

## **TOTAL QUALITY PRINCIPLES FOR EXCELLENCE IN TECHNICAL EDUCATION**

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### **1. INTRODUCTION :**

The paper outlines a model that will enable engineering educators and managements of higher technical institutions to understand and apply principles of Total Quality (TQ) in achieving the objective of excellence in engineering education. The objective is to train innovative engineers who give complete satisfaction to the users industries and themselves feel joyful with their creative contribution to the engineering profession. The Institutes of Engineering and Technology should also provide products of high quality by way of education technology, research outputs and patents, consultancy services to the industry ensuring the satisfaction of all its customers, viz. students, employees and industrial and governmental concerns, as well as professional societies of engineering.

### **2. BASIC CONCEPTS OF TQ :**

"Total Quality (TQ) may be defined as "performance superiority in satisfy-

ing customers by deploying people committed to using institutional resources to provide value to customers, by doing the right things right, the first time every time." Doing the right things means doing those things that add value to the "Service" (educational outputs) and doing things right means doing them efficiency with least cost. Effectiveness and efficiently together make for Total Quality. (TQ).

Quality can be built into technical education at all points within the value adding chain in the education process. This makes for peak performance and creation of well satisfied customers. For achieving this, there is need to have a quality strategy in place in the institutions. To be kept in mind is the fact that the coming years will see the following happen in a global market :

- Competition
- Constant change
- Customers exercising their choice amongst global competitors
- A severe crunch on resources, both

physical and financial.

Institutions failing to change their centuries old mind-sets and apply and implement TQ principles may soon have to wind the shop.

To prevent this, there are two aspects of quality that have to be kept in mind. One refers to the "attributes" of the service to meet the need of the users satisfactorily. The second aspect of quality is the "absence of deficiencies" in the service.

Engineering educators have, therefore, to be conscious of both these needs if they intend to consistently keep their customers - primarily the students and engineering industry - fully satisfied without any need for complaining.

Fig. 1 shows the broad outline of the process of engineering education. People, i.e. staff, technicians, administrative employees, top management and students are all involved in the process. Therefore, these people constitute a major source of variability in the process and the results achieved. Their role is critical.

Quality happens primarily in the minds of the people. Everyone in the institution has definite role to play and has a hand in achieving quality. Often however, these roles are not well defined in writing and properly communicated. Besides, while the institution as a whole has its "customers" (the external ones, as mentioned above), everyone working in the institution has also a "customer" (called an "internal customer"). Everyone has to become aware of his "internal customers" to ensure that quality is delivered to all of them in the entire chain of the process from in-

put to output. A culture of TQ has to permeate the whole institution.

### 3. STRATEGIC PLANNING FOR TQ :

Excellence is linked with long term effectiveness and planning becomes critical for total quality for which there has to be continuous striving. Also the entire institution should be total aligned towards the common goal of performance superiority.

For strategic planning it is necessary to have a clear vision of "what" the institution should do and how best it would like to give the optimal value for its customers. Planning deals with "macro" issues; spans departmental boundaries; is a continuing process dictated by changing technological environment in a climate of uncertainty. The following steps are suggested for strategic planning :

- (a) Analysis of data including environmental factors; SWOT analysis viz. Strengths, Weaknesses, Opportunities and Threats. Customer profile and preferences based on feedback surveys and approaches of other engineering colleges, technical universities world-wide based Information Technology.
- (b) Clear mission of the institution, whom it serves and for what purpose. The focus is on "what to do" in respect of macro issues.
- (c) Strategic thinking, viz creatively matching strengths with the opportunities.
- (d) Strategic plan : Long term, short term, tactical and operational goals to be specified within a time frame.

