

Lean Manufacturing Practices on Small Scale Industries' Sustainable Performance - A well thought-out Literature Review

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Abstract: Today, manufacturing industries are forced by governments, non-governmental groups and manufacturers to operate in a sustainable manner. Nowadays Small Scale industry (SSI) requires to be extremely performance oriented and effective to accomplish their role as essential connects in supply chains. To accomplish this, there is a need for Small Scale Industries (SSIs) to become lean manufacturing system. Lean is a philosophy which spotlights mainly on the recognition and elimination of waste from a manufacturing system or practice of processes, thereby making system more efficient. Even though lean practices may offer ecological, social, and economic benefits to industries, their effect on sustainable performance is vague. The purpose of this study is to survey the effect of lean production practices on industry's environmental performance by bearing in mind lean culture as a mediator. The objectives of this paper is to realize the diverse facets of lean production as a philosophy as well as a system and how it can be functional and practiced particularly for Small Scale Industries to create a Sustainable Performance of Lean Culture.

Keywords: Lean Manufacturing System, Lean Practices, Kanban, Continuous Improvement, Small Scale Industries.

1. INTRODUCTION

Manufacturing of Small Scale Industries (SSIs) account for a huge amount of resource utilization and waste generation all over the world (**Abdullah, M et.al., 2006**). All Stakeholders and regulatory groups put pressure on manufacturing industries to be sustainable due to the warnings about global warming and social issues (**Zailani, S et al., 2015**). With growing demand from stakeholders for industries to be environmentally and socially responsible, industries have become aware of the strategic function of sustainable performance for a cutthroat benefit (**Wong, W.P.; Wong, K.Y. (2014)**). A number of studies have considered that the implementation of lean manufacturing can enhance industries' environmental (**Wiese, A et al., 2015**), community, and economic performance.

In the present day's world of manufacturing competitiveness, every industry desires to adapt and practice production systems that assist it to distribute its products and services with superior efficiency, superior productiveness and reduction of costs. The philosophy of Lean production and its practices have materialized as one of the most winning and extensively used production systems in today's world. Several researchers around the world

have advocated Lean production as a extremely effective system for making an industry better and more capable. **Papadopoulou & Ozbayrak (2005)** recommended that lean production could be a substantial cost cutback mechanism and if well employed, will be a direction of guidelines to making an industry world class. **Nitin Upadhye et.al., (2010)** in their article described the newest rivalry is in terms of reduced cost, improved quality of products with superior performance, an enhanced wider range of products and better services, all delivered concurrently to improve value to the customer. Small Scale Industries (SSIs) play a significant role in Indian financial system and with the relaxation method facing remarkable challenges, but their strong point lies in the competitiveness of their value added products in the world marketplace. Lean production system (LPS) is differentiated by shorter product development and production lead-time, team based work industries, small setup/switch times, multifunctional personnel and JIT releases from few dependable providers. In theory, lean production can be applied to all industries (**Billesbach 1991**). **Sanjay Bhasin (2011)** elaborated that lean as a philosophy enlightens and eliminates non-value addition steps. When applied correctly, Lean techniques will create

any shortcomings in the system emerge speedily and they will have a philosophical impact. The major goal of a lean production system is to produce products of superior quality at the lowest potential cost and in the least time by eliminating wastes (**Dennis, 2007**). The supreme goal is the elimination of waste, as it can report for between 54% and 95% of the production process.

Small Scale Industries (SSI) are an integral part of the Indian financial system, presenting considerably to the monetary development of the country. However, the effect of globalization has tossed the Indian Industries against a cutthroat market, where imported products and multinational business industries are the largest threats. To strive this, Small Scale Industries (SSIs) have to arise with ways to humanize the end user experience while receiving close to the customer as well. This is in adding to them approving the lean production philosophy to distribute their products more efficiently and with superior productivity. A wide range of techniques, tools and practices specific to SSI like Kanban, TPM, JIT, Total Quality Control etc have been recommended to carry about the leanness needed. As a result, the Lean practices help to harvest the gains that lean supporters, believer; namely shorter cycle time, shorter lead times, lower WIP, faster response time, lower cost, greater production flexibility, higher quality, better end user service, superior revenue, superior throughput and increased profit (**Sanjay Bhasin, 2011**).

