An Empirical Study on Critical Issues of Lean Implementation in Micro, Small and Medium Enterprises with reference to Coimbatore city

1. **Dr.Mrs.Indrani, Head & Assistant Professor, Department of B.com(AM&FS), PSGR Krishnammal College for Women, Coimbatore**
2. **Mrs. C.Anitha Mary, Assistant Professor, Department of B.com(AM&FS), PSGR Krishnammal College for Women, Coimbatore**
3. **Mrs. G.R.Rajalakshmi, Assistant Professor, Department of B.com(AM&FS), PSGR Krishnammal College for Women, Coimbatore**
4. **Mrs. G.Rajamani, Assistant Professor, Department of B.com(AM&FS), PSGR Krishnammal College for Women, Coimbatore**

Abstract

Lean manufacturing also known as Toyota Production Systems was first introduced by Toyota. Lean manufacturing is acknowledged as Value additive Process by eliminating all wastes by Proper Process Management. Now days, almost all sectors industries are trying to implement Lean in their Organization while MSME's are struggling to implement these techniques. Hence, this paper has attempted to understand the tools and techniques of lean and to explore the Critical Issues of Lean Implementation in Micro, Small and Medium Enterprises.

Keywords: Lean, MSMEs, tools and techniques, critical issues

Introduction and Problem statement

Indian MSME industries are an integral part of Indian economy. The contribution to the economic development of the country is indeed significant in terms of GDP and employment. MSMEs are those industrial organizations whose number of employees and the annual turnover falls under a certain limit. According to newly enacted MSME Development Act 2006, which is effective from October 2, 2006; the enterprises are classified according to the following criteria.

Table 1: Classification of Micro, Small and Medium Enterprises (MSME)

Type of Enterprises	**Manufacturing Enterprises (in terms of gross investment in plant and machinery)**	**Service Enterprises (in terms of gross investment in equipment)**
Micro Enterprises	Does not exceed twenty five lakh rupees	Does not exceed ten lakh rupees
Small Enterprises	More than twenty five lakh rupees but does not exceed five crore rupees	More thanten lakh rupees but does not exceed two crore rupees
MediumEnterprises	More than five crore rupees but does not exceed tencrore rupees	More than two crore rupees but does not exceed five core rupees

(Source: Rodriguez et.al. 2007*)*

Today SMEs are flourished in well-organized clusters based manner (Mandar et al., 2014). However, globalization and new technologies are having great impacts on the manufacturing Industry in present era. Due to liberalization and globalization, Indian MSME's are facing tremendous challenges. Imports and MNCs are becoming major threats to Indian industries. For many industries abroad, Lean thinking is a way of life as it eliminates waste and improves the efficiency of an organization. But in India Lean implementation is still in its early stages. Lean Manufacturing have not received due attention in MSME's globally (Gunasekaran, A.,L. Forker and B.Kobu, 2000). Thus, this paper deals with identifying the critical issues in implementation of lean in Indian MSMEs and attempts have been made to provide realistic solutions to overcome major barriers identified, for successful implementation of Lean.

Literature Review

Gunasekaran (2000) in his study has addressed that the MSMEs are facing several issues and constraints in implementing Lean techniques successfully. He has suggested that the Indian government has started focusing on MSME's by cluster formation to implement Lean successfully. Lean Manufacturing has implemented successfully in Large Scale industries, but has only little evidence at SME's (Womeck et al., 1990; Billesbach, 1991; Bamber and Date, 2000; Achanga et al., 2006). Spann et al. (1999) have discussed that implementation of Lean manufacturing in MSME's will lead to huge benefits such as quality improvement, reduction in

