CRIMSON PUBLISHERS
Wings to the Research

ISSN 2637-7756

Modern Applications in Pharmacy & Pharmacology

Review Article

Total Quality Management: A Requisite Approach to Improve Research

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Submission: January 18, 2018; **Published:** April 02, 2018

Abstract

Total Quality Management (TQM) is an approach that seeks to improve quality and performance which will meet or exceed customer expectations. This can be achieved by integrating all quality-related functions and processes throughout the company. TQM looks at the overall quality measures used by a company including managing quality design and development, quality control and maintenance, quality improvement, and quality assurance. TQM takes into account all quality measures taken at all levels and involving all company employees. TQM can be defined as the management of initiatives and procedures that are aimed at achieving the delivery of quality products and services. Prevention costs are associated with the design, implementation and maintenance of the TQM system. They are planned and incurred before actual operation.

Introduction

The concept of managing quality had evolved from individual artisans taking pride in their work to today's approach of managing organizations to achieve continuous improvement in every aspect of its operations. The key stages in this evolution are identified as the inspection approach, quality control, quality assurance and total quality management. TQM is a management philosophy which highlights the need to improve the quality of goods and services in order to better utilize the resources of organizations. TQM offers each individual the opportunity to participate, contribute and develop a sense of ownership.

It is also defined as the "strategic commitment to improving quality by combining statistical quality control method with a cultural commitment to seeking incremental improvements that increase productivity and lower costs". During the last couple of years, the TQM concept is a proven systematic approach to the improvements of the organization's overall business process, including product and services. TQM addresses overall organizational performance and recognizes the importance of processes along with customer–supplier interfaces, both internally and externally. For TQM to be successfully adopted by an organization there need to be a perceived need for change in that organization. In putting TQM in place, senior management must provide a vision by identifying what they want to achieve. This should be communicated throughout the organization. Appropriate planning is necessary and work force will need to undertake appropriate training in the use of the tools and techniques of TQM (Figure 1). Depicts a favorable structure that shows the core principles and key imperatives in TQM.

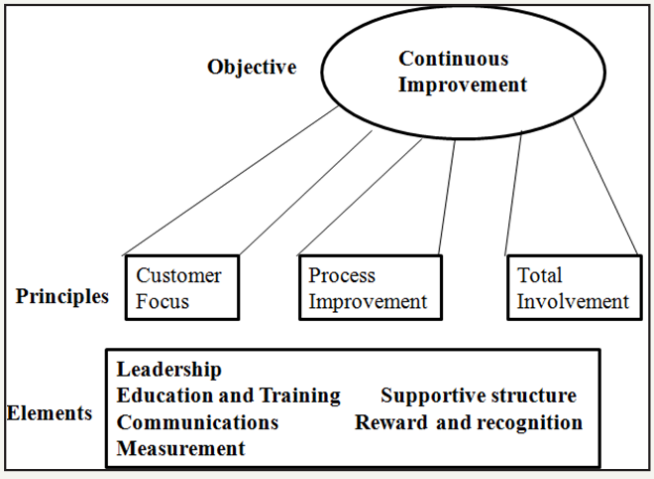

Figure 1 : The TQM system.

Organization Size and Implementation of TQM

The adoption of TQM is a radical and fundamental change in every aspect of business. Such a radical change requires careful planning if it is to succeed. One of the benefits highlighted through the TQM is the standardization of work which will help to reduce the opportunity for variance thus helping to reduce the cost. TQM is an effective system because it can be truly integrated at all levels of company. Ahire et al. [1] presented the analysis on the comparison for the Quality management in TQM firm vs. non-TQM firms. They had classified firms into four groups:

a. High performance TQM firms

b. Low performance TQM firms

c. High performance non-TQM firms and

d. Low performance non-TQM firms

Reasons that can cause the failure of TQM efforts

a. Lack of management commitment.

b. Unrealistic expectations.

c. Time-frame.

d. Cost of TQM implementation.

e. Under-reliance on statistical methods.

f. Failure to develop and sustain a quality-oriented culture.

TQM practitioners have proposed a number of different implementation models. Deming proposed an implementation plan consisting of 14 steps, Juran put forward a ten step plan, and Crosby suggested a 14 step programmed for the implementation of TQM [2]. Oakland proposed an eleven step process, but he also identified two preliminary stages:

a. Understanding the need for quality

b. Commitment to quality

These TQM implementation models are sequential and prescriptive. Ghobadian proposed an integrative model where only the key elements of TQM are predefined. Figure 2 depicts this model.

