

SOME EXAMPLES OF FRAMEWORK FOR PROMOTING QUALITY IN THE EDUCATIONAL SECTOR

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SUMMARY

While there have been sporadic initiatives for infusing Quality into Education in general and Technical Education in particular, organized and sustained activities have only begun since 1991 when the Corporate Sector began to recognize the importance of Quality in their products and services consequent upon the economic liberalization introduced then. This Paper discusses several frameworks which have been developed for introducing and sustaining Quality in the different sectors. While all of them have the same or similar objectives, the frameworks differ both in the identification of criteria and the assessment process.

1. Introduction :

Quality is of intrinsic importance to all sectors - Industry, Business, Services. Since the integration of the world economies about ten years back, it has assumed prime importance. While the response of the Corporate Sector has been timely and satisfactory -with many companies acquiring Quality recognition, such as ISO-9000 and QS-9000 certification - the Educational sector has been less responsive. The NBA (National Board of Accreditation) for Technical Education, and the NAAC (National Assessment and Accreditation Council) for General Education are laudable initiative of the AICTE and UGC, respectively, for infusing Quality into the Educational Sector.

This paper reviews the framework for promoting Quality in the Educational Sector, with particular reference to NBA Accreditation, the Malcolm Baldrige Quality Award Programs of the US - for both the Corporate Sector, and the very recently introduced framework for the Educational Sector - ISO-9000, and the CMM levels for Software Engineering.

2. The NBA Framework :

The National Board of Accreditation (NBA) was established in September 1994 by the All India Council for Technical Education, and was charged with the task of evolving a procedure for quality assessment in the technical education sector, and specifically to :

- * articulate the criteria for assessment of quality
- * identify parameters to quantitatively assess these criteria and assign appropriate program-specific weightages for each
- * validate the procedure by well-designed test runs, and
- * establish appropriate benchmarks.

The NBA has carried out country-wide awareness workshops, training programs and other essential activities, such as benchmarking and finalisation of the evaluation procedures and methodologies. The NBA is responsible for assessing the qualitative competence of educational institutions from the Diploma level to the Post-graduate level in Engineering and

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Technology, Architecture, Pharmacy, Town Planning, and Management. The NBA is also concerned with the assessment and quality assurance of the various constituent elements of these educational institutions, such as, the academic ambience, administrative infrastructure, physical resources, human resources, support services such as the library, computer centre, and avenues for moulding and developing the student's personality and learning characteristics.

The major decision adopted by the NBA is to accord Accreditation, not to the Institutions as a whole, but at the Program level viz., the 4-year under-graduate engineering degree course after 10+2, and the 3-semester M.E./M.Tech program after the Bachelor's degree. Furthermore, the Programs are to be graded into categories A,B,C and NA, depending on the rating they achieve on a 1000 point scale. This is especially significant for promoting healthy competition for Quality among the different degree Programs of the same institutions as well as among similar

programs in different institutions. Thus, in a given Institution, some degree Programs may be accredited with high grades, while some weak Programs may be rated low, or even denied Accreditation.

The Board comprises a Chairman, and 15 other Members, drawn from Industry, R&D establishments, Professional Societies and MHRD, and eminent educationists. The term of office of the Chairman and Members, other than ex-officio Members of the Board, is three years. One-third of the Board continues for another term, to ensure continuity; however, no Member will continue for more than two terms.

The final decision is based on Information supplied by the Institution in 'The Accreditation Proforma', a three-day Visit by peer Assessors, and their Report, which is evaluated by a Sectorial Committee and recommendation made to the Board.

Table I shows the NBA Accreditation criteria, under 8 categories, amounting to a total of 1000 points.

Table I
NBA ACCREDITATION CRITERIA

CRITERION		WEIGHTAGES	
		U. G.	P.G.
I.	Mission, Goals and Organisation	100	70
II.	Financial and Physical Resources and their utilization	100	80
III.	Human Resources	200	200
IV.	Students	100	100
V.	Teaching - Learning	350	250
VI.	Supplementary Processes	50	50
VII.	Industry - Institution Interaction	70	100
VIII.	Research & Development	30	150
	Total	1000	1000

A few hundred programs have now been assessed and accredited, and the results published and disseminated by the NBA.

