

Total Quality Management (TQM): A Need of Industry for Quality Product

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Abstract: We are using various products in our day to day life for different purposes. Most of the products of same category are manufactured by various industries. Such products are differed from each other by its quality parameters. Among these products only quality products are reached to top sale because most of the customers focuses on the quality as per their needs. Total quality management (TQM) makes it easier to keep a product's overall quality at a high level. To integrate the quality discipline into the organization's culture and activities, it uses strategy, data and effective communications. An organization can achieve long-term success by having all of its members, from entry-level staff to top executives, focus on improving the quality and, as a result, producing customer happiness. This is the foundation of the management concept known as Total Quality Management (TQM). In short, we can say that TQM is a philosophy and a set of guiding principles that form the basis of a company that strives for continuous improvement. TQM is now familiar worldwide and is being adopted by many industries to give quality product to customers. The objective of this article is to give a detailed view on the concept of quality, concept of total quality management and its implementation, TQM tools, quality risk management and historical development of TQM means total quality management philosophies.

Keywords: Quality, Total Quality Management, TQM, Quality Tools, TQM Philosophies

1. Introduction

Due to the rapid expansion of the global economy, businesses are under increasing pressure to achieve and maintain functional distinctiveness in order to improve their overall performance and competitiveness. Internationally, organizations also frequently deal with shifting organizational cultures, a competitive market, a bigger focus on improvements in quality, consumer loyalty, high-tech innovation and unpredictability in politics and the economy. Today organizations can never depend on their current business forms in remarkably competitive marketplace. In order to maintain their successful operations over the years, they must accept and implement new operation management practices. Organizations have been forced to pursue enduring quality and quality management in order to increase their

competitive edge due to the intensifying global economic rivalry and other external factors. Total Quality Management (TQM), which has received considerable attention from both business and academia over the last 20 years, stands out as one of the most well-known styles of modern operations management practice. [1, 2] TQM plays a crucial role in the economic growth and development of societies since it is the one who develops, promotes, and disseminates new ideas and knowledge. TQM improves their processes and services through the successful implementation of quality. [3]

Dr. Edwards Deming in 1940 proposed the idea about Total Quality Management (TQM). Total Quality Management allows firms to get, on the one hand, a high extent of differentiation, fulfilling need of customers and strengthening brand image, and reduces the costs of product by preventing mistakes and waste of time and also by making

improvements in the processes of corporation. [4] One of the best quality-oriented approaches that most organizations imply is total quality management. TQM has drawn the attention of scholars due to its growing popularity and acceptance in the business sector. Particularly over the last two decades, TQM is one of the most popular and enduring management principles. "TQM is a comprehensive management philosophy that strives for continuous development in all functions of an organization and it can be achieved". [5] TQM has gained international prominence recently and is being embraced by many companies, especially in developed economies. TQM system was established primarily as a result of developments in the global economy and the market forces that demand quality. TQM may be defined as a continuous search for excellence by forming the right skills and attitudes in people to make prevention of possible defects and fully satisfy customers/users at all times. TQM is an organization-wide activity or process that has to reach every individual who works in that organization or who relates with this organization through any discipline. Total Quality Management is an approach for the improvement in the effectiveness and flexibility of a entire business. TQM is essentially a mode of organizing which participating the whole organization; including every department, every activity, and every single person at each level. It is the combination of the socio-technical practice towards doing the correct things (externally), everything right (internally) first time and also all the time, by considering economic viability at each stage of each process. It combines socio-technical practices that emphasizes doing the right thing (externally), the right thing (internally) and the right thing all the time while taking into account economic viability at each level of each process. [6]

Total Quality Management's evolution can be divided into following four stages:

- a) Quality inspection
- b) Quality control
- c) Quality assurance
- d) Total Quality Management

The TQM method is focused on improving the processes' effectiveness and responsiveness in meeting customer needs as a part of the organization's excellence aim in achieving customer satisfaction. All of the elements or individuals must operate as a team to ensure the efficacy of the concept implementation in the organization.