cycle time etc., (Vikas K., Garg D and Mehta N.P., 2004) has explained that adoption of continuous improvement methodology with the use of different tools and techniques becomes the strength of the manufacturing system. Uma (2013) in her article has discussed that waste reduction in Industrialization is a very effective means for solving the problems related to economic and social progress as far as developing countries of the world are concerned. Myrdal (2013) has rightly described the relationship between industrialization and economic development when he observes that "the manufacturing industry represents, in a sense, a higher stage of production in advanced countries". Tamizharasi (2014) in her study has discussed about various waste management techniques used in Indian MSME and highlighted the benefits of lean concept and recommended its implementation in Indian MSME industries to reduce waste and to improve the organization performance. Kumar (2014) in his paper has identified various Lean manufacturing systems acknowledged by Indian industry as a capable system in enhancing organizational performance by focusing on elimination of waste from the manufacturing system and thus improving effectiveness of the organization. He has also examined in his another article that efforts have been made to identify the barriers for lean implementation and then to develop the relationships among these identified barriers. Prieto-avalos (2014) has studied that Lean manufacturing provides an approach to identify and eliminate waste and all non-value added activities through continuous improvements. Thanki (2014) has concluded a report of pilot study on Lean six sigma awareness and implementation using the survey data collected from about 32 industries situated in western and eastern region of India. A survey instrument containing 45 statements was designed to assess respondents' attitude and awareness toward lean practices and to explore the level of lean implementation in the organization. Naveen (2013) in his study has indicated that the requirement of Lean six sigma manufacturing has increased due to waste and subsequent increase in cost of the manufacturing goods. After thorough literature review it has been found that reduction of scraps can play a key role in order to maximize the profits of Indian MSMEs.

Objectives of the study

1. To understand the tools and techniques adopted in lean management.
2. To find out the critical issues that determines its successful application within MSMEs.

Research Methodology

A questionnaire has been prepared after identifying 29 problems of lean implementation with discussion to industrial personals and consultants. Interview Schedule has been conducted to 150 MSME's located in Coimbatore city, Tamil Nadu. The responses have been received on a four-point scale ranging from low to very high. Later 29 lean issues in reduced in to six broad categories, i.e., customer's issues, organizational issues, supplier issues, employee issues financial issues and management issues. Further descriptive statistics and Friedman rank test has been used to find the importance of lean issues to Indian industry.

Results and Discussion

Objective 1: To understand tools and techniques adopted in lean management. The following are the Various Lean techniques available:

5S is all about organizing the work area:

- Sort (eliminate which is not required)
- Set In Order (organize items)
- Shine (clean work area)
- Standardize (standards for above)
- Sustain

This will help in Eliminating waste those results from a poorly organized work area (e.g. wasting time looking for a tool).

Andon is a visual feedback system for the shop floor that indicates production status, signals when assistance is required, and authorizes operators to stop the production. It acts as a real time communication tool for the shop floor that conveys immediate attention to problems as they occur, so that it can be immediately addressed.

Bottleneck Analysis identifies which part of the manufacturing process limits the complete throughput and improves the performance of that part of the process. It will improve the throughput by consolidation the weakest link in the manufacturing process.

Continuous Flow: Manufacturing where work-in-process easily flows through production with minimal (or no) barriers between steps of the manufacturing process. It eliminates many forms of wastes (e.g. inventory, waiting time, and transport).

Gemba (The Real Place): A philosophy that prompts us to get out of our offices and spend some time on the shop floor – the place where real action occur. It stimulates a deep and thorough understanding of real world manufacturing issues – by first hand observation and by conversation with plant floor employees.

Heijunka (Level Scheduling): A system of production scheduling that deliberately manufactures in smaller batches by sequencing (mixing) product alternatives within the same process. It reduces lead time (since each product or variant is manufactured often) and inventory (since batches are smaller).

Hoshin Kanri (Policy Deployment): Aligning the goals of the company (Strategy), with the plans of middle management (Tactics) and the work performed on the plant floor (Action). It Ensures that progress towards strategic goals is consistent and thorough – eliminating the wastes that originates from poor communication and inconsistent direction.

Jidoka (Automation): Design equipment's to partially automate the manufacturing process (partial automation is much less expensive than complete automation) and to stop automatically when defects are detected. After Jidoka, workers can regularly monitor multiple stations (reducing labour costs) and many quality issues can be addressed immediately (improving quality).

Just In Time (JIT): Pull parts through production based on demand from customer instead of pushing parts through production based on demand projected. Depend on various lean tools such as Heijunka, Takt Time, Continuous Flow, Standardized Work and Kanban. It is highly effective in reducing inventory levels. Improves cash flow and reduces space requirements.

