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# Investigation on Quality Enhancement in Engineering Colleges in Kerala Using TQM

Suresh Babu S[1], Assistant Prof Veena S[2]

[1]*Industrial Engineering and management, RIT College, Pampady,*
[2]*Dept. of Mechanical Engineering, RIT College, Pampady*

**Abstract —** *The quality of higher education is everybody's concern today. Various studies and commission reports at official level has recognized the same and given recommendations for its improvement. Engineering education is currently being steered towards a market-oriented environment. Philosophies like total quality management (TQM), which have been successfully adopted in commercial organizations, are generally seen as the way forward. Institutions of higher learning have now begun to re-examine the educational process and the application of TQM principles in academics. TQM in engineering education is a process that involves the institutions adopting a total quality approach to the entire academic process and environment. For the proper steering and implementation of TQM in engineering education a study is need to be conducted.*

*For the study purpose the engineering education institutions in Kottayam district is selected as the target population. To ascertain and understand the key issues in relation to the working of the engineering education system a pilot study was carried with three focus groups top management, teachers and students. The main aim of the study is to propose a framework for effective Total Quality Management (TQM) implementation in engineering Education. A theoretical framework of the Critical Success Factors (CSFs) for implementing TQM is developed from the literatures. The current climate in engineering education places students as primary consumers, for that the study adopts the SERVQUAL instrument to assess the quality services from the point view of the students. On the other side a structured questionnaire survey is carried out to gather information from management and staff. Finally, the work concludes with proposing a framework for effective implementation of TQM in engineering institutions and some recommendations for education development in the light of TQM and some recommendations for further studies.*

***Keywords:*** *Engineering education; Quality Management; TQM; Critical success factors.*

## I. INTRODUCTION

There is no doubt that the education plays a pivotal role in the development and progress of any country. There has been a widespread belief that education development would lead to accelerated economic growth, more wealth and income distribution, greater equality of opportunity, availability of skilled human power, and national unity and political stability. This belief has made many societies and nations to invest heavily in education. However, increased competition for students, reduced government funding, changing student demographics and decreased student retention are some of the numerous challenges that higher educational institutions have faced around the world. Moreover, increasing expectations from stakeholders has resulted in rising calls for radical improvement.

.Thus, organizations that utilize public funds such as educational institutions face increasing pressures to demonstrate sufficient value in return for resources employed (Pounder et al. 2002).The quality of education is one of the major requirements is this age of globalization which have given rise to many problems that this institutions have to face. Therefore higher education institutions that want to overcome these challenges, cope with these difficulties, may need to search for effective and creative way to enhance their total quality systems management.

## II. METHODOLOGY

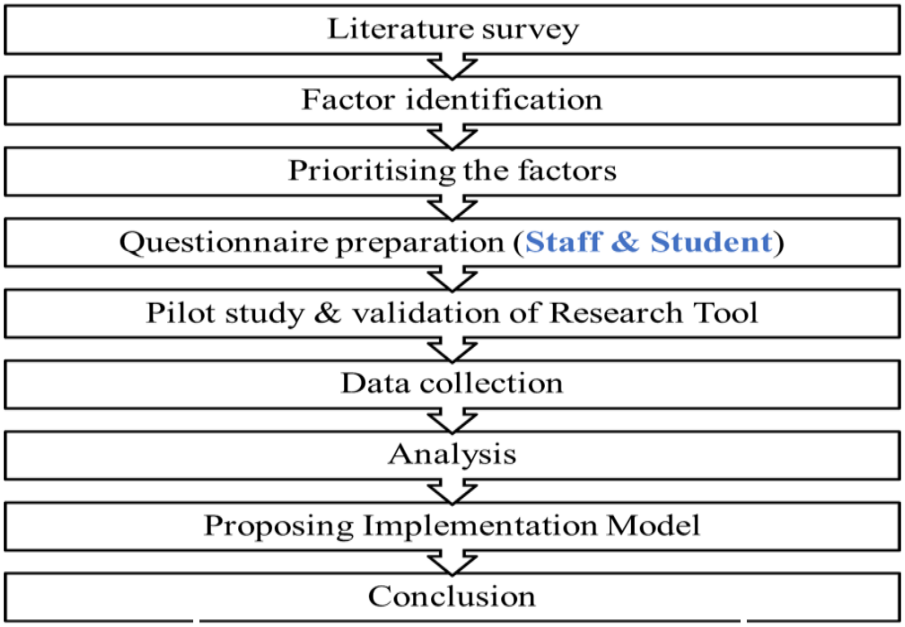



***Figure 1. Methodology***

## III. DATA COLLECTION

### 3.1 Method &Time horizon

The total time spend by the researcher to complete the work from the beginning of formulation of research question till the accomplishment of the final research objective. Usually the research methods are categorized under two types: cross-sectional and longitudinal. A cross-sectional study is one of a particular phenomenon at a particular time; data are collected just once, so it is called "one-shot".

