Quality Assurance in Technical Education by Total Quality Management Techniques

Veeranna D.K[1], Anand K.Joshi[2]
[1]Professor, S.G.Balekundri Institute of Technology, Belagavi, Karnataka, India
[2]Professor, Prin. L.N. Welingkar Institute of Management Development & Research, Bangalore

Abstract— *India has one of the largest systems of post secondary science, engineering and technical education in the world. The discovery of Indian talent by employers around the world has laid to a global competition for Indian talent. As a consequence, human resource is emerging as one of the most serious constraints to economic growth of India as well. The higher education system of India is struggling to meet the new expectation. At the same time, even though the concept of Total Quality Management (TQM) was developed by an American, W. Edwards Deming, after World War II for improving the production quality of goods and services. The concept was not taken seriously by Americans until the Japanese, who adopted it in 1950 to resurrect their postwar business and industry issues. Now the TQM is a common word used across the world including service and production industries. The use of TQM techniques in education system will definitely reform the quality and assures integrity at large.*

***Index Terms*—quality, integration, assurance, management.**

I. INTRODUCTION

Total Quality Management has been coined by combining three words, 'Total' stands for involving all resources such as human, technological, physical and financial. 'Quality' means fitness for use and 'Management' means to manage all the things, so that process of continuous improvement can move in the institutes. TQM is a total management system that sets the directions of the institute, tunes its engine and helps in realizing vision. In the recent years, TQM is being adopted to attain excellence in every facet of the organizational activities, attempts are being made to create its systems' right process and deploy right means to produce right products and services to maximize customer satisfaction.

TQM involves an ongoing cycle of measurement, evaluation, planning and improvement. TQM therefore is to be viewed as an integrated approach where in the organization strives to ensure for improving the quality as well as productivity continuously at all stages, at all levels. TQM ensures examining everything critically in an organization to establish baseline measures of performance and then striving towards improvement. The underlying principles behind TQM efforts therefore are,

- Customer satisfaction
- Continuous improvement of all process
- Management by fact through objective measurement of evaluation
- Cross functional interdependent for planning and implementation
- Participative problem solving and planning

Organizations are dynamic entities in a social milieu. They undergo changes in structure, culture, values, systems and beliefs continuously. The expectations of the customers who take services from organizations vary from customer to customer and from time to time.

To meet these varying expectations of the customers, an overall effort is always required. TQM plays a major role in bringing such change. TQM is a collaborative system. It can be conceptualized as a network of process and activities through which various people in the organization can see different aspects of a problem and can constructively explore their differences and search for continuous improvement that go beyond their own limited vision of what is possible. TQM thus is an interdepartmental and inter organizational effort to address problems of improvement. TQM provides a foundation for moving towards answering the questions of why, how and with what consequences people participate in chain of command. Transformational changes occur only when hard issues like budget, manufacturing, marketing, distribution and so on are blended with soft issues like values, culture, vision, leadership style, and innovative behavior etc.

II. ENGINEERING EDUCATION SYSTEM COMPONENTS

The basic observable component of a technical institute as shown in Figure 2.1[1]. It demonstrates different modules of a typical education organization. These are the key elements of any engineering education organization.

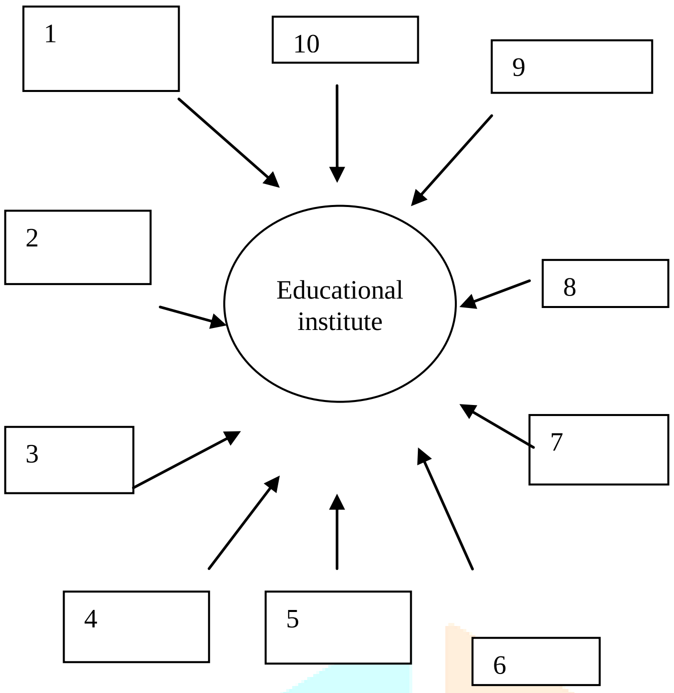

Figure 2.1: Educational System Model

1. Data management
2. Vision and leadership
3. Project activities
4. Technical curriculum
5. Learning community
6. Training
7. Industry interaction
8. Research
9. Infrastructure
10. Faculty

III.ENGINEERING EDUCATION: GLOBAL AND LOCAL CONTEXT

According to *Johnson* [2] the issues of engineering education were time variant. Engineering graduates were seen to be lacking the attributes, skills and knowledge necessary for the high level of innovation, the management of technology, human resources in the production of goods and services, as well as the entrepreneurial skills necessary in the commercial world. A survey in Australia of employers to determine employers' perceptions of engineering graduates from Australian universities proved that they lacked an adequate knowledge and skills essential to meet the future needs of the engineering workforce. Shortcomings in engineering practice were identified in the areas of innovation, research and development, design and technical improvisation.