2. METHODOLOGY

A structured questionnaire was used to collect data from respondents. All manufacturing firms in India that implement lean practices form the sampling frame of this study. Relevant data were collected through a survey of 120 Small Scale Industries in India and were examined. The outcomes point out that manufacturing process and equipment, product design and development, customer relationships and supplier relationships have a positive and vital effect on sustainable performance.

3. LEAN MANUFACTURING

The notion of lean manufacturing was pioneered in Japan, and Toyota was the first to employ lean practices in the shape of the Toyota Production System. **Karlsson& Ahlstrom, (1996)** described that lean is a production practice that incorporates a manufacturing system encompassed of certain principles, practices and techniques. It judges the costs of resources for any target other than

the establishment of value for the final customer to be wasteful, and thus a intention for elimination. Thus, the initiative of lean is to categorize and eliminate waste throughout the industry from starting from ordering raw of materials to delivering products to the end users. Basically, lean is the set of "tools" that helps in the classification and stable elimination of waste. **Seth and Gupta, (2005)** in their study found that fundamentally, lean is centered on protecting value with a reduced amount of work. The core idea is to maximize end user value while reducing waste. Primarily, lean means generating more value for end users with smaller amount resources. This is achieved by eliminating waste along total value streams and producing processes that require a lesser amount of human effort, less space usage, less capital, and less time. Lean production when implemented productively effects to enhance in production output per worker and a reduction in the finished products inventory and work- in process.

The following are the more significant lean principles are essential is evaluating lean performance of Small Scale Industries (**Karlsson& Ahlstrom (1996)**) Also, the implementation Five key Principles of Lean in Small Scale Industries will definitely eliminate the seven wastes which are transport, inventory, motion, waiting, over processing, over production and defects of the products.

i) Create or specify Value: identify and generate products or services in Small Scale Industries (SSI) that add value to a end user's objectives, ensuring full customer satisfaction and beyond.

ii) Map the Value Stream: Identify the vital steps in Small Scale Industry that facilitates an efficient manufacturing or service line workflow, and also the unnecessary steps that results in waste. Optimize the workflow in the layout through eliminating non-value steps and add value steps to create value stream. Also, the implementation of five key Principles of Lean in Small Scale Industries will definitely eliminate the seven wastes which are transport, inventory, motion, waiting, over processing, over production and defects of the products.

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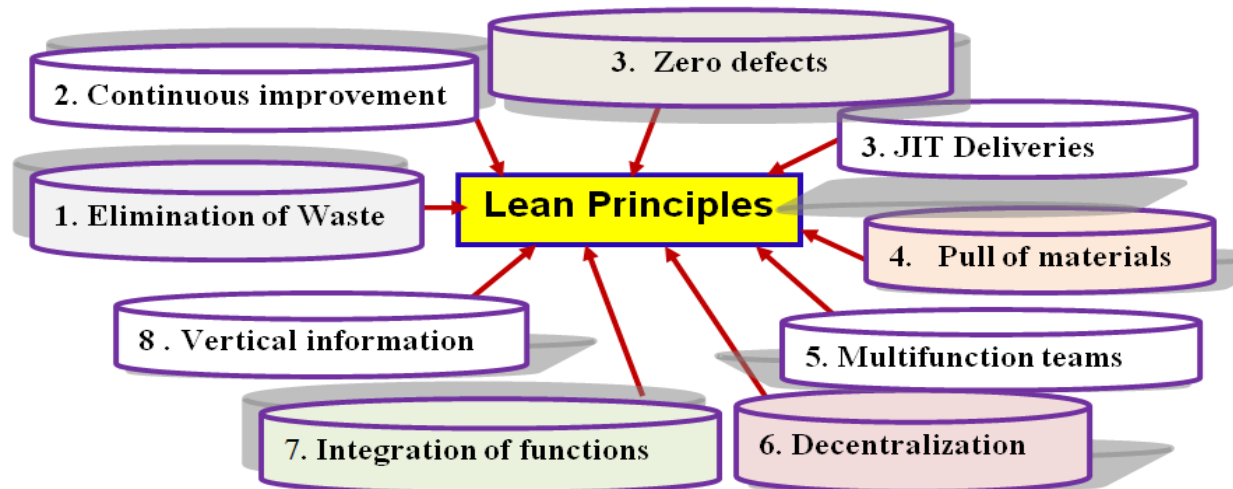