While a longitudinal study involves a survey, is a fixed sample, which is measured repeatedly. The choice of which one of these types to be undertaken is influenced by three factors; purpose of research, research strategy and time available for the researcher.

### 3.2 Questionnaire

Questionnaire can be defined as "a reformulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives". Questionnaire survey is the mostly used and popular data collection tool for management studies. Moreover, questionnaires can be more economical in terms of time and money and can be given to many people simultaneously. This is in addition to the greater uniformity a questionnaire can provide in gathering information. There are many types of questionnaires based on how it is administrated, classified a questionnaire as: *"either self-administered or interviewer-administered"*.

Self-administered questionnaires are usually completed by the respondents. Such questionnaires are delivered and returned electronically (on-line questionnaires), posted to respondents who return them by post after completion (postal or mail questionnaires), or delivered by hand to each respondent and collected later (delivery and collection questionnaires).

### 3.3 Piolet survey

The purpose of the pilot test is to refine the questionnaire so that respondents will have no problems in answering the questions and there will be no problems in recording the data. In addition, it will enable you to obtain some assessment of the questions' validity and likely reliability of the data that will be collected.

The main purposes of the pilot study were to:

- Determine whether the questionnaire instructions were easily understood.
- Identify questions that could be misunderstood or were poorly worded.

- Determine whether rating scales were understood.
- Determine how long it would take participants to complete the survey.
- Determine the participants' reactions to the survey in general.
- Make an initial reliability assessment of the measurement scales.

**3.4 Questionnaire Design**

The aim of the questionnaire design is to translate the research objectives into specific questions. The answers of these questions should provide data for answering all or more of the research questions, planning and designing the questionnaire. Good questionnaire construction is critical to the success of the survey; a poorly designed questionnaire can be the main sources of non-sampling error which can affect the response rate achieved in the survey.

The measurement scale of the questionnaire is one of most important parts of the questionnaire development process, since it has a significant impact on capturing the variables of the phenomena, reliability and validity, response rate, and lower item omissions per respondent. A five-point Likert ordinal scale was employed throughout the questionnaire in order to indicate the degree of agreement or disagreement with each statement included in the questionnaire. This scale is widely used and provides a range of responses to a given question or statement.

In this research there are two main questionnaires, the first one has targeted the top management and the faculties.
The second one has targeted the students in the case studies in order to assess the services that been delivered to them.

**3.5 Population identification**

A population is defined as the whole set of objects or things of interest that need to be investigated. The target population was selected from Kottayam district, which is known as the city of letters. For the research purpose of my study the target population was engineering colleges in Kottayam district which comes under two different clusters under KTU, Kottayam and Idukki. There are ten engineering colleges in Kottayam consisting both governments controlled and self-financing colleges. The population and sample size calculation for the study was calculated using the Krejcie & Morgan table

Engineering Education Institutions in Kottayam
1. Amal Jyothi College of Engineering
2. College of Engineering Poonjar
3. College of Engineering Kidangoor
4. GISAT
5. KITS
6. Mangalam College of Education
7. St. Joseph College of Engineering & Technology
8. Saintgits College of Engineering
9. Rajiv Gandhi Institute of Technology
10. Visvesvaraya Institute of Engineering & Technology (TOMS).

**Sample size calculation:**

**Table 3.1** sample Size calculation

| | **Staff** | **Student** |
|---|---|---|
| **Population** | **4275** | **1297** |
| **Confidence level** | **95%** | **95%** |
| **Margin of error** | **5%** | **5%** |
| **Sample size** | **353** | **298** |

## IV. RESULTS

The data collected using questionnaire was coded, tabulated and subjected to analysis using the statistical package for social sciences and Microsoft Excel.

### 4.1 Reliability of Questionnaire

As mentioned earlier, Cronbach's alpha measurement of internal consistency was utilised to evaluate the overall reliability of the measurement scale, where alpha gives an estimate of the proportion of the total variance that is not due to error which represents the reliability of the scale. The recommended minimum acceptable level of reliability "alpha" is 0.70. Table 4.1 provides a summary of the reliability analysis. For the data collection process there were two sets of self-administrated questionnaire. Among the two sets one set was for staff and faculties and another set was for the students. The questionnaire set designed for the staff members and faculties were analysed using the SPSS software package for reliability analysis.

