

## **EFFECT OF LEAN SIX SIGMA ON THE INDIAN MANUFACTURING ORGANIZATIONS AND ITS IMPACT ON PERFORMANCE**

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### *Abstract*

During the last two decades quality management has been put forward by a number of its promoters as a new management theory; however the description of quality management differs. Quality management can be described as a management revolution, a revolutionary philosophy of management, a new way thinking about the management of organizations, a comprehensive way to improve total organizational performance, an alternative to management by control or as a framework for competitive management. Industrial organizations have embraced a wide variety of management programs that they hope will enhance their competitive strength and provide them the opportunities to excel in their actions. Currently two of the popular programs are Six Sigma and Lean Management. In this paper we have to manufacture differently, innovatively, with class and perfection and achieve excellence in each process of manufacturing. Thus manufacturing or operations excellence is gaining importance for quite some time now. Manufacturing /Business Excellence has gained so much importance that it has become an independent management Function like any other in any good business organization.

### **1. INTRODUCTION**

In today's dynamic competitive industrial environment, mere average level manufacturing performance is not enough. We have to manufacture differently, innovatively, with class and perfection and achieve excellence in each process of manufacturing. Thus manufacturing or operations excellence is gaining importance for quite some time now. Manufacturing/Business Excellence has gained so much importance that it has become an independent management Function like any other in any good business organization.

Six Sigma is a capable business strategy that helps in yielding a sensational lessening of defects, errors, or mistakes in service processes (Antony, 2005)[1]. Six Sigma is an intense methodology which was created to accelerate quality improvement in service sectors by focusing relentlessly on reducing process variation and wiping out non-value added steps or tasks (Kwak and Anbari, 2004)[2]. Albeit Six Sigma methodological approach to quality and process improvement has been used by manufacturing organizations overwhelmingly, these days Six Sigma is developing exponentially and ending up more mainstream in some different sectors like: banks, hospitals, financial services,

aircraft industry, utility services and so on. (Antony, et al., 2007)[3]. Snee (1999)[4] points out that Six Sigma is not accepted to be something new by some people and it is accepted to be extremely remarkable in its approach and arrangement; it is a strategic business improvement approach that aids to increase both customer satisfaction and an organization's financial wellbeing.

## 2. BACKGROUND

Six Sigma was founded by Motorola Corporation and subsequently adopted by many US companies, including GE & Allied Signals. Lean management originated at Toyota in Japan and has been implemented by many major firms, including Danaher Corporation and Harley Davidson. Six Sigma and Lean Management have got diverse roots. The key issues driving the development of Six Sigma was the need for quality improvement, when manufacturing complex products, having a large numbers of components which often resulted in a correspondingly high probability of defective final products.

The driving force behind the development of Lean Management was the elimination of waste, especially in Japan, where it got its birth. Japan, as we all know is a country with low natural resources and minimal continental area.

## 3. PREVIOUS STUDIES

**SherrianFrancina Ellis (2016)[5]** investigated the application of Lean Six Sigma to determine main drivers of process inefficiency and make recommendations for improving the request processing process at a vehicle manufacturing office. Best in class process quality improvement initiatives

Lean, Six Sigma, and Lean Six Sigma are utilized to investigate literature and give a strong theoretical foundation to this examination. Since the examination uses both quantitative and subjective data, the investigation's methodological approach is delegated blended methodology. The examination is observational in nature, and single contextual analysis is system finished the investigation. The exact contextual analysis is completed by means of a DMAIC project. Parts of this Lean Six Sigma DMAIC methodology are utilized to gather and examine data with respect to the present process. Additional data is given by the car manufacturing office's connected stakeholders and combined with data gathered all through the DMAIC project to make recommendations for process improvement. The examination uncovers the main drivers of process inefficiency (high cycle time) and enables recommendations to be made that will improve the ebb and flow arrange process at the car manufacturing office. The application of Lean Six Sigma to make recommendations for improving the vehicle manufacturing office's request processing process was fruitful.