Fig.1 Lean Principles (Karlsson & Ahlstrom (1996).

iii) **Establish Flow:** Eliminate unnecessary steps in the workflow that potentially cause interruption, backflow, delay or destruction. Generate efficient steps without these negative effects to form a continuous flow of products and services of value flow in small Scale Industries (SSI).

iv) **Implement Pull from the customer :** Nothing is done by the upstream process until the downstream end user signals the require, actual demand pulls value added products or services through the value stream so that no resources wasted in Small Scale Industries.

v) **Work to towards Perfection:** The total elimination of waste so all activities generate value for the end user by breakthrough and seek continuous improvement in SSI.

4. SMALL SCALE MANUFACTURING INDUSTRIES

Small Scale Manufacturing Industries (SSIs) are one of the most essential links in supply chains nowadays. They are accountable for driving the competition and innovation in any economy. They shape the backbone of a country's manufacturing industry. Although, they countenance stiff competition on rivalry from large scale Industries, they are necessary mechanisms in a supply chain. To stay alive the manufacturing competition of nowadays, there is a straight need for Small Scale Industries (SSIs) to go lean and practice of lean tools & techniques and philosophies as soon and as much as achievable. According to the Development Commission, Govt. of India, Small Manufacturing Industries are those where the investment in plant and machinery is more than 25 lakh rupees but does not exceed 5 crore rupees. The European

Commission has classified SSIs on the basis of the number of workers. Small Manufacturing Industries can employ up to 50 workers. Investigators agree that there is a genuine potential for executing Lean philosophies and practices used by SSIs, even though there may be a desire to tailor some practices while implementing them. There are four key determinants which decide the achievement of lean implementation in Small Scale Industries (Achanga et al. (2006). They are : i) Leadership and management ii) Monetary strength iii) Organizational structure iv) Skill and expertise of the employees.

5. LEAN PRACTICES IN SMALL SCALE INDUSTRIES (SSIs)

Lean means generating more value for end users with fewer resources. A lean industry understands end users value and spotlights its main processes to continuously boost it. The ultimate goal is to provide perfect value to the end user through a perfect value generation process that has zero waste. There are several Lean tools and practices that supporters activist. Among the common accepted Lean practices are: Visual Management (VM), Continuous Improvement (CI), Just- In Time (JIT), Lot Size Reduction, Total Quality Management (TQM), Process Standardization (POS), Reduction in set-up – time (SMED), Quick Change over Techniques, Supplier Relationship (SR), Customer Relation (CR), Design for Manufacturability and Assembly (DFMA), High Involvement Work Practices (HIWP), Empowerment Training and Rewards (ETR), 5S, Cellular Manufacturing (CM), Kanban and Kaizen Focused Factory, Group technology, Reduced setup time, Total productive

maintenance, Multifunctional motivated teams.
Shaman Gupta a & Sanjiv Kumar Jain (2013) studied the following steps are important for implementing lean manufacturing industries:

- i) Categorization of wastes in the system.
- ii) Make out the types of waste and their origin of causes. Lean production considers in treating the causes and remedial the problems permanently. There are different tools and techniques that are quite useful in reducing or eliminating these types of waste.

- iii) To find the solution for the root causes. Everybody should know the basic lean ideas to recognize the root causes.
- v) The last step in the lean implementation process in industry is to discover the solutions and test the solutions first. Once key solutions are tested then they should be implemented in industries.

The following are the most general Lean practices and tools highlighted by various authors for Small Scale Industries.