3. The ABET Accreditation Framework :

The Accreditation Board for Engineering and Technology, ABET, is a federation of 28 Professional Societies, and is the sole agency responsible for accreditation of Engineering Education programmes in the US. It is the successor to the Engineering Council for Professional Development, ECPD, which functioned for 65 years. The official philosophy of ABET is to encourage innovation in Engineering Education.

ABET has recently looked inward, and the introspection has resulted in several corrective measures. For instance, it was realised that over the years, ABET evaluators became more dependent on rules and criteria, finding it easier and less time-consuming to evaluate a programme's compliance to these than to evaluate innovative curriculum responses to a changing world. During this period, accreditation criteria grew from a few paras to 30 pages of detailed course descriptions, credit-hour requirements, mandated faculty strength, etc.

ABET has now called for steps to lessen pre-occupation with quantitative criteria, and to respond to the fundamental challenges facing Engineering Education in the XXI Century. Notable among these are new Engineering Design criteria, which moved away from the rigid 16 credit-hour requirement for Engineering Design. The Innovation clause allowed institutions to submit innovative programmes that did not satisfy the quantitative aspects of the criteria, but met the spirit and intent of the criteria. The Accreditation Process Review Committee, APRC, was established

in 1992 to help outline "a quality-oriented, flexible accreditation system that encourages diversity and does not inhibit innovations in Engineering Education." APRC identified three key issues to be resolved :

- * excessive length and specificity of the accreditation criteria ;
- * difficulty in attracting mid-career pros from industry and research universities to participate as leaders in the accreditation process;
- * Complexity and length of the accreditation process.

3.1 Engineering Criteria 2000 (EC 2000) :

This is a radically new set of criteria, and comprises eight criteria that emphasize quality and professional preparation. These criteria maintain the traditional core of Engineering, Mathematics and Science requirements, but also place importance on a new skill set that includes, teamwork as well as global economic, social and environmental awareness. At the core of EC 2000 is an outcome assessment component, which calls for :

- * detailed, published educational objectives that are consistent with the Institution's mission and EC 2000.
- * a curriculum and process that ensures achievement of these objectives.
- * a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.

It is recognized that it will not be easy to implement EC 2000. Establishment of measurable objectives and evaluating their outcomes are sophisticated activities with which most engineering educators have had little experience. ABET has

mounted a massive national effort, along with NSF and industry leaders, in order to develop knowledgeable programme evaluators.

4. The Malcolm Baldrige National Quality Award Programme For Corporate Excellence :

The Malcolm Baldrige Award is a very prestigious National Quality Award in the US, which was instituted in order to promote Quality in the corporate sector. It is an annual Award to recognize US companies that excel in Quality Achievement and Management. The initiative for instituting this Award seems to have come from the then President, George Bush : "The improvement of quality in products and the improvement of quality in service - these are national priorities as never before."

The Foundation for the MBNQA was created to foster active partnership between the private sector and government. The management of the Award programme has been entrusted to the National Institute of Standards and Technology (NIST).

The Award promotes :

- * awareness of Quality as an increasingly important element in competitiveness.
- * understanding of the requirements for Quality excellence; and
- * sharing of information on successful Quality strategies and on the benefits derived from implementation of these strategies.

There are three eligible categories of the Award : manufacturing companies, service companies and small businesses.

The key concepts in the Award examination criteria are :

- * Quality is defined by the customer.
- * Senior leadership should create clear Quality values and build the values into the way the Company operates.
- * Quality excellence derives from well-designed and well-executed systems and process.
- * Continuous improvement must be part of management of all systems and processes.
- * Companies need to develop goals, and strategic and operational plans to achieve Quality leadership.
- * Shortening of response time of all operations and processes of companies to be part of the Quality improvement effort.
- * Operations and decisions of companies need to be based upon facts and data.
- * All employees must be suitably trained and developed and involved in Quality activities.
- * Design Quality, and defect and error prevention should be major elements of the Quality system.
- * Companies need to communicate Quality requirements to suppliers and work to elevate supplier Quality performance.

Table II shows the seven examination categories and the points for each, amounting to a total of 1000 points. While the NBA and MBNQA schemes are designed keeping in mind the specific objectives of the two systems, Human Resources and their Utilization is common to both; the focus of MBNQA is on Quality and Customer Satisfaction, while that of NBA Accreditation is Teaching- Learning Processes.