**Sophie ThiQuynhNga Ngo (2010)[6]** investigated the acts of organizing and managing operations has encountered an increased application of all inclusive, systematic examples of Lean Six Sigma joint implementation in numerous corporations presently (Shahet al.,2008). Notwithstanding this the connection between firm performance improvement results and Lean Six Sigma isn't yet very much researched or comprehended. Despite the fact that much episodic proof recommends a strong positive association of Lean Six Sigma with firm performance, a

nearer inspection of the literature uncovers there has been no experimental research that affirms this relationship. In any case, the present belief in the field that Lean Six Sigma can be related with improved organizational performance is well known and generally acknowledged. Given the inspiration to fill an apparent hole in our insight, and also the need to take care of the existing demand for more prominent insights into Lean Six Sigma from practitioners, the point of the research is to form insights into the connection between Lean Six Sigma implementation and its organizational performance improvement results. The value of this research is that it is the principal review construct research in light of this relationship. This is additionally the main endeavor to think about the levels of performance results between a Lean independent model and a combined Lean Six Sigma program. Utilizing an overview research methodology, an instrument has been developed to study and interview numerous manufacturing firms in the New Zealand setting which have been distinguished as implementing Lean as well as a Six Sigma program. The research proposes that for SMEs Lean is a better decision than Lean Six Sigma as implementing Lean independent from anyone else is probably going to prompt better business performance than implementing Lean Six Sigma.

**Ibrahim Alhuraish, et al (2015)[7]**decided the performance outcomes for industries rehearsing lean manufacturing and six sigma. Findings show that organization size (SME and substantial companies) has no impact on operational performance outcomes. This study also found that lean manufacturing and six sigma practices

support increases and improvements in organization's performance. The results of this study specifically uncovered that use six sigma in all departments supportive of enhancing quality; whereas companies that actualized lean manufacturing in all departments made a safe situation and improved worker inclusion. Moreover, findings illustrate that the use of a belt system supported the improvement in quality, lessened costs and decreased variation. The implementation of lean and six sigma are vital areas of study as there are few studies detailed in the literature on executing lean manufacturing and six sigma inside French industries.

**Mandahawia, et. al. (2012)** explored the process development work connected at a nearby paper manufacturing organization based on customized Lean Six Sigma methodologies. The DMAIC (Define, Measure, Analyze, Improve, and Control) methodology and numerous lean tools were used to reorganize. Production rate and Overall Equipment Effectiveness (OEE) are utilized to assess the performance of the cutting and the printing machines when the DMAIC cycle. The results showed that the production rate increased for printing machines by 5% and for the cutting machines by 10%. Moreover, the OEE for the printing and cutting machines has increased by 21.6% and 48.45%.

**Lokman and Lanita (2014)** worked over the point of part of performance and the manufacturing strategy. The point has been studied with the purpose of investigating over the opposition in showcase worried with the mass data innovation. The factors that are added for the inclusion of the assessment are development, rivalry, day by

day follow, operational performance and manufacturing strategy For the studied point, the methodological approach is received by researcher is directing interviews of 92 general director of rumored organization of Australia and apply the test to reach over the results. Results showed to determine the outcomes as the JIT hone in advertise rivalry have significant relationship over the financial performance of organization moreover the managers use data system which increases the development of organizations.

#### 4. NEED OF THE STUDY

The study conducted has been done and submitted for the partial fulfillment of the requirements of securing the Degree of Doctor of Philosophy in the Faculty of Management .The study aims at showing how important is concept of Manufacturing Excellence in today's context in the Indian manufacturing sector. The concepts of Lean Manufacturing and Six Sigma have been adopted in the Research Project to achieve the goal.

Some authors argue whether Lean Six Sigma approach is merely a “buzz word“, in an endless stream of proposed business improvement methodologies. We argue that an organisation can have certain benefits from Lean Six Sigma approach, through adding new concepts, methods and tools, which can result in increase of organisational performance. However, there is a need for a more comprehensive multiple case study that would provide an effective guide for the implementation of Lean Six Sigma, with respect to organisation size and specifics of organisational performance. We conclude that, in practice, Lean Six Sigma is seen as a manufacturing improvement

methodology, rather than a management philosophy.

#### 5. CONCEPT OF LSS& ITS IMPACT

There have been attempts to combine the two methodologies under titles such as “**Lean Six Sigma**” or “**Lean Sigma**”... indicating the need of speed and accuracy in today's manufacturing scenario. In other words in concurrent manufacturing, the processes have to be faster and reliable/stable. Often this alleged combination is no more than a near religious argument about professed compatibility of both the approaches. But today its application at the shop floor level or across the supply chains is a reality. This research is an attempt to show this aspect of application of **Lean Sigma** at the shop floor level.

Both Six Sigma and Lean management have evolved into comprehensive management systems. In each case, their effective implementation involves cultural changes in organizations, new approaches to production and to servicing customers and a high degree of training and education of employees, from upper management to the shop floor. As such both systems have come to encompass common feature such as an emphasis on customer's satisfaction, high quality and comprehensive employee training & empowerment.