Kaizen (Continuous Improvement): Is a strategy where employees work together in proactive manner to achieve regular, sustainable and incremental improvements in the manufacturing processes. It combines the collective talents of a company to create an engine that will continually eliminate waste from manufacturing processes.

Kanban (Pull-System): A method, which regulates flow of goods both within the factory, with outside suppliers and customers. Based on automatic replacement through signal cards that indicate when more goods are required. It Eliminates waste from inventory and overproduction. Can also eliminate the need for physical inventories (instead relying on signal cards to indicate when more goods need to be ordered).

KPIs (Key Performance Indicators): Metrics are designed to track and encourage progress towards critical goals of the organization. Strongly endorsed KPIs can be extremely powerful drivers of behaviour – so it is important to carefully select KPIs that will drive desired behaviour. The best manufacturing KPIs are:

- Aligned with strategic goals framed by top-level (thus helping to achieve those goals)
- Effective at exposing and quantifying waste (Example OEE)
- Influenced by plant floor employees (so they can drive results) Muda (Waste): Anything in the manufacturing process that does not add value from the customer's perspective.

Muda means 'waste'. The elimination of wastage i.e., Muda is the primary focus of lean manufacturing.

Overall Equipment Effectiveness (OEE): Framework for determining productivity loss for a specified manufacturing process. Three classes of loss are tracked:

1. Availability (e.g. down time)
2. Performance (e.g. slow cycles)
3. Quality (e.g. rejects)

It provides a benchmark and a means that tracks progress in eliminating wastes from a manufacturing process. 100% OEE means faultless production (manufacture of only good parts, as fast as possible, with no down time).

Plan Do Check and Act (PDCA): An iterative practice for implementation of improvements:

- Plan (establish strategy and expected outcomes)
- Do (implement plan)
- Check (verify expected results achieved)
- Act (review and assess; do it again)

It applies a scientific approach in making improvements:

- Plan (develop a hypothesis)
- Do (run experiment) Check (evaluate results)
- Act (refine your experiment; try again)

Poka-Yoke (Error Proofing): Design error detection, and prevention into production processes with the goal of achieving zero defects. It is not a very simple task in identifying all defects through inspection, and correcting defects typically gets significantly more expensive at each

stage of production. Hence, Poka-Yoke will be helpful in this regard, where each product is checked in all the process before going to further process.

Root Cause Analysis: A problem solving methodology that primarily focuses on resolving the underlying problem instead of applying readymade solutions that only treat immediate symptoms of the problem. A usual approach is to ask why five times – each time moving a step closer to discovering the true underlying problem. It ensures that a problem is eliminated by applying corrective action to the "root cause" of the problem.

Single-Minute Exchange of Dies (SMED): Reduce setup (changeover) time to less than 10 minutes. Techniques include:

- Convert setup steps to be external (performed while the process is running)
- Simplify internal setup (e.g. replace bolts with knobs and levers)
- Eliminates non-essential steps or operations
- Creates Standardized Work instructions and enables manufacturing in smaller lots, reduces inventory, and improves customer responsiveness.

Total Productive Maintenance (TPM): A holistic approach in maintenance that focuses on proactive and preventative maintenance to take full advantage of the operational time of equipment. TPM shapes the difference between maintenance and production by placing a strong emphasis on empowering operators to help maintain their equipment. It creates a shared responsibility for equipment that encourages greater involvement by shop floor workers. In the right environment, this can be very effective in improving productivity (increasing up time, reducing cycle times, and eliminating defects).

Value Stream Mapping: A tool, which is used to visually map the flow of production and shows the current and future (FSVS/VSD) state of processes in a way that highlights opportunities for improvement. It Exposes wastes in the current processes and provides a roadmap for improvement through the future state.

Visual Factory: A tool similar to Andon but this uses visual indicators, displays and controls used throughout the manufacturing plant to improve communication of any information. It makes the state and condition of manufacturing processes easily accessible and very clear to everyone.

