QUALITY EDUCATION: GETTING QUALITY RIGHT

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ABSTRACT

India is the youngest country of the world and is now facing a dire need to increase its technical force to accomplish as a developed country. The technical standards have been declining in India for the past 2 to 3 years despite of the competitive admission process. In India the number of the elite engineering colleges has seen a rise by 55 %(from 90153 to 140000) where as the number of the students are now growing smaller. The author has made a study regarding the major sets of the input based indicators i.e. the quantity and quality of new engineering students, the finance of undergraduate courses, availability of qualified factory and many more. This study may promote re-assessment of the current curriculum and accredited principles for Engineering Educational System. This study should foster an examination fit and stop the descent of the engineering students by not paring with quality. Author has applied Failure Mode Effect Analysis (FMEA), Cause and failure analysis and has used Pareto principle to contemplate and has recommended some suggestions by using the Six Sigma Methodology.

Keywords: Indicators, Engineering Educational System, Failure Mode Effect Analysis, Pareto

I. INTRODUCTION

Engineering education has turned earth into a paradise. Technical education has played a vital role in the social and economic wellbeing of the nation [1]. Engineering colleges in India are performing without sustaining quality technical education [2]. Managing quality in education is not same as that in case of the industries and manufacturing units, whereas the principles that are used in the industries can be applied to the education sector. Most of the performance measurement system in education system does not reflect the actual potential that lies within the institution. Quality has now become a decisive factor in attracting the students and faculty to the institution. Many engineering institutions have now opted for the ISO 9000 system in order to improve results and wealth. In the last 5 years the number of institutions offering technical education has seen a large increase whereas unfortunately the quality of education is not satisfactory. Now-a-days high student failure in examination and fewer amounts of placement opportunities are creating havoc in institutions which in manufacturing units are considered as defects. This is the right time to study the various types of the failures that are accruing in the system and to study if they can or cannot be removed.

II. CONCEPT OF SIX SIGMA

Six sigma can be viewed as a metric, a mindset, a methodology [4]. It is a new approach to the quality assurance and quality management. The main purpose of this to reach level of quality and reliability that will satisfy and even exceeds demands of the today's demanding customer[5].the Six Sigma concept was originated by

Motorola in 1980's and its philosophy has been widespread in the field of the manufacturing industry,Healthcare,Education and many more[6].

2.1 Six Sigma Methodology

Six sigma is a process improvement methodology which includes different phases logically linked with one another. Six sigma methodologies are generally described by the acronym DMAIC (Define, Measure, Analyze, Improve and Control) is used for continuous improvement of already existing products or processes [7]. One of the important aspects of six sigma is the involvement, training and reward of employees at all levels of the organization. Champions at the executive levels guide the selection of projects, securing of resources and goal setting for improvement efforts. Employees are given martial arts titles such as Master black belt, Black belt , Green belt, etc., reflecting their training and status in project improvement efforts [8].

III. CASE STUDY

A case study has been under taken in reputed engineering educational institutes of Himachal Pradesh of India. In these institutions, the aspect of quality is being overlooked, as profitability is emerging as the primary motto. The measure of quality in the technical education is done with the parameters such as job placements, passing rate of students, extra-curricular activities etc. Various industrial tools are used to study the various defects in the institutes (defects here include less number of students, minimal placements, loss of students).An initiative has been taken to contemplate the various causes and then give recommendations.

Voice of customer	Customer requirement	CTQ
Good education	Excellent faculty,good infrastructure, facilities, placements	%SSCI %SSHE %SE

Method: Parasuraman (1991) developed a SERVQUAL scale to measure service quality. SERVQUAL and its adapted versions have been employed extensively in different services such as banking, retail, wholesale, health, education in both developed and to some extent in developing nations (Babakus and Mangold, 1992; Dabholkar 1996; Chua, 2004; Tan and Kek, 2004; Mahapatra and Khan, 2007; Aghamolaei and Zare, 2008). [3] This tool remains popular despite severe criticisms (Cronin and Taylor, 1992, 1994; Carman, 1990; Schneider and White, 2004). Initially, Parasuraman (1991) identified ten determinants that characterized customers' perceptions of service quality. These determinants were reduced to five factors in their subsequent studies and comprised tangibles, reliability, responsiveness, assurance and empathy. The SERVQUAL instrument based on these five determinants used 22 items and a seven-point Liker scale ranging from "strongly disagree" to "strongly agree". Several studies have been carried out successfully in other countries based on the adapted version of the SERVQUAL instrument to assess student perceptions of service quality.

