



## A Study Of Six Sigma And Its Importance

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### Abstract

The six sigma method is a project-driven management approach to improve the organization's products, services and processes by continually reducing defects in the organization. It is a business strategy that focuses on improving customer requirements understanding, business systems, productivity, and financial performance. Dating back to the mid 1980s, applications of the six sigma methods allowed many organizations to sustain their Competitive advantage by integrating their knowledge of the process with Statistics, Engineering, and project management. The benefits of applying six sigma concepts to technologically driven and project-driven organizations are equally great. The objectives of this paper is to review and examine the evaluation benefits and challenges of six sigma practices and identify the key factors influencing successful six sigma project implementation.

**Keywords-**Six Sigma, organisational performance, Productivity.

### Introduction

Six Sigma is a set of techniques and tools for process improvement. It was developed by Motorola in mid 1986s as a result of recognizing that products with high first-pass yield rarely fail in use. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization, who are experts in the methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets, for example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits.

The term Six Sigma originated from terminology associated with manufacturing, specifically terms associated with statistical modeling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates. A six sigma process is one in which 99.9997% of the products manufactured are statistically expected to be free of defects.



Six Sigma, at many organizations, simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects in any process- from manufacturing to transactional and from product to service.

### **Definitions**

**According to ukdept,** Six sigma refers to "A data-driven method for achieving near perfect quality. Six Sigma analyses can focus on any element of production or service, and has a strong emphasis on statistical analysis in design, manufacturing and customer-oriented activities."

**Acc to General Electronic,** Six sigma is a highly disciplined process that helps us focus on developing and delivering near-perfect product and services.

### **Six Sigma – Levels**

Six Sigma can be utilised at three different levels:

- As a metric
- As a methodology
- As a management system

#### **As a metric**

The term "Sigma" is often used as a scale for levels of 'goodness' or quality. Using this scale, 'Six Sigma' equates to 3.4 defects per one million opportunities (DPMO). Therefore, Six Sigma started as a defect reduction effort in manufacturing and was then applied to other business processes for the same purpose.

#### **As a Methodology**

As Six Sigma has evolved, there has been less emphasis on the literal definition of 3.4 DPMO, or counting defects in products and processes. Six Sigma is a business improvement methodology that focuses an organization.

#### **As a management**

This six sigma ensure that process metrics and structured methodology are applied to improve the opportunities that are directly linked to the organizational strategy. It is a high performance system for executing business strategy.

### **Two Perspectives Of Six Sigma Processes**

#### **1. Statistical Viewpoint**

Six sigma methods have two major perspectives. The origin of six sigma comes from statistics and statisticians. If an organization is operating at three sigma level for quality control, this is interpreted as achieving a success rate of 93% or 66,800 defects per million opportunities.



Therefore, the six sigma method is a very rigorous quality control concept where many organizations still performs at three sigma level.

## 2. Business Viewpoint

In the business world, six sigma is defined as a ‘business strategy used to improve business profitability, to improve the effectiveness and efficiency of all operations to meet or exceed customer’s needs and expectations. The six sigma approach was first applied in manufacturing operations and rapidly expanded to different functional areas such as marketing, engineering, purchasing, servicing, and administrative support, once organizations realized the benefits. Particularly, the widespread applications of six sigma were possible due to the fact that organizations were able to articulate the benefits of six sigma presented in financial returns by linking process improvement with cost savings.

### Understanding Six Sigma - Strategies, Tools, Techniques And Principles

Six sigma is a systematic, data-driven approach using the Define, Measure, Analysis, Improve, and Control (DMAIC) process and utilizing Design For Six Sigma(DFSS) Method.

Anbari pointed out that six sigma is more comprehensive than prior quality initiatives such as Total Quality Management (TQM) and Continuous Quality Improvement (CQI). The six sigma method includes measured and reported financial results, uses additional, more advanced data analysis tools, focuses on customer concerns, and uses project management tools and methodology.

The fundamental principle of six sigma is ‘to take an organization to an improved level of sigma capability through the rigorous application of statistical tools and techniques’. It generally applies to problems common to production.

#### DMAIC Process

The DMAIC is a closed-loop process that eliminates unproductive steps, often focuses on new measurements, and applies technology for continuous improvement. DMAIC is commonly used by Six Sigma project teams and is an acronym for:

- Define opportunity
- Measure performance
- Analyze opportunity
- Improve performance
- Control performance.

The following table summarizes six sigma business strategies, tools, techniques and principles.



**Table 1**

Define	Define the requirements and expectations of the customer Define the project boundaries Define the process by mapping the business flow
Measure	Measure the process to satisfy customer's needs Develop a data collection plan Collect and compare data to determine issues and shortfalls
Analyze	Analyze the causes of defects and sources of variation Determine the variations in the process Prioritize opportunities for future improvement
Improve	Improve the process to eliminate variations Develop creative alternatives and implement enhanced plan
Control	Control process variations to meet customer requirements Develop a strategy to monitor and control the improved process Implement the improvements of systems and structures

### **DFSS methodology**

The DFSS is a systematic methodology utilizing tools, training and measurements to enable the organization to design products and processes that meet customer expectations and can be produced at Six Sigma quality levels. The goal of DFSS is to achieve minimum defect rates, six sigma level, and maximize positive impact during the development stage of the products. It is used to develop new products or services with a six sigma criteria, capability, and performance. It utilizes variety of quality oriented tools and techniques to meet customer requirements and has shown an increase in life cycle profits. DFSS is 'predicting design quality up front and driving quality measurement and predictability improvement during the early design phases'. Essentially, the DFSS process is focused on new or innovative designs that yield a higher level of performance.



