# Barriers in Implementation of Lean Manufacturing System in Indian industry: A survey

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**Abstract: Lean Manufacturing system has been acknowledged by Indian industry as a capable system in enhancing organisational performance by focusing on elimination of waste from the manufacturing system and thus improving effectiveness of the organisation. But still in most of Indian industries it is currently used as improvement tool instead of adopting this concept as a culture. Though if used on full scale as organisational culture it can produce significant improvement in organisational performance. This paper has attempted to explore the key barriers in extensive implementation of Lean Manufacturing even after two decades of introduction with Indian industry.**

**Key words: Lean Manufacturing; Barriers in Lean Manufacturing implementation; Indian Industry**

## I. INTRODUCTION

Over a period of time organisations over the globe have been working for improving their flexibility, increasing overall effectiveness, and reducing response time to act upon varying customer demands. As a result batch production model of manufacturing needs to be converted into a new approach of Toyota Production System called "Lean Manufacturing system". Singh et al. [13] states that the organizations which have adopted Lean Manufacturing or Toyota Production System have gained more advantage than the previous one.
Lean Manufacturing system has turned out to be a broadly acceptable best manufacturing practice across countries and industries [19]. The ultimate goal of a Lean organisation is to create a smooth and high quality organisation that is able to produce finished products fulfilling the customers demand with quality acceptable to customer and with no waste as stated by Nordin et al. [10]. Thus Lean Manufacturing system enables organizations to sustain in market competition by improving its competence for better quality; on time delivery with lower cost [13]. Lean Manufacturing aims for Identification and elimination of waste. Lean Manufacturing focuses on the smooth material flow through the value stream. Material flow should be free from problems, bottlenecks and waiting. Lean Manufacturing advocates the traditions that production must be based on customer demand and controlled by customer's order and aspires to deliver product or services based on customer specific requirement and delivered at the time decided by customer.

## II. LITERATURE REVIEW

Manufacturing has been acknowledged as the main driver for development of the economy for any nation. With the spread of globalization, India is becoming a hub for global manufacturing and at the same time scope of Lean Manufacturing implementation is turning out to be broader in Indian context. Singh et al. [14] has observed that many companies in India are now feeling the heat of global competition and this has motivated them to take serious step forward towards adoption of Lean Manufacturing. Frequently changing customer demand and international environment has been putting forward challenge of survival and competitiveness to all the element of the financial

system [17]. Khadse et al [7] describes that manufacturers in the Indian industry have always faced discriminating challenges such as increasing customer's expectation, demand variation, and competition in markets.

Mishra et al. [22] describes Lean Manufacturing as a system, which consumes lesser resources to achieve the same output, which is better in terms of quality and satisfy the needs of customers. Lean Manufacturing is set of tools and techniques which aim to create a customer centric organization by developing and adopting best manufacturing practices with the involvement of all level of employees. Vikas et.al [20] explains that adoption of continuous improvement methodology with the use of different tools and techniques becomes the strength of the manufacturing system. Researchers and practitioner has developed many tools and techniques to improve manufacturing from different ways and means.

Idea behind Lean Manufacturing is to downsize production lead time, cost, improve quality and reduce inventories in the manufacturing system as stated by Mishra et al. [22]. This is achieved by identification and elimination of waste existing in the business. Global managers recognize that Lean Manufacturing is a set of straightforward management tools and systems, and in fact it is a complex plan that Toyota has established all the way through enduring organizational culture and continuous improvement [12]. Lean Manufacturing can bring large scale changes in the organisation but cannot be put into practice immediately. The Lean Manufacturing implementation should be planned carefully, staff must have full understanding of concept and senior management must plan and execute firmly keeping the employees motivated as stated by Pingyu and Yu [11].

Darbari et al. [4] identifies one of the foremost known reasons of ineffective Lean Manufacturing implementation is being focus on tools and techniques only and ignoring human factor. Understanding to staff and senior management with clear implementation strategy is must for successful Lean Manufacturing implementation. Vienazindiene and Ciarniene [19] argue that practical obstacles may be organisation specific and can vary based on particular company and economic sector.

