International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 12 | Dec 2022 www.irjet.net p-ISSN: 2395-0072

Six Sigma Methodologies to Improve Processes in Industries

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Abstract - *Businesses operate in an environment that is fiercely competitive, where customer happiness and loyalty are essential to any company's success. Most businesses look for managerial techniques to enhance their goods and services, perfect their procedures, cut costs, and raise the profitability and happiness of the capital. These call for the application of improvement approaches, such as Six Sigma, giving businesses the chance to raise customer satisfaction and fulfil their expectations. Six Sigma has gained widespread acceptance across a number of global industries and has become as one of the most crucial topics of discussion in quality control. Using an efficient application of statistical tools and techniques, Six Sigma is a well-structured methodology used to identify the underlying causes of quality issues and to eliminate defects and process variability within the business processes. Additionally, it can assist a business in achieving anticipated goals through ongoing project improvement.*

Key Words: **Six Sigma, Quality, Improvement, Efficient, Business**

1. INTRODUCTION

A company must work to please clients by giving each one an amazing customer service experience in addition to offering a quality product. Delivering goods on time is one of the simplest methods to guarantee client happiness because "time is money." Only if a company's order processing procedure is set up in a way that will produce a minimal order processing cycle time can products and services be supplied on time. A corporation can analyse the existing condition of the process and apply quality improvement activities to improve the business process if cycle times are higher than anticipated. Total Quality Management (TQM), Six Sigma, and Lean Six Sigma are some of the quality improvement strategies that are most frequently used. By identifying the main reasons for process faults and creating and putting into practice ways to fix them, one can use those activities to increase the process's quality. The paper's main goal is to offer suggestions for enhancing the factory that makes cars' present order processing procedure. To shed light on the process' shortcomings, a single case study of the facility's existing order processing procedure is carried out. The quality improvement programme known as Lean Six Sigma is utilised to create suggestions for streamlining the order processing process.

2. BACKGROUND

2.1 What is Six Sigma?

The Six Sigma methodology gives businesses the tools they need to manage their operations more effectively. By enhancing performance and reducing process variance, it is feasible to lower defect rates, boost employee morale, and raise the calibre of output, all of which help to increase profitability. The Six Sigma collection of management tools and procedures is intended to increase the capability of the business process and lowering the likelihood of error. Six sigma is a data-driven strategy that employs statistical methods for defect eradication, defect reduction, and revenue growth.

2.1 History of Six Sigma?

The basic principles of Six Sigma, including the estimate standard, are based on Carl Friedrich Gauss (1777–1855), who developed the concept of the common bend. Since Walter Shewhart demonstrated in 1920 that interaction needed correction at three sigmas from the mean value, six sigma has been used as an estimation criterion in item class variety. Motorola University commissioned Barney and McCarthy (2003) to choose the names for their book "The phrase "Six Sigma" was coined by a Motorola engineer named Bill Smith, while many other estimation methods (such as CPK, zero deformities, and others) later appeared on the scene. (It turns out that Motorola's brand name "Six Sigma" is one that is registered with the government.) ". In the middle of the 1990s, Motorola launched a business initiative called Six Sigma. Wall Street has taken note of and encouraged the use of current Six Sigma examples of 12 overcoming adversity, particularly from any resemblance of General Electric, Sony, Motorola, and 5 AlliedSignal (George, 2002). In the middle of the 1970s, Motorola had established a solid platform for itself as the global innovator in the field of remote interchangeable items. Japanese producers soon engaged in severe economic competition in front of an audience. These difficulties were listed in 1973, the year Motorola admitted it was unprepared to face them. Under the direction of CEO Bob Galvin, a development and re-establishment organisation were established in 1979. To make the situation more evident, as stated by the VPs: "Our quality stinks." Selected pioneers in each specialist unit led the work on the 10X goal's nature. Whatever the case, it was clearly on the creation effort to identify the fundamental causes of problems. According to a report in the organization Motorola University, the Motorola Manufacturing

