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Total Quality Management in Educational Organisation: "A Case Analysis"

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ABSTRACT

There is a growing body of knowledge becoming available for quality practice, yet many interested Indian companies are struggling for its implementation. There is no single proven recipe that can be followed. Each company must devise its own approach on its strengths and weaknesses. Typically a combination of a) total people involvement, b) effective quality systems and procedures and c) judicious use of quality techniques can help move on the TQM path. All of these are essential and weakness in any one can severely constrain the overall efforts. This thesis has studied a Service Enterprise striving for quality methods of TQM. It has a good quality system and People at management levels are relatively well involved it is identified that an improved knowledge of quality techniques application can therefore boost the TQM efforts .The research paper described various quality techniques their importance and difficulties in their implementation through a case study conducted at Organization. Education institutions, as part of service industry, have to adopt the TQM universal philosophy of continuous improvement to enhance its status to World Class Excellence. Education provider's had to work on outward- looking policy of finding the expectations and needs of the students. As a result, the education system is to be modified to fulfill their requirements. Improvement in education system and its work environment is a continuous process through feedbacks from all the associates. This is the formal TQM practice in an Engineering Institution, which has resulted in generation of an excellent 'Action Plan' for future improvement. Other Engineering Institutions of the country can follow such best practices and work on improvement plan to achieve World Class excellence status. Survey was used as a data collection tool. Data collection is required in order to assess satisfaction level of customers and identify problems of service delivery process. Recommendations are compiled for process improvement. Survey is conducted at the 4th year of a B.Tech. Degree Engineering course to get information of the 'customer needs/expectations'. However, continuous feedback is obtained during the course from students to improve the process of service provision. Excellent customer's service is a mean of existence for an education institution. Customer satisfaction can be achieved through fulfilling their needs and expectations. It should be the endeavor of every institution to continuously improve their processes of service provision. It takes time and resources to build image and reputation for a service, but can be lost in a moment.

KEY WORDS: TQM, Technical Department, DBA.

INTRODUCTION

Today, industries have to face many challenges due to increase in product complexity and number of operations, stiff competition at national and international level, customer awareness etc. The progress of industrialization and consequently development of new techniques has led to the development of large industrial originality with multilevel operation. Today, industry has to face many challenges due to increasing product complexity and number of operations, stiff competition at national and international, levels, customer awareness etc. To face these challenges, to strive for excellence, and grow in business, the responsibility for product quality has gradually shifted from operator to foreman to inspector to quality control department of quality control measures though sound quality management alone can help the company to withstand the increased competition in the global market. Therefore Quality Management has moved away from inspection-oriented approach to Prevention-oriented approach, where it covers aspects of technology such as Statistical Process Control (SPC), Quality Assurance system as well as techniques for identification of problems and problems solving and some new

concepts. Therefore, Proper understanding of cost of rejection, scrap, rework and warranty claims can lead to in identification of problems. Substantial benefits due to improved productivity and profitability based on this concept can be achieved in industries.

LITERATURE REVIEW

INTRODUCTION OF TOTAL QUALITY MANAGEMENT

Total Quality Management (TQM) basically advocates the introduction and practice of a new culture. This is to be based on waste removal, maximizing organizational effectiveness and encouraging process of innovativeness and adding value by problem solving activity. This process encouraged by people interactions at different levels and continuous and effective communication process, which try to relay continually the need to focus organizational objectives. In other words, TQM refers to the total involvement of staff in an organizational work together, which includes suppliers, distributors and even customers in bringing about quality satisfaction by promoting quality cultures through Quality Circles, job enrichment and effective purchasing. Workers and supervisors have to be trained to solve problems in product/process variations.

Arcelo, A. A. (2009) have pointed out that here is a full literature on quality and TQM, but relatively little offers practical tools for supporting design and implementation processes that enhance the likelihood of achieving quality operation. Robbins, S. P. & Mary, (2010) have documented a relationship between total quality management (TQM) practices and employees' propensity to remain within a large Malaysian semiconductor packaging organization. Despite extensive research on TQM practices, none examines this scope of investigative study. Therefore, the proposed model was developed with the intention of examining this relationship.

Vinod. R Singhal and Kevin B., (2011) documented evidence on the relation between the financial performance from effective implementation of TQM to characteristics such as firm size, the degree of capital intensity, the degree of firm diversification, the maturity of the TQM implementation and the timing of the TQM implementation. It has been stated that smaller firms do better than larger firms. The results also indicate that it is never too late to invest in TQM. Finally, the results imply that the positive impact of TQM is widespread across a spectrum of firms with differing characteristics.

