A Case Study on Quality Analysis of various departments in Educational Institute using DBA Method

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ABSTRACT

This paper analyses Quality in various departments of educational institutes using DBA method. The objective of this work is to improve the quality of education system and find problems and their solution which students have to face while deciding about institute. The solutions were found out by brainstorming and SMART Technique and implemented according to the planned Milestone chart. The implementation was supported with the tools such as PDCA cycle, 5W1H, FMEA analysis. The paper also highlights the results obtained. The case study witnessed the effective implementation of Quality Circle in an educational institute with positive results. This case study contributes to the mutual growth of institute and students.

Keywords: Quality, Educational Institute, analysis, 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.

Similarly while deciding about educational institute, a student have to face many challenges regarding teaching faculty, results, institute position, laboratories etc. Here in our thesis work we are applying total quality management in an educational institute. Based upon that quality we can compare different colleges. We are applying TQM by using DBA approach. By this approach we can give rank to different institute. Dba approach can also be applied in a single institute to compare educational aspects of different departments.

Based upon those aspects we can give rank to every department and many problems like standard of education, college faculty, system of education, results can be examined. In our thesis firstly we prepared a question are for students. It was distributed among students and they give rank to every question depend upon their choice. But firstly we check quality of that question and it is checked by using Minitab software. It is commonly used as an estimate of the reliability of a psychometric test for a sample of examinees. So we check reliability of question are by using this software. Firstly we will read about total quality management as TQM is mainly applied in industry. So here is a brief introduction about TQM.

About DBA

The Research method of Distance Based Approach (DBA) is applied for supporting the department selection is presented. It covers all phases in the department selection from initial problem definition, over the formulation of parameter, to the final

choice among the departments. 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 department experts to consider all the attributes and their relative importance concurrently in an integrated manner for optimum selection of 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 department selection, a model is developed using DBA. The selection of department can be considered as one of the most important aspects in the design process for the department. So there is a need to develop a unified approach, which will enable development team to consider all the attributes and their relative importance concurrently in an integrated manner for optimum selection of a 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 department can be made which has been adopted for assessment, selection, evaluation, finally ranking of various departments used for particular department.

DBA Methodology

The software is developed based on DBA (Distance Based Approach) using MAT-LAB programme. As it generate the ranks after solving variable permanent function to get the required department. This lends to successful in evaluation and selection of any kind of object but here, we only select the department.This method has been implemented in MATLAB 9.Distance Based Approach method is based on matrix operations which can be easily computed using MATLAB. Theoretically, the methodology has no limits for number of parameter and number of alternatives and is capable of solving complex multi-attributes decision problems, incorporating both quantitative and qualitative factors. The method has been found very simple to implement in MATLAB because of relatively simple mathematical formulation, and straight forward operation.

INSTITUTE ANALYSIS

The case Institute is one of the repudiated institutes in **Haryana**. The institution has been always committed and responsive towards the needs of modern technical education. It has grown into a symbol of comprehensive education. It is like Bodhi tree–a source of knowledge and education. The group institutions offers school education from pre nursery to 12th, diploma courses, under graduate courses in engineering, Graduation and post Graduation courses in Professional and management studies through its team of experienced and competent professionals in their respective fields. This group endeavors to merge as a role model in the field of quality education. The future plans include providing quality education avenues by establishing institutions in various fields.

The case institute offers following courses:-

 4 Years full time degree course, Bachelor of Technology (B. Tech.) in

- Civil Engineering
- Computer Science & Engineering
- Electrical Engineering
- Electronics & Communication Engineering
- Mechanical Engineering
- Information technology
- 2 Years Master of Technology(M.Tech) in
- Civil Engineering
- Electrical engineering
- Computer Science & Engineering
- Electronics & Communication Engineering
- Mechanical Engineering
- The institute also offers **:-**
- Bachelor of Business Administration (BBA)
- Master's in business administration(MBA)

Mechanical Engineering Department:

Mechanical Engineering Department offers undergraduate program of Bachelor of Technology in Mechanical Engineering. The department is equipped with all latest Software's, Technology and Tools to impart high level of Education to the students. Under the guidance of highly qualified faculty members, who have worked with various highly prestigious corporate houses and research institutions in India as well as abroad, the department is dedicated to prepare each student for the tomorrow's difficulties and challenges. Well equipped classrooms, multimedia methods of teaching so that students understand all aspects of the subject in deep. Latest mechanical designing software's, fully equipped laboratories to give the students hand on experience of equipments and passion of faculty together provides an atmosphere to kindle the hidden potential and creativity of the students Innovation and creativeness comes through the novel minds of ambitious and enthusiastic students. The Department is in pursuit of creating such a pool of engineers which will become asset and pride of entire Mechanical fraternity and human society. Department has got well maintained and well equipped laboratories as enlisted below:

