QUALITY ASSURANCE IN A TECHNICAL INSTITUTION IN INDIA

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ABSTRACT

The present scenarios in engineering institutions are passing through a critical phase as they are facing a global competition. Certain technical institutions in India have adopted successfully some quality improvement strategies like ISO 9001, TQM, and Six-Sigma. The quality of education is becoming important, particularly in engineering institutions. Total Quality Management (TQM) involves total commitment from everyone in search for continuous improvement individually or collectively. Six-Sigma has been considered as a business strategy that employs a well-structured continuous improvement methodology to tackle process variability and drive out waste from the process with the phases called DMAIC (Define, Measure, Analyze, Improve and Control). The Six-Sigma use DMAIC methodology as a road map for problem solving and process improvement in the engineering institution. We have proposed a new structure of excellent engineering institution based on quality improvement strategies. This paper attempts to offer an approach that integrates TQM and Six-Sigma for quality assurance in engineering educational institutions through continuous improvement.

Key Words: TQM, Six-Sigma, Academic Performance Analysis Cell (APAC), Engineering Educational Institutions (EEIs)

INTRODUCTION

The Indian economy is entering a new era of domestic competition and globalization. Quality has become a decisive factor in attracting students and faculty to an institution. Engineering education encompasses the understanding of the technical knowledge employed in the utilization and improvement of natural resources for human fitness of purpose. Many engineering institutions now understand that they should adopt some kind of continuous improvement mechanism on top of their ISO 9000 system in order to improve results and wealth. At present, most of the manufacturing sectors are gaining more benefits by adaptation of quality concepts like TQM, Six Sigma, Kaizen, 5S and others, which are now tried in the service sector of education also. The ultimate aim of any institution is to assure the quality and reliability of students who graduate from an institution by the optimal utilization of the student potential, human resources as well as by optimizing the quality costs. This can be achieved by integration of TQM and Six-Sigma philosophy in Engineering Educational Institutions (EEIs).

Problem Faced By The Institutions in India

In the last decade there has been an increase in the number of institutions offering technical education in the country. Unfortunately, the quality of education and overall performance are not satisfactory in these institutions. Nowadays-high student failures in the university examination and fewer amounts of placement opportunities in engineering institutions are considered as defects. This is the right time to implement integrated TQM model for improving quality level of performance in the academic activities for achieving quality assurance in technical institutions.

TQM IN ENGINEERING EDUCATIONAL INSTITUTIONS

Definitions of "quality in education" follow the general definitions of quality. Thus, the term has been defined as " excellence in education" (peters and waterman, 1982); " value addition in education" (feignenbaum, 1951); " fitness of educational outcome and experience for use" (Juran and Gryna, 1988); " defect avoidance in the education process" (Crosby, 1979); and "meeting or exceeding customer's expectations of education" (Parasuraman et al., 1985). The quality of education is becoming important, particularly in Engineering Education, where the products / output of the system, can have a direct impact on the quality of their organizations**.** At present situation certain engineering educational institutions have got ISO certificates. But the performance level of institution is not good due to lack of awareness about quality management system i.e. TQM and Six-Sigma. TQM is a way of doing business that requires a permanent commitment from every one. Management recognizes that total quality management will not happen by accident, it is a planned process. TQM is a managed process, which involves people, system and supporting tools. Total Quality Management is an integration of all functions, processes and personnel, with an institution in order to achieve the continuous improvement of quality of services. TQM is a continuous learning process, which is a cyclic, iterative and never-ending activity. TQM is an attribute of good and effective management if adopted in practical use. It imparts durable competitive strength to the management.

The following benefits can be obtained due to implementation of TQM philosophy in educational institutions:

- ✓ Enhancement in the morale of the students and staff.
- ✓ Improvement in staff performance.
- ✓ Improvement in quality of teaching.
- ✓ Increased customer satisfaction.
- ✓ Improvement in financial, purchasing, admission and administrative processes.
- ✓ Reduction in costs.
- ✓ Enhancement in team working culture.

SIX-SIGMA IN ENGINEERING INSTITUTIONS

The success of Six-Sigma in businesses and industries all over the world has prompted educational institutions to adopt the same, with the objective of achieving break through improvement in quality education. The core concept of Six-Sigma is to reduce the defects in the process. Six-Sigma is a rigorous and disciplined methodology (DMAIC) that uses data and statistical analysis to measure and improve an institution's academic performance by identifying and eliminating "defects" (i.e. failure rate of the students) There have been many improvement models applied to process over years which is based on the steps introduced by Edward Deming i.e. Plan, Do, Check, and Act (PDCA). The revised version of PDCA is called DMAIC. DMAIC is a positive pro-active methodology and the Six-Sigma use it as a road map for problem solving and process improvement in the engineering institution, which is explained in the following paragraph:

