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A Study on Application of lean Manufacturing Methodologies in Indian Electronics Manufacturing Industry

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Abstract

The Indian electronics industry is one of the fastest growing industries and investments are flowing in to increase its manufacturing capacity. But, India is facing incremental challenges such as rising customer's expectation, widening customer-base of existing ones, fluctuating demand, taxation, lack of infrastructure and intense competition. Thus, India needs to be more efficient in her key activities or processes to cope with the challenges. Lean manufacturing could be a solution in order to improve the performance in this competitive globalized market where uncertainty is prevalent. The purpose of this study is to examine the techniques of adopting lean, the tools implemented, the motivators, obstacles and challenges in adopting lean in Indian Electronics manufacturing industry. The data collection was conducted through a structured questionnaire both online and off line, observations from the past studies, company reports and visits to the companies were also done. The results show that the degree of lean implementation in Indian electronics manufacturing industry is still nascent. So, the concerned authorities should play a considerable role and frame some policies to promote lean manufacturing. Future research would consider doing analysis in a more number of organizations as this will reflect the true index.

Keywords: Lean manufacturing, Lean tools and techniques, globalized market, Indian electronics industry.

Introduction

The Indian electronics industry, reportedly worth US$ 1.75 trillion, is one of the largest in the world. It is expected to reach US$ 2.4 trillion by 2020. The demand in the Indian market was US$ 45 billion in 2008-09 and is expected to reach US$ 400 billion by 2020 according to the Draft National Policy on Electronics, 2011[1]. India is considered as one of the fastest growing destinations for original equipment manufacturers (OEMs) and electronics manufacturing services (EMS). Despite the immense opportunities for India to grow as a manufacturing hub, it lags far behind many countries when it comes to its share of the EMS market.

Lean manufacturing is a wide set of production practices to eliminate or reduce waste or any activity that consumes resources without adding value in design, manufacturing, distribution, and customer service processes. It was developed by the Toyota executive Taiichi Ohno (1912-90) for large repetitive manufacturing in the automotive sector during post-Second World War reconstruction period in Japan, and popularized by James P. Womack and Daniel T. Jones in their 1996 book 'Lean Thinking.

The goal to eliminate waste demands "paperless" manufacturing. With lean growth model, profits increase by 'doing more with fewer resources', that is, the percentage of growth will be more as wastage is eliminated thereby improving quality while minimising production time and cost. Thus, a successful Lean implementation in an organisation has a significant impact on the performance of the entire organization.

Purpose of the study: The purpose of this study is to examine the techniques of adopting lean, the tools implemented, the motivators, obstacles and challenges in adopting lean in the Indian Electronics manufacturing industry.

Literature Review: In the electronics manufacturing service sector, lean manufacturing is a relatively recent advance. In a case study describing the production of electronic test equipment, this meant transforming from a traditional batch-and-queue circuit board assembly process to a continuous flow manufacturing process. The major problem solved by lean manufacturing methods was the reduction in work in process (WIP) inventory that was accumulating at a number of workstations along the manufacturing line, and too many pieces of WIP that required rework to correct defects from initial production. It was estimated that $1.9 million of WIP inventory was tied up in a manufacturing cycle time of eighteen (18) days[2].

The findings obtained by the International Motor Vehicle Program (IMVP) in Massachusetts Institute of Technology (MIT) shows that lean production combines the best features of both mass production and craft production. It possesses the ability to reduce costs per unit and dramatically improve quality while at the same time providing a wider range of products. It is a manufacturing system that provides the flexibility required to satisfy the rapidly changing demand of customers[3]

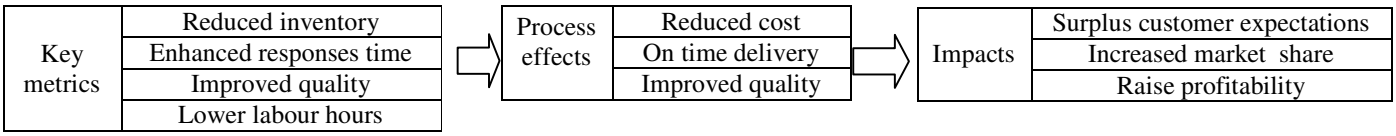

Figure-1
Lean manufacturing process

Lee-Mortimer explored the adoption of Kanban in an electronic manufacturer[4]. Álvarez et al. (2009) assessed the implementation of VSM and Kanban in an assembly line[5].

