

Implementing Total Quality Management to Improve Facilities and Resources of Departments in Engineering Institute

Sumit P. Raut, Laukik P. Raut

Student, M. Tech. (CAD/CAM) Department of Mechanical Engineering G. H. Raisoni College of Engineering Nagpur, India

Assistant Professor Department of Mechanical Engineering G. H. Raisoni College of Engineering Nagpur, India

Abstract

This research work aims to understand Total Quality Management concepts and evaluating the extent of TQM implementation in Mechanical Engineering Department through student feedback survey.

In keeping with the newer demands that have been placed on the self financed educational system by the various stakeholders, the technical educational system in particular, has been pressured to shift its focus from one in quantitative expansion to one with emphasis on quality. Growth and survival of these institutes is fully depending on their competitive working style, opinions of their customers/students about their performance, and contribution to economic growth. It is being increasingly recognized that high quality of products and services are associated with customer satisfaction and they are the key points for survival for any organization whether educational or otherwise. Not oblivious to the need for adaptation to serve the interests of its stakeholders, in terms of greater responsiveness, the educational system has begun to realize the significance of total quality management (TQM) in education.

Keywords: TQM, Stakeholder, educational institute.

I. Introduction

In the 1980s to the 1990s, a new phase of quality control and management began. This became known as Total Quality Management (TQM). Having observed Japan's success of employing quality issues, western companies started to introduce their own quality initiatives. TQM, developed as a catchall phrase for the broad spectrum of quality-focused strategies, programmed and techniques during this period, became the centre of focus for the western quality movement. A typical definition of TQM includes phrases such as: customer focus, the involvement of all employees, continuous improvement and the integration of quality management into the total organization. Although the definitions were all similar, there was confusion. It was not clear what sort of practices, policies, and activities needed to be implemented to fit the TQM definition.

[1]Recognizes the need for continuous improvement, cultural change and effective use of financial resources to improve the value addition at each level. Develops an understanding of the issues to be addressed at each phase of TQM implementation. It is expected that insights gained will help sensitize the emerging self-financed institutions towards the demands of new age students. Conclusions derived will also provide some opportunities for reflection by students, faculty members and leaders/top management of institutions for continuous

development at an individual as well as institutional level. A novelty of work lies in the use of a mix of qualitative and quantitative approaches, which not only evaluates the present system but develops an understanding of future challenges to continuous improvement.

Main objective of Total Quality Management is sustained (if not progressive) customer satisfaction through continuous improvement, which is accomplished by systematic methods for problem solving, breakthrough achievement, and sustenance of good results (standardization).

II. OBJECTIVES OF THE STUDY

The study carried out under the topic Total Quality Management. This research work aims 'to understand & implement Total Quality management and evaluating the extent of success of TQM implementation in Mechanical Engineering Department through student feedback survey'.

Other objectives are:

- To understand the concepts of total quality management.
- To study Resources & Facilities to determine the current status of quality level in the Mechanical Engineering Department.
- To analyze the performance of various facilities and resources offered by the Institute for the benefit of students from Mechanical Engineering Department.

- To suggest recommendations and suggestions towards improvement in the overall quality structure of the Department of Mechanical Engineering according to TQM fundamentals.

III. LITERATURE REVIEW

According to Juan jose tari [2] quality management consists of set of components, critical factors, tools, techniques and practices. The objective of this study is to identify the components of the TQM, in order to make them known to managers and thus facilitate successful management implementation and to show the situation.

After this review, it can be said that there is no unique model for good TQM program and TQM is a network of interdependent components, namely critical factors, practices, techniques and tools.

This paper has pointed out, on the one hand, which TQM components must be considered by manager who desired to successful implement TQM within their firms. One the other hand, it examine the TQM elements in ISO-9000 certified firms. The result may be use to identify the situation of many certified firms and show this firms must be improve their people oriented and use quality improvement tools to higher extent.

G. Dennis Beecroft [3], says that organization strive to increase their bottom performance. In this highly competitive environment they often forget to integrate to important planning activities, strategic and quality planning. This level due to lack of understanding of laws and effective relationship between strategy, quality, productivity, profitability and competitiveness.

It also indicates how to maximize the profit of an organization. It is necessary to understand the objectives and priorities of the business and quality improvement process.