Define Phase

The project team (Six-Sigma team) must be formed to solve the academic problems in the technical institution. Process mapping or Value Stream Mapping is a way of graphically depicting institution's academic activity process and then looking for ways to streamline the process and to reduce the defects. Project team frames the problem statements using Process Mapping consisting of more failure rate of students and less placement opportunities in the engineering educational institutions. The goal statement prepared by six-sigma team should be to eradicate the above academic problems. The team structure is shown in the table 1. The Dean or Director in the master black belt cadre should have 21days of training in the field of solving academic problems using six-sigma concepts. The Head of the Department holding the black belt cadre and with one week training, together with the help of the Dean or Director should help the faculty members in the green belt cadre and the students in the team member cadre in achieving the ultimate goals.

Table 1. Six-Sigma Structure In The Engineering Institution

Champion	Principal
Master black belt	Dean / Director
Black belt	HOD
Green belt	Faculty Members
Team Members	Students

Measure Phase

The information is to be collected by Six-Sigma project team throughout various departments for analyzing the increased failure rate of students and reduced placement opportunities in the engineering educational institutions.

Analysis Phase

This phase analyses the system to understand the causes for the student failure and key process variables. The engineering educational institution must adapt statistical tools such as Cause and Effect Diagram, Pareto chart, etc. The root causes of failure are to be identified by six-sigma team from cause and effect diagram analysis. Six-Sigma Team members should submit a clear report regarding the state of improvement of student performance.

Improve Phase

The Six-Sigma team suggests the management that statistical tools are to be frequently used to identify and quantify the key academic process variables and their influence on critical to quality. Moreover Process improvement tools such as Quality Circle, FMEA, 5S, and Brainstorming etc., are also to be used to reduce the number of failed students, improve the quality of teaching learning process and to reduce the number of rejected students by companies.

Control Phase

The wealth of any institution resides on the percentage of students getting placements in companies. It is important that institution must have Academic Performance Analysis Cell (APAC) for controlling the above-mentioned phases continuously to meet out required standards. The APAC is under the control of senior persons.
The above-mentioned DMAIC procedures must be followed in various departments (CSE, ECE, MECH, EEE etc) of engineering institution for attaining high standards. But it is literally not possible to be 100% perfect. However, excellent engineering institution is possible by making a continuous approach towards perfection. In this paper, we have suggested the model of how to improve academic performance to reach excellency in engineering institution as shown in figure 1. as explained in the following paragraphs:

- To begin with, a proper selection process of students must be established with guidelines, rules and regulation that make sure that the admission process is done only on the basis of merit.

- In order to improve the quality of engineering education and for attaining excellence in service of institute, they also must get ISO 9000(ISO 9001:2000) certification and accreditation to the NBA. One very important tool in the attempt to achieve quality in technical institutions is the 'mission statement', which is determined by the ISO standards and is the guiding principle of the institution. The overwhelming objective of the accreditation process (NBA) is to recognize and acknowledge the value – addition in transforming the raw student admitted to the institution into a capable technical professional, having a sound knowledge of fundamentals in responsible technical assignments. Moreover an adequate amount of interaction between the institute and industries must be established to give staff and students proper view or ideas concerning the industrial field by conducting various seminars and workshops.

- As in industry more importance is given to the Research and Development areas to meet out the competition and for the survival, the engineering institution should also give importance to the Academic Performance Analysis Cell (APAC). The APAC is under the control of senior persons who have more knowledge in the field of academics and well versed in the latest continuous quality improvement tools (Quality Circle, FMEA and 5S etc). The important teaching and learning process of engineering institution is intensive coaching regarding both theory and practical works and dissemination of knowledge through training, conference and seminars. Meanwhile every department must have a quality improvement team for extracting the student potential in an optimum manner and reporting it to the APAC. The APAC study the day-to-day academic activities using the quality improvement tools and it is the duty of APAC to act as a brain of the institution, which must be established in every engineering institution seeking excellence.

- At present scenario, the society expects outstanding skills and performance from the students and their abilities to be placed in recognizable positions while leaving the engineering institution. In order to enhance the effectiveness of Indian engineering education system they must have industry-institution interaction cell. The duty of the institution is to arrange the campus interview through this cell. The students failing in campus interview are to be trained by career guidance cell, which is controlled by APAC.

- 'Successful Professional Graduates' means the student communities must be able to get Placement in national and international companies while coming out of the engineering institution.

