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## “APPLICATION AND BENEFITS OF LEAN SIX SIGMA IN THE MANUFACTURING INDUSTRY: A REVIEW”

*Mayourshikha Pancholi (Bhatnagar)*

*Lecturer in Manufacturing Department, Dhar Polytechnic College, Dhar*

### ABSTRACT

*Six Sigma is a method for improving quality by removing defects and their causes in business process activities. Six Sigma” quality is defined as achieving reduction in the variation which allows for a  $\pm 1.5$  sigma shift (Harry Mikel 1997). It is also described as a philosophy, methodology, and a breakthrough strategy to solve problems. The Six Sigma standard of 3.4 problems-per-million opportunities is a response to the increasing expectations of customers and the increased complexity of modern products and processes. But the tools are applied within a simple performance improvement model known as Define-Measure- Analyze-Improve-Control, or DMAIC. The DMAIC method in Six Sigma is often described as an approach for problem solving. This thesis compares critically the DMAIC method within sights from scientific theories in the field of problem solving. Six Sigma is a rigorous, focused, and highly effective implementation of proven quality principles and techniques. Incorporating elements from the work of many quality pioneers, But the tools are applied within a simple performance improvement model known as Define-Measure- Analyze-Improve-Control, or DMAIC. The DMAIC method in Six Sigma is often described as an approach for problem solving.*

**Keyword:** Six Sigma, Business, DMAIC, Quality.

### I. INTRODUCTION

Six Sigma when coupled with ‘Lean Principles’ is called ‘Lean Six Sigma’ which professes eliminating waste in process steps by using ‘Lean Tools’ which is based on Toyota Production System(TPS) which enhances value in Six Sigma implementation one step further by increasing speed by identifying and removing non-value adding steps in a process. Six Sigma is a business strategy that allows the companies to improve drastically their bottom line by designing and monitoring everyday business activities in ways that minimize waste and resources requirements while increasing customer satisfaction .Six Sigma guides organization into making fewer mistakes in everything they right from preparing a purchase order to manufacturing airplanes engine thus eliminating lapses in quality at the earliest possible occurrence. Quality control programs have focused on detecting and correcting commercial, industrial and design defects .Six Sigma encompasses something broader .It provides specific methods to re-create the process so that defects and error never arise in the first place.

### II. RESEARCH OBJECTIVE

Lean Six Sigma has been used in manufacturing and other sectors. The objective of this research is to investigate the application and benefits of Lean Six Sigma in the manufacturing industry. Specifically, the project focus on improve the process/operations. Primarily focus on:

- 1) Improving efficiency and reducing cost.
- 2) Elimination of errors.
- 3) To Improve the Internal Customer satisfaction by increasing current sigma quality to six sigma quality
- 4) Reducing the defects during manufacturing and design by using Six Sigma Strategy.
- 5) Implementation of Six Sigma in Organization.

The basic objectives of Sigma are not only to reduce the number of defects but to increase the profit margins by reducing the shares of capital loss.

### III. LITERATURE REVIEW

The quest to achieve six sigma had its birth at Motorola in 1979, when executive art sundry stood up at a management meeting and proclaimed, “The real problem at Motorola is that poor quality stinks.

General Electric’s Jack Welch, a self-proclaimed cynic when it comes to quality programs, describes Six Sigma as “the most important initiative GE has ever undertaken. Larry Bossidy. CEO of Allied Signal inc. brought the \$14.5billion industrial giant back from the verge of bank ruptey by implementing the six sigma breakthrough Strategy.

Former Allied Signal executive Daniel P. Burnham ,Who become Raytheon’s CEO in 1998 ,has made Six Sigma is cornerstone of the company’s strategic plan .By pursuing Six Sigma Quality level throughout the company.

Asea Brown Boveri (ABB), which successfully applied the Six Sigma Breakthrough strategy to its power transformer facility in Muncie, Indiana ,has reduced measurement equipment error by 83% ,piece count error from 8.3 to 1.3% and load loss within 2 %.ABB also improved material handling ,resulting in an annual estimated cost saving of \$775,000 for a single process within a single plant.

According to **Xing xing Zu** while Six Sigma is increasingly implemented in industry, little academic research has been done on Six Sigma and its influence on quality management theory and application.

As per **Zhang Wu** and M. Shamsuzzaman Research Scholar at School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singaporean integrated control chart system for monitoring process shifts in mean and variance in a multistage manufacturing system.

The work of **Gulser Koksal** shows that many quality improvement (QI) programs including six sigma, design for six sigma, and kaizen require collection and analysis of data to solve quality problems

Umezawa developed a new method to predict the vibration of a helical gear pair. The developed simulator was created through theoretical analysis on the vibration of a narrow face width helical gear pair.

### IV. LEAN SIX SIGMA

Lean Six Sigma is a disciplined methodology which is rigorous, data driven, result-oriented approach to process improvement. It combines two industry recognized methodologies evolved at Motorola, GE, Toyata, and Xerox to name a few. By integrating tools and processes of Lean and Six Sigma, we’re creating a powerful engine for improving quality, efficiency, and speed in every aspect of business.

Cindy Jutras,Vice President, Research Fellow and Group Director Enterprise Applications Aberdeen Group says ,” Lean and Six Sigma are initiatives that were born from the pursuit of operational excellence within manufacturing companies. While Lean serves to eliminate waste, Six Sigma reduces process variability in striving for perfection. When combined, the result is a methodology that serves to improve processes, eliminate product or process defects and to reduce cycle times and accelerate processes”.

Embedding a rigourous methodology like lean six sigma into organizational culture is not a short journey, but it is a deep commitment not only to near-term results but also a long-term, continuous, even break-through results.

## V. SIX SIGMA DMAIC METHODOLOGY

Motorola developed a five phase approach called ‘DMAIC Model’ to achieve the highest level in the Six Sigma, i.e., 3.4 defects per million. The five phases are:

- **Define** process goals in terms of key critical parameters (i.e. critical to quality or critical to production) on the basis of customer requirements or Voice Of Customer (VOC).
- **Measure** the current process performance in context of goals.
- **Analyze** the current scenario in terms of causes of variations and defects.
- **Improve** the process by systematically reducing variation and eliminating defects.
- **Control** future performance of the process.



Fig.1 DMAIC Cycle

## VI. CONCLUSION

Lean Six Sigma is a disciplined methodology which is rigorous, data driven, result-oriented approach to process improvement. It combines two industry recognized methodologies evolved at Motorola, GE, Toyata, and Xerox to name a few. By integrating tools and processes of Lean and Six Sigma, we’re creating a powerful engine for improving quality, efficiency, and speed in every aspect of business.

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Improve the Internal Customer satisfaction by increasing current sigma quality to six sigma quality. The six sigma quality strategy is to identify faults, track them back to their origin and eliminate.

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