According to Anoop Patel [4] the cultural attitudes need changing if TQM is succeed and as Crosby 'changing mind set', is the hardest of management jobs. TQM is more recent element of quality improvement which Cotton is currently studying, particular emphasis is being set up of interfacing departments under the question "how can we improve our service to the next operation", culmination of all above quality elements have brought about consistent reduction in reject level to ford. Each of these elements has played a part towards the organization goal of continuous improvement.

According to John M. Ryan [5], in order to get the relevant information about Total Quality Management (TQM) is a systematic approaches to quality improvement that varies product and service specifications to customer performance. Its aim to produce the specifications with zero defects. This creates a virtuous cycle of continuous improvement

that boosts production, customer satisfaction and profits. Most companies today have chosen to adopt a TQM program. It refers to an integrated approach by management to focus all functions and levels of an organization on quality and continuous improvement. Over the years, it has become very important for improving a firm's process capabilities in order to achieve fit and sustain competitive advantages. It focuses on encouraging a continuous flow of incremental improvements from the bottom of the organization's hierarchy. It is not a complete solution formula as viewed by many – formulas cannot solve managerial problems, but a lasting commitment to the process of continuous improvement.

According to C. L. Yeung [6] in the field of Industrial Engineering suggests that the improvement of quality management practices is a continuous development process. According to this suggestion, a Quality Management System (QMS) is developed gradually and not in sudden dramatic jumps. It has also been pointed out by many authors that the improvement of quality management progressively leads to more efficient internal operations, followed by better satisfied external customers and eventually superior marketing and financial performance. However, the results from a number of case studies in our investigation reveal that those manufacturing companies in Hong Kong which realize that quality is an important strategic consideration for improving their sales and marketing performance invest heavily in quality management and develop their QMS close to standard suggestions in the literature but the transformation is too rapid. These manufacturing firms do not really improve their customer satisfaction by making internal operations more efficient. Instead, they put great effort in developing their QMS in order to satisfy their customers with quality products at low prices, resulting in market growth but not gains in financial benefits. This investigation suggests that quality management in such companies should be conducted in a cost-effective way and directed towards improving the operational efficiency and effectiveness of the entire organization rather than simply satisfying the customers.

According to Frank Dewhurst [7] The origins of the term TQM and clarify the different definitions employed by academics and practitioners. Feigenbaum and Ishikawa are perhaps the greatest contributors to the development of the term. The other recognized quality management gurus such as Crosby, Deming and Juran have shaped the dimensions, practices and mechanism which underpin the concept, but it is noted that none of these three actually uses the TQM term. TQM started to be used in the mid-1980s and only became a recognized part of the quality-related language in the late 1980s. The paper also

analyses the key dimensions of TQM and traces their origins.

Roberto antony [8] proposed a framework to help quantity practitioner involved in the task of quality planning. The proposed framework utilizes both external and internal information (such as market diagnosis and organization strategic plans) which are filtered through the methodology and techniques as quality management to deliver time phase plan consisting of the main action required to implement TQM in either in manufacture or service.

IV. OVERVIEW OF TOTAL QUALITY MANAGEMENT

[9]The concept of quality has existed for many years, though it's meaning has changed and evolved over time. In the early twentieth century, quality management meant inspecting products to ensure that they met specifications. In the 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. In the 1960s, with the help of so-called "quality gurus" the concept took on a broader meaning. Quality began to be viewed as something that encompassed the entire organization, not only the production process. Since all functions were responsible for product quality and all shared the costs of poor quality, quality was seen as a concept that affected the entire organization. The meaning of quality for businesses changed dramatically in the late 1970s. Before then quality was still viewed as something that needed to be inspected and corrected. However, in the 1970s and 1980s many U.S. industries lost market share to foreign competition. In the auto industry, manufacturers such as Toyota and Honda became major players. In the consumer goods market, companies such as Toshiba and Sony led the way. These foreign competitors were producing lower-priced products with considerably higher quality. To survive, companies had to make major changes in their quality programs. Many hired consultants and instituted quality training programs for their employees. A new concept of quality was emerging. One result is that quality began to have a strategic meaning. Today, successful companies understand that quality provides a competitive advantage. They put the customer first and define quality as meeting or exceeding customer expectation.