The attractiveness of the engineering profession is governed by how the prospective entrants perceive engineering as a profession and as a course of study. In the mid sixties, during the most intense time of the cold war period in the United States, when there was a strong empathy with science and technology in the belief that these could address human, economic and political issues, the engineering profession did not have a high professional profile in the community. Professional engineers were more likely to be valued on the basis of their expertise rather than as members of profession. According to *Josef Rojter*[3] *"An engineer is someone who uses mathematics and science to mess with the world by designing and making things that other folks can use..... and once you mess with the world you are responsible for the mess you made!"*. The science an engineer uses is means to an end, and its quality as science is irrelevant as long as it works.

Unlike the higher status of the more autonomous professions of medicine and law, engineering has derived its social status from scientific education of university. The adoption of engineering curricula - which shift from scientific norms to a professional practice orientation - necessitates a paradigm change within the faculties and school of engineering. An obstacle is witnessed in developing a problem or target oriented engineering curriculum with an emphasis on design which is without scientific norms. Unlike the faculties of law and medicine at universities, engineering schools and faculties were reluctant to recruit full time academic staff from the ranks of practicing professional engineers. According to *Yotard* [4], the construction of new paradigm of engineering education would thus require curriculum designers who are not only attuned to the changes in professional practice but also participate in developing engineering philosophy.

According to *John W. Prados* (Vice President Emeritus and University Professor, The University of Tennessee),a new engineering education paradigm is needed, characterized by active, project based learning; horizontal and vertical integration of subject matter; introduction of mathematical and scientific concepts in the context of application; close interaction with industry ; broad use of information technology; and a faculty devoted to develop emerging professionals as mentors and coaches, rather than as all-knowing dispensers of information. An engineering education based on this vision should not only produce graduates better prepared to meet the needs of engineering employers, but could very well increase student motivation and interest, with a consequent reduction in the present high dropout rates.

African educational institutions are confronted with several challenges [5]. An enormous challenge is in training a cadre of highly qualified professionals to fuel development and address the challenges confronting the continent. There are inadequate educational resources, with a loss of the best talented faculty to the outside world. There is a need to provide a more flexible educational system for students.

With these challenges, it is highly unlikely that current educational institutions on the continent will be able to provide access and affordable education to all of those seeking access to higher education. Even though tertiary institutions have a responsibility in producing scholars, the universities are constrained by space, time, and money. Finally, there is a need to adopt innovative learning methods that will permit the delivery of education to the majority of those seeking higher education.

The role of quality assurance of existing institutions through issuing guidelines has taken a back seat. Industry body FICCI (Federation of Indian Chamber of Commerce and Industry) has proposed an overhaul of regulatory framework for technical education in India in order to ensure delivery of quality in higher education. National Knowledge Commission (NKC 2008) stating…. "Multiple control mechanisms and controlling regulations have stifled innovative initiatives in recruitment of faculty, admission of students, curricula revision and upgradation, and financial management in most institutions".

P.K.Dutta and Somanath Chatterjee[6]opine that technical education offers a carefully planned system of learning and training that includes theory which is oriented towards problem solving, supported by detailed laboratory practice and some important attribute developing practices like dissertation work and workshop practice. *K.Velmanirajan* [7] said that the main requisite for student is the all-round development in academic and other co-curricular activities to fulfill the quality gap. The focus of the real customer (industry) expectation towards the society will help the direct customer (student) in shaping their expectation. Robin S. Adams [8] raised the question on who the engineering students are, how they learn, and what they need to know. Research on student engagement has moved the boundaries of learning environments beyond formal classrooms to informal spaces such as student lounges, professional work spaces, and virtual community spaces.

Narayan Murthy [9] revealed that over 50% of engineers in East European nations like Poland or Hungary are suitable to work for multinational companies, whereas the corresponding Figures for India is just 25 %. *Cunha, J.C. and Cunha, L.B.*[10]agree that regarding basic technical knowledge, the majority of newly engineering graduates are well prepared. On the other hand, apparently this is not true with regard to the fast-changing requirements of the industry, where there is an expectancy that young professionals will be prepared to exercise leadership, deal with business issues and implement policies that will contribute to corporate success and profitability.

Prados J.W. [11] discussed regarding, engineering schools admitting the science and mathematics proficient students. In the last ten years industry has complained that though the engineering students were smart and knew a lot of techniques, they took too long to train to be useful in industry. They "lack design capability or creativity, lack understanding of manufacturing or quality processes, have a narrow view of engineering, weak communications skills, and little skill or experience in teamwork."

