

Utility Of Six Sigma Application

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Abstract

In today's times of cut throat competition and growing consumer awareness it is only imperative that each and every industry move towards reducing errors and increasing their profitability by means of various quality tools available today than it has ever been. This paper provides the adequate understanding of six sigma, role of six sigma and also its methodology. This paper also takes cases of a couple of companies who have applied six sigma and what the benefits they have observed after applying six sigma.

Keywords: Six Sigma, QC Tools, DMAIC Methodology

1. INTRODUCTION

Six Sigma basically is a management philosophy which aims at customer satisfaction. If a corporation produces a product or delivers a service which is not up to the customer's satisfaction, then it will have a tough time being competitive or profitable for that matter. Reworking on a product or service due to inefficient processes means loss of not only cost of material, labour and time but also of customers and its reputation. It is important to involve the customer to define what is important to them as, retaining a customer is as important as gaining a customer. With appropriate understanding of consumer's expectation corporation should go back and work on their processes to improve the product or services basis the customers' requirements. Once these required improvements or changes are identified, and then there should be an objective, numerical approach to evaluate current practices as well as its future goals. While Six Sigma has many process and steps involved, these are not the only things involved to improve the system it also involves lots of statistical measurement to do this [1]. The ultimate goal of six sigma is to advance the processes to ensure that only 3.4 defects are there in

one million opportunities. "Sigma" is used to quantify and define the spread or distribution about the average or mean of any procedure/process. The sigma capability or the z-value for a process is a metric that specifies how well that process is performing. The greater the sigma capability, the better the process can be assumed to be. Hence, the sigma capability primarily measures the capacity of the system to produce defect-free products or services. A defect can be defined as anything that affects the product quality and may result in customer dissatisfaction [3].

1.1 Need of Six-Sigma

Six Sigma has over a period of time, developed as a systematic evolution in business to maximize profit by reducing the defects.

The modern business environment now demands and rewards creativity more than ever before due to:

- Higher Customer expectation
- Technological advancement
- Market Fragmentation
- Fierce global as well local competition

1.2 Key Concept Of Six-Sigma

Six Sigma involves a few key concepts which are:

- Critical to Quality: Customer or ultimate consumer feature in top priority for Six Sigma
- Variation: What the customers see and feel
- Defect: unable to fulfil the customer's demand
- Process Capability: what the process can deliver
- Stable Operations: Ensuring steady, predictable processes to improve customer satisfaction

1.3 Six –Sigma Level

Below table lists the sigma level and the the number of defects it may allow per million. It can be observed that the number of defects decreases exponentially with the increase in sigma level.

Table 1: showing the relation between Six-Sigma and Defect Per Million

Sigma Level	Defects/Million
1	690.000
2	308.537
3	66.807
4	6.210
5	233
6	3,4

2. METHODOLOGY OF SIX-SIGMA

The five primary steps that are followed when overseeing a project are DMAIC i.e. Define, Measure, Analyse, Improve, and Control

Define: A numerical parameter is used to define the problem. Along with this there must be an objective method to measure the problem. The ultimate goal, however, is not to manage the problem but to eventually solve the problem. Hence, the focus should be on the problem and not on the outcome. It is necessary to define specific goals in its achieving outcomes which are consistent with customer’s demands as well as business’s own strategy. In essence, here organizations lay down a road map for what is to be accomplished.

Measure: We need to have a base measurement in order to determine whether defects have been reduced or not. For this accurate measurements must be done & relevant data has to be collected so that comparisons done to determine whether or not defects have been reduced.

Analyze: To determine relationships & the factors of its causality, “analysis” is very important. If we are trying to understand how to solve a problem, cause & effect is very much needed and must be considered.

Improve: Optimizing the process or making improvements in the processes based on analysis and measurements can ensure that chances of defects are low and processes are optimized.

Control: Last step in the DMAIC methodology, control makes sure that any unwarranted variances stand out and are taken care of before they influence a process negatively and cause defects. Controls may be in the form of pilot runs to ensure that the processes are capable. A corrected and improved process can transition into standard production guidelines. However, continued analysis and measurement must follow to keep ensure that the processes is on track and free of defects with-in the Six Sigma limit.



