CHAPTER – I

TECHNICAL EDUCATION SCENARIO & QUALITY INITIATIVES IN INDIA

The last half of this century has transformed our environment, perhaps radically, and brought more changes in our lives and thinking than in any corresponding period in history. These are the consequences of discoveries of sciences and applications of technology. The concept of absolute knowledge in the sense of storing all knowledge is perhaps no more relevant today. Our efforts for reconciling the traditional concepts and ways with the demands of technological age cannot provide simple solutions for our difficulties and complexities based on such stored knowledge. Frontiers of knowledge are themselves expanding rapidly making it possible to device newer and more efficient methods of solving problems of the society.

Education must therefore make efforts for securing knowledge and mastering modern skills and methods than merely storing and distributing the traditional ones. For this purpose of training of mind and mastering of skills and for harnessing science and technology to profitable and productive processes of economic growth and social well-being, the technological education system has to be continuously reviewed and adopted.

This has indeed been the basis of our efforts during the last three decades, the result is that there is a well-organized structure and a wide network of technical institutions offering different types of programs: craftsman courses, technician (diploma) courses, graduate and postgraduate courses, etc., catering to the various levels of knowledge, skills and competences required by the economy.

Since Independence in 1947, Technical Education System in India has grown into a fairly large-sized system, offering opportunities for education and training in a wide variety of trades and disciplines at certificate, diploma, degree, postgraduate degree and doctoral levels in institutions located throughout the
Chapter 1: Technical Education system in India

country. In the year 1947-48, the country had 38 degree level institutions with intake capacity of 2,500 and 53 diploma level institutions with intake capacity of 3,670. The intake for postgraduates was 70. There was rapid expansion of the system in the next 20 years. By 1967-68, the number of degree level institutions had increased to 137 with intake capacity of 25,000; and for diploma to 284 institutions with intake capacity of 47,000. In the next 10 years (in 1977), the system capacity increased only marginally to admit 30,000 students for degree courses, 60,000 for diploma courses and 6,000 for postgraduate courses.

The system capacity increased very rapidly in the next 20 years, with the major role being played by the private sector. By 1997, the system had 547 degree level institutions with admission capacity of about 131,000 and 1,100 diploma institutions with admission capacity of about 184,000. Admission capacity for postgraduate courses had increased to 16,900. Out turn of PhDs were about 370 annually. In the year 2006, the total number of engineering institutions, not including the IITs, NITs and university colleges rose to 1518 with admission capacity of 5,69,283 students; and 1250 engineering diploma institutions with admission capacity of 2,77,576. Approximately, two-thirds of these institutions were in the private sector.

Now in the academic year 2010-11 there are 3241 Engineering colleges, 3858 Management Institutions, 1937 MCA Institutions, 1102 Pharmacy Institutions, 125 Architecture Institutions with respective total intake capacities as 1324246, 378907, 135173, 103867, and 4933.

The Central Government, States and Union Territories have played an important role in the development of Technical Education System by establishing a large number of fully funded and aided technical institutions, and by providing adequate policy support. At the apex of the Technical Education System in India are the fifteen Indian Institutes of Technology (IITs) located at Bhubaneswar, Chennai, Delhi, Gandhinagar, Guwahati, Hyderabad, Indore, Jodhpur, Kanpur, Kharagpur, Mandi, Mumbai, Patna, Ropar and Roorkee established with the objective of imparting world-class education.
The IISC Bangalore was established to offer postgraduate education and to conduct research in various areas of basic sciences, engineering and technology. The MHRD has also established Indian Institute of Science Education & Research at Kolkata, Mohali, Trivendrum, Bhopal and Pune. The Indian Institutes of Management (IIMs) located in eleven cities (Ahmedabad, Bangalore, Calicut, Kolkata, Indore and Lucknow, Shillong, Ranchi, Rohtak, Raipur and Trichy) are institutions of excellence established with the objective of imparting high quality management education and training, conducting research and providing consultancy services in the field of management to various sectors of the Indian economy.