### *2.1 Objectives of Lean Manufacturing-*

The Lean Manufacturing implementation objectives are to improve productivity and reduce production cost. Followings are some Lean Manufacturing objectives:

- Labor productivity improvement - Getting better work productivity by eliminating or reduction of unintentional wastage of time.
- Reducing manufacturing lead Times - Lowering cycle times and hence reducing production lead time by applying Lean tools to reduce production cycle and waiting time.
- Inventory Reduction – Mishra et al. [22] identifies that reducing inventories between production stations is essential to reduce inventory holding cost and working capital requirement.
- Defects Reduction – Reduction of defects by application of Lean tools resulting in reduced raw material requirement and reduced customer complaints in account of defects.
- Increased production – Production is increased by reduction of cycle times and manufacturing defects.
- Better Flexibility - Capability to manufacture wider range of products with reduced switch over time.
- Improved equipment Utilization – Equipments are utilized in efficient way a by eliminating bottlenecks in manufacturing processes.

### *2.2 Implications of Lean Manufacturing-*

Lean Manufacturing implementation produces numerous changes in manufacturing approach of any industry. The principal implications are

- Batch production method is replaced with one piece or single piece flow method.
- Scheduling is done at one point from where material is pulled throughout the value stream and rate of flow depends on demand from customer.
- There is lesser material in waiting for processing between work stations; hence work in process (WIP) inventory is reduced.

- Inspection becomes an integral part of production activities hence product is not waiting for quality approval from line inspector.
- Reference for manufacturing is changed from production and Supply to customer demand.

*2.3 Benefits of Lean Manufacturing-*

Taj and Morosan [6] demonstrates that there has been significant improvement in organisational Performance of the Indian Industry after Lean Manufacturing implementation. . Operational initiatives under Lean Manufacturing brings positive changes in overall equipment efficiency, inventory reduction, flexibility improvement, reduction of lead time and quality improvement. Ahuja and Khamba[2] recognizes that operational initiatives supports in improving productivity, reduced cost and hence improve financial results. Haffar et al. [23] finds employee's involvement as a part of Lean Manufacturing implementation which has direct impact on morale of the employees and hence improving organisational culture and overall improvement in performance of the industry.

*2.4 Barriers in Lean Manufacturing implementation in Indian Context-*

The intention of Lean Manufacturing is to support the business goals. It asks for to the shift from conventional process of working to a method that encourages business excellence practice. This all needs big changes to happen within the organisation; starting from change of management thought process, rational deployment of resources, allocation of funds, education and training of staff and so on. Bhasin [3] states that implementation of Lean manufacturing, like any other new system has many types of obstacles which hinders the throughout application and putting it into practice. According to prior studies a variety of obstacles in implementation of Lean has been discussed. Some of them are related to cultural, technical, organizational and economic factors to the implementation of Lean in manufacturing companies as affirmed by Darabi R et al. [4]. Despite of the fact that Lean is an established structure for improving the organization in all areas but still most of the companies faces difficulties in implementation of Lean Manufacturing. Lean production has been in India for more than 20 years but only a small number of companies have adopted Lean Manufacturing successfully and are able to make considerable success. The intention of this paper is to observe the barriers and ascertain actions for effective implementation of Lean Manufacturing based on the study in the Indian industry. Top management issues for lean implementation is also very important and top management policies and attitude towards lean implementation need some improvement in Indian industries as described by Singh et al.[14].

Individuals barriers of Lean Manufacturing implementation has been identified as Lack of management focus, lack of urge to create sense of urgency, lack of management support, lack of long term vision, lack of labor resources , lack of capital fund, lack of communication, lack of idea innovation, mediocre consultants, lack of time, lack of training, lack of understanding about Lean, lack of implementation know-how, conflicts with other Initiatives like TQP,TPM,JIT, disparate manufacturing environments, demand volatility, conflicts with ERP Implementations, company culture, employee's resistant to change, middle management resistance, no direct financial advantage , not recognizing financial benefits , no financial targets, past experience of failure and sliding back to previous state in the absence of staying power.

## III. RESEARCH METHODOLOGY

The approach has been aimed to determine the barriers in Lean Manufacturing implementation in Indian Industry and to establish the guidelines for fail safe implementation of Lean Manufacturing. This study has been carried out in the large and medium sized manufacturing companies across the country. This research has considered companies that either are in the process of implementing Lean Manufacturing or has successfully adopted Lean Manufacturing system.. A considerable number of manufacturing plants have been broadly examined to establish obstacles of Lean Manufacturing. With the intention of determining the barriers of Lean Manufacturing a comprehensive "Questionnaire" was organized for identifying barriers of Lean Manufacturing in Indian manufacturing industry. To test the effectiveness of the Questionnaires, the questionnaire was pre-tested on a controlled sample. The proposals experienced in sample survey were incorporated to improve the effectiveness of Questionnaire.