De Feo and Bar-El summarizes even elements of DFSS as follows.

- † Drives the customer-oriented design process with six sigma capability.
- † Predicts design quality at the outset.
- † Matches top-down requirements flow down with capability flow up.
- † Integrates cross-functional design involvement.
- † Drives quality measurement and predictability improvement in early design phases.
- † Uses process capabilities in making final decisions.
- † Monitors process variances to verify that customer requirements are met.

## Reported Benefits Of Implementing Six Sigma

### 1. Manufacturing Sector

Motorola was the first organization to use the term six sigma in the 1980s as part of its quality performance measurement and improvement program. Six sigma has since been successfully applied in other manufacturing organizations.

### 2. Financial Sector

In recent years, finance and credit department are pressured to reduce cash collection cycle time and variation in collection performance to remain competitive. Typical six sigma projects in financial institutions include improving accuracy of allocation of cash to reduce bank charges, automatic payments, improving accuracy of reporting, reducing documentary credits defects, reducing check collection defects, and reducing variation in collector performance.

### 3. Health Care Sector

Six sigma principles and the health care sector are very well matched because of the health care nature of zero tolerance for mistakes and potential for reducing medical errors.

### 4. Engineering And Construction Sector

In 2002, Bechtel Corporation, one of the largest engineering and construction companies in the world, reported savings of \$200 million with an investment of \$30 million in its six sigma program to identify and prevent rework and defects in everything from design to construction to on-time delivery of employee payroll.

### 5. Research And Development Sector

The objectives of implementing six sigma in R & D organizations are to reduce cost, increase speed to market, and improve R&D processes. To measure the effectiveness of six sigma, organizations need to focus on data driven reviews, improved project success rate, and integration of R&D into regular work processes.



### **Key Factors For Implementing A Successful Six Sigma Program**

- † Management commitment and involvement.
- † Understanding of six sigma methodology, tools, and techniques.
- † Linking six sigma to business strategy.
- † Linking six sigma to customers.
- † Project selection, reviews and tracking.
- † Organizational infrastructure.
- † Cultural change.
- † Project management skills.
- † Linking six sigma to suppliers.
- † Training.
- † Linking six sigma to human resources

### **Obstacles And Challenges Of Six Sigma Method**

- **Issues In Strategy**
- Hammer and Goding argued that six sigma has been the target of criticism and controversy in the quality community characterizing it as ‘Total Quality Management on Steroid’. One of the main criticisms is that six sigma is nothing new and simply repackages traditional principles and techniques related to quality. Organizations must realize that six sigma is not the universal answer to all business issues, and it may not be the most important management strategy that an organizations feels a sense of urgency to understand and implement six sigma.
- **Issues In Organizational Culture**
- Quality concepts need to be embedded into the process of designing rather than just monitoring the quality at the manufacturing level. The more important issue is the change in organizational culture that puts quality into planning. Addressing the problems and issues that are easy to correct and claiming that the six sigma method is a big success is simply deceiving.
- **Issues In Training (Belt Program)**
- Training is a key success factor in implementing six sigma projects successfully and should be part of an integrated approach. The belt program should start from the top and be applied to the entire organization. The curriculum of the belt program should reflect the organization’s needs and requirements. It has to be customized to incorporate economical and managerial benefits. Training should also cover both qualitative and quantitative measures and metrics, leadership, and project management practices and skills.



- **Future Of Six Sigma**

- Six sigma is likely to remain as one of the key initiatives to improve the management process than just being remembered as one of the fads. The primary focus should be on improving overall management performance, not just pinpointing and counting defects. Researchers and practitioners are trying to integrate six sigma with other existing innovative management practices that have been around to make six sigma method even more attractive to different organizations that might have not started or fully implemented the six sigma method.

## **Conclusions**

Successful implementation and growing organizational interest in six sigma method have been exploding in the last few years. It is rapidly becoming a major driving force for many technology-driven, project-driven organizations. Factors influencing successful six sigma projects include management involvement and organizational commitment, project management and control skills, cultural change, and continuous training. Understanding the key features, obstacles, and shortcomings of six sigma provides opportunities to practitioners for better implement six sigma projects. It allows them to better support their organizations' strategic direction, and increasing needs for coaching, mentoring, and training. The statistical aspects of six sigma must complement business perspectives and challenges to the organization to implement six sigma projects successfully. Various approaches to six sigma have been applied to increase the overall performance of different business sectors. However, integrating the data-driven, structured six sigma processes into organizations still has room for improvement. Cultural changes require time and commitment before they are strongly implanted into the organization. Effective six sigma principles and practices are more likely to succeed by refining the organizational culture continuously.

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