Multifunctional teams, decentralized responsibilities, integrated functions and vertical information systems were a few principles for organizational change in lean manufacturing companies[6, 7].

Lean production is an integrated socio-technical system, which consists of the social aspects (people and society) and technical aspects (machine and technology) [8]. The facets in human aspects such as motivation, empowerment and respect for people are greatly recognized and it is resolute that people and cultural change are the predominant reasons for failures in implementing lean[9].

In a survey by Technology Forecasters Inc. and Electronics Supply and Manufacturing, about 75 percent of the 250 electronics manufacturing surveyed were engaged in Lean implementation. In the study, about one third of the respondents claimed extensive Lean implementations and the area of greatest focus was on using Lean to improve efficiency and processes, removing waste, reducing production costs and improving material flows in the factory. Here, figure-2 shows the current level of lean adoption according to the study by Technology Forecasters Inc. and Electronics Supply and Manufacturing[10].

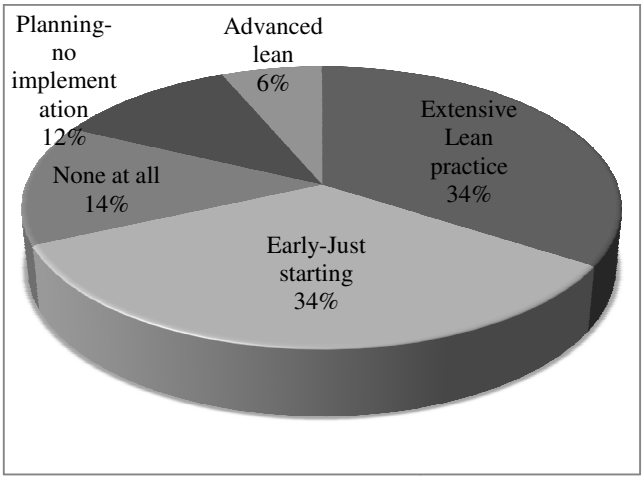

Figure-2
Current level of lean adoption (Technology Forecasters Inc.)

Methodology

The data collection was conducted with the help a structured questionnaire through E-mail and offline method by asking relevant questions with the help of a structured interview to the key personnel who are responsible for lean implementation.

The first section of the questionnaire aimed to seek the general information of the company such as the year in which lean implementation was initiated, the effects of lean adoption on the organizations, etc. After that, the adoption techniques and tools used by the organizations and inclination towards choosing lean manufacturing were examined. Finally, the obstacles in lean implementation were investigated. Besides interviews, observations from the company reports and short visits to the companies were also made.

Results and Discussion

The objective of the study is to investigate about lean implementation in Indian electronics manufacturing industry. Although, the response rate was low, the results found here can be considered satisfactory because Indian electronics industry is still novice in lean implementation and there are several improvement opportunities.

Table-1
Profile of the participating organisation

Ownership	Domestic private	24
	MNC	02
Nature of Lean efforts	Extensive	06
	Some	04
	None	16
Major Lean Tools	JIT	
	Lean Six Sigma	
	Jidoka	
	Supply Chain management	
	Kaizen	