Figure 1: Showing Six-Sigma methodology:

3. ROLES OF MANAGEMENT AND OTHERS IN SIX-SIGMA IMPLEMENTATION

For Six Sigma to be fruitful within an organization it is important that the high level management

positions are committed to it. It is not possible to execute this program without top level support. The leader should be knowledgeable about the program and should be committed to provide the resources to execute the program. They are the primary driving force to ensure and institute the Six Sigma philosophy within the corporation. From top level management it flows to the Champion, Master Black Belt, Black Belt and to the Green Belts.

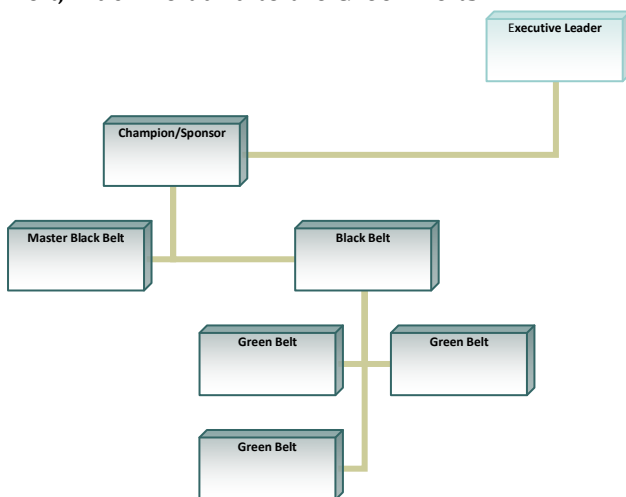


Figure 2: Showing Human Role In Six-Sigma

Champion/Sponsor Roles: This is another high level executive position which ensures management commitment to the six sigma program. The person at this position decides what is required to be done and also provides the assistance and guidance to the Black Belts in terms of dedicated staff as well as monetary resources. Apart from this, this position liaises with other organizations to gain key information of processes that they may need to work on and improve.

Master Black Belt Roles: Individual responsible to this position has the technical expertise in the Six Sigma and also in statistical methods. Usually, in the beginning, the Master Black Belt is an individual from a specializing Six Sigma consulting firm. Once the company is well versed and is on the course of six sigma, and its staffs are trained enough, this individual is substituted by a Black Belt from the organization who has become now an expert. They are now responsible for the proper training involved for the Black Belts & also for Green Belts. Apart from this, they also play a key role in overseeing processes as well as assisting with projects selection

Black Belt Roles: The individuals with these roles are the true leaders of process change. While the executive level decide what needs to be done, it is the Black Belts who decide how to do it. Black belt holders must have management skills as well as technical skill to work along the Green Belts & others in order to make the projects successful. Due to the importance of their position and the details it involves, Six Sigma is their primary and in most cases only responsibility.

Green Belt Roles: They work closely with the Black Belts to decide how go about and complete the project. These are the individuals who are trained in Six Sigma from within the organization, they are also “close to the action” and they provide the necessary and constructive input to progress the process.

4. TOOLS OF SIX-SIGMA

There are primary **Seven QC tools**, which are utilized to organize the collected data in such a way that is easy to comprehend and to analyze. Moreover, by using these seven QC tools, any specific problems within a process are identified and observed.

7QC tools always include :

1. **Pareto Chart** is used to define problems, to set their priority, to illustrate the problems detected, and determine their frequency in the process.
2. **Check Sheet** is used to easily collect data. Decision-making and actions are taken from the data.
3. **Histogram** shows a bar chart of accumulated data and provides the easiest way to evaluate the distribution of data.
4. **Cause-and-Effect Diagram** (Fishbone Diagram) is used to figure out any possible causes of a problem. After the major causes are known, we can solve the problem accurately.
5. **Flow Chart** shows the process step by step and can sometimes identify an unnecessary procedure.
6. **Scatter Diagram** is a graphical tool that plots

many data points and shows a pattern of correlation between two variables.

7. **Control Chart** provides control limits which are generally three standard deviations above and below average, whether or not our process is in control.

T-Test

The t-test evaluates whether the means of two groups are *statistically* differs from each other or not. This analysis is suitable whenever we need to compare the means of two different groups. T-test/*student's t-test* provides an indication of the distinctiveness of two sets of measurements. This means that it can be used to check and determine whether two sets of measures are essentially different or not. The usual way of doing this is to begin with the null hypothesis which means of the two sets of measures are considered equal unless check and proved otherwise.