Since the 1970s, competition based on quality has grown in importance and has generated tremendous interest, concern, and enthusiasm. Companies in every line of business are focusing on improving quality in order to be more competitive. In many industries quality excellence has become a standard for doing business. Companies that do not meet this standard simply will not survive.

- CONCEPT OF TQM

[10]What characterizes TQM is the focus on identifying root causes of quality problems and correcting them at the source, as opposed to inspecting the product after it has been made. Not only does TQM encompass the entire organization, but it stresses that quality is customer driven. TQM attempts to embed quality in every aspect of the organization. It is concerned with technical aspects of quality as well as the involvement of people in quality, such as customers, company employees, and suppliers. Here we look at the specific concepts that make up the philosophy of TQM.

Definitions:

“Total Quality Management is a set of management practices throughout the organization, gear to ensure the organization consistently meets or exceeds customer requirement.”

A comprehensive definitions

1) W. Edwards Deming – “Quality is the responsibility of the Management, not the worker. Management must foster an environment for detecting & solving quality problems.”

2) Joseph M. Juran – “Continuous improvement, hands-on management & training are fundamental to achieving excellence in quality”. Contribution- quality trilogy: planning-control-improvement

3) Bill Creech: “A total approach to put quality in every aspect of management”.

4) Kit Sadgrove: “TQM means satisfying customers first time every time. It means enabling your employees to solve problems and eliminate waste”.

5) James W. Cortada: “TQM is strategic, long term set of practices that make it possible for management to introduce continuous improvement initiatives across all function”.

TQM places strong focus on process measurement and controls as means of continuous improvement. Here are the few basic content includes in a total quality management system.

Principles of TQM:

- Management Commitment
 1. Plan (drive, direct)
 2. Do (deploy, support, participate)
 3. Check (review)
 4. Act (recognize, communicate, revise)
- Employee Empowerment
 1. Training
 2. Suggestion scheme
 3. Measurement and recognition

4. Excellence teams
- Fact Based Decision Making
 1. SPC (statistical process control)
 2. DOE, FMEA
 3. The 7 statistical tools
 4. TOPS (FORD 8D - Team Oriented Problem Solving)
- Continuous Improvement
 1. Systematic measurement and focus on CONQ
 2. Excellence teams
 3. Cross-functional process management
 4. Attain, maintain, improve standards
- Customer Focus
 1. Systematic measurement and focus on CONQ
 2. Excellence teams
 3. Cross-functional process management
 4. Attain, maintain and improve standards
- TQM Tools
Here follows a description of the basic set of Total Quality Management tools. They are:
 - Pareto Principle
 - Scatter Plots
 - Control Charts
 - Flow Chart
 - Cause and Effect, Fishbone, Ishikawa Diagram
 - Histogram or Bar Graph
 - Check Lists
 - Check Sheets.

V. METHODOLOGY

‘It involves data collection, its analysis and interpretation. Researcher cannot draw decisions, but it helps the researches in the task of decision making’. A successful researcher will never depend upon guessing but he looks for more accurate information through as research methodology.

1. PRIMARY DATA COLLECTION:

Primary data is the data collected to solve a problem or take advantage at an opportunity on which decision is pending. In this project work the primary data was collected through students feedback forms. The major data has been collected from the consumer through well designed feedback forms and the additional data has been obtained by discussing the project with librarian, each lab in charge and T & P department. They were helpful in parting knowledgeable relevant information about the topic.

2. SECONDARY DATA: This is the existing data, collected from known sources. Some of the secondary means of data collection are:

- Magazines
- Internet,
- Institute data sources
- Journals
- Books

VI. DATA ANALYSIS & INTERPRETATIONS

- 1) SWOT analysis
- 2) A.B.C analysis

- SWOT Analysis

A scan of the internal and external environment is an important part of the strategy planning process. Environmental factor internal to firm usually be classified as Strength (**S**) and Weaknesses (**W**) and those external to the firm can be classified as Opportunity (**O**) Threat (**T**) such an analysis of the strategic Environment is referred as a SWOT analysis.