**Table 4.1 Questionnaire Pattern**

| Items | Statements |
|---|---|
| Leadership | 4 |
| Training & Education | 6 |
| Continues Improvement | 5 |
| Employee Involvement | 6 |
| Academic Condition | 4 |
| Financial Condition | 5 |
| Organizational Structure | 4 |

### 4.2 ANALYSIS OF DEMOGRAPHIC VARIABLE

The primary purpose of this section is to describe the participants in this study who completed the survey with respect to the following demographic variables: (a) Age, (b) Gender, and (c) Experience. The descriptive information, which involved simple descriptive statistics, Frequencies, measures of central tendency and measures of dispersion are presented in the following figures and tables.

**Table 4.2 Gender**

| Sl. No: | Gender | No. of Respondents |
|---|---|---|
| 1 | Males | 114 |
| 2 | Females | 184 |
| | | 298 |

**Figure 4.1**

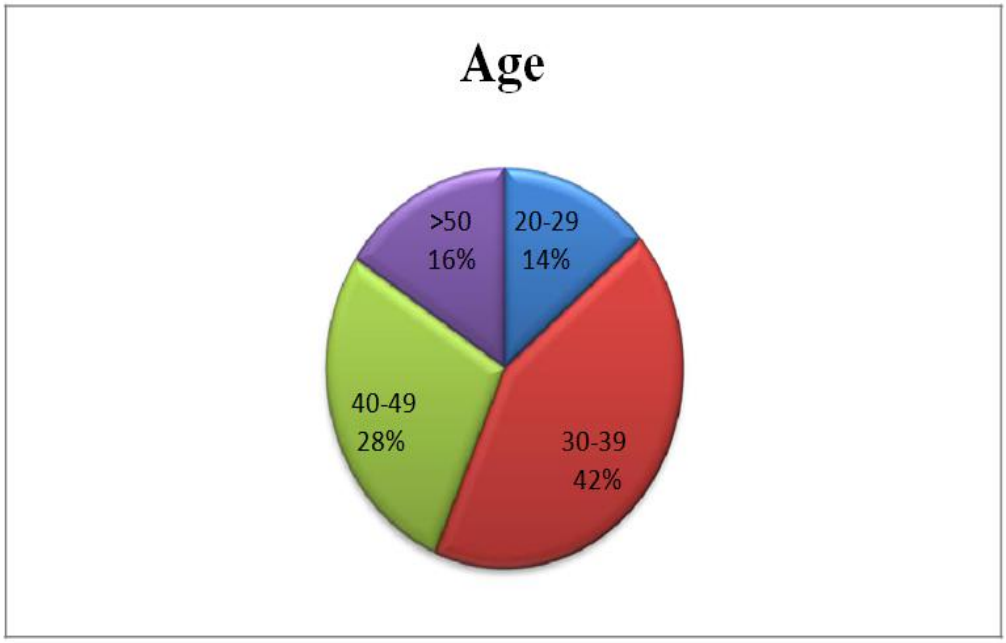
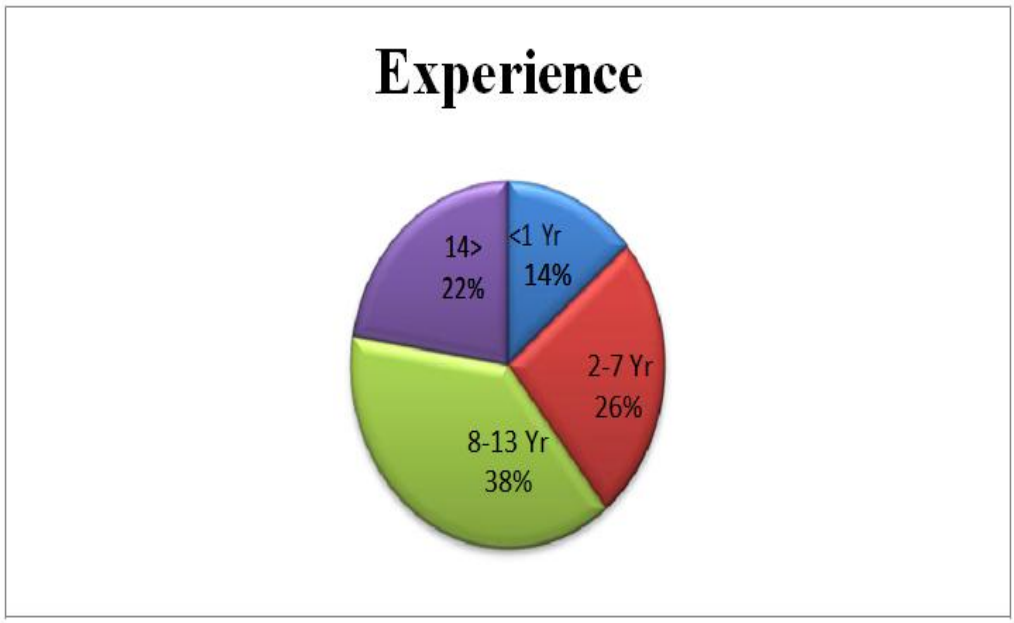