In the second tier, there were 17 Regional Engineering Colleges (RECs). These were established, one each in the major States, to meet the growing requirement of trained technical manpower for various developmental projects. On the basis of the recommendations of a High Powered Review Committee, GOI has renamed all RECs as National Institutes of Technology (NIT) and declared them as deemed universities for ensuring high standards of education and research on the pattern of IITs. At present there are 30 NITs in the country. Some of the existing engineering colleges of important States/newly created States have been upgraded as NITs. The NITs are being managed by governing bodies, enjoying complete academic autonomy and interacting closely with the industry in all academic ventures and are performing various activities aiming towards establishment of Centers of Excellence.

Over the years, several other institutes have been established for imparting quality education and conducting research in specialized areas. These include the Indian Institute of Information Technology (IIIT) at Allahabad; Indian Institute of Information Technology, Amethi, Allahabad (UP); Atal Bihari Vajpayee Indian Institute of Information Technology & Management, Gwalior (M.P.); Pandit Dwarka Prasad Mishra Indian Institute of Information Technology, Design & Manufacturing, Jabalpur (M.P.); Indian Institute of Information Technology, Design & Manufacturing, Kanchipuram, Chennai (Tamil Nadu); National Institute for Training in Industrial Engineering (NITIE) at Mumbai; National
Institute of Foundry & Forge Technology (NIFFT) at Ranchi; Indian School of Mines at Dhanbad; Sant Longowal Institute of Engineering & Technology (SLIET) at Longowal; North-Eastern Regional Institute of Science & Technology (NERIST) at Itanagar; School of Planning & Architecture (SPA) at New Delhi, Bhopal and Vijaywada; and 4 Technical Teachers’ Training Institutes (TTTIs) at Kolkata, Chennai, Bhopal and Chandigarh which have been renamed as National Institute of Technical Teachers’ Training and Research (NITTTR).

In addition to the above, there are a number of institutes & universities and deemed universities that have earned a name for themselves. These include Anna University in Chennai; Jadavpur University in Kolkata; Bengal Engineering & Science University at Sibpur; Birla Institute of Technology & Science at Pilani; Birla Institute of Technology at Ranchi; Thapar Institute of Engineering & Technology, Patiala; Institute of Technology of BHU at Varanasi; Punjab Engineering College at Chandigarh; and College of Engineering at Pune, VJTI and UICT at Mumbai.

The new millennium has witnessed unprecedented challenges and opportunities for higher education, arising from the effect of changing economic policy of liberalization and globalization. The economic policy has not only opened wider options for the investment for the Indian industry but has brought in the realization that only the best can survive in the world market and that only quality in products and manpower is the key to success. Knowledge is increasingly recognized as the main force behind economic growth and development in the context of global economy, coupled with information and communication revolution, the emergence of worldwide labor market leading to significant change in the global sociopolitical environment across the world.

The Indian Economy is helped greatly with availability of strong talent in Information Technology. Since IT is pervasive in all fields of technologies and India being the hub in this sphere, the present situation has created much larger avenues of education and training. To meet the existing demand, a large number of private self financing institutions were established in the country in the last ten
years, mostly catering to IT industry which has now reached a saturation point and creating the problem of sustenance of these institutions.

The management of private institutions lacked vision and expertise to adjust their curriculum to suit the changing needs efficiently and effectively and hence are unable to maintain world standards in education. The Government institutions on the other hand, have so far survived due to public support. The institutions can no longer survive with obsolete knowledge among teachers, old curricula, obsolescence in the laboratories and workshops and widespread indifference to the need of the industry.

One of the other major offshoots of globalization is the rising prosperity and reach of world media even in middle class homes creating awareness and demand for the latest technology among the consumers in every field, and consequently forcing the industry to provide the latest. The need for skilled manpower to cater to the changing technological needs is attracting multinational companies to invest in the country. Along with sound technological skills, today’s technocrats need sound management skills to survive. The ability to take tough decisions, be motivating team leader, understanding the market behavior and orienting it to his/her advantage, are some of the key attributes of successful managers.