TQM implementation can be divided into 3 stages:

- a) Preparation stage,
- b) Planning stage
- c) Execution stage. [7]

Implementing quality initiatives, like TQM, is a one-way process where businesses aim to offer the consumer high-quality services. The foundation of TQM is to create an organizational culture and mentality that is committed to meeting customer needs by delivering services that satisfy those needs. Today, an organization's survival and worldwide competitiveness depend on its capacity to provide clients

with products and services of the highest caliber. Basically, providing exceptional quality increases consumer pleasure and raises institution production. One method that organizations are attempting to provide clients with excellent services is through the deployment of quality improvement initiatives, such as Total Quality Management. [8]

2. Quality

Quality has been defined by the quality gurus by different ways as conformance to standards or specifications of the product; suitability for its use; fulfilling customer's need or their expectations; delighting the customer etc. Although quality is a widely used concept, it is not very specific. It is difficult to quantify quality because it is too difficult to visualize. It is a question of feeling, and each person will define it differently depending on their point of view.

The eight dimensions of quality, which are critically important elements to organizational success, are as follows.

- a) *Performance*: Product's primary operating characteristics.
- b) *Features*: Supplements to a product's basic functioning characteristics.
- c) *Reliability*: A probability of not malfunctioning during a specified period.
- d) *Conformance*: The degree to which a product's design and operating characteristics meet established standards.
- e) *Durability*: A measure of product life.
- f) *Serviceability*: The speed and ease of repair.
- g) *Aesthetics*: How a product looks, feel, tastes and smells.
- h) *Perceived quality*: As seen by a customer. [9]

3. Total Quality Management

3.1. Evolution of TQM

As in conventional systems, quality depends only on final product quality control testing. This resulted in increase in cost of product and also increases time consumption for detection of the problem if any. In conventional systems the problem detection was possible only at the end of the process. With the evolution and application of TQM, this situation has altered, and now every department is concerned with product quality management. Today, quality is verified at every stage of the process, and if a problem arises, it is attempted to be resolved just at that stage. Quality is checked at every stage of the process and is not solely dependent on quality control testing of the finished product. Therefore, this also led to an improvement in product quality and a reduction in time and expense associated with batch failures or other process-related issues. Pharmaceutical industry is the most vital part of the healthcare system and therefore quality of the product is must requirement. So, TQM should be applied by pharmaceutical industries as it results in improving the quality of the product and also decreasing the time required for quality production, which ultimately result in decreasing cost of the product. [10]

3.2. TQM Tools

There are a wide range of TQM tools. There is no tool that is best for every application; the knowledgeable practitioner is aware of a rich variety of tools and uses the appropriate one(s). Following are some of the important TQM tools.

3.2.1. Process Maps

One of the important ways of understanding how to improve a process is to map the process. While there are several different approaches used to process mapping, the important key is to determine who does what at each step of the process. Often, the simple drawing of a process map is sufficient to solve many quality problems because the map makes it so obvious where defects can be introduced.

3.2.2. "Poke-A-Yoke" and the Plan-Do-Check-Act (PDCA) Cycle

This concept is of the Japanese management philosophy which meaning to make a process foolproof. The idea is to plan the process in such a way that it is self-checking or incorporates process steps that cause immediate detection of defect and its possible correction. Simple examples include color-coding and special keying of parts to confirm that they are assembled the right way.

PDCA Cycle tool is also known as the Shewhart Cycle. Deming popularized this cycle in Japan; as a result, the Japanese refer to Shewhart Cycle as the Deming Cycle. The tool emphasizes a new plan for change. It carries out tests to make the change on a small scale, observes the effects, and finally, studies the results to determine what has been learned. The cycle is repeated as needed.

3.2.3. Statistical Tools

William Deming was an American engineer, statistician and management consultant. One of Deming's major contributions to the quality management was the introduction of statistically grounded approaches to the analysis of defects. Without the use of such statistical tools, one can often make inaccurate decisions regarding the cause of a problem. This can often lead to exactly the reverse effect of that being sought. Tools included in this set of tools are statistical process control (SPC) charts, Pareto Charts and histograms.