Based on the SERVQUAL, an instrument for measuring quality in technical education was developed and validated. The new scale EduQUAL comprises of 28 items with five dimensions: Learning Outcomes, Responsiveness, Physical facilities, Personal Development and Academics. The same instrument has been implemented here and list of 178 questions has been prepared. Some related items were combined which led to the reduction to 96.Further after expert evaluation only 42 items were considered for study.

3.1 Data Analysis

The data reduction and verification usually makes the data in a sorted manner that can be utilized in an organized order.

Table 4.1 Details of Questionnaire

Stakeholders	Students	Alumni	Parents	Industries	Total
Questionnaire sent	882	357	187	43	1369
Response	588	221	52	23	884
Usable	462	189	46	11	708

3.2 Data Reduction

The useful responses that have tested after the validity and reliability are found to be 818.The test for quantitate validity was concluded by the factor analysis test that has been for the proposed 96 variables that has been proposed. Principal component [40] method has been used to find quantitative validity and followed by the Chronback's Alpha [42] to check the internal consistency between the values. This all testing is done on the Statistical Package for Social Sciences (SPSS 14.0). The total items that have loaded more than 0.5 are kept under five dimensions viz. Student Service, Personality Development, Academics, Management Facilities and Alumni salutation. 42 items under five dimensions have been found relevant and,"EduQUAL" is being used in technical education system. There are several items that does not makes to the list which includes course explanation, record keeping, management helpful etc.

The internal consistency is being checked and tested by the Cronbach's Alpha SPSS 14.0 software. The value for the five dimensions that has been mentioned above is found to be near 0.91.Since the combined value has been found to be near numeric number 1 and well above the minimum requirement of 0.70. Therefore it establishes the internal consistency of the data.

The instrument contains 42 items under consideration which has observed a mark of 0.50 in the factor analysis and has been classified into the five categories:

1. Student Service: Student has been provided with the service dependability like availability of teachers and course that has been important towards the course they have opted out.

2. Management facilities: physical facilities, machines and equipment, library and several other facilities.

3. Personality Development: overall development of a student in respect to the knowledge he/she has and ability to present themselves effectively.

4. Academics: Result focused individual reports on the students and the performance as an individual.

5. Alumni Salutation: willing to comfort and help the customer i.e. actually student.

Table 4.2 Test for Reliability (Cronbach Alpha)

Dimensions of EduQUAL	Alpha For Each Item	Alpha for total
1. Student Service	0.82	
2. Management Facilities	0.71	
3. Personality Development	0.89	0.91
4. Academics	0.92	
5. Alumni salutation	0.89	