5. RESULT AND DISCUSSION

5.1 Benefits Of Six Sigma

- Generates sustained success
- Enhances value for customers
- Sets performance goal for everyone
- Promotes learning across boundaries
- Executes strategic change
- Accelerates rate of improvement

When practiced as a management system, Six Sigma is a ultimate high performance system meant for executing business strategy.

Six Sigma is a top-down solution which helps organizations in following ways:

- Mobilize teams to attack high impact projects
- Align their business strategy to critical improvement efforts
- Govern efforts to ensure improvements are sustained
- Accelerate improved business results

6. CASE STUDY

6.1 Case Study 1: Motorola's Six Sigma Journey

It was 1986, when engineer Bill Smith started to work on a methodology to drive manufacturing improvements and standardize defect measurement for his company Motorola and thus begun the Motorola's tryst with six sigma. Along with the direction of then CEO Bob Galvin, they made the Six Sigma and its methodologies available to the world. They implemented training efforts at large-scale in the organisation and applied the methodologies which were beyond manufacturing and extended into transactional, engineering, services and support functions. Motorola took Six Sigma to its the next level, in 2003, by moving it to the management system. They rebranded it as "Digital Six Sigma." In this next gen. phase, they started with a business-wide well-adjusted scorecard & then identified the activities which were required to achieve their goals. They assigned Black and Master Black Belts, basis their statistical capabilities and change management skills to work on projects with complex problems and with an unidentified root cause. They incorporated the term "Digital" to add the requirement that the solutions identified and implemented has to be controlled with a non-manual control and systematic mechanism to make sure that the changes are sustainable. The program then further evolved in 2005 when they added Lean six sigma concepts to their existing Six Sigma framework to identify redundancies & to reduce costs. Motorola separated, in January 2011, to form two independent and publicly traded companies: Motorola Solutions and Motorola Mobility. But, the quest for perfection remains intact in both and will never go away. The potential for Six Sigma is limitless now than it had ever been.

6.2 Case Study 2: Six Sigma at Sony Ericsson

In their pursuit of perfection Sony Ericsson embraced Lean Six Sigma with a great deal of interest. This initiative was helmed by the leadership

team and was the results from their employees like Jennifer, Danny and Jason. Sony Ericsson's management realized that Six Sigma, while very effective in the world of customer service and reverse logistics, can also be applied to supply chain, development functions, sourcing and other concerned departments. And, tis proved to be immensely successful for them. Their main hallway, in their HQ, has a "wall of fame" dedicated for their successfully implemented Lean Six Sigma project. Though their poor economic performance in recent past has sometimes drawn their attention toward other critical and important business deliverables, they are still pushing ahead with their Lean Six Sigma efforts. They have been steadily training more and more of their staffs the methods and nuances of Lean Six Sigma. More of their employees are now using the common six sigma vocabulary in their day to day workings. Their every project follows Six sigma's DMAIC process of Define, Measure, Analyze, Improve and Control [2].

7. FUTURE SCOPE AND DEVELOPMENT

Six Sigma and other quality control tools can be implemented to every process and department of an organization, which clearly insinuates that scope of Six Sigma is much broader than what it is today. In near terms Six Sigma is very likely to remain as one of the key initiatives for enhancement and improvement of the management and industrial process. Six Sigma specializing companies and professionals are trying to integrate Six Sigma along with other current existing management practices to ensure that Six Sigma methodology is even more attractive. Integrating Six Sigma with ISO 9000, ISO 9001, Lean Production, Human Resource Functions, Total Quality Management, and the capability maturity model is one of the primary areas of interest for practitioners and researchers to maximize the output of the Six Sigma method.

8. CONCLUSIONS

Six Sigma considers all integrated steps as a series of processes which has inherent variations, and which can cause inefficiencies or defects. It focuses on those processes which have highest impact on the performance of business, as demarcated by leadership teams. The methodology involves, among other steps, statistical analysis to compute and identify repeated common cause variations. These are then attended by and reduced by the Six Sigma methodology. Six Sigma is a continuous process for cost reduction and quality improvement flowing throughout the organisation. As an cost reduction and quality improvement process, Six Sigma is equally relevant for product development and marketing as well as for customer satisfaction and manufacturing process. Six Sigma improvement techniques and projects are now the foundation of continued success in quality improvement and cost reduction.

11. REFERENCES

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