Establishment (MMI) was founded in 1984 and immediately began to plan educational projects. Quick fulfilment of senior management, "Plan for Manufacturability" (DFM), and "Six Steps to Six," a training programme used by all specialist personnel worldwide. The "Six Sigma Design Methodology" (SSDM, now known as Design for Six Sigma and DFSS from many other businesses) was developed and taught by Craig Fullerton, another Motorola Engineer. After Six Sigma's success, Motorola's top executives issued a more assertive goal of 10X to 100X improvement. Six Sigma started using it on everything from estimating preparing deformities to financial 13 viability at Motorola. A one-day course named "Understanding Six Sigma" was subsequently developed around the world for all non-specialized faculty (Breyfogle, 1999). Motorola received the first Malcolm Baldrige National Quality Award in 1988 as a result of their efforts. In 1990, Motorola tried to implement Six Sigma in all they did, but it seemed to have plateaued at 5.4 sigma (Barney and McCarty, 2003). Motorola tried to implement Six Sigma into everything they did in 1990, but it seemed to be stuck at 5.4. sigma (Barney and McCarty, 2003). (Barney and McCarty, 2003). Over time, Six Sigma has advanced. It's not a quality framework like TQM or ISO, for example. Six Sigma is a collaborative working approach. sigma (Barney and McCarty, 2003). (Barney and McCarty, 2003).

3. PRINCIPLES OF SIX SIGMA

Six Sigma is a methodical, data-driven methodology that uses the DMAIC (define, measure, analyse, improve, and control) approach and includes the following principles:

- Increasing customer satisfaction
- Data- Based Management
- Process-Oriented
- Limitless Operations
- Target to perfect and tolerate to failure

4. SIX SIGMA ORGANIZATION STRUCTURE

Six Sigma has its own organizational structure, which consists of a belt system. Each belt has a job description based on education. Generally, this organizational structure is a yellow belt, green belt, master black belt and champion belt. Furthermore, there is hierarchical coordination with each other.

I. Yellow Belt

• He is a part-time team member.

• Provides supporting roles.

• Helps in data collection, validation, monitoring and effectiveness.

• Basic understanding of analytical tools.

II. Green Belt

• Part time team member.

• Drives fewer complex projects.

• Understand basic working knowledge for the Lean 6 Sigma project.

• Works under the guidance of black belt, trained to analyze & solve quality problems.

III. Black Belt

• Generally full-time person for lean 6 Sigma projects and drives complex projects.

• Train and educate green/yellow belts, understanding team dynamics and assigning responsibilities to the team members

. • Communicate with the champion.

IV. Master Black Belt

• Assistant and advisor to champions

• Support black belts • Monitors and removes bottlenecks

• Spread expertise about lean 6 Sigma in the organization.

V. Champion

• Leader of the organization

• Sponsor of the projects

• Promotes and supports projects with resources.

• Take decisions on bottlenecks.

5. METHODOLOGIES IN SIX SIGMA

DMAIC and DMADV are two distinct approaches used by Six Sigma with the goal of examining related facets of business processes. The differences between these techniques are intended to simultaneously but differently target various business sectors. Despite having just one difference, they complement one another during the analysis processes and work toward the same objective, which is the enhancement of business processes. Both of these techniques have certain rules and objectives aimed at enhancing corporate operations through the use of data collection and statistical tools. Even though the strategies have the same goal, there are significant differences between them that professionals working in corporate situations should be aware of.

5.1 DMAIC Methodology

Define:

- Identifying, prioritizing, and selecting the opportunities

- Defining the processes to be improved and preparing process maps
- Developing project team charters
- Building effective teams
- Identifying the customer segment and requirements

Measure:

- Determining the parameters to be measured
- Managing the measure process
- Understanding variation
- Evaluating the measure system and selecting the measuring devices
- Determining the process performance

Analyse:

- Identifying potential root causes
- Implementing alternative methods
- Conducting sources of variation studies
- Conducting correlation analysis

Improve:

- Generating solutions
- Identifying alternatives
- Ranking alternatives
- Selecting the best solution
- Discussing the implementation aspects
- Implementing the final solution as per plan

Control:

- Developing a control plan (specify the check points and control points)
- Implementing a suitable monitoring system for control
- Reviewing and evaluating the impact of changes
- Updating the documents, incorporating process changes
- Closing the project, rewarding the team members, and disbanding the team

A review happens at the end of each phase, which happens in order. Before proceeding on to the next phase, the review makes that the previous phase is finished. These connected phases enable a team to effectively identify issues with a process, assess the effectiveness of the current process, analyze process inefficiencies and identify the underlying causes of the inefficiencies, make suggestions to improve the current process, and confirm that the suggestions will have a positive long-term impact on the process.

6. SIX SIGMA METHODOLOGIES FOR IMPROVING PROCESSES

The six-sigma technique employs a number of clearly defined steps as a problem-solving methodology or process improvement framework. This includes defining the problem (D), measuring the problem (M) (i.e., identifying the defects that are the cause of the problem), analyzing data (A) to identify the root causes of the problem (i.e., analyzing defects), improving (I) processes to get rid of the root causes of defects, and controlling (C) or overseeing processes to avoid the recurring problem.