The methodology adopted in the study has been depicted in Figure1.

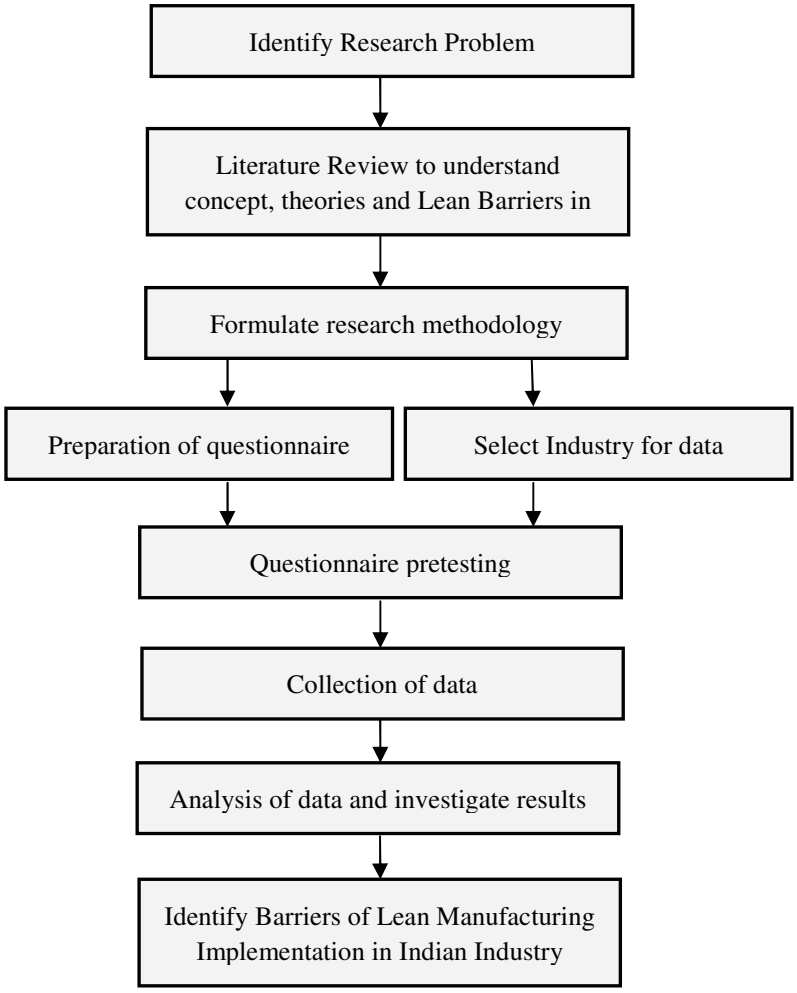


Figure 1: Research methodology adopted for study

## IV. RESEARCH DESIGN

The research process is based on a survey. A questionnaire was developed with concentration on key Barriers in Lean Manufacturing Implementation within Indian Industries. Data collected through mails, post, and face to face interview. A controlled approach has been adopted for effectively measuring barriers in Lean Manufacturing implementation.

All comprehensive Lean barriers were examined carefully and were condensed into followings seven major attributed barriers of Lean Manufacturing implementation.

- Management
- Resource
- Knowledge
- Conflicts
- Employee
- Financial
- Past experience