INTEGRATED TQM AND SIX-SIGMA

Total Quality Management and Six-Sigma have evolved in Japan as the management philosophy for satisfaction of ever changing customer needs and expectation in an efficient manner. The core concept of Six-Sigma is to minimize variation in a particular process. The core concept of TQM is to achieve zero defects through continuous improvement. Six-Sigma is a methodology within the large framework of TQM; also it is an innovative approach to continuous process improvement. Continuous improvement is one of the main principles of both TQM and Six-Sigma. An ISO 9000 quality management system is a framework that includes systematic methods, documented processes and defined responsibilities. In educational institution, ISO 9001 means quality assurance in servicing where suppliers' capability is demonstrated through quality system to the buyers (i.e. parents and industry owners). ISO 9000 need not be the enemy of TQM. TQM looks at the corporate culture and ISO 9000 and Six-Sigma are looking at the corporate system and together they can help the institution to achieve quality in engineering institution. This is the reason why ISO 9000 and Six-Sigma are incorporated into TQM. The integrated TQM model is shown in the figure 2. The end result of integrated TQM is to meet out the customers (i.e. Parents / Industry owners) expectation as well as improve the wealth of institution.

CONCLUSION

Education is a life long process. Quality assurance in education particularly in the case of engineering educational institutions is not expensive but it needs hard work, commitment and dedication on the part of all concerned in the institutions. The significance of TQM and Six-Sigma methodology (DMAIC) in engineering institution are explained above. Only attitude of the people at every level will determine the success of the institution. Excellence is assured if an institution can create a quality culture with the participation of the entire team. The right quality culture is the result of consistent and persistent quality education that can be formed by the system of integrated TQM model. It is clear that if the proposed structure of excellent Engineering Institutions and Integrated TQM model is implemented, Engineering Institutions could assure quality and desired placements in reputed companies for student community.

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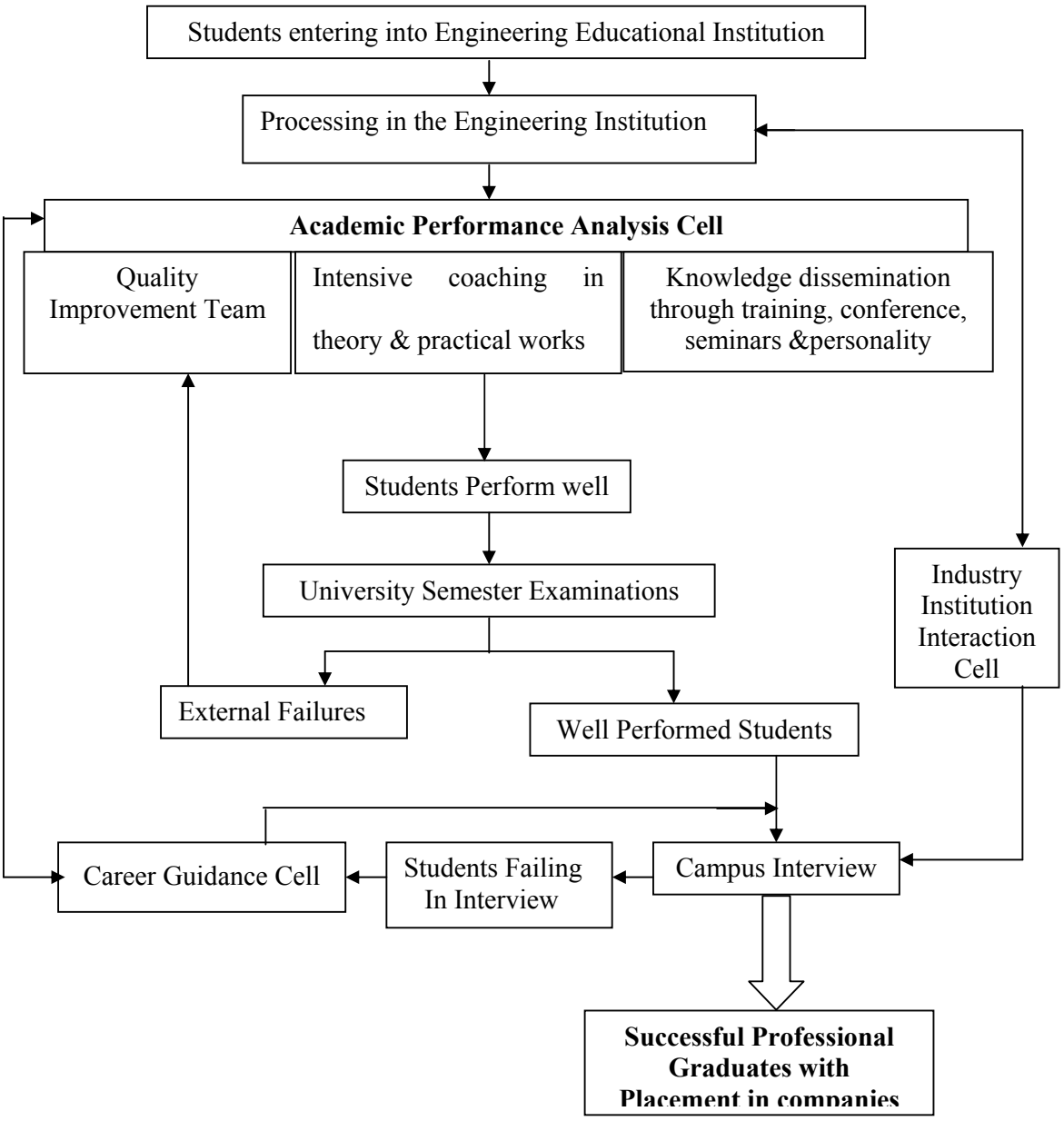