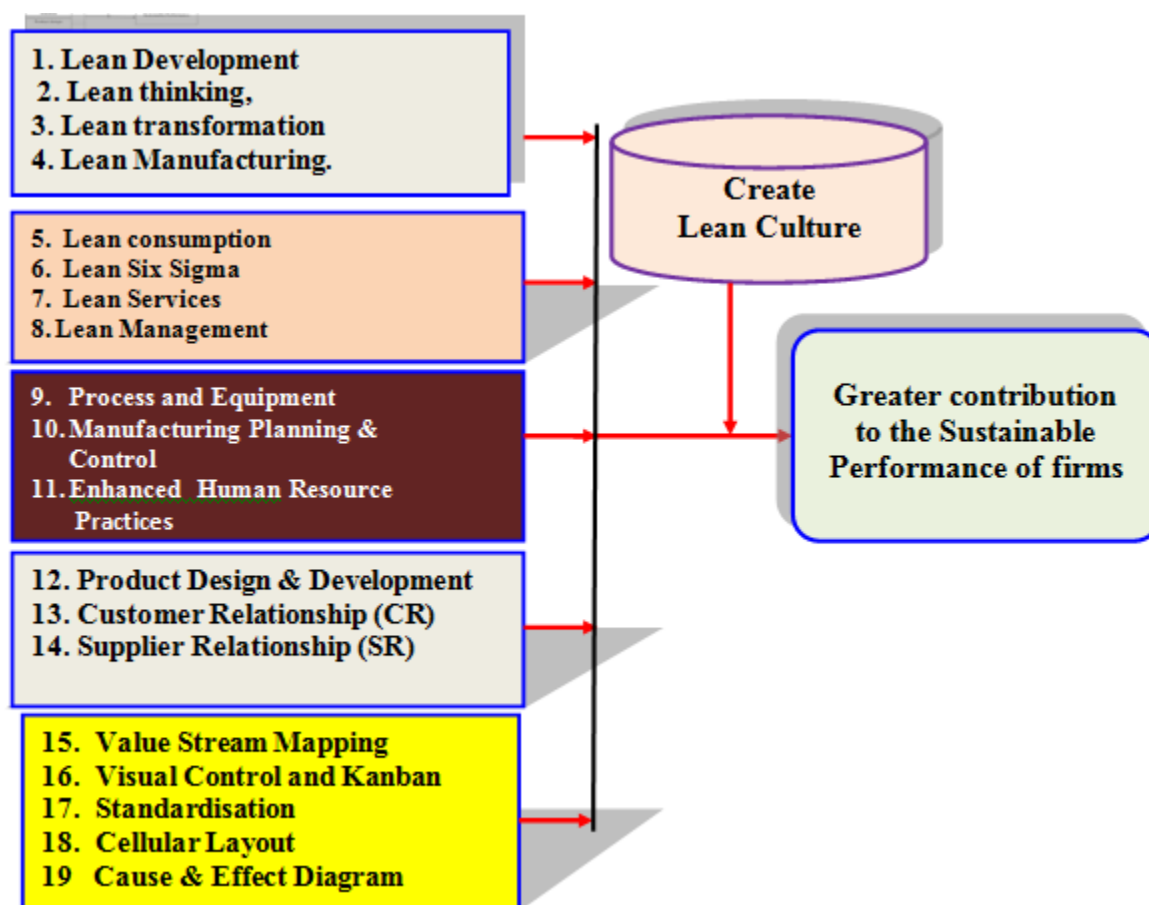


Fig. 3 Sustainable performance of Lean Manufacturing in SSIs.

Table 1. Various common Lean Practices that different author have highlighted.

Sl.	Lean Practices & Authors	Description
1	JIT – Shaman Gupta a & Sanjiv Kumar Jain (2013)	JIT sets out to cut costs by reducing the amount of products and materials a firm holds in stock
2	Kanban - Ahmad Nasser Mohd. Rose et al.,	Kanban is a easy parts-movement system in which material movement between workplace in a production line is based on cards.

3	5S – Ahmad Nasser Mohd. Rose et al.(2009), Shaman Gupta a & Sanjiv Kumar Jain (2013)	The phases in 5S are: i) Sort: eliminate unnecessary obstacles to ensure smooth flow. ii) Systematize: Retain a system so that everything is within easy reach . iii) Sweep: Maintain the workspace clean and tidy. iv) Standardize: To have a specific system for maintaining the workspace v) Sustain: maintain the high quality of the workspace
4	Total Productive Maintenance (TPM) - White, R.E. et.al (1999), Upadhye, N. et.al (2004),	The goal is to keep all equipment in good condition to avoid breakdowns and to get operators involved in maintaining their own equipment and highlighting preventive and proactive maintenance.
5.	Continuous Improvement – Sanjay Bhasin (2011), Shaman Gupta a & Sanjiv Kumar Jain (2013),	Continuous Improvement (CI) means that organizations should run on activities that strive to continually improve all functions, involve everyone from top management to the bottom layer and ultimately, eliminate all waste from the system.