IV. TQM TECHNIQUES TO ASSURE QUALITY

The research has been carried out to find out the challenges for the engineering education which are directly and indirectly affecting the quality. A survey has been conducted in Karnataka state to understand the issues of the quality and challenges to overcome. The three parameters like Physical, Academic and Psychological parameters were considered for the study.

The random sampling method is adopted to collect the responses from students, staff members and head of the organization. Based on the study the following Cause and Effect/Fish bone diagram (Figure 1) is drawn to showcase the causes and its effects on quality parameters in an engineering education system.

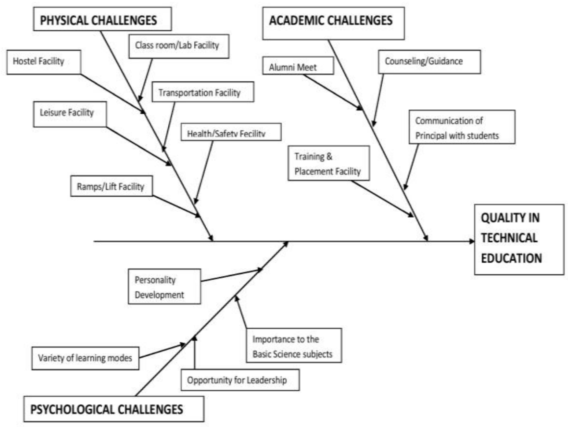

Figure1: CRITICAL PARAMETERS IN QUALITY

V. CONCLUSION

The Indian technical education system is growing rapidly and is subjected to fast radical changes since its inception. But, it is now facing major threats which may also create ample opportunities and room for qualitative improvements. The foreign universities are also stepping in with the proven model of engineering education. To achieve the Mission 2020, we need engineers who will contribute to society through productive and satisfying engineering careers as innovators, decision-makers and leaders in the global economy of the twenty first century. To realize this, the education system need to be strengthened which will be capable of honing the students to attain all-round multi-faceted personality; to acquire leadership qualities, to sharpen communication and interpersonal skills, to acquire knowledge of the latest trends in technology, to have exposure to industrial climate and to gain confidence to face challenges in the highly competitive and ever-changing industrial world. The regulatory and accreditation bodies should be autonomous in true sense as suggested by FICCI and National Knowledge Commission. The faculty shortages; infrastructure deficiencies; curricula obsolescence; lack of autonomy in academic, financial, administrative and managerial matters; poor involvement in knowledge creation and dissemination, and poor interaction with community and economy need to be addressed. There should be deliberate attempts to attract and retain the qualified staff and faculty. To enhance the ability of existing employees, the formulated promotion procedures, incentives for quality performance, and staff development policies should be developed and implemented effectively.

REFERENCES

[1] Patil, V.H., Kamlapur, S.M. and Dhore, M.L. “Six Sigma in Education: To Achieve Overall Excellence in the Field of Education”, ITNG 2006. Proceeding by IEEE Computer Society, pp. 2-5, 2006.

[2] Johnson “Changing the culture: engineering education in to the future”, Barton Act: Institution of Engineering Australia, 1996.

[3] Josef Rojter “Humanizing Engineering Education for twenty first century, and Engineering Education: Perspective, Issues and Concerns”, The International Journal of Engineering Education, Vol. 26, No. 6, pp. 1508-1523, 2009.

[4] Yotard The Post modern condition: A report on knowledge, Minneapolis University of Minnesota Press, 1984.

[5] Osei Darkwa and Fikile Mazibuko. “Creating Virtual Learning in Africa:challenges and prospects”, www.firstmonday.org /issues / issue5_5 / darkwa/index.html,2004

[6] Dutta, P.K. and Somanath Chatterjee “In the Recession Period- Jobs and Career Opportunities through Technical Education”, The Indian Journal of Technical Education, Vol. 32,No.2pp. 50-64, 2009.

[7] Velmanirajan, K., Runosri, K. and Anuradha, K. “Role of Engineering Colleges towards expectation of Direct Customers”, The Indian Journal of Technical Education, Vol. 32, No. 3, pp. 33-40, 2008.

[8] Robin S. Adams. “Reframing Professional Development: A Systems Approach to Preparing Engineering Educators to Educate Tomorrow’s Engineers”, Journal of Engineering Education, pp. 239, July 2008.

[9] Narayan Murthy, Chairman and Chief Mentor, Infosys Technologies Limited Key note address at the National Institute of Personnel Management (NIPM) *Silver Jubilee Annual National Conference*, Thiruvananthapuram on September 6, 2007, ISTE News Letter 2007.

[10] Cunha, J.C. and Cunha, L.B. “Looking Ahead: Challenges for Petroleum Engineering Education”, Oil and Gas Business, pp. 24-29, 2005,through www.ogbus.ru/eng/

[11] Prados, J.W., Peterson, G.D. and Latucca, L.R. “Quality Assurance of Engineering Education through Accreditation”, Journal of Engineering Education Vol. 94, No. 1, pp. 165-184, 2005.