2.2 The Government of India Vision

The Report of the Committee on India Vision 2020 rightly recognized that a large number of the country’s engineering colleges need to be up-graded to quality standards close to those of the IITs, and given similar autonomy. Private sector initiatives and investment, Indian corporate or NRIs or reputed foreign universities, need to be fully encouraged to participate in upgrading technical education in the country. Close links need to be fostered between technical institutions and industry. Besides NPE 1986, a number of policy initiatives have been taken by the Government, some of these are: (a) National Technology Policy Statement (1983), Technology Policy Vision for India 2020 (1996), National Policy Initiative for Technician Education (1998), Information Technology Policy
The GOI’s vision is “To develop and nurture a technical education system in the country which would produce skilled manpower of the highest quality, comparable to the very best in the World and in adequate numbers to meet the complex technological needs of the economy; and would provide the nation a comparative advantage in the creation and propagation of innovative technological solutions and in the development of a technological capacity of the highest order, both for its application in the economic development of the country and for becoming a major supplier of technology and technological services in the World.”

The Vision Statement has the following six main components:

a) To produce skilled manpower in sufficient numbers to meet the needs of the economy
b) To ensure the highest quality of output from the technical education system comparable to the very best in the world
c) To develop a comparative advantage in the creation and propagation of innovative technological solutions
d) To develop national technological capacity of the highest order
e) To use innovative technological solutions and technological capacity for economic development, and
f) To become a major supplier of technology and technological services in the world

As per the India Vision 2020: “The advent of computer and the internet-based educational methods offer an exciting new learning medium that can literally transform our concept of school and classroom from physical into virtual realities. As a result of digital revolution, the studies conducted in the USA project a radical reshaping of higher education over the next two decades resulting
into many traditional colleges closing down as more course works are delivered at
a distance through alternative channels. The traditional boundaries between
education and other sectors will fade, as publishers, for profit and non-profit
organization, offer accredited, multimedia-enhanced courses directly to students,
by passing the university.

The traditional classroom type of education, which is most useful for
students that require personal attention and assistance and for subjects that
involve hands-on experimentation, will no longer be the predominant model of
educator. For all other purposes, it is very costly and not very efficient in the way
it uses the time of both teachers and students.” Therefore, the entire higher
education system is on the verge of change and the institutions that do not
recognize the sign would tend to decline.

### 2.3 Government of India in Education

Before 1976, education was the exclusive responsibility of the States. The
Constitutional Amendment of 1976, which included education in the Concurrent
List, was a far-reaching step. The substantive, financial and administrative
implication required a new sharing of responsibility between the Union
Government and the States. While the role and responsibility of the States in
education remained largely unchanged, the Union Government accepted a larger
responsibility of reinforcing the national and integrated character of education,
maintaining quality and standards including those of the teaching profession at all
levels, and the study and monitoring of the educational requirements of the
country.

The Central Government continues to play a leading role in the evolution
and monitoring of educational policies and programs, the most notable of which
are the National Policy on Education (NPE), 1986 and the Programme of Action
(POA), 1986 as updated in 1992. The modified policy envisages a National
System of education to bring about uniformity in education, making adult
education programs a mass movement, providing universal access, retention and
quality in elementary education, special emphasis on education of girls,
establishment of pacesetting schools like Navodaya Vidyalayas in each district, vocationalization of secondary education, synthesis of knowledge and interdisciplinary research in higher education, starting more Open Universities in the States, strengthening of the All India Council of Technical Education, encouraging sports, physical education, Yoga and adoption of an effective evaluation method, etc. Besides, a decentralized management structure had also been suggested to ensure popular participation in education. The POA lays down a detailed strategy for the implementation of various policy parameters by the implementing agencies.

The National System of Education as envisaged in the NPE is based on a national curricular framework, which envisages a common core along with other flexible and region-specific components. While the policy stresses widening of opportunities for the people, it calls for consolidation of the existing system of higher and technical education. It also emphasizes the need for a much higher level of investment in education of at least six per cent of the national income.