Gregory, V. L. (2011) stated that TQM constitutes the success formula, the world over in the current decade of competitive industrial scenario. In this article, TQM, from the viewpoint of a small supplier of parts to a multinational firm. For this small supplier is a manufacturer of plastic components, located in England and the MNC is Ford Motor Company. His main concept was employing TQM implementation is as important as what the process.

Subba Rao & Raghunathan ,(2011) pointed out in their article TQM and work culture in an empirical analysis that work culture is an important contribution for the success of Quality Management practices. This research analysis, the existence of relationship between work Culture and customer satisfaction. The basic premise being that organizations practicing. TQM and having higher customer satisfaction have better work culture is also being discussed.

Kennedy C.W, (2012) (Management Philosophy) produces his 14 points for management in order to help; people understand and implement the necessary transformation. Furthermore, the Deming cycle and the system of profound knowledge are important considerations in quality improvement.

Grant E.L. AND R.S. Leaven Worth, (2012) have presented an article which dealt in a model of training for TQM implementation in technical training Institutions, at various levels from management to clerical staff, in the sense of identity the responsibility of individual at each level according to its importance and role in achieving academic excellence and systematically designs the training models for each level to fulfill the goals of TQM. Grant and Leaven stated a TQMEX model as the result of survey highlights, where survey conducted 180 UK firms and another survey conducted based on 16 each UK and Japanese firms. Finally, a worldwide TQM movement towards business excellence is predicted and the way TQMEX model can contribute is proposed.

Lal H. (2013) has been made an attempt in his work to examine Quality Performance ratio and their application. He found that Quality Performance Ratio (QPR) is very useful for identifying the ways to improve the ame as well as assessing the effectiveness of the management and function. Lakshmi et al. (2013) documented the reasons for which TQM efforts are failing to improve in companies. They suggested that the companies with successful TQM programs develop quality vision, make Quality a part of strategic planning, establish goals for customers satisfaction, communicate quality vision down to all employees, measure both tangible and intangible costs and benefits and restructure their reward system.

THE CASE STUDY

The college is providing Engineering educations in four disciplines at B.Tech Engineering level. In order to obtained feedback, a comprehensive questionnaire was delivered to students and their feedback was obtained. The questionnaires (separately for each deptt.) are distributed among a sample size of **40, 35, 28, and 20** to students and consequently the average return rate for units was **75 percent**. Four departments respectively are Mechanical, Civil, Electronics & communication, Computer science. In order to gather data, the questionnaire is used. This contains 20 questions which asked to students expectations about Education Aspects with (1-5) like spectrum. Ranking of Department is done by using the DISTANCE BASED APPROACH (DBA) method. In order to test the reliability of the questionnaire, Cronbach's alpha is found to be more than 0.9 for each unit, which indicated that the questionnaire has high internal reliability.

MAJOR AREAS OF STUDY

The study concentrated on Educational Aspects:

a. Standard of Education.
b. Faculty / Teaching Staff
c. System of Examination
d. Laboratories and Libraries
e. Result and Reports

Table 1: Sample table

Departments	SAMPLE QUANTITY	RESPONSES RECEIVE	% RETURNS
Mechanical	40	30	75
Civil	35	25	71
CSE	28	20	71
ECE	30	25	83
Total	133	100	75

SURVEY SCALE

All the major area of case study was measure on a five point scale of 1 to 5.
1 = Unsatisfactory
2 = Needs Improvement
3 = Satisfactory
4 = Good
5 = Very good

METHODOLOGY

DISTANCE BASED APPORACH (DBA)

The Research method of Distance Based Approach (DBA) is applied for supporting the technical department selection is presented in this chapter. It covers all phases in the technical department selection from initial problem definition, over the formulation of parameter, to the final choice among the potential technical department. Moreover, the propose method for selection have not been suggested so far. So there is a need to develop a unified approach, which will enable technical department experts to consider all the attributes and their relative importance concurrently in an integrated manner for optimum selection of technical department. The salient features of the methodology in comparison to already available methods are discussed at the end in order to validate the methodology.

In order to evaluate the various parameter and sub-parameter of technical department selection, a model is developed using DBA. The selection of technical department can be considered as one of the most important aspects in the design process for the department trading industries. So there is a need to develop a unified approach, which will enable technical department development team to consider all the attributes and their relative importance concurrently in an integrated manner for optimum selection of a technical department. The Distance Based Approach methodology that combines various attributes relevant to a department into single measures and hence the comprehensive ranking of the alternative technical department can be made which has been adopted for assessment, selection, evaluation, finally ranking of various technical department used for particular gear.