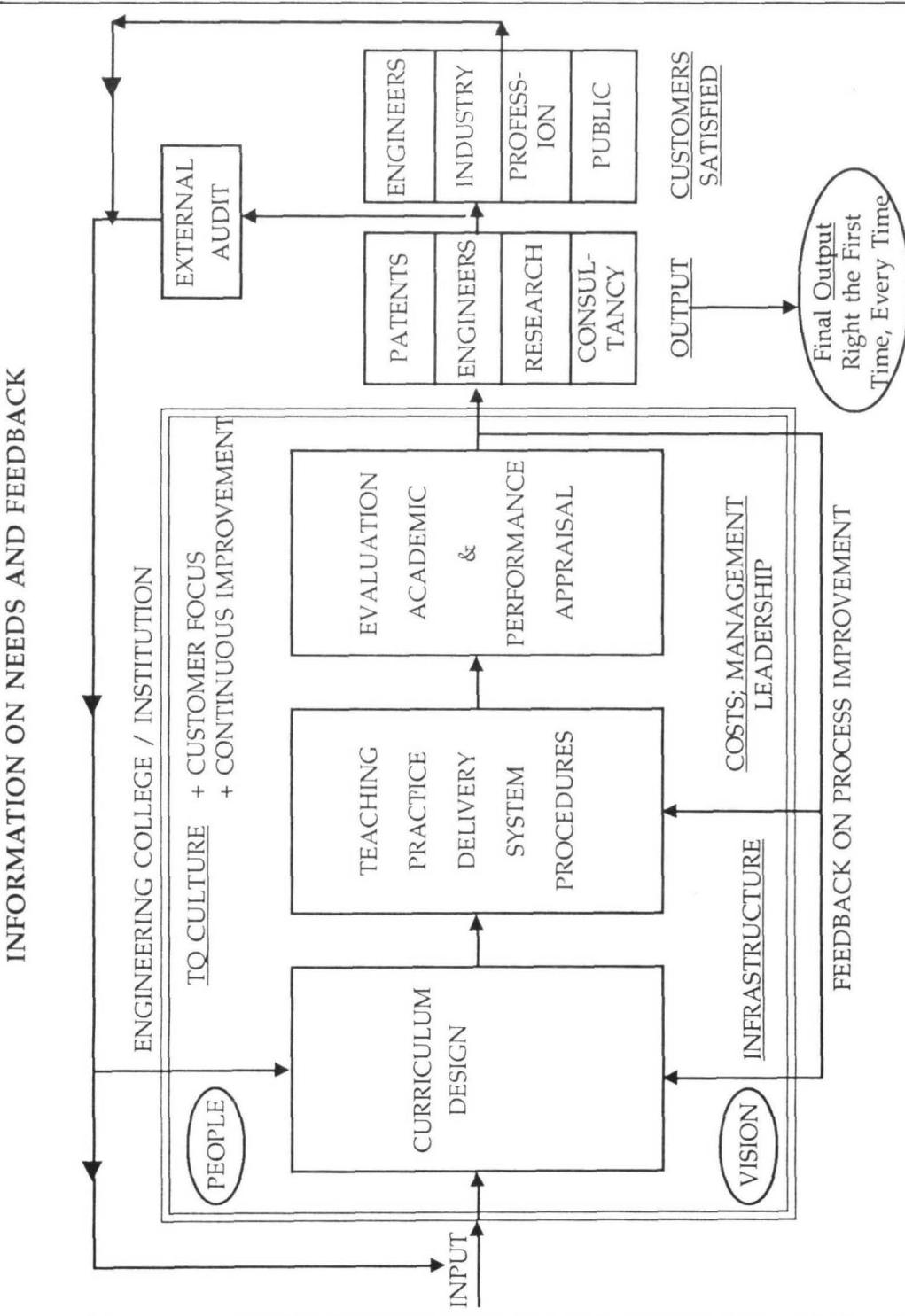


FIG. 1 : TQ SYSTEM MODEL FOR ENGINEERING EDUCATION

- (e) Education system and process. Practice and delivery. Line and staff strategies.
- (f) Operational Tactics : How to do it ? ways and means. Impact of macro issue on micro issues. Written policy statements for internal consistency, curriculum design, teaching practice and performance evaluation procedures, etc.
- (g) Implementation schedules linked to budget/resources allocation process.
- (h) Review of the process and return to step (a) above for rethinking and modifying plans, where and if needed.

The strategic planning will provide a new focus on mission, values, means of academic delivery and administrative and technical support services. Every employee is geared up to achieve excellence as a part of a coherent and vibrant team with a new approach to delivery of instruction, research, consultancy and public services.