The Central Advisory Board of Education (CABE), the highest advisory body to advise the Central and State Governments in the field of education, was first established in 1920 and dissolved in 1923 as a measure of economy. It was revived in 1935 and had continued to exist till 1994. Despite the fact that in the past, important decisions had been taken on the advice of CABE and it had provided a forum for widespread consultation and examination of issues relating to educational and cultural development.

CABE has a particularly important role to play at the present juncture in view of the significant socio-economic and socio-cultural developments taking place in the country and for the review of the National Policy on Education which is also due. It is a matter of importance therefore, that the Central and State Governments, and educationists and people representing all interests, should increase their interaction and evolve a participative process of decision making in education, which enhances the federal structure of our polity.

The National Policy on Education, 1986 (as modified in 1992) also envisages that the CABE will play a pivotal role in reviewing educational
development, determining the changes required to improve the system and monitoring implementation, and will function through appropriate mechanisms created to ensure contact with, and coordination among, the various areas of human resource development. Accordingly, the CABE has since been reconstituted by the Government in July 2004 and the first meeting of the reconstituted CABE was held on 10 and 11 August 2004. The Board consists of nominated members representing various interests in addition to elected members from the Lok Sabha and the Rajya Sabha, and the representatives of the Government of India, State Governments and UT Administrations.

In the meeting of the reconstituted CABE held on 10 - 11 August 2004 some critical issues had emerged needing detailed deliberations. Accordingly, seven CABE Committees were set up to examine:

a. Free and Compulsory education Bill and other issues related to Elementary Education
b. Girls Education and the Common School System
c. Universalisation of Secondary Education
d. Autonomy of Higher Education Institutions
e. Integration of Culture Education in the School Curriculum
f. Regulatory Mechanism for the Text Books and parallel text books taught in schools outside the Government system
g. Financing of Higher and Technical Education.

The above mentioned Committees were set up in September 2004. The reports of these Committees were discussed in the 53rd Meeting of the CABE held on 14-15 July 2005 at New Delhi. Necessary steps are being taken to identify the action points emerging from all these reports and to prepare a road map for action on them in a time bound manner. In the meeting it has also been decided, inter alia, to constitute three Standing Committees of the CABE, viz.,
a. A Standing Committee on Inclusive Education for Children and Youth with Special needs to oversee the implementation of the new education policy on this subject.

b. A Standing Committee on Literacy and Adult Education to guide the National Literacy Mission.

c. A Standing Committee for looking at the integration and coordination of efforts for children's development, taking into account different schemes of education, child development, nutrition and health aspects.

On the recommendations made by the CABE, in its meeting held on 6-7 September 2005, a monitoring committee has been setup to oversee the preparation of syllabus for the textbooks by NCERT. Measures have been taken to reform the functioning of the accrediting and affiliating institutions by introduction of steps to receive and process the applications on-line and also bringing in the reforms in other processes by making things transparent.

Consultation process has been initiated to consider the setting up of a National Commission on Higher Education & Research (NCHER) for overseeing generation of new ideas and monitoring the reforms in the higher education sector.

In the 57th meeting of CABE held on 19th June 2010, five principles for NCHER were dealt as under:

a) Unity of the regulatory structure in place of multiplicity of regulators,

b) Restoration of academic freedom and institutional autonomy of universities and Institutions of higher learning,

c) Prevention of fragmented and compartmentalized approach to knowledge

d) Continuous engagement of society for achieving equity, access and balanced development of higher education and

e) Encouraging cutting edge research through network research centers within and outside Government.
In order to facilitate donations including smaller amounts from India and abroad for implementing projects/programs connected with the education sector, the Government has constituted "Bharat Shiksha Kosh" as a Society registered under the Societies Registration Act, 1860. It was launched officially on 9 January 2003 during the celebrations of Pravasi Bharatiya Diwas. The Kosh will receive donations/ contributions/endowments from individuals and corporate, Central and State Governments, Non-Resident Indians and People of Indian Origin for various activities across all sectors of education.

