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Total Quality Management in Terms of Six Sigma

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ABSTRACT: As customers are increasingly demanding high-quality and reliable products at low cost, industries are continuously facing fierce competition and the challenge is of meeting increasing demands for higher quality products at economic costs. The business strategy for achieving a competitive advantage is the successful implementation of a quality management system. The success of an organisation is directly related to how effective its implementation of continuous improvement (CI) is. For any manufacturing system, Total Quality Management (TQM) and Six Sigma are important CI methodologies. During the last few decades, continual quality improvements methods, including total quality management (TQM), six sigma and lean, have been practised by many different organisations. Six Sigma filled the vacuums created by TQM failures in several ways. Six Sigma is customer focused and has the potential to achieve exponential quality improvement through the reduction of variation in system processes.

I. INTRODUCTION

Total quality management is a management path for continuously improving the quality of processes and products. TQM is based on the involvement of management, workforce, suppliers and customers to meet customer expectations. The nine common TQM practises are cross functional product design, process management, supplier quality management, customer involvement, information and feedback, committed leadership, strategic planning, cross-functional training and employee involvement for improving and enhancing the product quality.[17] It is related with the development, deployment and maintenance of organizational systems that are mandatory for business processes. It is pointed out on maintaining existing quality standards.

Six Sigma is a business management strategy, a set of techniques and tools for process improvement. It is developed by Motorola. Motorola Company is an organization which has implemented the six sigma successfully for over 25 years. The use of six sigma has helped the company improve on the quality of its products and services, making it very famous among its competitors. [7]. Due to this we enjoy widespread applications in many industry sectors. Six Sigma seeks to improve the output quality of process by identifying and removing the reason of defects and minimizing variability in manufacturing and business processes. It helps a set of quality management methods, mainly empirical, statistical methods, and creates a special infrastructure of people within the organisation. [6]. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets, such as reduce process duration, reduce costs, increase customer satisfaction, and increase profits[9]. It involves designing, improving and controlling business activities to minimize or eliminate waste while optimizing customer satisfaction and increasing financial stability. A six sigma process is one in which 99.99966% of all opportunities to produce some feature of a part are statistically expected to be free of defects (3.4 defective features / million opportunities) [10]. Both TQM and Six Sigma have many similarities and are compatible in varied business environment including manufacturing and service industries. TQM and six sigma therefore focus on overall improvement of companies production through establishment of short term and long term strategies and processes.[8] The three key elements of Six Sigma Process Improvement are Customers, Processes, Employees.

II. METHODS OF SIX SIGMA

Six Sigma is comprised of various methods that help in increasing the effectiveness and efficiency of business processes. The two most commonly used Six Sigma methodologies include DMAIC and DMADV.

1. DMAIC (Define, Measure, Analyze, Improve, and Control)

DMAIC is a model for continued improvement. It is systematic, scientific and fact based quality improvement and problem reduction for existing processes. The project methodology has five phases:

Define: This phase summarizes the problem, the project objectives and focuses on clearly specifying the problems: the goals of the process improvement project, the scope of the project and identifying the customers (internal and external) along with their requirements. An input to this phase comes from the voice of the customer (VOC), the voice of business (VOB) and/ or the voice of process (VOP).



Measure: This phase measures the key aspects of the present process and collects the data that is relevant to the scope of the project. This phase focuses on identifying the parameters that need to be quantified, ways to measure them, collect necessary data, and carry out measurement by different techniques. Two commonly used measurement techniques are – Defects per Million Opportunities (DPMO) and Process Sigma.

Analyze: The phase follows a drill-down approach to investigate and reach exact root causes of business inefficiency from various potential causes identified initially. Commonly used tools in the Analyze phase are Fishbone Diagram, Brainstorming, Histogram, 5 Whys, Hypothesis testing, Time series plots, and Scatter plot.

Improve: This phase optimize the procedure and technique by determining potential solutions, test, ways to implement them for improvement. Tools used to eliminate the defects are Brainstorming, Mistake-proofing (Poka Yoke), Simulation software, Prototyping, Piloting, and Pugh Matrix.

Control: This phase control the future state process to ensure that the required performance is maintained. It defines and validates the monitoring system, develops standards and procedures, verifies benefits and profit growths, and communicates to business.. Important tools used in the control phase are Process sigma calculation, Control charts, Cost saving calculations, and control plan.

2. DMADV (Define, Measure, Analyze, Design, and Verify)

DMADV is also a data-driven assurance method that focuses to create new processes and product or services in comparison to existing ones. The DMADV technique or strategy is frequently utilized when adopting innovative tactics due to its data-driven foundation, ability to detect great foresight and process, which necessitates rigorous investigation. It features five phases:

Define: Design the project goals that are consistent with customer demand and the enterprise strategy.

Measure: It is important process elements and measures the critical components, product capabilities, risks.

Analyze: Analyse to develop various design for alternative process, create a high level design and evaluate on the appropriate option.

Design: Design details, optimise them and evaluate procedure specifications.

Verify: Verify the design by simulations, set up pilot runs, implement the production process and then handling over the process to the customers.

It can be concluded that DMAIC is used on a process or product that already exists but is unable to meet customer needs or specifications. In comparison DMADV is used when a new product or process needs to be developed to meet customer requirements. It is also used when a product or process has been optimized using DMAIC but is still unable to meet customer needs and specifications or the Six Sigma quality levels.

III. QUALITY MANAGEMENT TOOLS AND METHODS USED IN SIX SIGMA

Within the individual phases of DMAIC or DMADV project Six Sigma utilizes many quality management tools. The main methods used are.[14]

- 5Whys
- Pareto Analysis
- Analysis of Variance
- Pick chart
- Check sheet
- Regression Analysis
- Control Chart
- Run charts
- CTQ tree
- Stratification
- General linear model
- Taguchi method
- Histograms
- Scatter Diagram
- Fishbone Diagram

- Root cause analysis
- Cost benefit analysis
- SIPOC analysis
- Correlation
- Pareto chart

IV. IMPORTANCE OF SIX SIGMA

Implementation of Six Sigma methodology leads to rise of profitability and reduction in costs. Thus improvements achieved are directly related to financial results. The six sigma process is critical since it will benefit firms in a variety of ways, including employing workflow modelling which may be characterized as a flowcharting method that allows for the documenting of a specific business process. It can also be used for removing waste and other unnecessary business processes. It targets the customer delight and new innovative ways to exceed the customer expectations. In addition to that, by using this method, employees are able to clearly define the issues as well as solve the problem that affects the overall performance and quality expectation of the product.

V. CONCLUSION

One key innovation of Six Sigma involves professionalizing of quality management functions. Six Sigma is similar and just different from TQM in that it is fact based and data driven, result oriented, providing quantifiable and measurable bottom line results linked to strategy and related to customer requirements. It is helpful to all common business processes such as sales, marketing, administration and R&D. In six sigma the focus is on strategic and systematic application of tools. All six sigma methodologies and approaches have the same objective, to simplify corporate procedures in order to create the finest goods and services with the fewest flaws possible. Its widespread adoption by businesses throughout the world demonstrates its best in today's market. Six sigma is the specific methodology to improve the existing process, to meet the desired level of satisfaction. It can be applicable to various sectors and organization which gives fruit full results so that the respondent will be satisfied.

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