With separate routes but similar goals, Six Sigma and Lean Management are both effective on their own ways. However some organizations that have embraced either Six Sigma or Lean Management might find that they eventually reach a point of diminishing returns. That is, after re-engineering their core and the supporting systems, by solving

major problems and resolving key inefficiencies, further improvements are not easily generated. These organizations have begun to look elsewhere for sources of competitive advantage. Natural lean organizations however, are expediting application of Lean management. So the term **Lean Sigma** has recently been used to describe a Management system that combines the merits of the two unique effective systems.

## 6. IMPACT OF LEAN MANUFACTURING AND SIX SIGMA IMPLEMENTATION

Descriptive statistics were used in analyzing and interpreting the survey results. Companies were categorized also into three groups commensurate with their implementation methods as a means of analyzing the participants' task performance outcome variables (Table 1). In such manner, A-Companies actualized lean manufacturing and six sigma, B-Companies executed lean Manufacturing, and C-Companies have not revealed actualizing lean or six sigma method, despite the fact that these companies has been executing a considerable lot of the lean manufacturing and six sigma practices.

**Table 1 Comparing Companies' Performance That Are Linked To The Implementation Of The Chosen Methodology**

Benefit	Companies implemented lean manufacturing and six sigma	Companies implemented lean manufacturing	Companies using the tools but not referring as and six sigma methods with their organization
	Mean	Mean	Mean
Increase profit	4.12	3.90	3.25
Improve quality	4.63	4.19	4.00
Reduces variation	4.25	3.95	3.75
Reduces cost	4.50	4.00	3.75
Improves productivity	4.13	4.38	3.50
Reduces Lead-time	4.13	4.33	3.50
Increases suggestions from the employees	3.50	3.90	2.75
Involves employees	3.63	4.00	2.75
Increase Customer satisfaction	3.50	4.10	3.75
Decreases Inventory	3.13	4.24	3.75
Reduce turnover rate	2.88	2.95	2.00
Creates safety environment	2.88	3.48	2.50

## 7. CURRENT PROJECT

In today's critical manufacturing scenario various techniques are used by industries to cut down their operating costs and increase the overall profits and in the process achieve excellence. In terms of manufacturing this implies getting the maximum results with minimum input. In order to achieve this, many new techniques have come up in manufacturing technology such as zero inventories, zero defects, Management by Objectives MBO, part per million etc. For this purpose Lean manufacturing and Six Sigma are the methodologies which are adopted to achieve fruitful results both in manufacturing and other areas. One such new concept, which is explained in this

project, is the synergy of Lean manufacturing and Six Sigma i.e. '**Lean Six Sigma**' or '**Lean Sigma**'. The same is used in this project.

In this project work Lean manufacturing and Six Sigma concepts are discussed and used. Their tools and techniques have been utilized to bring about the change and the results.

To initiate the process of manufacturing excellence and prove the methodology of Lean Six Sigma, an experimental case study was conducted in a medium sized mass production manufacturing company **M/s Mehta Engineers Ltd**, Ludhiana, Punjab ( A large Auto sector OEM supplier ), which utilized various tools in order to increase the productivity of one of its main product lines; reduce the cost of poor quality and reduce the die change over down time during production. After initial Assessment of the Factory Fundamentals (FFA), consecutive experimental datas were collected before and after the project implementation, to verify the results.

This project helped in removing all the barriers to change that was brought in to achieve excellence in various operations of the Press and the Weld shops of MEL.

The focused projects undertaken to promote Manufacturing Excellence in the unit demonstrate the power of Lean in the Weld shop and the Press shop .A case of Focused Quality improvement with the objective to reduce the overall cost of poor quality is also illustrated .All these projects were undertaken as a part of the consultancy effort, of which Ashok Kumar Puri was the Principal Member.

## 8. CONCLUSION

From the literature reviews above, it can be presumed that all organizations can be profited from using lean manufacturing or Six Sigma, as Ngo (2010) study gave a closer insight into the status of the applications of business improvement programs, Lean and the consolidated Lean Six Sigma in New Zealand showcase where thirty three manufacturing firms in New Zealand were included, and this study will focus on the Jordanian Pharmaceutical Manufacturing Organizations. What's more, study showed that effect of Six Sigma on organizational performance by taking these four indicators for the Six Sigma (leadership, customer focus, structured improvement method and focus in metric), while this study will investigate the eight Lean Six Sigma elements as they were said before the yet it is normal that the advantage will be increasingly if both are used together.

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