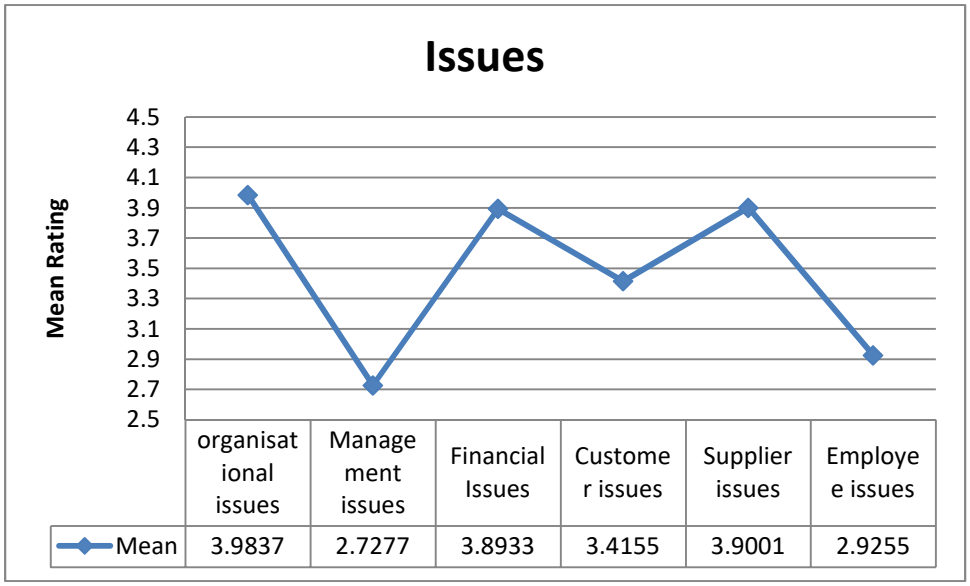
Objective 2: table 2-Descriptive statistics: Lean implementation issues

Issues	N	Minimum	Maximum	Mean	Std. Deviation
Organizational issues	150	1	4	3.9837	0.65296
Management issues	150	1	4	2.7277	0.24212
Financial issues	150	1	4	3.8933	0.74393
Customer issues	150	1	4	3.4155	0.25725
Supplier issues	150	1	4	3.9001	0.52525
Employee issues	150	1	4	2.9255	0.43711

(Source: computed)

A four point rating scale ranging from low to very high have been constructed to obtain the opinion of the respondents. From the mean ratings it is inferred from the table that, the high mean rating has been found for 'Organisational issues' (Mean 3.98) and the low mean rating has been found for 'Management issues' (Mean 2.73). Hence, based on high mean rating, it is inferred that, lack of support from top management, lack of practical implementation knowledge, lack of capital fund, owner cum managers etc have been the organizational issues faced by MSMEs.

Figure 1: Critical issues in Lean Implementation



Friedman Rank test

The respondents have been asked to give ranks for the critical issues faced by them in implementing lean concept. They have given rank 1 for the most impediment issue and 6 for the least problem. The mean value of the rank has been found out for each factor and the results are exhibited in table

Table3: Critical issues in implementation of lean concept in MSMEs

Issues	**Mean rank**	**Actual rank**
Organizational issues	**3.78**	**5**
Management issues	4.15	6
Financial Issues	3.38	2
Customer issues	3.58	4
Supplier issues	3.55	3
Employee issues	**2.57**	**1**

(Source: computed)

It is observed from the table that, the respondents have given the highest rank to 'Employee issues' (Mean 2.57) and the least rank have given to 'Management issues' (Mean 4.15). It is inferred that employee absenteeism, high contract labours and lack of skilled manpower are the reason for unsuccessful implementation of lean concept. Moreover, the respondents have opined that the employees assume that implementation of lean will lead to job cuts and decrease the salary of employees.

The Friedman Rank test has been applied to find out the significant variation in mean ranks.