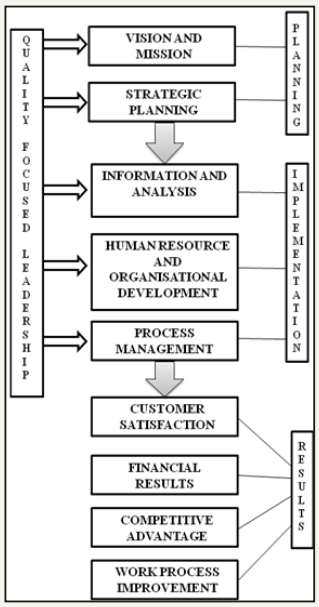

Figure 2 : Total Quality Business System.

Principles

A number of key principles can be identified in defining TQM, including:

a. Executive Management– Top management should act as the main driver for TQM and create an environment that ensures its success.

b. Training– Employees should receive regular training on the methods and concepts of quality.

c. Customer Focus– Improvements in quality should improve customer satisfaction.

d. Decision Making– Quality decisions should be made based on measurements.

e. Methodology and Tools– Use of appropriate methodology and tools ensures that non-conformance incidents are identified, measured and responded to consistently.

f. Continuous Improvement– Companies should continuously work towards improving manufacturing and quality procedures.

g. Company Culture– The culture of the company should aim at developing employees ability to work together to improve quality.

h. Employee Involvement– Employees should be encouraged to be pro-active in identifying and addressing quality related problems [3].

The Benefits of TQM Implementation

Whenever an organization is implementing any new concept it would like to have a return on investment. Due to this, it is very important for an organization to know the advantages and benefits of TQM implementation. With a proper understanding, the employees can accept the changes required openly. Some of the major benefits of TQM are as follows [4].

Reduced operating cost

Manufacturing a quality product, providing a quality service, or doing a quality job with a high degree of customer satisfaction is alone not enough. The cost of achieving this goal must be carefully managed, so that the long term effect of quality costs on the business or organization is the desirable one. Quality cost is the quantification in terms of money of the various aspects of quality as it relates to the organization. The quality cost approach demonstrates quality as a valuable perspective that can be utilized within the organization to measure, analyze and improve operational efficiency. The examples of the internal failure costs are waste, scrap, rework, re-inspection and failure analysis. External failure costs are the costs that occur when products or services fail to reach design quality standards, but are not detected until they are transferred to the customers. This refers to repair and servicing, warranty claims, complaints, returns, liability and loss of goodwill. With reduction in all these type of errors and wastages, it will lead to a better productivity and the company profit will also be increased. Quality cost is considered to be a very effective tool to monitor the financial functions of TQM [5-10].

Improved employee involvement

By practicing TQM, teamwork is improved and employees are motivated and encouraged to control, manage and improve the processes which are within their responsibility.

How to cite this article: Ruchi T, Gaurav T. Total Quality Management: A Requisite Approach to Improve Research. Mod Appl Pharm Pharmacol. 2(1). MAPP.000527. 2018. DOI: 10.31031/MAPP.2018.02.000527

Improve company morale

No organization can succeed without a certain level of commitment and effort from its members. Even though the management can do much to design a high performance workplace, the day-to-day management activities which include how employees are selected and developed, how they are motivated at work, and how their performance is evaluated can have a major impact on the success or failure of total quality effort in an organization. The empowerment of employees through the use of teamwork, education and by giving people responsibility for the control over the quality of their work will also cultivate a friendly and happy working environment. Indirectly this will improve the morale of the employees, reduce the cost of poor quality and lead to the increase in productivity [11-15].

Establishing a process of continuous improvement and business process reengineering

The journey toward excellence is a never-ending road. Some people, because they see no end to their road, never take the first step. Others accept the challenge of the new day and continue down the road, forever improving, and looking forward to tomorrow's challenge. The tools of TQM, provides an environment conducive to improve performance of employees and management alike. It provides focus on aspect of the business that is normally addressed only when it is out of control. TQM is a good management practice which when followed, will change the management characteristics and personality of an organization [16-20].

Total Quality Management and the Environment

Cardy & Dobbins suggest that "what exactly constitutes TQM seems to differ across organizations and quality proponents." However, the quality movement has focused organizational resources on improving customer satisfaction and value. Taguchi, Elsayed & Hsiang's social loss function framework suggests that quality is defined by the total costs that a product (or an organization) inflicts upon society. These losses could be either due to:

a. Variation in the total product.

b. Negative externalities that result from any stage in the product's lifecycle, from product development to ultimate disposition [21-25].