Following two are the main organizations which have been established at the National Level for setting norms and standards and seeing to their observance in the field of higher and technical education

**INSTITUTIONAL FRAMEWORK**

Following two are the main organizations which have been established at the National Level for setting norms and standards and seeing to their observance in the field of higher and technical education

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sector</th>
<th>Institution Established for Quality Standards at National Level</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universities &amp; General Colleges</td>
<td>University Grants Commission (UGC)</td>
<td>Statutory body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Assessment and Accreditation Council (NAAC)</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Technical &amp; Management Education</td>
<td>All India Council for Technical Education (AICTE)</td>
<td>Statutory body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Board of Accreditation (NBA)</td>
<td>--</td>
</tr>
</tbody>
</table>
As has been mentioned above, the Vocational Training/Craftsmen Courses are offered at the Industrial Training Institutes. The Diploma courses are offered in the Polytechnics which are widely spread over all the States and Union Territories and are affiliated to the respective State Boards of Technical Education who lay down in general the levels and standards of the courses and guide the system of evaluation of the students appearing at the examination. Degree and Post-Graduate courses are offered in colleges affiliated to the various Universities, certain University Departments, and institutions declared as of national importance or as deemed Universities.

Control over the Technical education system is affected at Central government level through:

**Bureau of Technical Education** (BTE) in ministry of HRD

This agency undertakes the monitoring and evaluation of centrally funded institutes. All proposals for new plan schemes and assistance through foreign agencies are processed by BTE.

**University Grants Commission** (UGC)

This apex body undertakes funding of Central Universities, maintenance of standards of teaching, examinations and research in Universities. It also recommends recognition of new universities.

**All India Council for Technical education** (AICTE)

is a statutory body responsible for planned growth of the technical education system, maintenance of standards and norms, funding for Research and Continuing education, QIP and Industry partnership schemes.
The National Board of Accreditation (NBA)

Functions under AICTE and is responsible for ensuring norms and standards are met and through a rigorous process of Course wise study grades are awarded by NBA for guidance of all stakeholders and help the college in Quality up-gradation (AICTE Reports).

National Assessment and Accreditation Center (NAAC)

An autonomous body of UGC was set up for Assessment of Quality in Universities, by examination of the affiliated colleges as a sample and assessment of Colleges by study of attached Departments. The rating by means of Stars serves to guide stakeholders and the concerned college (NAAC Reports).

Source: Various Reports of AICTE

PROBLEMS AND PERSPECTIVES:

Significant as the achievements in creating facilities for technical education in the country over the post independence period are, there appears a good need for total review of the system that has been built up, with a view to make it more relevant and effective to the national needs. For historical reasons, the technical education system has been more or less inward looking; the impact of the system on the other elements of the economy is yet to be objectively assessed.

Some of the relevant issues identified by MHRD through various studies are:

A) Wastage in the System - To take first the building of the competence of the professional itself, we might try to understand the efficiency with which the system has worked so far. Considerable facilities have been created in the institutions over the last number of years and even on the basis of the non-uniform and separate evaluation results themselves, one is rather constrained to find that
there is a large wastage in the efforts put in the institutions, of the order of about 30% in degree level and of 52% at Diploma level.

**The possible reasons for wastage were stated to be:**

(i) Lack of necessary aptitude for the course among the concerned students;

(ii) Inadequacy of instructional facilities;

(iii) Ineffective teaching, possibly because of the teachers not being trained; and a heavy curriculum. Valid as these reasons are even today, there may be many other contributory factors also such as:

   a. Non-selective admission of students to the institutions;

   b. Changing mix of urban and non-urban background of students without corresponding modifications/orientation of educational methods contributing to the detriment of the non-urban element;

   c. Inadequate utilization of even the existing instruction facilities;

   d. In spite of adequate capital investment and hardware provided in the institutions quite often, the lack of appropriate matching provision for adequate departmental operating and training costs;

   e. Insufficient development of the correct attitudes to the professional education by both the teachers and the students; and

   f. External factors, such as lack of motivation because of inadequate or assured employment opportunities at the end of the course.
From the planning point of view, any effort to reduce wastage would contribute to the efficiency of the system as such and thus provide for out-turn of additional manpower that may be required without further inputs.