Figure 1. Proposed Structure of Excellent Engineering Institution

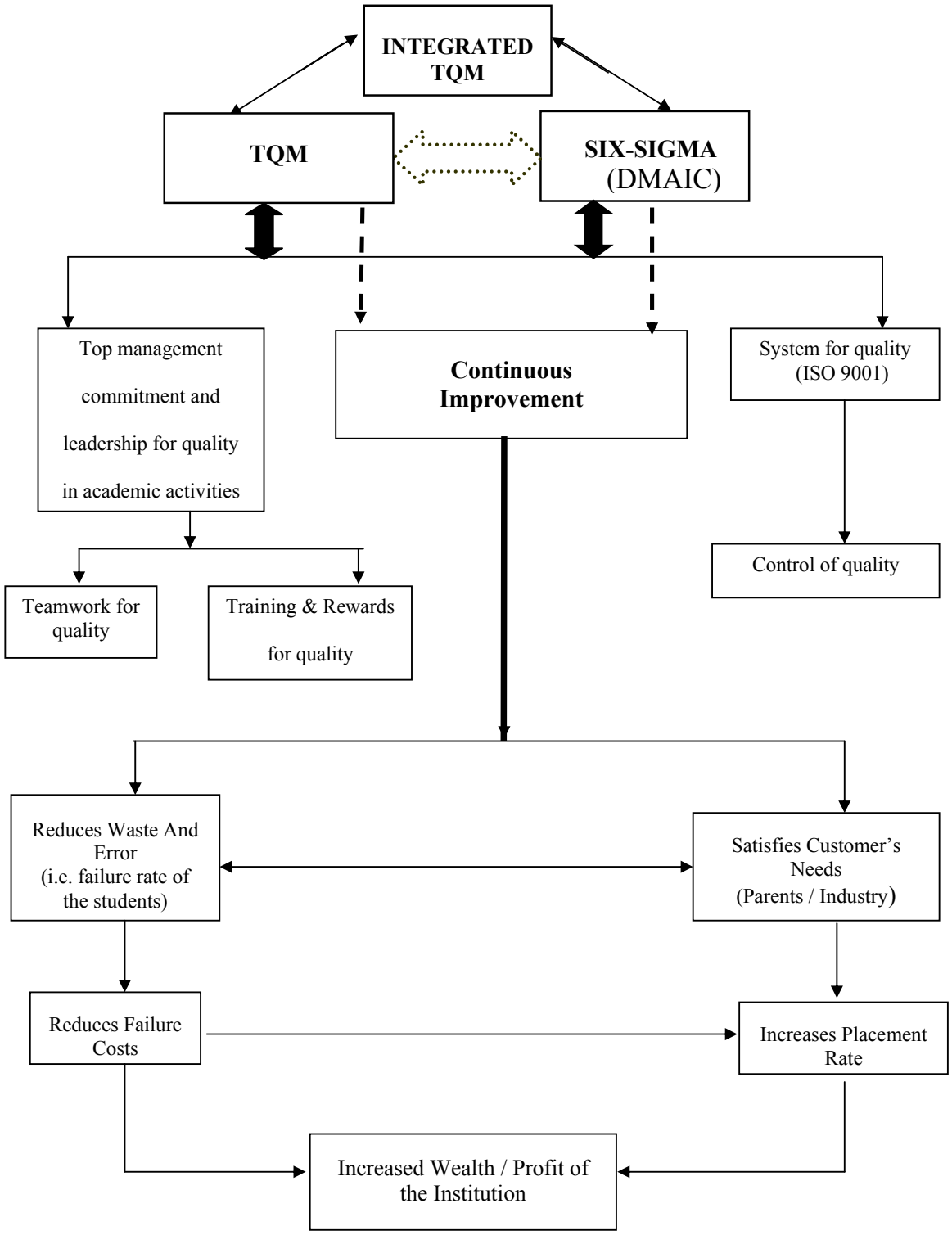

Figure 2. Integrated TQM Model For Excellence in Engineering Institution