The SWOT analysis provide information that is helpful in matching the firm resources and capabilities to the competitive Environment in which it operates. as such, it is instrumental in strategy formulation and selection. The following diagram shows how a SWOT analysis fits into an Environment scan.

Brief Description:-

- Strengths:
 - Good institutional culture: Institute decides framework for academic year.
 - Experienced staff: Department is growing with experience and mature staffs in their fields and lightening their students in today knowledge platform. They are more supportive and productive in nature.
 - Excellent sports culture: Institute has provided basic sports facilities to the student and organizes various sports events. They always promote student for participate at institute as well as university level sports competition. Affordable fee structure: College has low fee structure compare to other regional colleges.
 - Healthy environment: Institute has greenery & fresh environment throughout the campus.
 - Well maintain library: Ample quantities and varieties of books are avail by the institute to the students. Recognized national and international journals and research papers are facilitate within the library.
 - Commits toward social responsibility: Apart from education institute works for water harvesting plant in a campus. Institute

organizing various activities such as Helping Hands, NSS camp, blood donation camp, renewable energy sources program to contribute to society.

Weakness:

- **Low recruitment rate:** Institute is unable to bring as many as companies to institute as compare to other institute in the region.
- **Inefficient utilization of facilities:** Labs such as m/c shop, CAD lab, R & D are not use effectively.
- **No separate space for internet accessing:** No separate space for internet surfing such as zone or room.

Opportunities:

- **Improve industrial relationship:** To get more practical knowledge to the students, the department should arrange more and more industrial visits for the students.
- **Organizing expert lecture:** To get information and knowledge about recent activities and research in the industries.
- **More M. Tech. stream:** Department can grow more by increasing number of M. Tech. Specializations to promote more number of students.

Threats:

- **Location of Institute:** Institute is located far away from city which affects students mentality for choosing an institute.

Table 1 SWOT analysis results

Strength	Weakness
1. Good institutional culture. 2. Experience staff 3. Excellent sport exposure 4. Committed towards social responsibility. 5. Comparatively low fee structure. 6. Healthy environment throughout the campus. 7. Well maintain Library.	1. Recruitment is less. 2. Inefficient utilisation of facilities. 3. No separate space for internet accessing.
Opportunity	Threats
1. Improve industrial relationship. 2. Optimum use of foreign university collaboration. 3. Organising more expert lectures. 4. Increasing more M. Tech streams.	1. Location of college. 2. Good competition from other colleges.

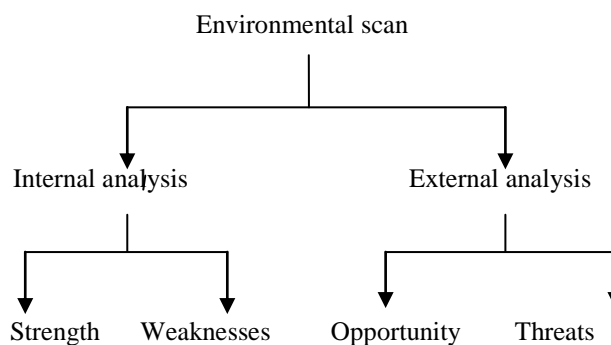


Figure no. 1 SWOT matrix

• **ABC codes:**

- “A class” inventory will typically contain items that account for 80% of total value, or 20% of total items.
- “B class” inventory will have around 50% of total value, or 30% of total items.
- “C class” inventory will account for the remaining 5% or 50% of total items.

A.B.C analysis is similar to PARETO principle in that “A class” group will typically account for large proportion of the overall value but the small percentage of overall volume of inventory.

Another recommended breakdown of ABC classes

1. “A” approximately 10% of item or 66.6% of value.
2. “B” approximately 20% of item or 23.3% of value.
3. “C” approximately 70% of item or 10.1% of value.

A.B.C analysis performed on teaching quality in Mechanical department. For that, prepare a sample feedback forms and distributed it among the mechanical engineering students of department. On the basis of ten important quality factors, rated out of 10 points and obtain a collective data from feedback form and compare it with the standard A.B.C analysis system.