Define phase:

The following steps must be carried out in the define phase:

- Define the issue briefly and precisely (as a project).
- Determine the stakeholders.
- Recognize the connection between the current issue and its importance as seen from the viewpoint of the customers.
- Establish the process inputs, outputs, and various controls of the processes.
- Perform a quick mapping of the processes both upstream and downstream to identify the problem.
- Create a six-sigma project charter that outlines each person's job and responsibility for the project.
- Set a time limit for the project at hand and specify the resources that will be needed. The project scope, project boundaries, and significant advantages to internal or external clients should all be disclosed in the charter.
- Determine the project sponsor and stakeholders, then do a cost-benefit analysis to decide whether the project is worthwhile.
- List all clients (internal and external), and explain how this issue relates to client satisfaction.

Measure phase:

When using the six-sigma methodology, the following factors should be taken into account:

- Ascertain the service process's existing performance (process yield, DPMO, short- and long-term capabilities).

- Make a decision regarding what to measure (a critical-to-quality characteristic, or CTQ), as well as how to test it (if applicable).
- Establish the gaps for improvement; identify the strengths and shortcomings; and ascertain how well our process is performing in comparison to others.

Analysis phase:

During this phase, it's important to keep the following things in mind:

- Identify the underlying reasons behind process flaws.
- Identify the root sources of variability that result in problems and rank them for additional research.
- Understand the nature of data and the distribution or patterns of data.

Improvement phase:

The methodology's phase of improvement covers the following topics:

- Create viable fixes for the issues and ways to stop them from happening again.
- Utilize a matrix of criteria and decisions to assess the effects of each prospective solution.
- Determine how much time, effort, and money will be required for implementation by looking at solutions that have a strong impact on customer happiness and financial savings for the firm.
- Evaluate the risks connected to potential fixes.
- Use pilot studies to validate any improvements (such as lowering the defect rate or raising the process's sigma quality level).
- Reconsider the effects of the potential solutions you've selected.

Control phase:

The methodology's control phase should include the following components:

- Create corrective measures to maintain the enhanced degree of service process effectiveness.
- Create new guidelines and standards to guarantee long-term success.
- Put process control strategies into action and assess the process's capacity.
- Choose a process owner and define his or her responsibilities; confirm the advantages and cost-savings/avoidance;
- Document the new techniques.
- Wrap up the project, complete the documentation, and communicate the most important lessons discovered; and
- Publish the findings both internally (monthly bulletins) and internationally (conferences or journals) and acknowledge the team members' contributions.

6.1 Six Sigma Performance Metrics commonly used by Industries

The key performance indicators (KPIs) differ in firms and organizations and from process to process. However, there are some KPIS, or performance measurements of six sigma, that are frequently and broadly applied across a number of industries. Some of the six sigma performance indicators (KPIs) that are frequently utilized in the service sector are as follows:

- DPMO – Defects per Million Opportunities
- Process Capability (C_p)
- Time to address to customer complaints
- Processing time (mortgage applications, insurance cover, bank loans, etc.)
- Delivery speed, or time to delivery
- Time to address customer complaints
- The length of the wait for the service and dependability of services
- The veracity of the information offered to customers.

6.2 KPI'S of Six sigma in Industries

An organization's objective should be in line with the Six Sigma initiative and a Key Performance Indicator (KPI) is a quantitative value that determines how well a company is reaching key business objectives. KPIs are used by organisations to measure their success in achieving their goals. Some of the crucial KPIs for Six Sigma in industries discovered through literature study are:

- Efficiency
- Cost reduction
- Time to delivery
- Quality of service
- Employee satisfaction
- Customer satisfaction
- Reduce variation

- Financial benefit
- Cycle time
- Waiting time
- Inventory turnover
- Operational cost
- Productivity

7. CONCLUSION

This essay attempts to show the utility of six sigma in the service sector. Six sigma has been effectively applied in numerous manufacturing industries, but due to a number of limitations, its use in the service sector is still relatively limited. This paper briefly discusses the potential applications of six sigma to service tasks. The most typical six sigma performance indicators employed by service companies are also disclosed in the report. Following a discussion of the crucial success criteria that contribute to the successful use of six sigma, some guidelines for the selection of six sigma projects are provided. The report also emphasizes the important similarities and contrasts between six sigma and TQM. This study is based on an investigative approach, future researchers can venture further by following a qualitative approach.

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