Miles, Russell & Arnold suggest that when firms incorporate quality as the foundation of their corporate culture they should consider:

a. Both the production and consumption externalities associated with the product.

b. The satisfaction of both latent and explicit customer needs.

c. The creation of the highest total value possible for the specific product/market interface.

These definitions of quality suggest that organizations consider, if not always explicitly, the environmental effects of the production and consumption of the product. The Global Environmental Management Initiative (GEMI) created the Total Quality and Environmental Management (TQEM) model in an attempt to "marry environmental management and Total Quality Management". TQEM is the integration of a comprehensive lifecycle approach to TQM and environmental management which includes

a. Customer identification and satisfaction.

b. Continuous improvement.

c. A proactive approach to problem solving.

d. A systems approach to business, explicitly including the natural environment.

TQEM even adapts some of the basic TQM tools into an environmental quality framework including

a. Plan, do, check, act cycle

b. Fishbone diagrams

c. Pare to charts

d. Control charts

e. Flow charts

f. Benchmarking

Hence, TQEM appears to be an extension of TQM, explicitly taking into consideration environmental issues and costs pertaining to the production, consumption, and the ultimate disposition of the product, its packaging, and related by-products. Provides a summary of the similarities between TQM and TQEM .

Plan, Do, Check, Act

Plan

a. Identify the process which requires continuous improvement.

b. Locate the problem area.

c. Define the problem.

d. Project the expected results.

e. Identify the best method for solving.

f. Set targets for solving the problem.

g. Preparing the resources.

h. Prepare a time schedule.

Do

a. Proper training.

b. Improvement activity has to be taken up.

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c. Commitment on personnel involvement.

Check

a. Methodology and the outcomes are compared with the plans already made.

b. Gap existing if any identified.

Act: Involves either standardisation or non-conformance analysis.

Fishbone diagrams

A useful way of mapping the inputs that effect quality is the Cause & Effect Diagram; also know as the Fishbone or Ishikawa Diagram. It is also a useful technique for opening up thinking in problem solving. The effect or problem being investigated is shown at the end of a horizontal arrow; potential causes are then shown as labelled arrows entering the main cause arrow. Each arrow may have other arrows entering it as the principal causes or factors are reduced to their sub-causes; brainstorming can be effectively used to generate the causes and sub-causes [26-28].

Pareto chart

Pareto Analysis can be used to analyze the ideas from a brainstorming session. It is used to identify the vital few problems or causes of problems that have the greatest impact. A Pareto diagram or chart pictorially represents data in the form of a ranked bar chart that shows the frequency of occurrence of items in descending order. Usually, Pareto diagrams reveal that 80% of the effect is attributed to 20% of the causes; hence, it is sometimes known as the 80/20 rule [29-33].

Control chart

It is used to monitor processes that are in control, using means and ranges. It represents data, e.g., sales, volume, customer complaints, in chronological order, showing how the values change with time. In a control chart each point is given individual significance and is joined to its neighbors. Above and below the mean, Upper and Lower Warning and Action lines (UWL, LWL, UAL, LAL) are drawn. These act as signals or decision rules, and give operators information about the process and its state of control. The charts are useful as a historical record of the process as it happens, and as an aid to detecting and predicting change

Flow chart

Another tool used in the construction of process maps is process flowcharting. This is a powerful technique for recording, in the form of a picture, exactly what is done in a process. There are certain standard symbols used in classic flowcharts, and these are:

If a flowchart cannot be drawn using these symbols, then the process is not fully understood. The purpose of the flowchart is to learn why the current process operates the way it does and to conduct an objective analysis, to identify problems and weaknesses, unnecessary steps or duplication and the objectives of the improvement effort.

Benchmarking

Benchmarking is a process that compares your business activities to similar companies. It questions what you are doing, identifies opportunities for improvement and often provides the momentum necessary for implementing change. It is used to compare performance between different organizations or different units within single organizations undertaking similar processes on a continuous basis. Benchmarking aim to document and measure a key process and then compare the resulting data with those relating to similar process in other organizations [34] (Figure 3).

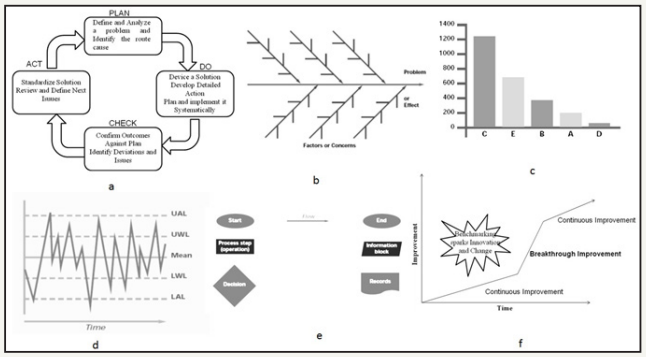

Figure 3 : (a) PDCA Cycle; (b) Fishbone Diagram; (c) Pareto Chart; (d) Control Chart; (e) Flow Chart; (f) Benchmarking and Breakthrough Improvement.