Explanations of quality factor mentioned in feedback form as follows,

1. **Knowledge:** Lecturers should have deep knowledge in their specialize field. He /she must deliver knowledge to the students.
2. **Time management:** They should have proper time management or manage the time in such a way that topic should be complete in prescribed time.
3. **Coordination:** It is necessary to have coordination of teachers with their students so that they can organize the student for specific work completion.
4. **Skill:** Teachers should have command over the subject. They should have very good command in English. They should have ample explanation of

the subject matter and having readjustment of teaching technique if the class does not follow him or her.

5. Friendly: Lecturers should treat student politely. They always show faith on the student.
6. Behavior: They don't differentiate the student on the basis of their quality. They should just go on motivating then enthusiastically.
7. Personality: It is an important factor that influence mainly to the student, if the teacher's gesture is up to the mark teacher may influence & dominant over the student.
8. Initiative: Teacher must have the tendency to promote students for doing innovative things. They must show faith to the student and always provide moral support to them.
9. Language: It is also an important factor for consideration. If language is not understandable they cannot deliver to the student at all about the subject.
10. Technique: It is the term related to the methodology to teach a particular topic during the lecture. For example, giving a good example for

understanding the topic.

To keep the following specification for the key words A, B and C in table

Table 2 ABC analysis

Codes	Rating	Marks
A	Very good	Above 8
B	Good	5-8
C	Average	Up to 5

By evaluating all the feedback form taken from students and applied 100% sampling plan to the result obtained. Then, sum up all the number awarded to each teacher and calculate the average of all the numbers. Further, based on above specification and categories the resources into their respective regions.

Table 3 ABC Analysis result

Codes	No. of teachers
A	2
B	7
C	11

Table 4 Feedback form

T vs Q	Knowledge	Technique	Time-Mangt.	Coordi-Nation	Skill	Friendly	Beha- viour	Perso- nality	Initiate- Ative	Language
T1										
T2										
T3										
T4										
T5										
T6										
T7										
T8										
T9										
T10										
T11										
T12										
T13										
T14										
T15										
T16										
T17										
T18										
T19										
T20										
T21										
T22										

Where, T1, T2.....T22 are teachers Q- quality factors

VII. RECOMMENDATIONS & LIMITATIONS

1. RECOMMENDATIONS

Following are the Recommendations in the research work:

1. Guest Lectures: Organizing more guest lecturers so that the student can more interact with industries experts.
2. Industrial Visits: Provision for industrial visits in each semesters so that students can get more practical knowledge about the subject.
3. Internet Access: Providing separate space for internet access to avoid the scattering the student within the campus.
4. Industrial Institution Relationship: Making healthy industrial relations so that it helps in increasing more recruitment in department.
5. Organizing Events: Lack of awareness towards conducting institutes level events as compare to other institute.
6. Research & Development: Promoting students for contributing towards research & development work.
7. Lab Facilities: Repair or replace old or non working equipment in the lab so that equipment salvage value can be recovered after reselling.
8. Transport Facility: There should have a separate bus for the students
9. Library:
 - a) Allow the students to issue the journal.
 - b) Organizing the video lectures.
10. Faculty Development Programs (FDP): Institute should have the faculty development program in terms of their all round development and providing more industrial exposure to promote research work in their field.

2. LIMITATIONS

Following are the Limitations in the research work:

- One of the constraints of project work was the time factor.
- TQM is very vast concept and it is not possible to cover the whole concept.
- Data collection from various sources such as T & P department, labs is difficult.

VIII. CONCLUSION

By understanding the concepts of total quality management given by researchers one come to know how to study and analyse the system to implement Total Quality Management.

Studied the Resources & Facilities of the Mechanical Department and determined the current status of quality level in it based on several parameters like teaching methodology, lab facilities,etc.

By collecting the data from various sections of the Mechanical department, analysis of the performance of various facilities and resources offered by the Institute for the benefit of students from Department was done.

Using the analytical tools of TQM such as SWOT analysis and ABC analysis, this applied to the system of Mechanical Department.

Some recommendations and suggestions are given to improve the overall quality structure of the department. According to TQM fundamentals and limitations understood during completion of the project work.

Future Scope:

1. Total Quality Management can be implemented step by step in all departments of institute.
2. To look forward implement six sigma technique to improve the facilities and resources of Institute.
3. Using TQM institute can get ISO-9000 certificate for its excellence.

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