Implementing the Lean Six Sigma as a Strategy in a Small Medium Enterprises (SMEs)

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Abstract

In this paper we provide an exploration and analysis of implementing Lean Six Sigma (LSS) as a strategy in manufacturing small- and medium-sized enterprises (SMEs). Critical factors are identified and analysed. Exploratory evidences about LSS implementation in SMEs were collected from a survey study. To understand insight in how organizations translate CSFs into practice and cope with impeding factors, additional in-depth qualitative information was gathered from secondary source. The study outlines the issues that were fundamental to their successes in implementing the concept as a strategy. A research methodology comprises of literature review, observation of companies’ practices and personal interviews have been employed to reach to the conclusion.
1. Introduction

Founded by Motorola, USA in 1986, Six Sigma is a strategy that optimizes the process of outputting products and services by getting rid of errors so that results are always constant and always growing. Several quality management methods are used to achieve this, including methods based on statistics. A unique infrastructure of people is created within an organization linking together people who are experts in this field. Projects that are carried on in the organization are then done following a series of steps aimed at reaching pre-determined financial targets.

The term Six Sigma is one that comes from the manufacturing sector, in particular statistical modeling of processes involved in manufacturing. A sigma rating is used to indicate the yield of a manufacturing process. This rating is based on the percentage of products manufactured that have no defects. In a six sigma process, the manufacturing process creates products where 99.99966 percent are defect free, this is the equivalent to only 3.4 defects in every 1 million products created.

Application of Lean Six Sigma (LSS) for deploying continuous improvement is increasing largely in the last decade and seems to have become the de-facto approach for industry. LSS represents the merger of two well known improvement programmes that both have a long history: Lean manufacturing and Six Sigma. The origin of lean manufacturing is located in Japan, where elements of lean manufacturing were applied from around 1950 (Womack and Jones, 2003). Lean manufacturing became popular after the publication of the books The Toyota Production System (Ohno, 1988) and A Study of the Toyota Production System (Shingo, 1989). Six Sigma, on the other hand, started at Motorola in the USA in the 1980s. Interest in Six Sigma increased rapidly after General Electric adopted Six Sigma as their leading quality improvement programme.
(Eckes, 2000; Henderson and Evans, 2000). The term LSS has been introduced around 2000 (George, 2002).

3. Objectives and Research Methodology

3.1 Objectives

1. To analyse the current status of implementation of LSS in manufacturing SMEs in India.
2. To find the Critical factors in LSS implementation, from a manufacturing SME perspective.

3.2 Research Methodology

Research methods can be classified in different ways, the most common distinction is between the quantitative and the qualitative approaches (Myers, 2007). Quantitative approaches were originally used while studying natural sciences like: laboratory experiments, survey methods and numerical methods. A qualitative study is used when the researcher wants to get a deeper understanding on a specific topic or situation. Myers (2007) stated that the qualitative approach was developed in social sciences in order to support the researcher in studies including cultural and social phenomena. Sources included in the qualitative approach are interviews, questionnaires, observations, documents and the researcher’s impression and reactions. The chosen approach is qualitative.

This study typically takes the form study of secondary data available on Lean Six Sigma manufacturing. As a strategy in SMEs To understand and conclude the Critical Factors in implementing this approach in Indian

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2 Ibid
SMEs, we have not only gone through a number of reports and papers but also visited and surveyed select mid-sized manufacturing organisations. This has the advantages of providing very rich information and avoiding the influence of others on the opinion of any one individual.

4. Implementation of Lean Six Sigma as a Strategy in SME

Lean Six Sigma (LSS) concept is the integration of two (2) quality management concepts which are Lean Manufacturing and Six Sigma whereby it attempts to increase the scope and size of improvements achieved by either concept alone. However, different individual and companies view LSS in different ways. Some would perceive LSS as a fully integrated system between Lean Manufacturing and Six Sigma while others would perceive LSS as two different concepts which is adapted in parallel (Assarlin et al. 2012). Moreover, the integration between the two quality management concepts varies between each integration as Assarlin et. al. (2012) points out that each integration may involve transferring of different tools, ideas and philosophies. This leads to many theories on how Lean and Six Sigma could be integrated. Some authors recommended that Six Sigma should lead the initiatives, with Lean tools added during the analysis phase of the initiatives while other authors recommend that Lean should be the backbone of the framework and Six Sigma is used to reduce and then eliminate the variation found.

Lean Manufacturing focuses on waste reduction and non value-added activities in production (Womack et al. 1990) while Six Sigma focuses on process variation reduction with both concepts aiming to reduce waste. The integration would take into account the strength, weaknesses and effective aspects of each concept to form a better concept (Kumar et al. 2006; Snee 2010). There is a need towards this integration in quality management as a solution provided via Lean Manufacturing concept would be of no use if the execution of the solution has high variation. The
Six Sigma concept on the other hand would give too much focus in reduction of variation only leading to high risk of providing poor service due to long lead times even if the company are operating at Six Sigma level. Even though most would agree that there is a need for the integration of Lean and Six Sigma, most companies would prefer to implement both concepts in isolation (Smith 2003) or in parallel but this would lead to increase of projects and resources while causing conflicts of interest between the two quality management concepts (Bendell 2006).