3.2.4. Force Field Analysis and Root Cause Analysis

This tool asks one to diagram the forces (policies, culture and so forth) that are resisting a desired change and the forces that support the change. This assists one in clearly determining the degree of difficulty of making change and exactly where effort will be needed. The supporting forces are places where support can be anticipated.

Root Cause Analysis tool used by the Japanese people and made it popular. In this tool series of questions (whys) are asked until one uncovers the basic cause of a defective product. The main objective of this tool is to find out why a defective product was produced; this is to be contrasted with the typical approach of just setting up the defective product to remove defect or replacing the product.

3.2.5. Fishbone Diagram (Ishakawa Diagram)

This tool is also called a cause-and effect diagram. It is used in a brainstorming sessions to observe factors that may affect a given situation or affect outcome. The causes are often grouped into various categories such as people, material, process or method, and equipment. The resulting diagram takes the fishbone shape, hence the name fishbone diagram.

3.2.6. Loss Functions

In many manufacturing situations, one creates tolerance limits for a product. Products that do not fall within the limits are called defective and those that are within the limits are considered as good products. Several difficulties arise with this approach. First, there is always the enticement to group products that are just outside the limits into the adequate category, especially if there is a huge push for quantity. Second, and which is more important, the accumulative effect of numerous parts which are all on the tremendous limits of acceptability, may lead to defective performance. The loss function tool is used to know a cost associated with any deviation from the ideal value.

3.2.7. Brainstorming

This process has become a staple of the TQM movement. The concept is to invite participants to suggest "solutions" to a problem without any evaluation of the usefulness or correctness of their ideas. Several approaches are their including open suggestions, rotating suggestions or blind suggestions. There are several computer tools that have been developed and made available to assist in this process. After a fixed period of time or after all suggestions has been received, there is discussion of the "value" of the suggestions.

3.2.8. Affinity Diagram and Tree Diagram

The affinity diagram tool is used to organize large amounts of non-quantitative (ideas, opinions, issues, *etc.*) information into groupings based on natural relationships between the items. It is a very creative process than a logical process. In a very loose sense, the affinity diagram work for ideas what statistics does for numbers, *viz.* extract meaning from raw data. The affinity diagram process is often used with the results of a brainstorming session to organize the resulting ideas. The full range of paths and actions that must be completed to fulfil a major objective and every connected sub goal are meticulously mapped out using a tree diagram tool. It is depicted graphically as a family tree or organizational chart.

3.2.9. Interrelation Digraph

This tool takes complex, multi-variable problems, or desired outcomes, and explores and displays all of the interrelated factors involved. Graphically it shows the logical and often casual relationship between various factors. It is often used in conjunction with the results of an affinity diagram exercise to seek causes and effects in order to determine why corrective action needs to be applied.

3.2.10. Prioritization Matrices and Activity Network Diagram

Prioritization matrices are one of a group of decision making tools that help to prioritize tasks, issues, or possible actions on the basis of agreed upon criteria. While these tools are unable to make decisions directly, they can only help to ensure that all factors are evaluated and they also ensure that logical decisions are reached.

Activity network diagram includes a wide range of project management tools used to plan the most appropriate schedule for a complex project. Classic examples of activity network diagram are Gantt Charts and PERT charts. These tools work likely providing completion time and associated effects and provide a suitable method for judging compliance with a plan. Several excellent computer programs exist for automating the work associated with this class of tools. [11]

3.3. Benefits of Total Quality Management

Total quality management is characterized as an integrated organizational effort that aims to raise standards of quality throughout the entire organization. It has also been described as the finding of excellence, suitability for use, value for money, and client happiness, among other things. Financial advantages include the opportunity to charge higher pricing as opposed to competing ones, reduced costs, and larger returns on sales and investments. Hendricks and Singhai works for ten years and their study showed that there is strong link between financial performance and TQM. Other benefits include better access to international markets, increased customer retention rates, shorter development times for new inventions, and a reputation as a reliable company. Because it takes a lot of time, effort, money, and patience to establish a good programme, very few businesses employ TQM. However, firms with the essential resources may gain major competitive advantages in their industries by the implementation of TQM. [12]

3.4. Quality Risk Management (QRM)

Quality risk management is a procedure that allows for decisions to be made at any stage of the process and is used to assess, control, communicate, and review risks to the quality of pharmaceutical products.