Table II
MBNQA - Examination Categories

★ Leadership	100
★ Information and Analysis	70
★ Strategic Quality Planning	60
★ Human Resource Utilization	150
★ Quality assurance of products and services	140
★ Quality results	180
★ Customer Satisfaction	300
★ Total Points	1000

5. The MBNQA Education Criteria For Performance Excellence :

President Clinton signed legislation into law on October 30 1998, enabling education institutions and health care organizations to take full advantage of the Malcolm Baldrige National Quality Award in 1999. The Award application process, as well as self-assessment against the Criteria for Performance Excellence, provides a steady and proven course for education institutions to pursue performance excellence and maintain a leadership position in their communities. The Criteria Provide a valuable framework

for performance excellence, and assist in assessing and measuring performance in a wide range of key institutional performance indicators : student / stakeholder, educational service and outcomes, operational and financial. Self-assessment permits the identification of strengths and targeting of opportunities for improvement on processes and result affecting all key stakeholders - including students, faculty, staff and community.

Table III provides a listing of the Education Criteria for Performance Excellence.

TABLE III
1999 EDUCATION CRITERIA FOR PERFORMANCE EXCELLENCE
ITEM LISTING

1999 Categories/Items	Points	Values
1 Leadership		110
1.1 Leadership system	80	
1.2 Public Responsibility and Citizenship	30	
2 Strategic Planning		80
2.1 Strategy Development Process	40	
2.2 School Strategy	40	

3 Student and Stakeholder Focus	80
3.1 Knowledge of Student Needs and Expectations	40
3.2 Students and Stakeholder Satisfaction and Relationship Enhancement	40
4 Information and Analysis	80
4.1 Selection and Use of Information and data	25
4.2 Selection and Use of Comparative Information and Data	15
4.3 Analysis and Review of School Performance	40
5 Faculty and Staff Focus	100
5.1 Work Systems	40
5.2 Faculty and Staff Education, Training, and Development	30
5.3 Faculty and Staff Well-Being and Satisfaction	30
6 Educational and Support Process Management	100
6.1 Education Design and Delivery	60
6.2 Education Support Processes	40
7 School Performance Results	450
7.1 Student Performance Results	150
7.2 Student and Stakeholder Satisfaction Results	100
7.3 Faculty and Staff Results	100
7.4 School-Specific Results	100
TOTAL POINTS	1000

5.1 Explanation of Concepts :

★ Measures and Indicators :

Measures and indicators refer to numerical information that quantifies input, output, and performance dimensions of processes, products, services, and the overall outcomes; they can be simple (derived from one measurement) or composite.

While the Criteria do not make a distinction between measures and indicators, some users of these terms prefer the term indicator : (i) when the measurement relates to performance but is not a direct or exclusive measure of such performance. (e.g., the number of complaints is an indicator of dissatisfaction, but not a direct measure

of it); and (ii) when the measurement is a predictor (or leading indicator) of some significant performance.

★ Performance :

Performance refers to information on output results obtained from processes and services that permits evaluation and comparison relative to goals, standards, past results, and other organizations. Performance might be expressed in financial or non-financial terms.

Two types of performance are addressed in the Criteria : (i) operational, referring to performance relative to effectiveness and efficiency measures and indicators; examples being productivity, and regulatory compliance. (ii) student and stakeholder-related, referring to

performance relative to measures and indicators of student and stakeholder perceptions, reactions and behaviours.

❖ **Process :**

Process refers to linked activities with the object of producing a product or service for a customer within or outside an organization. In knowledge work, such as teaching, strategic planning, R & D, and analysis, process does not necessarily imply formal sequences of steps; rather it implies general understanding regarding competent performance, such as timing, options to be included, evaluation, and reporting.

❖ **Productivity :**

Productivity refers to measures of efficiency of the utilization of resources.

5.2 Explanation of Criteria :

❖ **Leadership System :**

How senior leaders guide the institution in setting directions, and in developing and sustaining effective leadership throughout the organization.

❖ **Public Responsibility and Citizenship :**

How the Institution addresses its responsibilities to the public, and how the Institution practises good citizenship.

❖ **Strategic Planning :**

This category examines how the institution sets strategic directions, and how it develops key action plans to support the directions; also how plans are deployed and how performance is tracked.