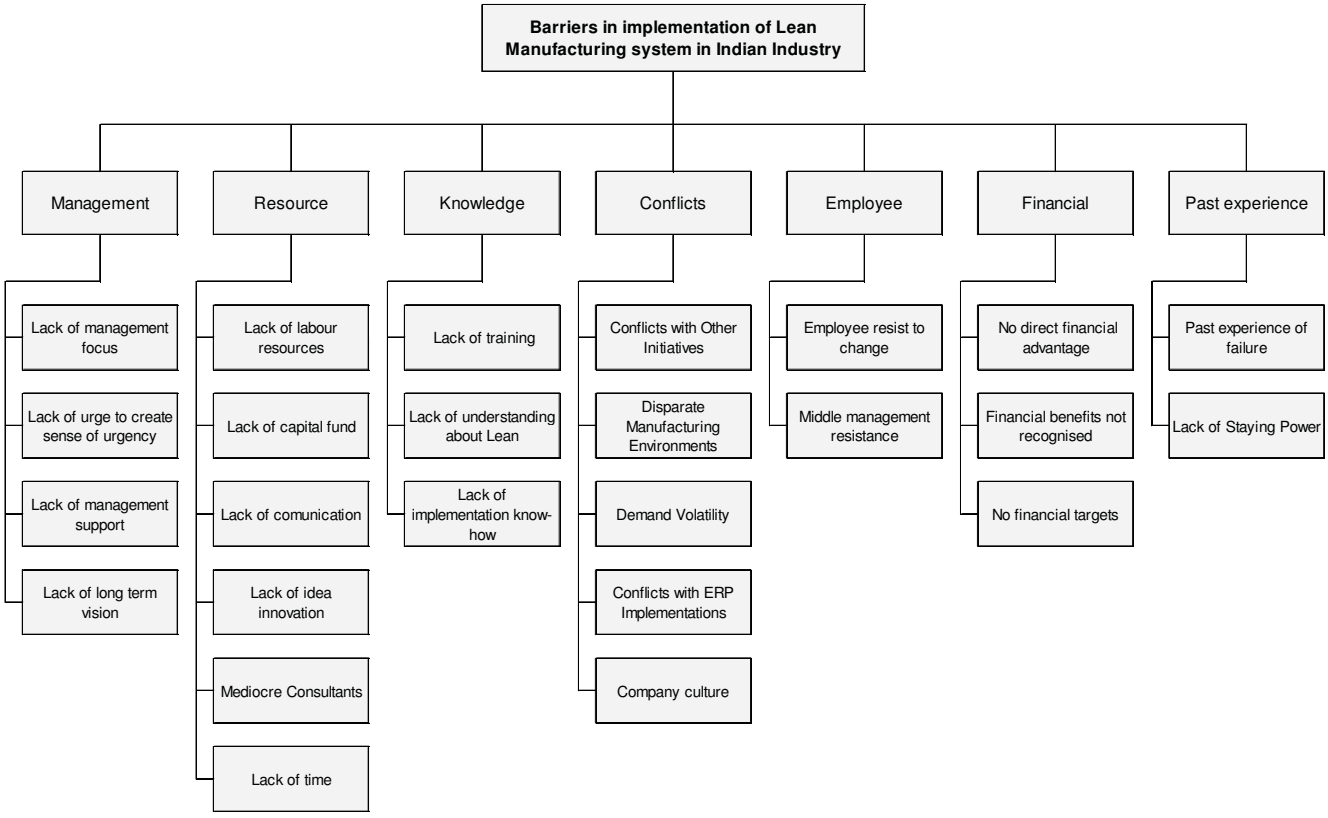


Figure 2: Theoretical models for Barriers in Lean Manufacturing Implementation

**Management:** Management is cited a major attribute of Lean barrier if management has lack of focus for Lean Manufacturing, does not creates urge of urgency, does not provides support to Lean Manufacturing activities and does not have long term vision, itself turn out to be a barrier in Lean Manufacturing implementation.

**Resource:** Resource is another characteristic of Lean Manufacturing. In the absence of resource in the form of labor, capital fund, communication, innovation power, competent consultancy and lack of time can be a factor in implementing Lean Manufacturing. Lack of access to new technology and lack of resources resulting in poor communication turn out to be the major obstacle in Lean Manufacturing implementation. In some cases Consultancy firm having average knowledge of the subject or lack of implementation practices results into confusion about Lean Manufacturing and becomes barrier in Lean Manufacturing implementation.

**Knowledge:** Knowledge is influential feature in Lean Manufacturing implementation. Absent or lack of training, understanding about Lean Manufacturing and lack of knowhow of implementation of Lean Manufacturing is potential barrier in Lean Manufacturing implementation. In majority of the cases having the impression of Lean Manufacturing being simply a inventory reduction and technique for improving supplies to customer by removing waste is misunderstanding about Lean Manufacturing and becomes bigger obstacle. This can lead to a barrier for Lean implementation focusing on some of the tools and not getting full benefits of Lean Manufacturing implementation.

**Conflicts:** Conflicts with Other program are prominent barrier in Lean Manufacturing implementation. In a number of companies other improvement techniques such as Total Productive Maintenance, Just-In-Time, Total Quality Management and Six Sigma, etc., are already in progress as a broader policy or for some localised improvement projects or can cause internal conflicts with Lean Manufacturing implementations. Some companies are working with Enterprise Resource Planning (ERP) for better utilization of resources that finally supports to Lean Manufacturing system, but it is sometimes is difficult to adjust with Lean agenda. Insufficient awareness of IT

professionals about Lean Manufacturing can be major barrier in Lean Manufacturing implementation and need to work a lot on this issue. Correct integration of ERP and Lean can result in concrete resource planning for the organisation. Demand unpredictability has been observed as one of the Lean barriers where having lower inventories with complex mix of product; can lead to interruption in supplies to customer.