**B) Improvement of the System** - Any efforts at improvement of the system have naturally to take into account the various elements which contribute to its weaknesses.

Under the “Quality Improvement Programs” some steps have been taken to tone up that aspect of the system which concerns the teaching-learning process. Apart from these efforts, which, of course, require to be strengthened to a very great extent, there are other steps which might enhance the effectiveness of the system. Some of these are enumerated below:

- **Special remedial courses for non-urban/non-elite students**------ It would appear that the courses at present offered, based as they are on urban aptitudes, situations and characteristics, tend to cater to the needs of the elitist group. A majority of the students are from the non-urban sectors and from the institutions in the interior areas.

The background of the students also is not uniform in that many of the students may be first or second generation learners. Because of the lack of communication facilities on the same basis as his urban counterpart, such a student would require to be given special orientation/remedial course to be brought on par with the other students. Not only has that, even the Programs sometimes had to be appropriately changed to suit his non-urban experience and background.

1). **Multiple entry and flexibility.**

At present the attitude and aptitude of the students who take these professional courses have no obvious relationship with the professional courses offered to them. Quite often both because of the lack of aptitude, or absence of developing the correct attitude, or because of various other factors such as the duration of the course, the sudden change the student has to undergo in the
professional courses as compared to his earlier academic experience, etc., have an adverse effect on his performance. Again for reasons beyond one's control or because of economic and social background etc., the student might have taken up a different course and might like to opt for a professional course at a later stage. Even within the professional courses, the student might like to change either the branch or particular study which he has chosen earlier, or the orientation of this particular course. Occasionally the possibility of the student having to migrate from one place to another within the country itself also exists. The present system is rather a straight jacket one, with more or less a single entry point and perhaps a rigid course structure. To allow for different types of contingencies, it is necessary to think in terms of multiple entry points (depending upon the earlier academic/field experience) as well as of flexibility of the course structure and organization.

2). Need for review of course content

It is necessary to have a good look at the courses being offered now not merely for the organizational purposes of "graded" facilities. Mere accumulation of information is not knowledge, and complete knowledge by itself does not give the necessary wisdom. The purpose of education is not to produce “educated " individual at one stretch by putting all information and knowledge into course at one time, but, on the other hand, it is to take the individual to progressive stages where he would be in a position to acquire what further information and knowledge he wants for his future activities. If we accept this philosophy, it is to be conceded that what is important is not to " load " the curriculum but to arrange it in such a way that different requirements and needs of the individual's calling are provided in the process of life-long education. The credit system no doubt can go quite some way in this regard. But a deliberate attempt is to be made to recognize the fact that many of those who pursue these courses of studies will remain as technologists whereas quite a few of them might end up as managers. Further even a technologist has to have sufficient insight into the marginal areas of the allied fields, if not in-depth study in that field itself. The course content
therefore should be so modified as to allow for the technologist to have an overall view in addition to this core discipline, e.g., the professional may have to have managerial training in addition to his professional calling. The education in our institution campuses should break away from the rigid stand of a non disciplinary approach and a fixed framework but cater to a larger interest to acquaint and give an insight in various fields of expertise of which the institutional faculty and facilities are capable of, by offering on a massive scale refresher courses, study Programs, etc. Attempts should also be made even in the undergraduate Program to provide for an intensive managerial training for those who desire it within the course frame work apart from those who want to pursue the technological Program. Complementary courses might also be provided for the technologist to acquaint himself with the necessary management techniques and practices, and vice versa.

3). **Diversification, new courses**

The infrastructure that has been built up appears to be quite adequate to meet the major requirements of the system for most of the efforts mentioned above. However, with the changing technology and development there may be many areas where specialized personnel are required. Many of the emerging areas have been enumerated in Annexure 'G', for industrial and rural requirements, etc. A cluster of courses might be required; organization of diversification on a large scale and occasionally new courses also might be called for. This has to be looked into by appropriate agencies taking care at the same time to see that the fresh inputs for any such effort would be marginal and capable of diversion, whenever required. This is easily said than achieved in practice, but nonetheless the issues are important to be considered.