The development of the DBA method begins with defining the optimal state of the overall objective, and specifies the ideally good values of comparison parameter involved in the process. The optimal state of the objective is represented by the optimum model, the OPTIMAL. The vector OP (X1,X2…..,Xn),, is the set of "optimum" simultaneous parameter values. In an n-dimensional space, the vector OP is called the optimal point. For practical purposes, the optimal good value for parameter is defined as the best values which exist within the range of values of attributes. The OPTIMAL, then, is simply the alternate technical department that has best values of all technical department selection parameter. It is very unlikely that a certain alternate technical department has the best values for all parameter. Instead, a variety of alternate technical department may be used to simulate the optimal state. For this reason, the OPTIMAL is not to be considered as feasible alternatives, but it is used only as reference to which other alternatives are quantitatively compared. The numerical difference resulting from comparison represents the effectiveness of alternate technical department to achieve the optimal state of the objective function. Hence, here, the decision problem is to find a feasible solution which is as close as possible to the optimal point. The objective function for finding such a solution can be formulated as:

Minimize δ[Alt(x),Optimal]
Subject to xςX

Where {Alt(x)} and δ represent a technical department alternative in the n-dimensional space and the distance from the optimal point, respectively. Thus the problem, and its solutions depend on the choice of optimal point, OPTIMAL, and the distance metric,δ, used in the model. In two dimensional spaces, this solution function can be illustrated as in Fig. 1, where H is feasible region and OP is the optimal point.

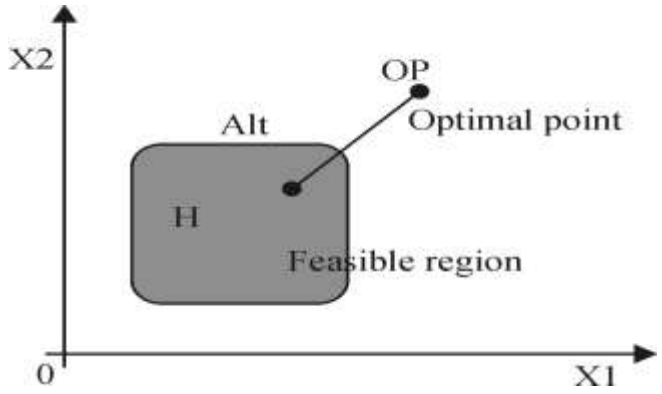


Fig. 1: Solution Function in 2 - Dimensional Space

The DBA method determines the point in the H region which is "the closest" to the optimal point, and is graphically explained in Fig. 2 for two dimensional cases. Note that the lines (Alt-OP)X1, and (Alt-OP)X2 are parallel to the X1 and X2 axis respectively. Therefore, (Alt-OP)X1 = |OP X1-Alt X1| and (Alt-OP)X2 = |OP X2-Alt X2| based on Pythagoras theorem in two dimensional, δ is

$$\delta = [(OP_{x1}-Alt_{x1})^2 + (OP_{x2}-Alt_{x2})^2]^{1/2}$$

In general terms,

$$\delta = [\sum(OP_{ij} - Alt_{ij})^2]^{1/2}$$

Where i = 1, 2, 3, ..., n = alternate technical department(s), and j=1, 2, 3,... ,m = selection parameter.

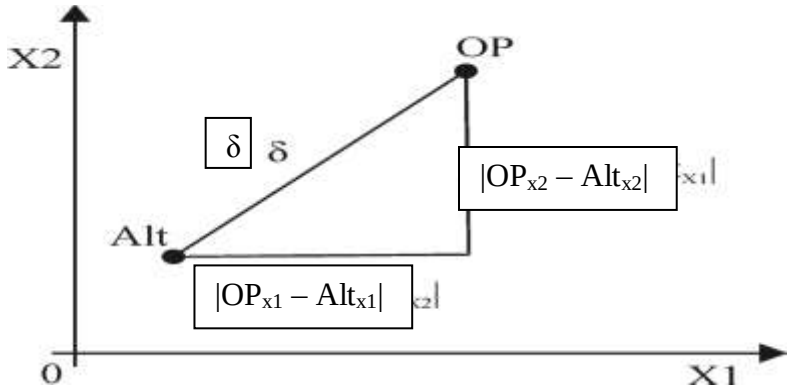


Fig. 2: Distances of Real Vector in 2 - Dimensional Space

To implement the above approach, let us assume that we have 'n' alternate technical departments and 'm' selection parameter corresponding to each alternate technical department e.g. Alt1 (X11,X12…..,X1m), Alt2 (X21,X22…..,X1m), Altn (rn1,rn2…..,rnm), and the OPTIMAL (Xb1,Xb2…..,Xbm) , where Xbm = the best value of the parameter 'm'. It is observed that the best numerical value of some parameter is smaller than that of the worst level of the other parameter. To avoid confusion and difficulties in performing the analysis, those values have been adjusted using following two cases:

