# An Investigation of Lean Manufacturing Implementations in SMEs-A Review

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Abstract: In competitive environment lean manufacturing is necessary in every industry. Lean production is a standard manufacturing mode of the 21st century. Lean manufacturing have various synonyms like lean management, lean production, It is very use full techniques for reduce the flow of non value added time. The available research papers in area of Lean are studied to know the implementation level of different lean tools, barrier and benefits of implementation are also considered in the review .The commonly used lean tools in the various organization, most common barriers and benefits have been identified and listed in this paper. Most common barrier is also components of quality of work life.

Keywords: Quality work life, Lean Manufacturing, Toyota production system, Kanban.

### Introduction

Lean manufacturing is an important tool used across the industries in the recent scenario. At present the industries are facing a higher level of competition because of the globalization. In this context, to remain and compete in the market, companies need to deploy certain tools and techniques which are useful to the uplift their performance and to respond rapidly to the customer's needs. The fundamental concept of lean manufacturing is to provide a quality product while also ensuring that the product does not cost too much to the customer. In this paper an attempt has been made to present a review of the literature to identify the important and useful contributions to this Lean concept. Lean manufacturing utilizes a wide range of tools and techniques; the choice of tools is based on the requirement. Many parameters contribute success of lean. Organizations which implemented lean manufacturing have higher level of flexibility and competitiveness. However, lean manufacturing provides an environment that is highly conducive to waste minimization.

# **Objectives of the Paper**

- To find the level of Lean implementation in SMEs.
- To find out the tool used most and least under Lean implementation.
- To examine the benefits and barriers of Lean implementation in manufacturing.
- To evaluate the implementation of the Lean manufacturing.

# **Literature Review**

The research papers related to Lean manufacturing from various reputed journals have been considered for the review. After doing thorough study of the Lean implementation, the results of the research papers considered for the review. The considered review papers have been grouped based on awareness about the Lean, lean implementation, Barrier and benefits of Lean and performance. There are quite a good number of studies available in the body of literature focusing on the awareness and Potential for implementation of Lean tool in different sector. The one important such study is discussed below. PerumalPuvanasvaran et al, (2017) studied the implementation techniques in an aerospace manufacturing in Malaysia. A five-point scale questionnaire is used as the study instrument. These questionnaires were distributed to 45 employees working in a kitting department and to 8 top management people. The results indicate that the degree of leanness were moderate.

Zahid Abbass Shah et al, (2016) y explored the implementation of lean manufacturing practices in textile industries of Pakistan. A total of 76 responses were received. The results of the study showed that the textile sector is at the beginning stage of lean implementation – more than half of the surveyed companies were intransition to implement lean. The most important driver to implement lean was found to be organization's continuous improvement program followed by the drive to focus on customers, and desire to use best practices. The respondents perceived cost reduction to be the biggest benefit that can be achieved by implementing lean, followed by customer satisfaction, and improved delivery time. Among tools and techniques 5S, quality control circles, kaizen and SMED were used extensively. Manufacturing planning and control was not

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formally implemented. Human resource related factors were perceived to be crucial to effectively implement lean. Level of implementation was found to have a significant relationship with the size and the type of company and not with the age of the company. Lack of awareness to implement lean, company culture, lack of communication, and employee resistance were the main barriers faced by the sample companies during the implementation of lean.

Roba Salem et al, (2015) studied on the level of recognition of lean concepts, principles, tools, and techniques in different industrial sectors in Qatar, to ass's lean awareness and to know the perception about lean benefits and lean challenges. Data were collected from 333 organizations from various sectors like oil and gas, academic institutions and service sectors through an on-line survey. Results showed that industries in Qatar need to give more credit to lean thinking in order to strategically advance current efficiencies as well as cope with competition at global level. Research also reveals that there is a difference on the levels of awareness, recognition and appreciation of lean concepts in different industrial sectors.

Chaple (2014) investigate the enablers and barriers in implementing the Lean principles and lean diffusion in Indian manufacturing industries. Result shows that the trend in lean manufacturing for research now is focused on lean assessment. Leanness attracts focus to answer specific questions of different levels of managers responsible for lean implementation to assess the lean implementation level and to justify spending over lean implementation. He worked on multiple criterion decision-making (MCDM) for lean assessment to assess lean performance holistically & popularity of lean in India; but when it comes to success, its only start of journey.