4). **Proliferation of courses**

The facilities available at various levels right from the craftsman to the post-graduate level are adequate and any further expansion of these facilities has to be gone into only after a deep study and with caution. The ratio between the
graduate, technician and craftsmen in some of the more industrialized economies is of the orders of 1:3:5; facilities for education being also provided for in that order. With us, the facilities provided at the graduate and technician level are in the ratio of 1:2, but in the output the ratio comes down to about 1:1. Organization of any new course/diversification at one or the other levels has to take into consideration a systematic study of the manpower requirement and utilization, linked with the occupational structure of the various employing sectors. It is, therefore, necessary to keep this in mind while organizing any new course/diversification at any level right from the craftsmen to the post-graduate so that the entire spectrum of activities in the employing fields are kept in mind. This is not to forget the needs of the research and development activities where academic considerations might point to growth potential at a particular level.

5). Sisterhood Programs

While there is no doubt that certain segments of the Technical Education system have built up strong potential (IITs, University Departments, some of the State Colleges, for example), there are others which are rather weak. It is here that practicable and effective systems of cooperation Programs between institutions of different types at different levels are to be organized. Desirable are the Programs of exchange of teachers on short term and long-term, on a massive scale planned in relation to specific levels and goals of development, providing opportunities and appropriate Programs for making available at specific and for known periods the facilities available at the better institutions for the use of the staff of the not-so-well-off institutions, organizing of special Programs of refresher courses, extension lectures, etc. by the faculty of the better institutions at the other institutions etc. Efforts at curriculum development, faculty development etc., though now well organized and recognized, have yet to be gone through on a much larger scale and in a more purposeful way. Preparation of manuals for lectures, workshop practice etc., production of text-books, preparation of teaching aids etc. also have to be undertaken by all the institutions by pooling the resources that are available.
6). **Industry-Institution collaboration**

For the improvement and further development of the system it is necessary that there is interaction between technical institutions and industry and other field organizations. There has been an awareness of the need for such interaction: creation of agencies such as Industrial Liaison Boards in the States, Co-option of Industrial representatives on the various academic bodies such as the Boards of Management, Boards of Studies etc., and the system of visiting Professorship/guest lectures etc. has helped to an extent in breaking this ground. But much more remains to be done in this direction. This initiative so far has been with the technical education system with the industry and field organizations, unfortunately, not always showing more than lukewarm interest. This attitude had radically to be changed in that both technical institutions, who produce manpower for the industry and the field organizations, and also the latter themselves are partners in the same enterprise of developing the economy; and it is high time that this responsibility, is duly realized by setting up this interaction. The employing sector should go all out to associate and involve itself in all matters and at all levels of technical education, planning and implementation. On the other hand, the technical education system should make this possible by appropriate incentives and safeguards for such involvement by personnel from the industry and employing organizations. A stage has been reached where purely academic consideration in a system of professional education should not be the criteria in determining about the suitability of personnel for technical education. Sufficient credit should be given by the educational authorities for giving appropriate recognition for field expertise- while considering the faculty requirements. Schemes such as adoption of institutions by industry etc., which have been initiated, should be encouraged totally by the industry.

7). **Improvement of teaching methods**

Production of textbooks, other teaching material and teaching aids which have been started now on a small measure have to be considerably stepped up. Manuals for better utilization of the laboratory and workshop equipment, use of
the library as a resource centre both by the teachers and the students have to be encouraged. In all these attempts of preparation of teachers and students materials, emphasis also has to lay on the possible slower comprehension of the non-urban student to the methods employed in the urban situation.

8). Integration of practical training with the institutional courses

Because of the lack of sufficient 'training' places in industry and field organizations, the provision of training under the Apprenticeship Training Program has been after the institutional course. For a more effective and coordinated approach, it is necessary to think in terms of integrating the practical/industrial training with the institutional course itself, at appropriate stages of the course. This will lead not only to better supervision but also better comprehension of the field precepts and practices by the student.