Case - I: When smaller value of the parameter represents fitting well to the actual data i.e. is the best value:

Parameter Adjusted Value = Parameter Maximum Value in the database – Parameter Value.
Case - II: When bigger value of the Parameter represents fitting well to the actual data i.e. is the best value:

Parameter Adjusted Value = Parameter Value - Parameter Minimum value in the database.
Thus, the whole set of alternatives can be represented using the adjusted values of the parameter by the matrix

$$[r] = \begin{bmatrix} X_{11} & X_{12} & \dots & X_{1m} \\ X_{21} & X_{22} & \dots & X_{2m} \\ : & : & : & : \\ X_{n1} & X_{n2} & \dots & X_{nm} \\ X_{b1} & X_{b2} & \dots & X_{bm} \end{bmatrix}$$

Thus, in this matrix, a vector in an m-dimensional space represents every alternate technical department. To ease the process, and to eliminate the influence of different units of measurement, the matrix is standardized using

$$Z_{ij} = \frac{X_{ij} - \overline{X_j}}{S_j}$$

$$\overline{X_j} = \frac{1}{n}\sum_{i=1}^{n} X_{ij}$$

$$S_j = \left[\frac{1}{n}\sum_{i=1}^{n}\left(X_{ij} - \overline{X_j}\right)^2\right]^{1/2}$$

Where i = 1, 2, 3, ... , n, and j = 1, 2, 3, … , m.

$\overline{Xj}$ and Sj represent the average value, and represent the average value, and the standard deviation of each selection parameter for all alternate technical departments. The standardized matrix is represented as:

$$[Z_{std}] = \begin{bmatrix} Z_{11} & Z_{12} & \dots & Z_{1m} \\ Z_{21} & Z_{22} & \dots & Z_{2m} \\ : & : & : & : \\ Z_{n1} & Z_{n2} & \dots & Z_{nm} \\ Z_{OP1} & X_{OP2} & \dots & Z_{OPm} \end{bmatrix}$$

$$Z_{11} = \frac{X_{11} - X_1}{S_1}, \quad Z_{12} = \frac{X_{12} - X_2}{S_2}, \quad Z_{1m} = \frac{(X_{1m} - X_{1m})}{S_m}$$

The next step is to obtain the difference of each alternate technical department to the reference point, the OPTIMAL, by subtracting each element of the optimal set by a corresponding element in the alternate set. This result in another interim matrix namely distance matrix and is given as:

$$[Z_{dis}] = \begin{bmatrix} Z_{OP1} - Z_{11} & Z_{OP2} - Z_{12} & \dots & Z_{OPm} - Z_{1m} \\ Z_{OP1} - Z_{21} & Z_{OP2} - Z_{22} & \dots & Z_{OPm} - Z_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ Z_{OP1} - Z_{11} & Z_{OP2} - Z_{12} & \dots & Z_{OPm} - Z_{1m} \end{bmatrix}$$

The next step is to introduce the aggregated preference weights for selection parameter. If the aggregated preference weight for any selection parameter j is denoted by W_j then this will results in another interim matrix as given

$$[Z_{inter}] = \begin{bmatrix} (Z_{OP1} - Z_{11})W_1 & (Z_{OP2} - Z_{12})W_2 & \dots & (Z_{OPm} - Z_{1m})W_m \\ (Z_{OP1} - Z_{21})W_1 & (Z_{OP2} - Z_{22})W_2 & \dots & (Z_{OPm} - Z_{2m})W_m \\ \vdots & \vdots & \vdots & \vdots \\ (Z_{OP1} - Z_{11})W_1 & (Z_{OP2} - Z_{12})W_2 & \dots & (Z_{OPm} - Z_{1m})W_m \end{bmatrix}$$

Finally, the Euclidean composite distance, CD, between each alternate technical department to the optimal state, OPTIMAL, is derived using

$$CD_{OPAlt} = [\sum_{j=1}^{m} \{(ZOP - Zij)Wj\}^2]^{1/2}$$

Within any given set of alternate technical department, this distance of each alternate to every other is obviously a composite distance. In other words, it can be referred to as the mathematical expression of several distances on each selection parameter for which the technical department are evaluated and ranked. The lowest value of composite distance ranked first and so far.

RESULTS

COMPOSITE DISTANCE FOR EACH DEPARTMENT

In this study we applied TQM in Education organization by using DBA Method.
The total resulted gap in Mechanical, Civil, ECE, and CSE Department are respectively, 3.4397, 3.3091, 2.9142, and 4.4435.