❖ **Knowledge of Student Needs and Expectations :**

Describes how the Institution determines longer-term requirements, expectations, and preferences of present and future students; also describes how the institution employs this information to understand and anticipate needs, and to

create an overall climate conducive to learning.

❖ **Analysis and Review of School Performance :**

Describes how the Institution analyzes and reviews overall performance to assess progress relative to plans and goals, and to identify key opportunities for improvement.

❖ **Faculty and Staff Education, Training :**

Describes how the Institution's education and training support the accomplishment of key Institution action plans and addresses Institutions' needs, including building knowledge, skills, and capabilities, and contributing to improve faculty and staff performance and development.

❖ **Faculty and Staff Well-being and Satisfaction :**

Describes how the Institution maintains a work environment and work climate that support the well-being, satisfaction, and motivation of faculty and staff.

❖ **Education Design and Delivery:**

Describes how educational programmes and offerings are designed, implemented, and improved; also, how delivery processes are designed, implemented, managed and improved.

5.3 Core Values, Concepts and Framework :

The Education Criteria are built upon a set of core values and concepts, which are the foundation for developing and integrating all requirements within a result-oriented framework. These core values include :

❖ **Learning-Centered Education :**

Places the focus of education on learning and the real needs of students.

Such needs derive from the requirements of the marketplace and the responsibility of citizenship. Rapid changes in technology and in the national and global economies are creating increasing demands on employees to become knowledge workers and problem-solvers, keeping pace with the rapid changes in the marketplace. A learning-centered Institution needs to fully understand and translate marketplace and citizenship requirements into appropriate curricula. Education offerings need to be built around learning effectiveness. Teaching effectiveness needs to stress the promotion of learning and achievement.

6. MBNQA As An Engine For Continuous Improvement :

The MBNQA seeks to improve national competitiveness by building active partnerships in the private sector, and between the private sector and all levels of government. The National Institute of Standards and Technology (NIST) promotes US economic growth by working with industry to develop and deliver high-quality measurement tools, data, and services necessary for the nation's technology infrastructure.

For more than a decade, the Baldrige Criteria for Performance Excellence have been a significant tool used by thousands of US companies to assess and then improve performance on the critical factors that drive their overall success. In the most competitive business sectors, organisations with world-class results are able to achieve a score above 700 on the 1000-point Baldrige Scale. Even if an organisation does not win the Award, submitting an application in itself has valuable benefits. Every applicant receives a detailed feedback report - based on an independent external assessment conducted by a panel of specially trained and recognized experts - outlining the strengths and opportunities

for improvements.

Many recipients indicate that their greatest rate of improvement occurs the year after receiving the Award. There is only one requirement of recipients : that they share information from their application summary, and participate in the Quest for Excellence Conference, the next year, so that the others might learn from their success. The Award itself is traditionally presented by the President of the US at a special ceremony in Washington, D.C.

7. Quality Considerations In Software Engineering :

The Software Engineering Institute (SEI) of the Carnegie Mellon University has developed a set of Capability Maturity Model (CMM) levels for assessing and certifying Quality in Software Engineering; this has come to be regarded as the most prestigious recognition in the world of IT. CMM is an application of TQM to Software Engineering. Two top Indian Software powerhouses, viz. Satyam Computers and TCS, have recently earned the distinction of securing a level-5 CMM rating from the Institute. Ron Radice, an IBM veteran and Director of the SEI at Pittsburgh, has worked closely with many companies, assisting them to successful completion of various levels.

The CMM comprises a set of carefully-designed norms to provide guidance to a company to effect improvements in key process areas. This set of practice touches aspects like quality, skills, schedule, cost, cycle time, productivity, consultancy, and value of processes.

The meaning of different maturity levels is as follows :

- ❖ **Level 1** : an initial phase to set things right for a company growing in total chaos.

- ★ **Level 2** : brings discipline to processes.
- ★ **Level 3** : defined so that the company can undertake standard and consistent processes.
- ★ **Level 4** : the company reaches a stage where everything can be predicted, controlled, and measured.
- ★ **Level 5** : the last level, or optimising level 5 stresses opportunities, prevents defects, and brings about incremental changes in the company, and focusses on continuously improving processes.