**Figure 4.2**




**4.2 Quality Culture Assessment**

The researcher built his questionnaire on the eight quality culture factors that have been considered as a critical success factors (CSFs) which discussed in literature review. Based on the analytical framework and the literature review, the quality culture consists of:

Leadership; Training & education; Continues improvement; Employee's involvement; Organisational Structure; Financial and Academic conditions. In addition, based on the literature these elements are very essential to enhance quality and to create culture that is suitable to implement TQM successfully. Every element is measured against the ideal score (5) as mentioned methodology.

**Table 4.3 The whole Quality Culture**

| Sl. No | Critical Success Factor | Mean | S. D |
|---|---|---|---|
| 1 | Leadership | 2.90 | 0.86 |
| 2 | Training & development | 2.54 | 0.66 |
| 3 | Continues improvement | 2.67 | 0.78 |
| 4 | Employee involvement | 2.93 | 0.75 |
| 5 | Academic condition | 3.17 | 0.91 |
| 6 | Financial condition | 3.22 | 0.87 |
| 7 | Organizational Structure | 3.35 | 0.94 |

| | Mean | Std. Dev |
|---|---|---|
| **Whole culture** | **2.94** | **0.82** |

The Table shows that the mean score means of quality culture (2.92) out of (5) on five-Likert scale. It means that the quality culture (as a whole) which consists of (7 critical success factors including: Leadership, Training &Education, Continues Improvement, Employee Involvement, Organizational Structure, Financial Condition and Academic Condition) is below the ideal situation. It shows the gap between the actual and ideal situation of the quality culture at the first case study through the critical success factors (CSFs). This is because the low level of practices of all the quality culture components.

**4.5 Student's perception and expectation on Quality Culture**

The SERVQUAL instrument was used to assess the student satisfaction. It measures the difference between what is expected from a service encounter and the perception of the actual service encounter (Service Quality (Q) = Perception (P) - Expectation (E). This section presents the finding of student satisfaction through the: Tangibility; Reliability; Responsibility; security and Empathy factors.

For the service quality gap analysis the selected ten colleges in Kottayam district were grouped into two on the basis of recent analysis of colleges in each semester exams conducted by KTU. The first group consisting Amal Jyothi College of Engineering, St. Joseph College of Engineering & Technology, Saintgits College of Engineering and Rajiv Gandhi Institute of Technology. Whereas the second list Consisting the remaining six colleges, College of Engineering Poonjar, College of Engineering Kidangoor,GISAT,KITS, Mangalam College of Education and TOMS.

**4.5.2 Service quality Gap score**

Service quality gap assessment in the following colleges, **AJCE, SAINTGITS, SJCET, RIT**

**Table 4.4** Service Quality gap score of group -1 colleges

| Sl.No | Dimension | Expectation score | Perception score | Gap score |
|---|---|---|---|---|
| 1 | Tangibility | 4.35 | 3.71 | -0.64 |
| 2 | Reliability | 4.70 | 3.35 | -1.35 |
| 3 | Responsibility | 4.71 | 3.35 | -1.36 |
| 4 | Security | 4.14 | 3.42 | -0.72 |
| 5 | Empathy | 4.59 | 3.35 | -1.24 |

The overall service quality gap score for the first group of four college is obtained as -1.062
Service quality gap in the remaining colleges **GISAT,KITS,KIDANGOOR,MANGALAM,POONJAR, TOMS**

**Table 4.5** Service Quality gap score of group -2 colleges

| Sl.No | Dimension | Expectation score | Perception score | Gap score |
|---|---|---|---|---|
| 1 | Tangibility | 4.55 | 1.95 | -2.60 |
| 2 | Reliability | 4.67 | 1.996 | -2.67 |
| 3 | Responsibility | 4.71 | 2.15 | -2.56 |
| 4 | Security | 4.16 | 2.91 | -1.25 |
| 5 | Empathy | 4.60 | 1.77 | -2.83 |

The overall service quality gap for the second group of six colleges is obtained as -2.382.
The gap score analysis reveals that students are not satisfied with the service they received. Based on all the dimensions of servqual it is visible that the students in the first group of colleges are more over satisfied to the service provide to them than those on the second group of colleges. The highest gap is observed in empathy and followed by reliability, tangibility and responsibility

## V. Proposed Theoretical Frame work

The frame work based on the fact that the shift from traditional management to a TQM culture is revolutionary and should come after profound thinking about what is involved during every stage of the transformation. Self-assessment of quality culture is the first step in TQM implementation. The Self- Assessment process allows the organisation to discern clearly its strengths and areas in which improvements can be made and culminates in planned improvement actions which are then monitored for progress.