H_0: "The mean rank of critical issues in lean implementation does not differ significantly among the respondents"

Table 4: Friedman Rank test- critical issues in lean implementation

N	**Chi-Square**	**Df**	**Sig.**
150	156.219	5	**

*(** - significant at 1 % level)*

The ranking as per the above table infers that, the chi square value (χ^2 = 156.219, p<0.000) is statistically significant. It implies that, the respondents have varied in the order of assigning ranks with respect to the critical issues in implementing lean concept. Hence, the null hypothesis has been rejected at 1 per cent level of significance.

Findings of the study

- Lean tools and techniques are not meant only for large scale manufacturing which is the basic assumption of all industries. But this assumption is not true as lean is a creative tool which is best suited for all industries irrespective of their scale of operations.
- Challenges of Lean implementation has been identified and classified into six major categories: Management issues, Organizational issues, Finance issues, customer issues, supplier issues and employee issues. Among them orgaisational and Employee issues have been the major impediment issues in successful implementation of lean manufacturing by MSMEs.

Suggestions

The following are the constructive suggestions to overcome the challenges in implementation of Lean.

1. Lack of finance is a major challenge for Indian MSMEs, as they start up their enterprises with very less initial capital.
2. Lack of support from employees can be addressed through awareness drive about what is lean and how lean will help to achieve their individual goals and organisational goals at large. In this drive it must clearly state that in implementation of lean will not lead to job cuts nor decrease the salary, but main aim is to retain only those processes which adds value and eliminating non-value added activities (wastes) in the Industry.
3. Intensive training by professional lean practitioner is necessary in order to implement lean in very effective manner.
4. Frequent training sessions about the new practices adopted under the lean management must be provided time to time so that employees are aware of the prevailing tools and techniques.

5. Lean management will surely increase production, through its tools and techniques if adopted in well-defined manner, along with advice from the experts in the field of Lean.

Conclusion

Lean has become a way of life for all the manufacturing and service industries in the world and India is not an exception. Lean manufacturing reduces waste and increases productivity and hence facilitates industries to stay competitive in global market. Successful implementation of lean manufacturing is a major challenge faced by Indian industries. This paper has discussed all about the critical issues faced by MSMEs in successful implementation of lean. The study reveals that due to organizational and employee issues, the MSMEs lack in its successful implementation of lean concept in the industry. Moreover, lack of adequate funding also hampers its successful implementation. Among the lean practices that require least financial investment are 5S, visual control & display, standardization of operation, Statistical Process Control (SPC) and Kaizen circle. Hence, MSMEs should apply these practices first and then followed with other practices such as kanban card, pokayoke. These can be implemented once the production flow is efficiently run, with minimum machine breakdown and quality issues. These steps if taken could help MSMEs to improve their performance gradually.

References

- Gunasekaran, A.,L. Forker and B.Kobu,. (2000). Improving operations performance in a small company: A case study. International Journal Operation Production Management, 3, 316-336.
- Vikas K. , Garg D and Mehta N.P. (2004). JIT practices: in Indian context. Journal of scientific and Industrial research, 63, 655- 662.
- Kumar, R., & Kumar, V. (2014). Barriers in Implementation of Lean Manufacturing System in Indian industry : A survey. International Journal of Latest Trends in Engineering and Technology (IJLTET), 4(2), 243–251.
- Khadse Priti B., Sarode Avinash D. and Wasu Renu. (2013, September 1). Lean Manufacturing in Indian Industries :A Review . International Journal of Latest Trends in Engineering and Technology, 3(1), 175-181.

- Pingyu Y. and Yu yu. (2010, June). “The Barriers to SMEs’ Implementation of Lean Production and Countermeasures. International Journal of Innovation, Management and Technology, 1(2).
- Ravikumar, M. M., Marimuthu, K., Parthiban, P., & Zubar, H. A. (2014). Critical issues of Lean implementation in Indian micro, small and medium enterprises - an analysis. Research Journal of Applied Sciences, Engineering and Technology , 7(13), 2680–2686.
- Upadhayay N, Deshmukh S. G. and Garg S. (2010). Lean manufacturing system for medium size manufacturing enterprises: an Indian case. International Journal of Management Science and Engineering Management, 5(5), 362-375.
- J. P., Jones, D. T., & Roos, D. (1990). The machine that changed the world: the story of lean production. New York: Harper Collins.