

# **Detecting Process Design & Manufacturing defects Using Six Sigma quality strategy tool**

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## **ABSTRACT**

Six Sigma as a systematic framework for quality improvement and business excellence has been popularized for more than a decade. With its high profile adoption by companies such as General Electric in the mid 1990s, Six Sigma spread like wild fire toward the end of the 20th century.

“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. 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. 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. This thesis compares critically the DMAIC method within sights from scientific theories in the field of problem solving.

## **INTRODUCTION**

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.

Six Sigma Performance has the goal that equate to 3.4 defects per million (Process, Product or service opportunities. the focus is on reducing variability to achieve the goal .Six Sigma is disciplined methodology for improving organization processes, based on rigorous data gathering and analysis .The approach focuses on helping organization produce product and services better, faster, and cheaper by improving the capability of processes to meet customer requirement.

## Research Objectives :

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

## 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 Koksai** 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.

## Why Six Sigma?

The situation of the companies in the developing countries is not yet too good because of low level of working capital , supply of sub – standard material and use of know- standardization process, this substandard material , when introduce into the manufacturing systems, adversely affects the quality of the end product. Developed

nations like USA, Japan and Germany are working to attend 99.99997% defect free (or) even zero defect products, while in India, manufacturing organizations are struggling hard to reduce their rejection rates under 5%.,So industries in developing countries like India needs Six Sigma break through quality strategy for achieving world class quality to compete in the world market.

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.

### Why is Six Sigma fascinating?

Six Sigma is very popular in Korean industry. There are several reasons for this popularity. First, it is regarded as a fresh quality management strategy which can replace TQC, TQM and others. In a sense, we can view the development process of Six Sigma as shown in Figure 1. Many companies which were not quite successful in implementing the previous management strategies such as TQC and TQM are eager to introduce Six Sigma.

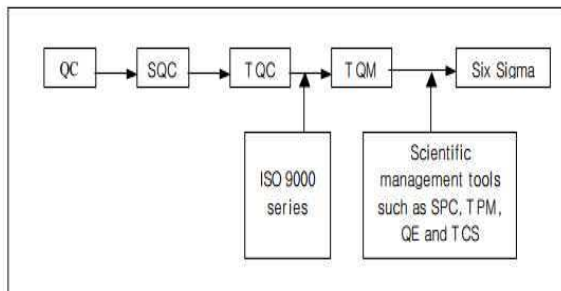


Fig Development process of Six Sigma in quality management

### Problem-solving processes for project activities:

The original problem-solving process for Six Sigma developed from Motorola is MAIC which means measurement, analysis, improvement and control. Later, DMAIC instead of MAIC is advocated from GE where D stands for

definition. MAIC or DMAIC is mostly used as the unique problem-solving process for manufacturing areas. However, for DFSS there are multiple proposed processes. They are as follows-

DMADV (Define - Measure - Analyses - Design - Verify). MADV was suggested by Motorola for DFSS, and D was added to it for definition. DMADV is similar to DMAIC.

IDOV (Identify - Design - Optimize - Validate). This was suggested by GE and has been used most frequently in practice. DIDES (Define - Initiate - Design - Execute-Sustain). This was suggested by Qualtec Consulting Company.

DMAIC (Define – measure – analyse – improve - control).

It seems that the above problem-solving processes for manufacturing and R&D areas are not quite suitable for service areas. The author believes that DMARI (Define - Measure - Analyses -Redesign - Implement) is an excellent problem-solving process for non-manufacturing service areas. Here, the phase 'redesign' means that the system for service works should be redesigned in order to improve the service function.

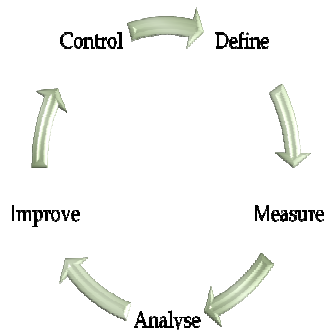
### What is DMAIC Cycle

Six Sigma projects of continuous process improvement are led, from concept to completion, through five project management steps or phases named DMAIC (define measure, analyse, improve, control).

For over 25 years Six Sigma has been considered to be one of the most effective methodologies for improving the quality of processes and their key organizational areas. The projects initiated within this strategy are based on the DMAIC model of problem-solving, which is described in greater detail in the works.

The project leaders who adopt this methodology gain access to a number of methods, tools and techniques which help to improve the production processes and products at any stage of the project.

### DMAIC Cycle



### MSA : Measurement Analysis System

A measurement systems analysis considers the following:

- 1) Selecting the correct measurement and approach
- 2) Assessing the measuring device
- 3) Assessing procedures and operators
- 4) Assessing any measurement interactions
- 5) Calculating the measurement uncertainty of individual measurement devices and/or measurement systems.

### Conclusion:

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- Analyse-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.

Reduction of rejection in inventory.

Optimization cycle times in industry.

Improve efficiency and reducing cost.

Elimination of errors.

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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