3.3 Fishbone Diagram

The Cause-and –Effect analysis [9] is a graphical approach to the major classifications of the problems and potential causes. This also is referred to as fishbone analysis, a name derived from the fish shaped pattern used to plot the relationship between the various factors that contribute to a specific event.
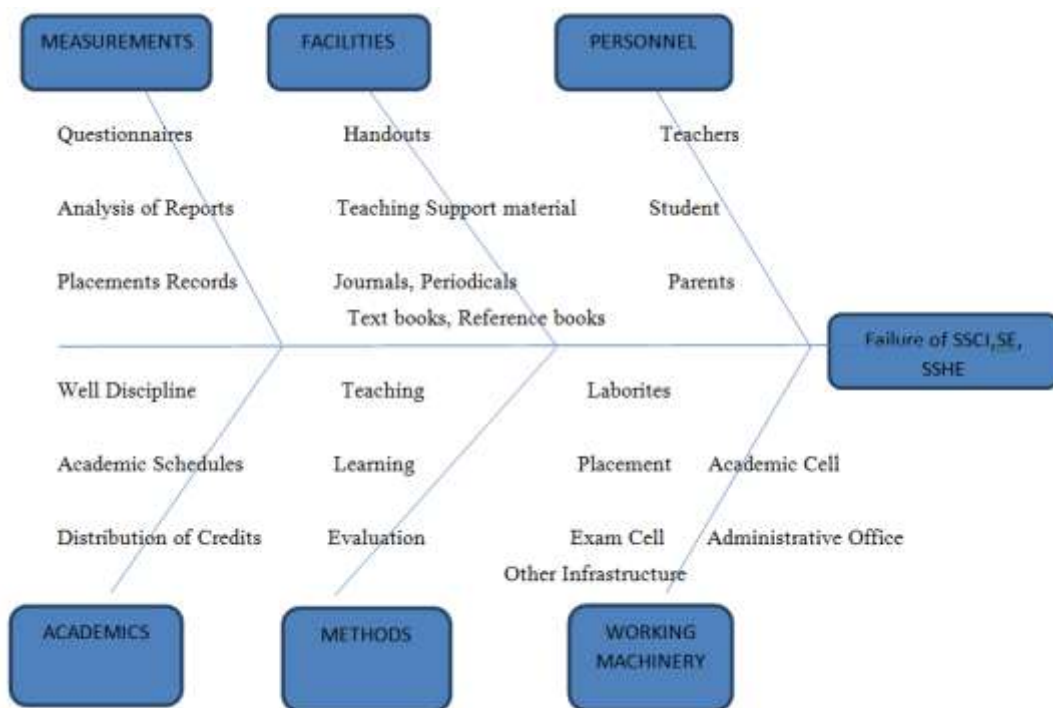

3.4 Fmea Analysis

Failure Mode and Effects Analysis [10] (FMEA) was one of the first systematic techniques for failure analysis. It was developed by reliability engineers in the 1950s to study problems that might arise from malfunctions of military systems. An FMEA is often the first step of a system reliability study. It involves reviewing as many components, assemblies, and subsystems as possible to identify failure modes, and their causes and effects. For each component, the failure modes and their resulting effects on the rest of the system are recorded in a specific FMEA worksheet. There are numerous variations of such worksheets.

Process	Potential Failure mode	Potential effect Of failure mode	Frequency (likeli ness scale 1 – 10)	Potential causes of failure	Current process Control (prevention)	Current process control (detection)	Severity (1 – 10)	Detect ability (potent ial for discov ery 1 - 10)	Risk priorit y numb er
Good educatio n	Teaching Staff not good	Lack of ideas for students	6	Not trained teachers	Training should be provided	Students not performing	8	8	384
			7	Non serious attitude of teachers	Should be hardworking and fair	Attendance very low	6	8	336
			7	Discrimin ation by teachers			7	6	252
	Students not serious	Reputation of college depreciate	7	Not strict rules in academics	All things should be transparent	Lack of interest in subjects	6	7	294
			9	Not discipline d		Regulations not followed	8	8	576
	Books/Jour nal not available	Lack of new technologies	8	Not provided by managem ent	Journals/onlin e libraries subscriptions	Half-yearly check of stocks	7	9	504