6. OBSTACLES IN IMPLEMENTING LEAN

There are a few obstacles which occur in implementing Lean as well. The following are the

hurdles that SSIs might come across while implementing Lean production systems that various authors have highlighted:

Table 2. Various obstacles that different authors have highlighted.

Sl.	Obstacles & Authors	Description
1	Insufficient Funding Achanga, P. et.al (2006), Sanjay Bhasin (2011), Shaman Gupta a & Sanjiv Kumar Jain (2013),	Most SSIs have an inadequate budget and restricted resources. Due to this, they may not be able to pay for to implement the needed good Lean practices either completely or profitably of products and materials a industry holds in stock.
2	Lack of training or of skilled resources. White, R.E. et.al (1999), Achanga, P. et.al (2006), Ahmad Nasser Mohd. Rose et al., (2009),	Suitable training in the ways of Lean production systems has to be instructed to the management and to the workers. If there is a lack of training, there will be a lack of skilled employees which may be not able to achieve tasks according to lean principles.
3	Lack of understanding of lean concepts. White, R.E. et.al (1999), Achanga, P (2006), Ahmad Nasser Mohd. Rose et al., 2009,	The concept of Lean may not be fully understood by the top management, which may direct to unsuccessful or incorrect accomplishment of the lean practices.
4	Lack of top management Commitment Achanga, P (2006), Ahmad Nasser Mohd. Rose et al., (2009), Sanjay Bhasin (2011)	The top management desires to have tolerance and full commitment to implement Lean effectively and completely.
5.	Inadequate understanding of the potential benefits. White, R.E. (1999), Achanga, P (2006), Ahmad Nasser Mohd. Rose et al., (2009)	There is also a likelihood that the management might not know or recognize the possible benefits that Lean could bring about in their industry and so, fail to employ Lean when it really might be required.

7. BENEFITS OF LEAN

Sanjay Bhasin (2011) presented several advantages of the Lean system from operative to

administrative have been recommended by investigators. They are :

Vital benefits of Lean System in Small Scale Industries (SSIs)	
<ul style="list-style-type: none"> • shorter cycle time, • shorter lead times, 	<ul style="list-style-type: none"> • greater production, • flexibility,

<ul style="list-style-type: none"> • lower WIP, • faster response time, • lower cost • higher throughput 	<ul style="list-style-type: none"> • higher quality, • better customer service, • higher revenue, higher • increased profit
<p>- are several of the common enhancement from implementing Lean system .</p>	

8. CONCLUSION

It is concluded that the concept of Lean is one of the most cost - effective and broadly used in many industries today.

- The moderating result of creating lean culture was proved by the effects of manufacturing processes and equipments and supplier relationships on sustainable performance of the industries. Several researchers have advertized it as being the most winning in making an industry added profitable and efficient. Lean system should be out looked more as a philosophy than as a system. All types of Small Scale Manufacturing Industries (SSIs) have to implement the Lean philosophy currently because of rising competition from globalization. They require to become more efficient in manufacturing their products as well as making sure the products reach the end users.
- There are several practices that can assist them to become lean. However, Small
- Scale Industries cannot implement all of the practices due to economic constraints. The vital benefits to implementing Lean in an industries are (i) improved quality of the products, (ii) reduction in lead and cycle times, (iii) lower Work-In-Progress (WIP) inventory, (iv) better customer responsiveness etc.
- There are several obstacles to implementing lean system as well, like (i) inadequate funding, (ii) lack of understanding of lean concepts, (iii) lack of training, (iv) lack of top management assurance among employees.
- However, the obstacles and problems far outweigh the fundamental advantages of lean, making it beyond doubt a essential for successful and top class industries.

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