**Employee:** having resistance to change is widespread incident. Wong et al. [21] identifies major reason as having a fear of failure, lower confidence and lesser capability to collaborate for common projects becomes big barrier in Lean Manufacturing implementation.

**Financial**: Lean Manufacturing many times does not produce any direct financial payback rather it supports the process of identification and elimination of waste hence reduction of cost. So Lean not being equipped with a financial in and out does not find place in top priorities of many organizations.

**Past experience:** Is the perception of employees about Lean Manufacturing. If a few of Lean projects have failed in the past it becomes hurdle for the next attempt of Lean Manufacturing project implementation. Wong et al. [21] recognized one of the reasons of failure may be lack of staying power, poor initiation, and lack of strategy or coming back to original status under some circumstances results in reduction of confidence of employee in Lean and hence becomes big obstacle.

## V. DATA COLLECTION

In this paper survey method has been deployed to determine the barriers in Lean Manufacturing implementation in Indian industry. Total 163 nos. of Indian industries were selected and contacted for the survey from different geographic locations of India from a variety of industries like automotive OEM (Original Equipment Manufacturer), Tier 1 suppliers to OEM, farm equipments manufacturing, pharmaceutical, fast moving consumer goods manufacturing and auto parts manufacturing industry. Questions were offered to answer about general information about the industry and barriers in Lean Manufacturing implementation. Total 47 complete responses were observed at a reply rate of 28.8%.

## VI. RESULT AND DISCUSSION

To determine the reliability of the data collected through survey, the Cronbach's Alpha for Lean Barrier was calculated. The Cronbach's Alpha values for Lean barriers are shown in Table 1. The Cronbach's Alpha values for all the parameters was observed more than 0.650 representing, reasonable dependability of the collected data.

Table 1: Cronbach's Alpha for Lean Manufacturing implementation Barrier

| Category | Management | Resource | Knowledge | Conflicts | Employee | Financial | Past experience |
|---|---|---|---|---|---|---|---|
| Cronbach's Alpha (α) | 0.661 | 0.654 | 0.736 | 0.683 | 0.820 | 0.707 | 0.869 |

The mean and standard deviation were calculated for data collected through answers on questions of Lean Manufacturing implementation Barrier. Major Lean Manufacturing barriers along with nos. of content questions in each attribute barrier with results are depicted in Table 2. This data is based on a five point scale ranging from "No significance" to "Full significance". one considering "No significance" to five considering "Full significance".

Table 2: Major Lean Manufacturing Implementation barriers

| | Count (n) | Mean | SD |
|---|---|---|---|
| Management | 4 | 3.9 | 0.66 |
| Resource | 6 | 3.7 | 0.56 |
| Knowledge | 3 | 3.8 | 0.70 |
| Conflicts | 5 | 3.6 | 0.62 |
| Employee | 2 | 3.3 | 0.83 |
| Financial | 3 | 3.4 | 0.82 |
| Past experience | 2 | 2.9 | 0.74 |

Although Lean Manufacturing is well acknowledged concept for the many of Indian industries, but still the acceptance for Lean practice is not greatly encouraging. This study examined the implementation of Lean Manufacturing among Indian industries. In the study Lean Manufacturing barrier are investigated by ranking them based on "mean method" from lowest to highest. The observations from the study are depicted in bar graph in figure 3.