The SEI improves the ability of software engineers to analyse, predict and control selected functional and non-functional properties of software systems. It focusses on defining, maturing and accelerating the adoption of improved technical engineering knowledge processes and tools.

The optimising level, level-5, is not the destination of process management; it is a foundation for building an ever-improving capability. The companies will increase efficiency and quality. They will also meet customer expectations, better time-to-market position, improved productivity and efficiency, and most importantly a rise in revenue. No certificate is given to show any achievement; it is up to the company to feel confident.

The mission of SEI is to promote the evolution of software engineering from an ad-hoc, labor-intensive activity to a discipline that is well-managed and supported by technology. Thus a company must achieve the maturity levels for purely business reasons.

The SEI was established by the US federal government in order to advance the practice of software engineering as quality software, produced on schedule, and within budget; only companies having at least level-3 are considered for businesses and ventures.

Ron Radice says that the SEI-CMM levels are "like a doctor's prescription: you can improve the quality of your life and remain healthy if you follow certain standards in life. CMM just tells you that."

8. Award Of ISO 9001 Certificate To IIT-Madras By RWTUV :

The Corporate Sector has universally recognized the importance of Quality in their products and services for achieving and sustaining competitiveness. Since 1991, many Indian companies have sought and obtained ISO-9000 certification, which has not only helped them to internally strengthen themselves, but also to project an image of quality in all its facets to the outside world. The manufacturing sector has taken the lead in this direction, while the service sector, as for example, hospitals, hotels, etc., is also following in its footsteps.

Quality assurance has always been a matter of concern and significance in Education, in general, and in professional education, such as Engineering Education, in particular. While specific regulatory mechanisms exist for ensuring minimum standards before an institution is started, and performance appraisal after it has functioned for over six years through the National Board of Accreditation, ISO-9000 certification has special significance in the matter of design and documentation of procedures for establishing and implementing Quality Systems. It enables the streamlining of processes and procedures, and internally strengthens the system. It is easily recognized as a stamp of Quality by industry. It is these

considerations which prompted IIT-Madras to go in for ISO-9000 certification. Since it is an autonomous and unitary institution with responsibility and control over the design of academic systems, we applied for ISO-9001 certification.

The effort commenced in September 1996 with the enunciation of a Quality Policy, consensus for which was generated from the grassroots. The five components of the Quality Policy are given below :

- ★ Impart Quality Education in Technology and Science for Professional Excellence and Instill Commitment to Sustainable Development.
- ★ Perform World Class Research to Advance the Frontiers of Knowledge.
- ★ Provide Innovative Solutions through Research, Consultancy and Continuing Education for Satisfying Current and Future Industrial and R & D Needs.
- ★ Extend Expertise towards improvement in the Quality of Technical Education.
- ★ Achieve Excellence in the Support Services of the Institute through Continuous Improvement and Teamwork.

Six Units were identified and subjected to detailed scrutiny and certification audit; these may be classified into two groups. In the first group, comprising the Academic Section, Central Workshop, Central Library and the Computer Centre, the main stakeholder is the Student of the Institute, who is an internal customer. The other two activities chosen were the Centre for Industrial Consultancy and Sponsored

Research, and User-Oriented Programmes, for which the stakeholders essentially are from Industry, representing external customers. In all cases, a systematic generation of procedures and documents, largely based on well-established systems of the past, has helped to streamline the processes and workflow in the concerned Units. The certification audit by RWTUV resulted in the refinement of many of the systems and procedures; and as a recognition of compliance with their requirements, they have certified that "IIT-Madras has established and applies a quality system for Design of Academic and User-Oriented Programs; Support Services : Library, Computer Centre, Workshop, Industrial Consultancy & Sponsored Research."

This effort has involved the active participation from more than 200 persons of the different Units of the Institute over the past two years. IIT-Madras is the first research university of its kind in India to have obtained this distinction.

9. CONCLUDING REMARKS :

Quality has assumed prime significance in the Educational Sector in recent times. Perceptions of Quality vary among the different stakeholders, and different frameworks have evolved for assessing and promoting Quality over the years. Each has its own specific goals, objectives and roles. They may not be directly applicable to all types of institutions and context, but they provide guidelines for Institutions and Educational Administrators to embark on the journey to Excellence.

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