It must be emphasized that “people” are the most critical elements of this process. Individuals must be respected. Students and scholars are the focus of all services. Excellence and superior performance must be relentlessly pursued. Training of students and professional outputs of the academic staff must receive the highest priority.

#### 4. ACHIEVING TOTAL QUALITY :

TQ has become a “way of life”. The four pillars of TQ are :

- Perfect process of training and skill building systems and services including information, professional inputs, procedures and methods.
- Excellence of academic and administrative staff, technicians and other employees. Full participation, high motivation and continuous improvement, continuing education, QIP and training. Identify, groom and support capable people. People are listened to and developed further.
- Customer Focus involving internal and external customers. Satisfaction of industry and other users of students. Excellent placement of students in entrepreneurship / business / industry / public services.

Achieving TQ requires continuous benchmarking of data from other worlds-class institutions. The process of continuous improvement is vital to TQ. This is stimulated by external changes and by internal or external feedback pointing out deficiencies.

TQ is staff driven and requires a new collective mind-set. People alone can create excellence and they must work across departments and beyond narrow boundaries of hierarchy. Everyone has to participate and TQ cannot even begin until there is “total attitudinal change” which has to be planned and wilful.

Vision of wholesome sustainable development (WSD) propelled by wholesome technology motivates engineers. For this, innovative technologies by creative engineers trained in the institutions, will be needed. Such a vision

must be internalized because where there is no vision, people perish.

Performance for TQ has to be integrated with this vision. There has to be equilaterally harmonious integration of technology, management and creative leadership<sup>1</sup>. Outstanding leadership for TQ must be flexible, loving, unbounded, creatively impassioned, holistic and constructive. Above all, academic leadership means leading by example in academic delivery, research and involvement in consultancy and professional work.

## 5. ASSURING QUALITY THROUGH SUPERIOR SYSTEMS :

"A system in the context of TQ is an integrated set of tasks, processes and activities that enable people responsible for the task to achieve their specified

- Inputs – Students, staff
- Equipment – Laboratories, infrastructure
- People – Staff, Students, Technician, Administrative staff, Employees
- Procedures & Methods – Working, Doing tasks (steady state)
- Dynamic staff – Students, Employee, Student interactions
- Evaluation and Measurements – Evaluation of students. Performance of staff. Evaluation of research, Consultancy and other products, Projects. Peer evaluation.
- Feedback for control – Modification to be made in the above.

Effective systems are an absolute necessity for achieving total quality. The process must create a culture of self-evaluation and continuous improvement. The college must also satisfy external audit and accountability. Policies,

goals". A system always provides as part of its "output" a service / product or information or a combination of all three."

Methods and procedures must be documented and followed meticulously until feedback calls for modification. There must be sufficient room and flexibility for creativity of the trainer. Balance is needed. Control vis-a-vis TQ must not stifle creativity. Education is a process of dynamic human interaction which necessitates provision for creative chaos within the process. Unchanging steady-state systems are not organic, human and dynamic.

Excellence in output can be ensured by a "dynamic-meditative-state" of "total awareness" cultivated by training staff. The goals of steady-state (TQ) are well integrated in the system comprising as follows :

practices and procedures must be made public and accessible through adequate documentation of objectives, process and outcomes (in measurable terms wherever possible).

Costs are increasingly important in

TQ approach. Total cost measurement is essential and pressure to contain costs of technical education are posing a great challenge to college managements. Activity Based Costing (ABC) is an approach that will help to pinpoint where value addition is not happening by additional costs, inputs.

## 6. SUMMARY :

The mission of TQ approach for excellence in technical education is to have continuous improvement in all types of learning, processes, curriculum courses, research, consultancy, administration and team work. It is also to apply quality principles in curricular, co-curricular and extra - curricular education. The students have to be developed to the level of their capabilities to become innovative engineers, and the academic staff have to be provided opportunities in the educational system to develop themselves professionally while helping students.

The involvement model outlined in this paper combines the interest of the students, academic staff, administrative staff, employees and management, on the one hand with those of its customers, viz students, industry, public ser-

vices and the engineering profession on the other. All are focused on the vision of excellence and are driven by the grand vision of achieving wholesome sustainable development by creating eco-friendly engineered system for the welfare of human kind and providing a quality of life (QoL) free from stresses caused by lop-sided technological growth.

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