Pratik Chikhalikar (2015) study focused on the implementation of the lean in the engine manufacturing unit in India. Research identified the important lean tools and time horizon to implement the same. Study revealed that following factors effects on lean implementation they are 7 Types of waste, Lack of information transmission, Improper inventory management, Bottleneck operation, Material flow and transportation problem, JIT, Kanban, Kaizen, TPM, 6 sigma, 5S, Single Minute Exchange of Die. Rakesh kumar and vikaskumar (2015) conducted a study to establish the significance of Lean Manufacturing elements related to Indian manufacturing industry, study also list the benefits gained-, major obstacles faced- and identifies the adverse impact such as over cost cutting, exceptionally low inventories, over dependence of Lean guideline, physical and mental health, society, product quality.

Sudipta Chowdhury (2015) conducted a study to improve the productivity of the furniture manufacturing industry in India. Various lean strategies such as Single-Minute Exchange of Dies (SMED), Gemba (The real place) and Short Interval Control were implemented. Result revealed that significant improvement in both monetary terms and also in reduction of processing time of different lots. Study also reveals that Overall Equipment effectiveness increased in a higher multifactor productivity of 2.26. It was realized through this study that lean strategies can successfully be implemented in furniture manufacturing industry.

Youssef Larteb et al (2015) study identified that success parameters of lean implementation are top management engagement, commitment, allocation of time and resources for improvement projects, strong management's leadership, and employee's development program. Study used a structure questionaries' it includes seven parameters of lean implementation they are, personalized demarche, top management commitment, allocation of resources, strong communication, structural methodology, multifunctional teams, and continuous performance measurement.

NordinNorani et al(2010) research identified the, main reason for failure of implementation of Lean manufacturing is due to the letdown in managing the change process during a lean manufacturing transformation, organizational change management. Serve as the basis for further empirical research and validation. Provide practitioners with a better understanding of lean transition and unambiguous guidance, and/or tools to minimize the resistance and conflicts of implementing a lean manufacturing system. In the present research 11 critical factors were studied, and proposed framework of organizational change is intended to provide practitioners with a better understanding of the lean transition and a clear guidance to minimize the resistance and conflicts for the implementation of lean and thus improves its chance of success.

Azharul Karim et al(2013) conducted a research to develop an effective methodology for implementing lean manufacturing strategies and a leanness, following are the methodology are adopted for the present study they are Production and process details, Lean team study, Performance variables. VSM and MTM together and offered a new approach to reduce lead time and to measure productivity based on Lean principle and standardized processes. George L. Hodge et al(2011) conducted a research to identify lean tool for textile industries to eliminate waste and non-value added activities in US to enhance the customer satisfaction, Author identified the following barriers for implementing lean manufacturing they are resistance to change both shop floor employees and management; shop floor employees are reluctant to offer suggestions for improvements; disconnect among marketing, sales, product and development; shop floor personnel are not native English speakers; so training needs to be multilingual.

Dave et al(2015) study deals with Lean Construction along with information and communication systems. Study reveals that by adopting techniques such as process modelling, lean principles and process analysis techniques, the manufacturing industry maintains a well performing process.- process standardization across the industry will highly effective and efficient.

Giuliano Almeida Marodin et al(2014) conducted a research to classify the risks that affect the lean production implementation process and to demonstrate how that classification can help to identify the relationships between the risks. Researcher used multiple sources of evidence for the present study such as interviews, observations and documents analysis.

In this study risks that affect LPI were grouped into three categories: management of the process of LPI, top and middle management support and shop floor involvement. Mainly classification and relationship between risks were given major importance. 14 risks were identified, the collected data was analyzed using an exploratory factor analysis (EFA). The limitations of this study should also be emphasized. First, it did not include external risks in LPI, but only internal ones. Second, it does not deal with two risk management stages: response and monitoring. Rahul Sindhwani et al( 2015) study reveals that, LI will improve the manufacturer and consumer relation by meeting the latest demand of consumers. Typical seven parameters like Overproduction, Processing Waste/over processing, transportation, Waiting/delays, Inventory waste, Motion waste, defects are used. Follows tools and technique for eliminating wastes were- Pull system/KANBAN, VSM,5s, By applying the lean and agile principles of one piece flow, pull system and value streaming the production rate of the lower frame was increased. The pull system utilized to understand that there is need to increase the production rate. VSM was done to identify the constraints and one piece flow to achieve the required cycle time.

RamuneCiarniene et al 2014 research reveals the challenges and barriers to be faced and overcome while implementing lean concept. Lean enterprise or simply "Lean", is a practice, which regards the use of resources for any work other than the creation of value for the end customer, as waste, and thus a target for elimination. Research depicts the following three types of barriers they are the people issue, The process issue, The sustainability issue. Study suggested that first use the tools and techniques instead of sufficient consideration to personally related issues. Trust issue, human motivation and commitment are the real constraints. Secondly clearly understood by top management maintained properly, thirdly, LI have to be incorporated into thecompany's strategy. Concluded remarks- specific value to the customer, VSM waste elimination, CI, continuous flow and pull driven system.