➢ Workshop
➢ Material Science Lab
➢ Fluid Mechanics Lab
➢ Energy Conversion Lab
➢ Kom & Dom Lab
➢ Internal Combustion Engine
➢ Fluid Machines Lab

Civil Engineering Department:

Civil engineering is the design, construction and maintenance of bridges, roads, railways, airports, tunnels, canals, dams, offshore structures and buildings. It provides the sanitation and clean drinking water that are the fundamental requirements for health. An industrial placement option enables students to gain valuable experience with a variety of companies at the forefront of the discipline Excellent design studies and laboratory facilities (structures, hydraulics, soils, natural building materials, timber workshop) together with an adjacent outdoor test facilities 80-90% of our graduates go on to work in the civil engineering profession every year, with the remainder going into related employment or further academic study Rapid development in the infrastructure in India and construction of new innovative projects like Metro Rail, Flyovers has resulted into a mega boom in the demand of qualified Civil Engineers.

DATA COLLECTION AND ANALYSIS

The Research method of Distance Based Approach (DBA) is applied for supporting the department selection is presented in this chapter. It covers all phases in the department selection from initial problem definition, over the formulation of parameter, to the final choice among the departments. 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 department experts to consider all the attributes and their relative importance concurrently in an integrated manner for optimum selection of department. The salient features of the methodology in comparison to already available methods are discussed at the end in order to validate the methodology.

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Where {Alt(x)} and δ represent a 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.
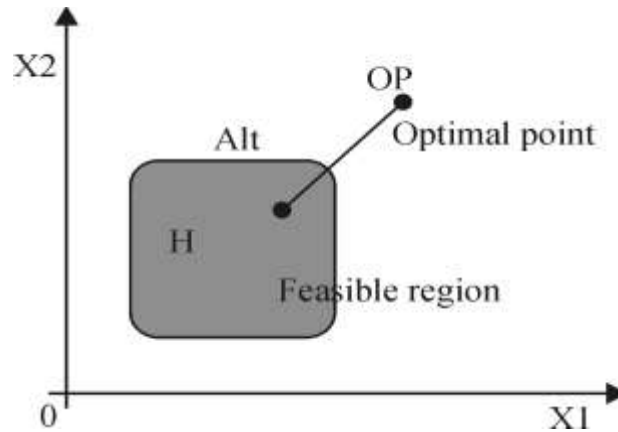
Fig.1: Solution Function in 2 - Dimensional Space

Distances of Real Vector in 2 - Dimensional Space

To implement the above approach, let us assume that we have 'n' alternate departments and 'm' selection parameter corresponding to each alternate 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:

Thus, the whole set of alternatives can be represented using the adjusted values of the parameter by the matrix

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

Thus, in this matrix, a vector in an m-dimensional space represents every alternate 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 department. The standardized matrix is represented as:

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

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

The next step is to obtain the difference of each departments 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:

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

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

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

Finally, the Euclidean composite distance, CD, between each alternate departments 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 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 departments are evaluated and ranked. The lowest value of composite distance ranked first and so far.

The importance of students is well recognized in all types of educational institutions of the world. All institutes takes care of their students because their existence is dependent upon them. Customers are not an interruption to their work; rather they are the purpose of it. Businesses are not doing them favor, rather customer are doing favour by providing service opportunities. In fact, customers are not outsider to any business but are the part of the holistic chain. It is the customer, which provide the success for any business

Service industry, including education sector, provides greater employment opportunities than manufacturing. TQM philosophy of continuous process improvement is of great value in service industry like other. Education institution has its peculiar working system and environment. It has different culture system, method, procedure and attitude towards customer. The more they work effectively and efficiently, the more they attract new customer and retain the old customer and give them great satisfaction.

Key Service Indicators

Key service indicators of students satisfaction are those chosen by the institution. It indicates quality of their service and the way it is delivered. For service institutions that accompany a product, the range of indicators depends on the nature of the service. Quality experts have suggested some important parameter for consideration as following:

➢ Timeliness of the service

➢ Dependability

➢ Friendliness / courteousness of employees

➢ Safety / risk of service

➢ Responsiveness to requests

➢ Competence

➢ Appearance of the physical facilities

➢ Approachability of the service provider

➢ Location and access

➢ Respect for customer feelings / right

➢ Empathy

➢ Honesty

➢ Reliability

Students Satisfaction Index

Student satisfaction is defined as the liking and contentment of the students with fulfillment of his / her need of the service provided by the institution. It is a measure of success of the institution in achieving its aim of providing quality service to student satisfaction index is derived from student feedback survey. This is quantification of the subjective information provided by the students. It is derived to establish the efficiency and effectiveness level of education providing service.