Quality risk management includes:

3.4.1. Identification of Risks

It involves identification of risks before they become serious to be solved.

3.4.2. Analysis of Data

It involves analysis of risk data that and classifying the risks based on their impact and priority.

3.4.3. Planning

Based on analysis of risk data planning for mitigation of risks involved and making decisions how to mitigate risks.

3.4.4. Track

Monitor the plans for risk mitigation and also monitoring

risk indicators.

3.4.5. Control

It involves strict control over risk mitigation plan to avoid deviation from these plans.

3.4.6. Communication

It involves communication of feedback about quality risk management plans, their usefulness in mitigation of risks and about finding the emerging risks. [10]

3.5. TQM Philosophies

TQM philosophies made up of three key elements-customer focus, people involvement and continuous improvement.

- a) *Customer focus*: By considering definition, TQM is a customer-oriented philosophy. Finding out who are the customers? is the first step towards delighting them. It is necessary to take into account both internal and external customers. Because expectations are dynamic, a company must maintain close communication with its clients and put systems in place to ascertain their expectations and gauge their levels of satisfaction.
- b) *People involvement*: TQM stresses the importance of involving everyone in the process of "customer driven" continuous improvement, which can only happen if all staff is given the space and responsibility to innovate and make decisions. This generally implies a new job design, which encompasses more autonomy and flexibility in performing daily activities.
- c) *Continuous improvement*: Continuous improvement requires an organizational culture that constantly encourages members to innovate, minimizes fear and provides them with a rich and diverse set of tools. Improvement comes from identifying and learning from mistakes, implementing corrective actions to overcome mistakes and trying new things based on the lessons learned from the past. Thus, improvement opportunities must be continuously identified and feedback collected from external and internal customers to continuously measure progress towards the goals. [13]

3.5.1. Deming's Approach

Deming had made a highly significant contribution during the war in increasing America's industrial efficiency. Ideas of Deming were well received by engineers and scientists after the war was won, yet top management did not respond to his ideas. At that time industry went back to the old conventional ways of trying to meet consumer market. At that time in Japan Deming found a much more interested audience to share his ideas. His ideas once implemented led during the 80s, to American business was being battered by Japan's superior industrial practices. The rest of the world was then forced to take his ideas seriously in order to compete and survive. This was done by adopting "Japanese methods" such as TQM and Lean Manufacturing.

Deming proposed 14 points as the principles of TQM,

which are listed below:

- a) "Create a constancy of purpose"
 - 1) Define the problems of today and the future
 - 2) Allocate resources for long-term planning
 - 3) Allocate resources for research and education
 - 4) Constantly improve design of product and service
- b) "Adopt the new philosophy"
 - 1) Quality costs less not more
 - 2) Superstitious learning
 - 3) The call for major change
 - 4) Stop looking at your competition and look at your customer instead
- c) "Cease dependence on inspection"
 - 1) Quality does not come from inspection
 - 2) Mass inspection is unreliable, costly, and ineffective
 - 3) Inspectors fail to agree with each other
 - 4) Inspection should be used to collect data for process control
- d) "Do not award business based on price tag alone"
 - 1) Price alone has no meaning
 - 2) Change focus from lowest initial cost to lowest total cost
 - 3) Work toward a single source and long-term relationship
 - 4) Establish a mutual confidence and aid between purchaser and vendor
- e) "Improve constantly the system of production and service"
 - 1) Quality starts with the intent of management
 - 2) Teamwork in design is fundamental
 - 3) Forever, continue to reduce waste and continue to improve
 - 4) Putting out fires is not improvement of the process
- f) "Institute training"
 - 1) Management must provide the setting where workers can be successful
 - 2) Management must remove the inhibitors to good work
 - 3) Management needs an appreciation of variation
- g) "Adopt and institute leadership"
 - 1) MBO's
 - 2) Work standards
 - 3) Meet specifications
 - 4) Zero defects
 - 5) Appraisal of performance
 - 6) Replace with leadership
 - 7) Leaders must:
 - i. Remove barriers to pride of workmanship
 - ii. Know the work they supervise
 - iii. Know the difference between special and common cause of variation
- h) "Drive out fear"
 - 1) The common denominator of fear
 - 2) The fear of knowledge
 - 3) Performance appraisals
 - 4) Management by fear or numbers
- i) "Break barriers among staff areas"