EidaNadirahRoslin et al(2014) Studies suggests, LM approach does not allow these organizations to fully explore and exploit the system's effectiveness; neither do they experience any massive improvements when measured against L M success standards. Up to so many days pick and choose concept were used, The Obstacles of LMI Grouped in to 3 levels, attitude of shop floor employees and middle management, Inability of quantify benefits, and Lack of top management/Senior management commitment. Conceptual model of full blown Implementation of LMS-Influence factors, Lean Manufacturing and Organizational performance. Here implementation difficulties, perceived barriers, work culture, monetary restraints, knowledge and its understanding at every level.

Nirav Patel et al (2015) LM can be considered as a business strategy and it has been proved to be an effective management philosophy for improving business by eliminating non value added waste and improving in process operations.VSM can be an extremely powerful tool, combining material processing steps with information flow as well as other important related data. Parameters used were Cost Rate, Material Cost, Duration (min), and Predecessors, its inter relationship between them with the money and time. Application of tools were Process activity mapping, Demand amplification mapping, quality filter, production variety funnel, value adding time profile and related parameters. VSM works in any of the sector such as hospitability, manufacturing, service industry, automobile, machining and casting, transportation etc.

Gulshan Chauhan et al (2012) research depicts about, Elimination of waste, JIT, and CI. Driving parameters towards LM are vertical information system, integration of functions, decentralization, multifunctional teams, Pull, JIT deliveries, zero defects, CI and Elimination of waste. JIT is top priority, then CI. He follows SPSS correlation method to find the importance of implementation. Naga VamsiKishnaJastietal 2014 research identifies the existing lean product development frame work that is useful in implement LMS. Researcher done validity and reliability analysis using questionnaire survey. Respondents are from Top and middle level management determined through Cronbach's alpha value. The LPD framework can be categorized under two broad areas, namely: 1. researcher/academic-based; 2. consultants/experts-based. The study has identified 40 elements from eight frameworks, which reflects these are playing an important role in the implementation of LPD frameworks.

David D. Ciemnoczolowski et al (2013) research suggests, In LM, milk run (MR) systems represent route-based, cyclic material handling systems that are used widely to enable frequent and consistent deliveries of containerized parts on an asneeded basis from a central storage area to multiple line sided deposit points on the factory floor a central storage area (the \_supermarket') to multiple line-side deposit points on the factory floor. Here Kanban with simulation method followed to work on bottleneck stages. If a single tugger does not meet the demand on a particular route, an alternative solution that is also found in practice is to add more tuggers to the same route, which leads to the \_chase method.' The dynamic interaction between the tuggers serving the same route, and their impact on WS starvation, would also be a promising avenue for future research.

SourabhSharma(2014) main goal of study the potential benefits and limitations of lean standards and certification and analysis that whether the standardization would be helpful in implementing lean principles or not, so before starting the surveying; Company should first know the opinion from lean practitioners about how standardization will help to eliminate major problems in implementing the lean tools and their principles. Through survey, they have a chance to quantify various motives and objectives of individual industry and lean professionals.

Pius Achanga et al (2005) research identified the critical factors that constitute a successful implementation of LM within manufacturing SMEs. Leadership, management, finance organizational culture and skills and expertise, amongst other

factors; strong leadership and management permeate a vision and strategy for generating, while permitting a flexible organizational structure. Good leadership ultimately fosters effective skills and knowledge enhancement amongst its workforce.

Form the available literature it is clearly concluded that some of the lean tool like Standardizing Work/ cycle reduction, Kanban, continuous smooth flow/ cell design, Value stream mapping, TPM/TPS,JIT, Kaizen, SMED-Single Minute Exchange Die, Poke yoke, Visual Management/Control are most commonly used lean tools across the various sectors. Table 1.1 depicts the frequency of different lean tools used by the organization.

#### Conclusion

Lean is applicable for all the type of the organization irrespective of their size, lot of work has been carried out in manufacturing sector that to in different functional areas, the level of implementation varies across the sectors and their size. It is evident from the research paper studied that kanban, continuous flow and TPS are the most commonly used lean tools in the organization. The Reduction of waste, Inventory reduction and Productivity improvement are commonly cited benefits across the lean implemented firms. Apart from this management of employee involvement are the most commonly cited barriers across the implemented organization. These parameters are also component of the quality of work life, so it can be concluded that QWL needs to be studied across the lean implemented firms in order to get higher light on the issue also to reveal the linkage between QWL dimensions with the lean implementation.

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