explained below with the help of table 4.1.

| Sr.No. | BARRIER | Mean | Rank |
|--------|-------------------------------------|-------|------|
| 1 | Lack of Planning | 4.3 | 1 |
| 2 | Lack of top management commitment | 4.175 | 2 |
| 3 | Lack of Methodology | 4.025 | 3 |
| 4 | Unwillingness to learn and see | 3.95 | 4 |
| 5 | Misunderstanding of lean Production | 3.825 | 5 |

| | | | |
|----|--------------------------------------|-------|----|
| 6 | Lack of Contingency | 3.65 | 6 |
| 7 | Human Aspects | 3.525 | 7 |
| 8 | Lack of Strategic Perspective | 3.5 | 8 |
| 9 | Lack of organizational structure | 3.35 | 9 |
| 10 | Lack of technological Infrastructure | 3.275 | 10 |

Table 4.1 List of Barriers

Misunderstanding of Lean Production

There is some misunderstanding to Lean manufacturing: The implementation of lean production requires a large investment and is only suitable for large enterprises; Lean production is only suitable for specific industries, not suitable for our business; Lean production originated in Japan, and it is not suitable for other country; Lean production is a technical which we can well learn as long as afford more money.

Lack of Planning

Lean has to be planned. If Lean is suggested on Monday and implemented on Tuesday, then this is not just a barrier, but it is a recipe for disaster. Planning is essential for it to be a structured process, it simply cannot be rushed in to or done in a way that has not been carefully thought out, or else it will simply falter and no one will actually understand the strategy or what is being done.

Lack of top management commitment

The successful implementation of LM or any new innovative strategy needs to be supported by top management. Top managers have to provide sufficient time and resources to develop an effective plan, and manage changes arising from the implementation process. For middle managers the benefits are not very clear and their training and experience is not sufficient to provide them with the ability to manage change in thinking, responsibility and roles. Alternatively, benefits for top management from implementing LM [7].

Lack of Methodology

LM is a group of clearly defined processes or methods used to search important knowledge among different LM operations. Despite top management commitment, organizational structure and technological support, LM may fail due to lack of methodology. Successful LM implementation requires a set of methodology. Methodology defines each and every activity which is going to be held during the LM implementation. It is necessary for enhancing LM implementation. Organizations have to understand those guidelines and transfer them according to their context

Unwillingness to Learn and See

It is Central to the philosophy of Lean is the need for those who are involved in the process to learn from things that go wrong, to see where waste exists and to keep looking, learning and improving continuously.

Lack of contingency

There is still a general misunderstanding of the contingent nature required to apply lean thinking. Indeed, the otherwise excellent "Learning to See" publication from the Lean Enterprise Institute(LEI) failed in its first conception to have an appropriate focus on demand variability and quality issues. However, this lesson had been learnt by the time that the extension "Seeing the Whole" was published in 2002. This having been said, for many companies the major focus of lean implementation is still the shop floor and their search for competitive advantage has yet to rely on the more recent lean integrative approaches [10].

Human aspects

It is the further aspect that has high pressure to the shop floor workers. As it mentioned that respect to the shop floor worker is superior to first basic of Toyota production system. Williams also suggest that lean production is derived from humanity thinking. Although he has failed to gain widespread support for his views, he has however raised an important point for those academics and practitioners interested in applying lean management, namely that lean should be regarded as more than a set of mechanistic hard tools and techniques and the human dimensions of motivation, empowerment and respect for people are very important[10].

Scope and lack of strategic perspective

Almost the complete lack of discussion of strategic level thinking in lean management as opposed to discussions of how to apply a series of different tools and techniques is one of the main shortages. In particular, the use of policy operation and other strategy formation and arrangement of tools is of central importance [10].

Lack of Organizational structure

Business organizations should adopt an organizational structure (OS) which matches and supports its strategy. OS includes division of labor, departmentalization and distribution of power which is necessary to support the information and decision process of the organizations. It is defined as the specification of jobs to be done within an organization and the

ways in which those jobs relate to one another. OS needs to support the knowledge transfer and must contribute towards creation and reuse of knowledge for the successful implementation of LM in the organizations. It must be capable enough to administer the knowledge related activities. Creating an organizational structure to manage knowledge is by no means enough for the success of LM.

Lack of technological infrastructure

As most of the issues of LM are culture based, the role of technology can't be overlooked. Lack of technological infrastructure (TI) is one of the barriers in implementation of LM. TI provides a stronger platform to LM and enhances its impact in an organization, by helping and leveraging its knowledge systematically and actively. TI enables collecting, defining, storing, indexing and linking data and digital objects in order to support management decisions. It is able to overcome the barriers of time and space.

5. CONCLUSION

This paper shows that one the major difficulties companies encounter in attempting to apply lean is not knowledge of particular tools and techniques, perhaps lack of comprehensive and suitable lean knowledge related to probable problems within the companies by the managers, direction, gap and a lack of recognition of lean culture in whole of the organization and planning cause the fails within the implementations. Additionally, some managers try to enhance the implementation by some of the lean tools and mostly try to only implement the "continuous improvement" and explicitly forget another basic lean principle, "respect for people". The managers should know that lean thinking won't derive during a short time, and they should prepare the context of implementations before every decision making. Lack of Planning, Lack of top management commitment, Lack of Methodology, Unwillingness to learn and see and Human Aspects are the main barriers or problems which can be faced while implementing the Lean Manufacturing. These have already been discussed in the previous section.

SCOPE FOR THE FUTURE WORK

The interrelationship between the barriers is important, without this we can't further analyzed any barrier. The interpretive structural modeling (ISM) methodology is used to evolve mutual relationship among these barriers. The ISM methodology is also helpful to understand mutual influences of barriers. It identifies those barriers which support other barriers (driving barrier) and also those barriers which are most influenced by other barriers (dependent barriers). ISM

will provide the Initial or base model which will be further used for the experimental work.

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BIOGRAPHIES



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