- 1) Know your internal suppliers and customers
- 2) Promote team work
- j) "Eliminate slogans, exhortations, and targets"
 - 1) They are directed at the wrong group
 - 2) They generate frustration and resentment
 - 3) Use posters that explain what management is doing to improve the work environment
- k) "Eliminate numerical quotas"
 - 1) They impede quality
 - 2) They reduce production
 - 3) A person's job becomes meeting a quota
- l) "Remove barriers"
 - 1) Performance appraisal systems
 - 2) Production rates
 - 3) Financial management systems
 - 4) Allow people to take pride in their workmanship
- m) "Institute a program of education and self-improvement"
 - 1) Commitment to lifelong employment
 - 2) Overtime and education
 - 3) Work with higher education of needs
 - 4) Develop team building skills in children
- n) "Take action to accomplish the transformation"

Management must:

 - 1) Struggle over the fourteen points
 - 2) Take pride in the new philosophy
 - 3) Include the critical mass of people in the change
 - 4) Learn and use the Shewhart cycle [14, 15]

3.5.2. Juran's Approach

Juran believed that main problems in quality are arises due to management rather than workers. The attainment of quality requires activities in each and every function of a firm. Firm-wide quality assessment, use of statistical methods, supplier quality management, quality information system and competitive benchmarking are essential for quality improvement. Juran's method emphasizes on teamwork and project work, which can serve to encourage quality improvement, enhance communication and coordination between management and employees, as well as improve coordination within the workforce. As per Juran's opinion, customer needs, are crucial to realize. Identifying customer needs requires more detail analysis to make sure that the product not only satisfies consumer needs but also that it is appropriate for the use for which it is designed. As a result, market research is essential for determining client wants. Juran considered quality management as three fundamental processes (known as Juran Trilogy) as Quality control, quality improvement and quality planning. Juran defined four wide categories of quality costs, which can be used to estimate the firm's costs related to quality. Such information is very fruitful for quality improvement.

The four quality costs are listed as follows:

- a) Internal failure costs (scrap, rework, failure analysis, etc.), related with issues that were discovered before the product was given to the customer;
- b) External failure costs (allowances, complaint

adjustment, returned material, warranty charges, etc.), associated with defects found after product is shipped to the customer;

- c) Appraisal costs (incoming, in-process and final inspection and testing, maintaining accuracy of testing equipment, product quality audits, etc.), incurred in determining the degree of conformance to quality requirements;
- d) Prevention costs (quality planning, training, new product review, supplier quality evaluation, quality audits, etc.), incurred in keeping failure and appraisal costs to a minimum. [15]

3.5.3. Crosby's Approach

Crosby (1979) in his study acknowledged a number of key principles and practices for a successful quality improvement program, which include some examples like management responsibility for quality, management participation, employee recognition, employee education, reduction of the cost of quality (this includes- prevention costs, failure costs and appraisal costs), emphasis on prevention rather than later inspection, doing things right the first time with zero defects.