The development of this model was based on the TQM literature review. The model can assist its users in evaluating the strengths and weaknesses of their quality culture, targeting their improvement areas, setting up an action plan for improvements, and tailoring a special part to the needs of their institutions. The TQM implementation frame work developed in this study consists of three stages.

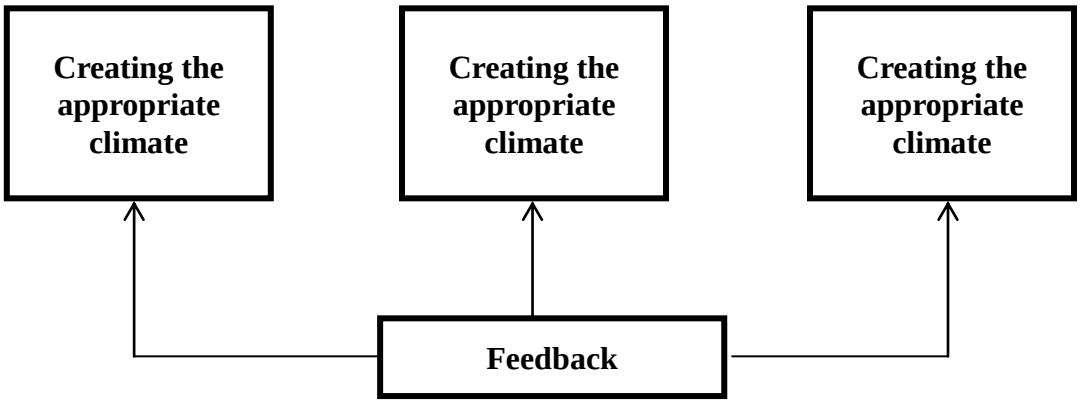



**Figure 5.1** Theoretical frame work

## V. FINDINGS AND RECOMMENDATIONS

### 6.1 Findings

I. Engineering institutions could develop a strategy for implementing TQM by paying more attention to the identification, analysis and adoption of an appropriate organisational culture that suits TQM implementation.
II. Inadequate infrastructure and the associated resources should be considered, since there is a severe lack of resources and infrastructure (buildings including lecture halls, laboratories, libraries, poor book stock, poor journal stock, lack of computing facilities, and no internet access to students.
III. Along with all the supporting factors in favourable to implement TQM, but without proper financial stability and availability of adequate funding the implementation process would be a cumbersome process ended in failure.
IV. The institutional mission and vision must be effectively communicated and explained to all people in face-to-face meetings in order that staff feedback may be obtained, and subsequent improvements made to the service provided.
V. Regular feedback is essential to correct unwanted results and to encourage successful implementation, along with the Performance measurement and assessment is to be practiced within a TQM approach.

### 6.2 Recommendations

I. The secondary school sector is considered as an input to the Engineering higher education sector. Thus it is recommended to conduct such studies in secondary school where the improvement of quality in this sector will lead to enhance the quality of higher education.
II. Implementation of TQM needs provision of sufficient resources with suitable budget. So, it can be implemented fully and properly.
III. Proper training could be given to the heads of the institutions, principals and managers in the institution regarding the worth and benefits of TQM.
IV. Further empirical studies using large sample sizes and greater geographical diversity may be helpful in further validating the findings of this study.
V. The implementation of any development needs time and preparation to be introduced to an educational organization, as any sudden change may end in failure as a result of strong opposition.
VI. All implementers should have the necessary training. This is to enable them to acquire the new knowledge and implement the development effectively.

## VII. CONCLUSIONS

Based on the literature review and the findings from empirical study through the questionnaire. It is evident that a low level of implementation of the critical success factors. It is due to: lack of knowledge of quality management systems, methods and tools; lack of top management commitment which caused a lack of vision; poor strategic competence and employee involvement; poor communication channels and a lack of customer satisfaction. The assessment of the quality culture revealed that the current situation does not lead to implement TQM successfully. Members of top management are hesitant to educate themselves and become role models in leading the quality journey. There is a need to fundamental change in the institutional culture to implement TQM. Also the students are not satisfied with the service provided to them.

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