Implementation of both concepts in isolation too will not enable each concept to be adopted effectively as it is constraint by one another’s needs in the organization. In fact, Lean and Six Sigma can be compatible whereby both are of quality management (Shah et al. 2008), both are methods that brings changes and improvement to organization; particularly as a cost reducing mechanism (Achanga et al. 2006), both has the same final objectives which is to provide quality throughout the organization and both stresses the needs towards continuous improvement at all level in the organization (Pepper and Spedding 2010). Both concepts complement each other, where lean can adopt the scientific, standard and data driven approach from the Six Sigma DMAIC (Define, Measure, Analyze, Implement, Control) methodology to reduce waste while Six Sigma can change their focus from projects work based on identified variation to a customer requirement focus (Bendell 2005). Through the implementation of lean, a company would be able to recognize key areas of improvement while Six Sigma would then be implemented in those key areas to reduce variation.
Implementation stages of Lean Six Sigma may be given as

Phase 1: Define the problem - The SME is competitive, where each company will strive to provide their products with lower cost and lower lead time. In order to compete at such level, a company should be operating with as minimal waste as possible. In order words, the production of the company should strive towards operating at six sigma level and aiming towards lean. The SME sometime is unable to cope with demands, leading to unsatisfied customer with late delivery of products. The company too is unable to receive orders which are urgent; reducing the number of customers in the company. While it is obvious that the problem is the inability to cope with demands, the root cause towards the problem is yet to be identified. Solving the root cause of the problem will reduce the probability of the same problem to occur again. To determine the root cause of the problem, data regarding production has to be collected and analyse in the next phase. Collection of data includes data

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regarding products, capacities and capabilities of the production and process flow. Collection of data is carried out based on observation in the production line, discussion with the manager, supervisor and operator of the label printing section and time study.

**Phase 2: Data Analysis and problem source identification**

Based on the data collected, it can be deduced that low productivity is the reason why the company cannot cope with customer demand. Customer demands for product; hence, the focus of the LSS implementation will start off with analysis on SME type.

The production processes such as printing, die-cut, cutting, drying and packing process have a very low significant amount of defects. Based on the discussion from the manager and supervisor, the company aims to reduce the setup time of each job order thus an analysis relating to the setup is further carried out.

**Phase 3: Root Cause Identification**

Based on the observation in the production line of each setup and discussion with manager, test production time is directly proportional to how well each setup is being made. This is also depicted in where test printing time is repetitive if the previous setup is not carried out correctly at the first time.

**Phase 4: Implement feasible solution(s)**

Based on the root causes that have been determined in Phase 3 via Fishbone diagram and Why tool, feasible solution is being discussed and brainstormed in order to reduce or eliminate the root causes. By reducing the time to locate the materials, the total setup time will be reduced. The storage is designed with such concept, whereby the processes are place
into the slot according to the customer code. Another feasible solution to propose is to implement SMED on the manufacturing process by shifting the setup process out from the real production process called external setup. Production can run continuously. The process preparation is proposed to be setup externally where by a dedicated cell with one skilled and experienced worker is required to prepare final product.

**Phase 5: Control**

This phase is very important in the Lean Six Sigma implementation as LSS does not only aim to reduce waste but also to be able to sustain the improvement that has been made. 5S and Standard Operating Procedure (SOP) are used as a control tool in the LSS framework because 5S provides a guideline to sustain the arrangements. SOP provides a step by step guide in implementing the new setup process since some of the setup process is shifted. 5S is a name representing the five (5) steps that needs to be taken in order to maintain efficiency and effectiveness of a work place. The five (5) steps mentioned are seiri, seiton, seiso, seiketsu and shitsuke which means sort, arrange, clean, standardize and sustain. SOP is a guided procedure for operator to do a certain job. A guided SOP is designed to guide operator in their change of work activities such as the process flow for manufacturing.

**4. Conclusion**

The LSS framework is a relatively simple guided methodology used in problem identification providing suitable solutions to solve problem(s) and controlling the improvement made. This method emphasize on problems derived from data, and solution deriving from the root cause of the problem. The strength of using this method is that problem identification can be relatively easy when there is data supporting it and the solution towards the problem is to solve the root cause of it. By
solving the root cause, the potential for the same problem to arise will be low once the improvement is made.

By embracing the methodology that is critical to the success of LSS, an organization needs to make a total commitment to a culture of continuous improvement and workflow optimization. Implementation of successful LSS programs result in increased efficiency, higher quality and better customer service from any organization willing to make that commitment. It can further be an integral part of instilling a team culture where everyone involved in the process is empowered to take ownership in every aspect of the operation, whether it relates directly to their daily responsibilities or not.

5. References


9. Raghunath A, Dr. Jayathirtha R V, “Lean and Six Sigma approach for Manufacturing SMEs”.