Crosby offered a 14-step program that can direct the firms in pursuing quality improvement. These steps are as given below:

- a) Management commitment: To make it clear where management stands on quality.
- b) Quality improvement team: To run the quality improvement program.
- c) Quality measurement: To provide a display of current and potential nonconformance problems in a manner that permits objective evaluation and corrective action.
- d) Cost of quality: To define the ingredients of the cost of quality, and explain its use as a management tool.
- e) Quality awareness: To provide a method of raising the personal concern felt by all personnel in the company toward the conformance of the product or service and the quality reputation of the company.
- f) Corrective action: To provide a systematic method of resolving forever the problems that are identical through previous action steps.
- g) Zero defects planning: To investigate the various activities that must be conducted in preparation for formally launching the Zero Defects program.
- h) Supervisor training: To define the type of training that supervisors need in order to actively carry out their part of the quality improvement program.
- i) Zero defects day: To create an event that will make all employees realize, through a personal experience, that there has been a change.
- j) Goal setting: To turn pledges and commitment into actions by encouraging individuals to establish improvement goals for themselves and their groups.
- k) Error causal removal: To give the individual employee a method of communicating to management the situation that makes it difficult for the employee to meet the pledge to improve.

l) Recognition: To appreciate those who participate.

m) Quality councils: To bring together the professional quality people for planned communication on a regular basis.

n) Do it over again: To emphasize that the quality improvement program never ends. [15]

3.5.4. Ishikawa's Approach

Ishikawa (1985) argued that quality management extends ahead of the product and encompasses after-sales service, the quality of individuals, the quality of management and the quality of firm itself. He claimed that the success of a firm is well dependent on treating quality improvement as a never-ending search or discovery. A commitment to continuous improvement can assure that people will not at all stop learning. He advocated employee participation as the key to the successful implementation of total quality management. He believed that Quality circles are an important vehicle to achieve TQM. Additionally, he emphasized the role that education plays in quality, saying that it is the beginning and the end of quality. Ishikawa is linked to the creation and promotion of universal education in the following seven quality assurance measures.

These *tools* are listed below:

- 1) Pareto chart
- 2) Cause and effect diagram (Ishikawa diagram)
- 3) Stratification chart
- 4) Scatter diagram
- 5) Check sheet
- 6) Histogram
- 7) Control chart

Ishikawa's concept of TQM contains the following six *fundamental principles*:

- 1) Quality first-not short-term profits first
- 2) Customer orientation-not producer orientation
- 3) Customer-breaking down the barrier of sectionalism
- 4) Using facts and data to make presentations-utilization of statistical methods
- 5) Respect for humanity as a management philosophy- full participatory management
- 6) Cross-functional management. [14]

3.5.5. Kaizen Philosophy

Kaizen is an improvement strategy that involves everyone in the organization, from top management to managers to supervisors to employees, in a continuous improvement process. Both managers and employees in Japan have the idea of Kaizen so deeply ingrained in their minds that they frequently aren't even aware that they are thinking of it as a customer-driven strategy for improvement. The fundamental tenet of Kaizen is that those who perform a work are the most informed about that task; as a result, by incorporating them and having faith in their talents, improvements can be made. In addition to this, the team effort encourages innovation, change and by involving all levels of employees, the imaginary organizational barriers get disappear to make room for productive improvements. From such a point of view, Kaizen is not only an approach to competitiveness in

manufacturing but also everybody's business, because its idea is based on the concept that every person has keen interest in improvement. [16]

4. Conclusion

In today's day to day life we are using different products from the market. Sale of the such products is based on the quality of the product. The quality is critically important ingredient for the success of organization and this can be achieved by total quality management. By applying TQM we can prevent defects rather than to detect defects in products and processes. If any company will apply this tool for their improvement it helps in providing the quality product at low cost by avoiding defects. Actually, this is the future need of all industries to maintain their level in competitive market by fulfilling customers need by providing quality product.

TQM gives assurance about the quality of product, which is applied for all processes about product. This review gives detail idea about total quality management including five philosophies about TQM.

Abbreviations

TQM: Total Quality Management; SPC: Statistical Process Control; PDCA: Plan-Do-Check-Act; QRM: Quality Risk Management; MBO: Management by Objectives.

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