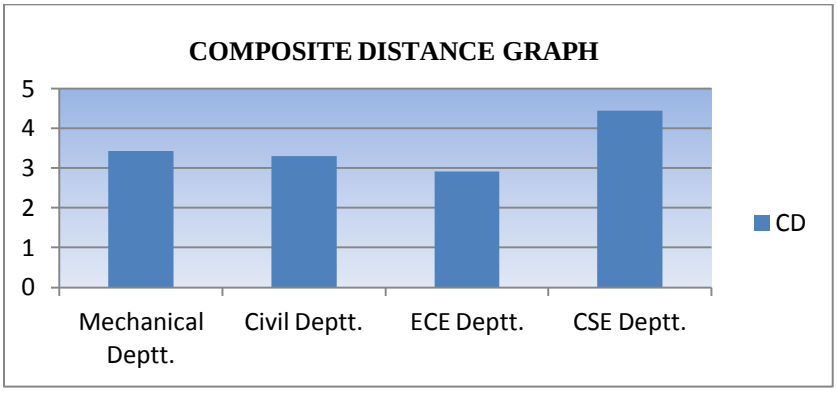
Departments	CD
Mechanical Deptt.	3.4397
Civil Deptt.	3.3091
ECE Deptt.	2.9142
CSE Deptt.	4.4435

Common Distance for each Department

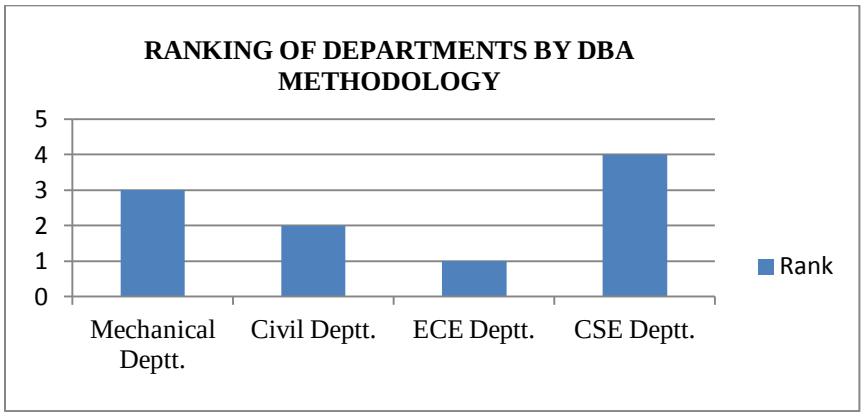
Ranking of Each Department

Departments	Rank
Mechanical Deptt.	3
Civil Deptt.	2
ECE Deptt.	1
CSE Deptt.	4

Ranking Of Departments By DBA Method



GRAPH OF COMPOSITE DISTANCE OF DEPARTMENTS BY DBA METHOD



GRAPH OF RANK OF DEPARTMENTS BY DBA METHOD

CONCLUSION

The figures reveal that Computer science Department has been ranked at 4 and Electronics Department is with the least one.

- Also, the results of Total Quality Management in Educational organization by using DBA method reveal that respectively, Standard of Education, Teaching Staff, Laboratories / Library, System of Examination and Results & Reports parameter have the highest priority in the student's views.

In the present study, it has been tested and confirmed that questionnaire is appropriate for TQM in Education organization and confirmed the validity and reliability of all five parameter in a education system setting.

- Based on the results of educational aspects gaps; the following **suggestions are offered for two department.**

- In **Computer science department,** the greatest gap is related on Standard of Education, Laboratories / Library, and Teaching Staff. It also appears from the results of total quality management parameter that Computer science department should improve its educational aspects regarding the parameter of Standard of Education, Laboratories / Library, and Teaching Staff to increase the student's satisfaction. Hence, some proposed strategies for this department include:
  - Possess good communication skills.
  - Seminar organized by experts.
  - Notes provided to students.
  - Quantity of books in library should increase.
  - Highly focus on practical work.

- In **Mechanical Department**, the 2nd greatest gap is related on Standard of Education, Laboratories / Library, System of Examination. It also appears from the results of total quality management parameter that civil department should improve its educational aspects regarding the parameter of Standard of Education, Laboratories / Library and System of Examination to increase the student's satisfaction. Hence, some proposed strategies for this unit include:

  - Experience faculty required.
  - No. of sessional increased.
  - Separate lab from other departments.
  - Good practical knowledge laboratory instructors require.
  - Highly focus on practical work.
  - Reference books increased.

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