Survey

A survey should measure the students satisfaction on various attributes of a service. The case in study is an education intuition, that is, an Engineering institution that provides educational facilities to the students. The following service attributes have been studied:

➢ Standard of Education.

➢ Faculty / Teaching Staff

➢ System of Examination

➢ Laboratories and Libraries

➢ Result and Reports

The most important part of the case study, after data collection and analysis, is to generate action plans and allocate resources to improve the processes.

RESULTS AND CONCLUSIONS

Common 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.

Table 1: Common Distance for each Department

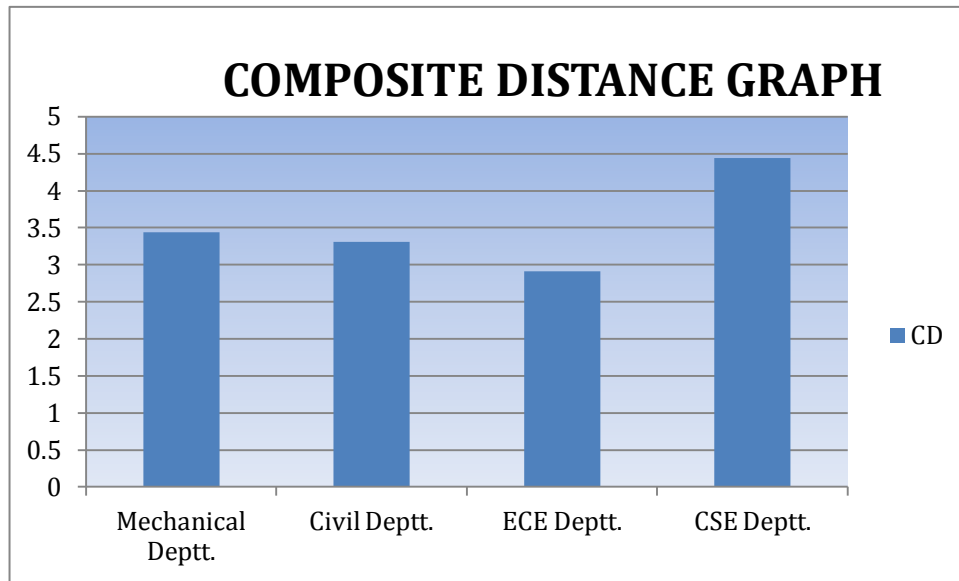| Departments	CD
Mechanical Deptt.	3.4397
Civil Deptt.	3.3091
ECE Deptt.	2.9142
CSE Deptt.	4.4435

Fig. 2: Common Distance Graph for each Departments

Results of Ranking of Each Department

Table 2.: Ranking of Departments by DBA Method

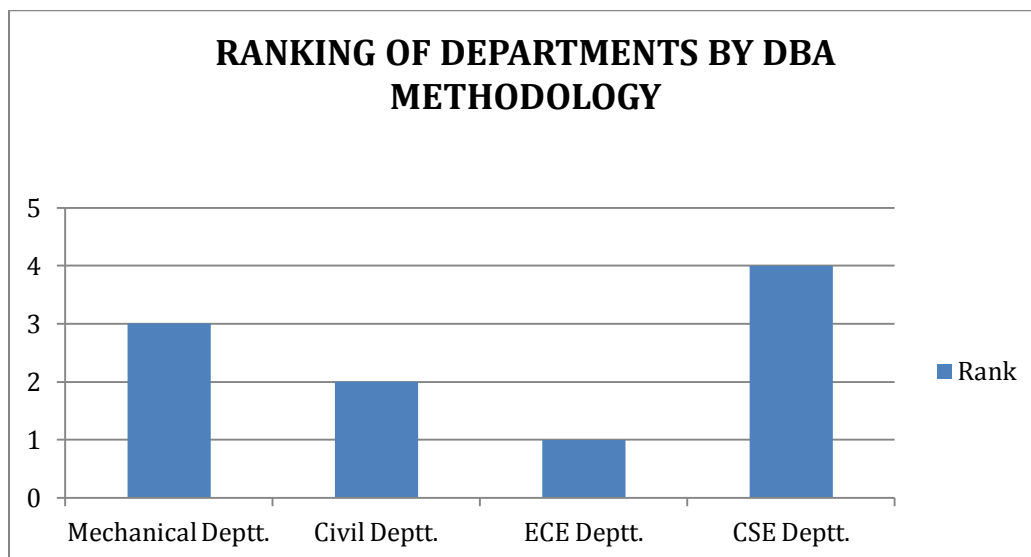| Departments	Rank
Mechanical Deptt.	3
Civil Deptt.	2
ECE Deptt.	1
CSE Deptt.	4

Fig. 3: Graph Of Ranking of Departments By DBA Method

CONCLUSION

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 mechanical 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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