3.5 Relative importance of the 'EduQUAL' items and dimensions

After the data reduction and the tabulation of the data that have been collected it has been found that data has been varied from the lowest response i.e. 1 to the highest response i.e. 7 in the questions that has been asked. The dimensions are being considered five in the number first of which is student service which include the Student Service, Management Facilities, Personality Development, Academics and Alumni Salutation.
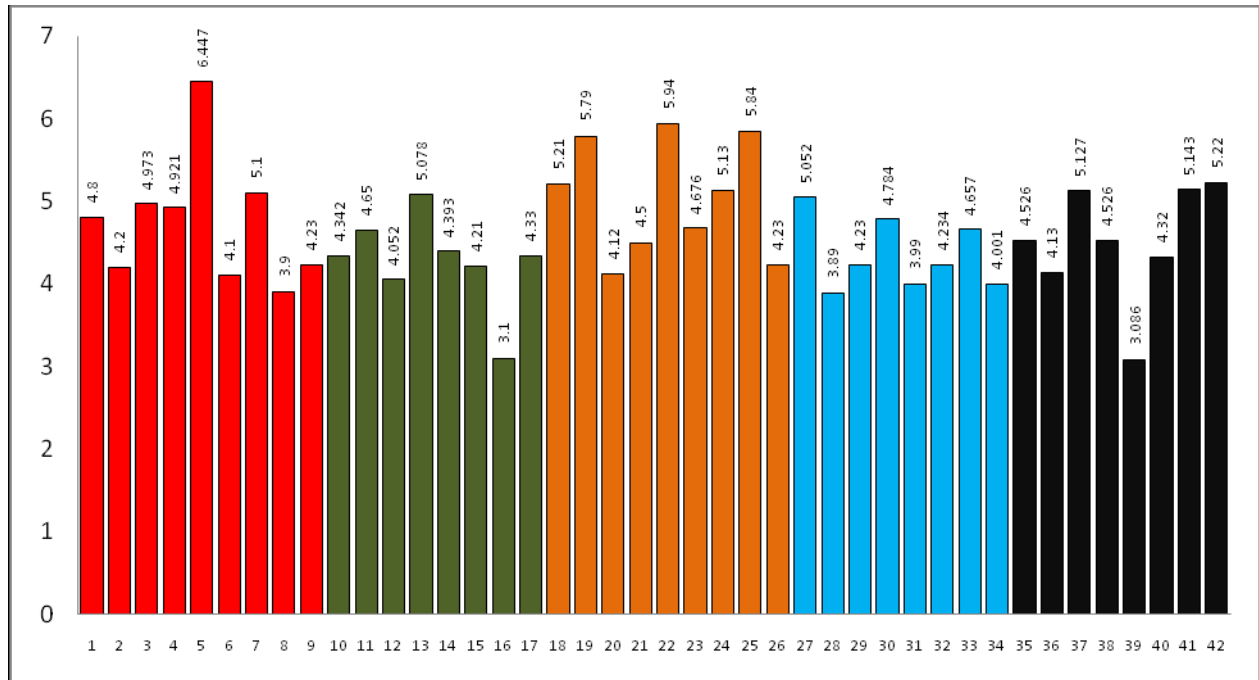
Figure.4.1: Average Response Score of Students for all EduQUAL Items.

As per the above Pareto Analysis if we rely on the 80:20 principle, if we are able to resolve the 80 percent of the problems then we are able to solve most of our problem we are facing in the above mentioned problems. The problems that constitute the 80 percent mark are only considered in this.The FMEA chart we get after resolving the problems :

Process	Potential Failure mode	Potential effect Of failure mode	Frequency (likeliness scale 1 – 10)	Potential causes of failure	Current process Control (prevention)	Current process control (detection)	Severity (1 – 10)	Detectability (potential for discovery 1 - 10)	Risk priority number
Good education	Teaching Staff not good	Lack of ideas for students	5	Not trained teachers	Training should be provided	Students not performing	7	7	245
			7	Non serious attitude of teachers	Should be hardworking and fair	Attendance very low	7	6	294
			7	Discrimination by teachers			4	7	196

Students not serious	Reputation of college depreciate	6	Not strict rules in academics	All things should be transparent	Lack of interest in subjects	8	5	240
		6	Not disciplined		Regulations not followed	7	7	294
Books/Journal not available	Lack of new technologies	8	Not provided by management	Journals/online libraries subscriptions	Half-yearly check of stocks	6	7	336

IV. CONCLUSION

The conclusion from the above is that we need to focus on the quality which is mentioned by the students in the education system. The students has perceived the management efforts as the major issue towards the lack of quality education in the system and various CTQ factors being studies as the major criteria as students selected as entrepreneurs, students selected from campus interview. The Six sigma and other industrial tools therefore can be used for the improvement of the quality in education system and therefore they can be used to define, measure and control the quality. Quality can be perceived and therefore controlled by also using various industry tools and which is clear from the Failure Mode Effect Analysis. These tools have set a control over the education quality and increased the performance of the institutions. Furthermoreapplications of the industrial tools can be used like Taguchi method, Quality Function Deployment etc.

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