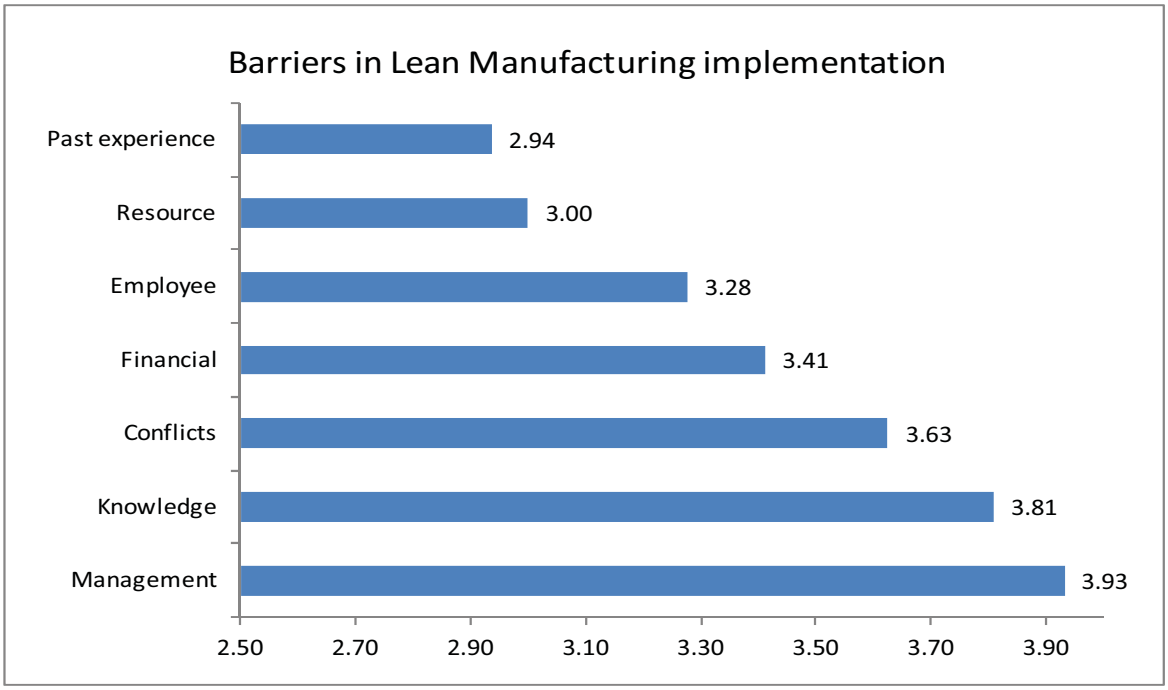


Figure 3: Observed barriers in Lean Manufacturing implementation in Indian Industry

Though implementation of Lean Manufacturing has never been easy job in Indian industries but results observed with this survey presents sets the priority of obstacles in Indian context. Management has been identified as biggest hurdle in Lean Manufacturing implementation with a mean of 3.93 against a common mean value of 3.43. Though management seems responsible for implementation of such revolutionary concepts but has emerged out to be barrier despite of the reasons which may be one or other. Knowledge about the subject Lean has been identified as second biggest barrier in Lean Manufacturing with a mean of 3.81 against mean value of 3.43. Lean Manufacturing may conflict with other systems which may present in the organisation stands as third big barrier in Lean Manufacturing implementation with mean value of 3.63 as compared to mean value of 3.43. Financials issues have also been recognized as Lean barrier in the system in the absence of understanding of long term benefits. Employee's resistance to adopt Lean as a new system, Resource consisting of access to latest technology, communication media or consultancy support available to staff has emerged out a barrier and the last one is past failure of Lean projects.

## VII. CONCLUSION

In this study reason has been examined based on the ranking provided by respondent companies about barriers of Lean implementation in Indian industries. All the macro level hurdles accountable for complicating the Lean Manufacturing implementation has been put under seven major barriers of Lean Manufacturing. This is an attempt to understand where to have more focus for unproblematic implementation of Lean Manufacturing. To improve upon weaknesses and hold on the success, Indian companies need to understand and acknowledge the barriers of Lean Manufacturing. The most rated barrier has been identified as management itself by lacking in focus, lacking in providing support, being deficient in creating sense of urgency and not having long term vision regarding benefits of Lean Manufacturing implementation. Providing adequate consultancy, provision for capital funds, adoption of new technology for better communication and allocation of time for Lean Manufacturing is the need for the day for successful implementation of Lean Manufacturing. But Lean cannot be implemented with providing instructions and resources alone. Though this is prime responsibility of management to initiate and implement Lean but management need to create a culture of learning organisation to manage the changes within the organisation. Management is supposed to work on discovering solution for any disagreement between the existing system and Lean Manufacturing. Creating better understanding about Lean by providing training to employees and creating culture of improvement can help in easy and long term result oriented Lean implementation.

The outcome of this study can be helpful for Indian industries and practitioner to be aware of the Lean barriers for unproblematic implementation of Lean model in the business. Limitation of this study may be that this study is restricted to a batch of 47 companies and may not be able to represent all the barriers Indian industries is having as of now. Nevertheless, based on this study Indian industries is supposed to initiate the awareness and participation of senior leadership team to create learning culture within the organisation and develop effective communication to organise transformation in the industry with the help of effective implementation of Lean Manufacturing.

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