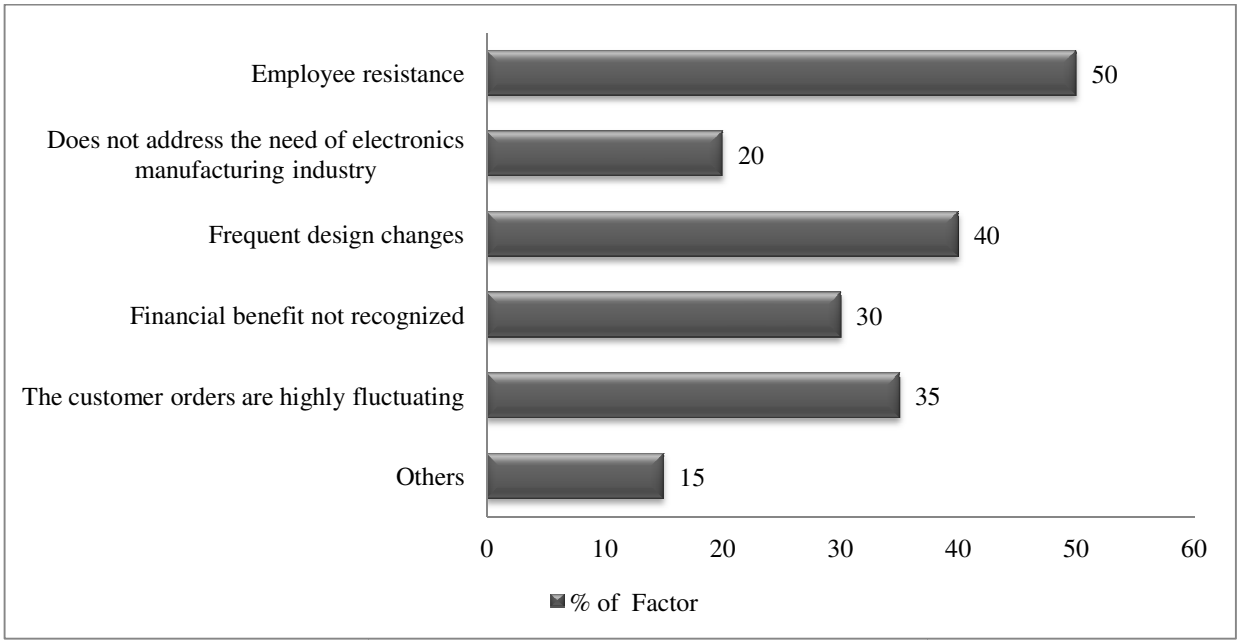

Figure-3
Obstacles for Lean Implementation

Profile of the participating organisation: A total number of 26 electronics companies with manufacturing facilities in India were studied. The data for this survey were collected within a period of 3 months. A majority of the respondents were senior executives of quality department responsible for lean management. The following table gives a brief profile of the participated organisation.

JIT (Just in Time), Six Sigma, Jidoka, Kaizen and Supply Chain Management are the most widely used lean manufacturing tools in Indian electronics manufacturing industry. Lean implementation in the Indian electronics manufacturing industry is just a decade old and the respondents stated that the benefit of lean implementation is yet to reap.

Obstacles of Lean Implementation in Indian Electronics manufacturing industry: Some of the major obstacles of Lean implementation in the Indian Electronics industry are highly fluctuating customer orders, employee resistance and frequent design changes. The obstacles for Lean Implementation in the Indian electronics manufacturing industry are shown in figure-3.

In many organizations, lean Implementation is not fully done and is implemented in few core areas. Some of the reasons for giving low priority in other areas may be due to lack of training and lack of lean awareness in India. The factors responsible for non-uniform lean implementation within an organisation are shown in figure-4.

Motivational factors of Lean implementation in Indian Electronics manufacturing industry: i. Improve sales productivity by creating good work environment and Culture, ii. Education and Training, iii. Reduces rework, iv. Low labour costs, v. A large base of technical manpower and massive workforce

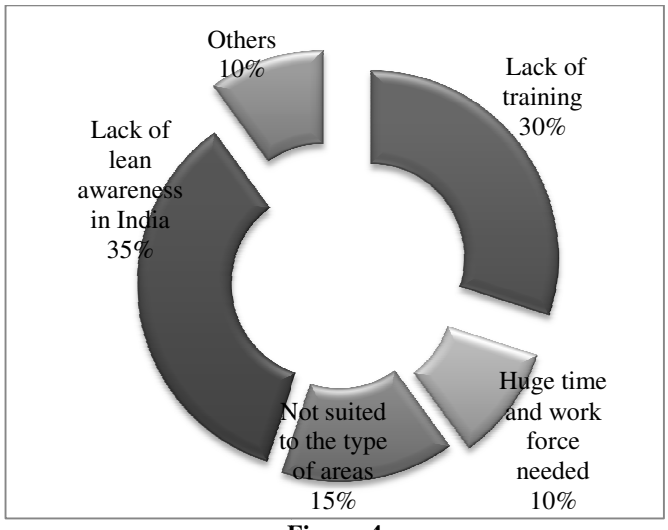

Figure-4
Factors responsible for Non Uniform lean implementation within an organisation.

Improvement opportunities for Indian Electronics manufacturing industry: i. Low electronics hardware manufacturing capacity, ii. Lack of infrastructure, iii. Market responsiveness iv. Changing governmental policies, v. Lack of cohesive RandD roadmap

Conclusion

The results show that the level of lean adoption in the Indian electronics manufacturing industry is still at nascent stage and little studies regarding lean manufacturing have been done in Indian electronics manufacturing industry. The study suggests that the Indian electronics manufacturing industry has not yet exploited the leap frogging effect of lean implementation. Many of the successful Lean implementations throughout the world are well known. Despite this, the industry still follows the traditional way.

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