What is Six Sigma?

The word is a statistical term that measures how far a given process deviates from perfection. Six Sigma is named after the process that has six standard deviations on each side of the specification window. It is a disciplined, data-driven approach and methodology for eliminating defects. The central idea behind Six Sigma is that if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and get as close to "zero defects" as possible. "Six Sigma is a change strategy for accelerating improvements in our processes, products, and services. Six Sigma is a way to define our progress towards becoming premier."

Six Sigma starts with the application of statistical methods for translating information from customers into specifications for products or services being developed or produced. Six Sigma is the business strategy and a philosophy of one working smarter not harder. One sigma gives a precision of 68.27%, two sigma of 95.45% and three sigma of 99.73%, whereas Six Sigma gives a precision of 99.9997%. Although 99.73% sounds very good, it slowly dawned on companies that there is a tremendous difference between 99.73% and 99.9997%. For example for every million articles of mail, the difference is between 66,738 lost items and 3.4 lost items [35].

To achieve Six Sigma Quality, a process must produce no more that 3.4 defects per million opportunities. An opportunity is defined as a chance for nonconformance, or not meeting the

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required specifications. This means one needs to be nearly flawless in executing key processes. The process and culture is conditioned for zero defects rather than being one that accepts that it is inevitable, and acceptable, that mistakes will occur. Hence Six Sigma delivers substantial cost reductions, enhanced efficiencies, sustainable improvements and increased stakeholder value.

Two Meanings of Sigma

a. The term "sigma" is used to designate the distribution or spread about the mean (average) of any process or procedure.

b. For a process, the sigma capability (z-value) is a metric that indicates how well that process is performing. The higher the sigma capability, the better. Sigma capability measures the capability of the process to produce defect-free outputs. A defect is anything that results in customer dissatisfaction [36].

Origin of Six Sigma

Motorola the company that invented Six Sigma

a. The term "Six Sigma" was coined by Bill Smith, an engineer with Motorola.

b. Late 1970's - Motorola started experimenting with problem solving through statistical analysis.

c. 1987 - Motorola officially launched its Six Sigma program [37] (Figure 4).

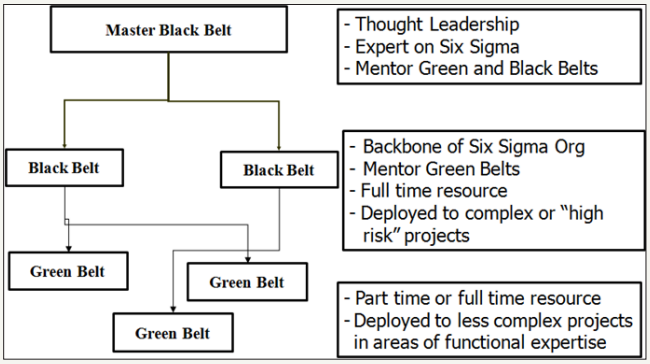

Figure 4 : SIX SIGMA: THREE DIMENSIONS: The Quality Team.

What Makes Six Sigma Different?

a. Versatile.

b. Breakthrough improvements.

c. Financial results focus.

d. Process focus.

e. Structured & disciplined problem solving methodology using scientific tools and techniques.

f. Customer centered.

g. Involvement of leadership is mandatory.

h. Training is mandatory.

Benefits of Six Sigma

a. Generates sustained success.

b. Sets performance goal for everyone.

c. Enhances value for customers.

d. Accelerates rate of improvement.

e. Promotes learning across boundaries.

f. Executes strategic change.

Conclusion

Quality has always been an important issue in the manufacture of goods and services. With the environment in which organizations operate have becoming more turbulent, organizations are increasingly concerned with obtaining a sustainable competitive edge Collin. This study focuses on the understanding of TQM concept, the advantages and disadvantages of the TQM implementation. The study looks into the paradigm shift of the TQM concept, the impact of an effective TQM implementation and also the various TQM measurement techniques. The study also gathers the information on the guidelines and various types of implementation plans that have been established by the Quality Gurus. It also aims at identifying the importance of customers and continuous improvement [38,39].

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