Organizations engaged in quality Control at Govt. level

1) Board of assessment of qualifications

The Board of Assessment of Qualifications of the Government of India, which also deals with professional qualifications and equivalence of various awards has a limited view of assessment for a specific purpose, i.e., for governmental employment. Further, as it is practiced, the work of the Assessment Board is a sort of one time evaluation based on a minimum requirement.

For a healthy and effective growth, what is required is a sort of continuous and objective assessment aiming at higher and still higher standards. Even though many agencies, particularly, statutory agencies are involved and any such attempt may not be looked upon with unmixed favor, to strengthen the system, by identifying the weaknesses and strength of a particular sector/course/institutions so that there is adequate motivation and direction for further improvement. To achieve these objectives two bodies NBA and NAAC were set up by MHRD.
2) **The National Board of accreditation (NBA)**

Functions under AICTE and is responsible for ensuring norms and standards are met and through a rigorous process of Course wise study grades are awarded by NBA for guidance of all stakeholders and help the college in Quality upgradation (AICTE Reports).

3) **National Assessment and Accreditation Center (NAAC)**

An autonomous body of UGC was set up for Assessment of Quality in Universities, by examination of the affiliated colleges as a sample and assessment of Colleges by study of attached Departments. The rating by means of Stars serves to guide stakeholders and the concerned college (NAAC Reports).

Having understood the system of technical education in India, relevant issues identified by expert bodies, constraints of the system and importance attached by MHRD to continuous monitoring of standards, we can now attempt to study the Quality assessment mechanisms of NBA and NAAC.

**Towards Accreditation-Role of NAAC**

In pursuance of the policy declaration of the National policy on education (NPE) in 1986, NAAC (national Assessment and accreditation Council) was set up by the UGC in 1994 at Bangalore by the UGC which observed that “Excellence of Institutions of Higher education is a function of many aspects. Self evaluation and self improvement are important. By setting up of a mechanism to encourage self assessment and accreditation by a council, the quality process, participation, achievements etc will be constantly monitored and improved”

Thus the mandate of NAAC is to accredit institutions to help them to work continuously for quality improvement. Assessment is accomplished through a self study by the University, followed by a peer group review which ends with a grade of Accreditation.

The unit of study in the NAAC process is either a University or a College or a department. Thus the scope of process will be decided by the applicant first.
Based on the unit of study, formats have been designed to get information from applicants and also self study formats have been prepared. The general theme in these formats is that information captured is used subsequently to provide inputs to the peer group on Identified 7 criteria and the key aspects studied under each criterion are which are summarized as follows:

1. Curricular aspects:
   - Compatibility of the Program with goals and objectives.
   - Initiation, review and redesign of Programs
   - Feedback on Programs
   - Interaction with academic peers and employers
   - Program options

2. Teaching learning and evaluation:
   - Programs account for individual differences in learners and provides academic flexibility
   - The evaluation procedures are rigorous and fair
   - Regularity of examinations and confidentiality
   - Recruitment process of qualified faculty
   - Institution has an open and participative mechanism for evaluation of teaching, research and work satisfaction of the faculty.
   - Opportunities for academic progress and professional advancement.

3. Research, Consultancy and extension:
   - Promotion of a culture of research in students and faculty
   - Outcomes by way of research, consultancy projects.
   - Interaction with the Industry
4. Infrastructure and Learning resources:
   - Adequacy of Infrastructure availability in relation to Programs being run
   - Mechanism for effective and optimal use of the infrastructure.

5. Student support and progression:
   - Departmental support to the student for his experiences on the campus
   - Student and alumni feedback

6. Organization and Management:
   - Organization design for delegation of powers and clarity of responsibilities for facilitating action on earmarked goals.
   - Transparency in administration
   - Academic and administrative planning to be in tandem
   - Realistic academic calendar and adherence to schedules
   - Recruitment policy for faculty and staff
   - Transparent admission policy
   - Effective Financial policy

7. Healthy practices:
   - Efficient running of academic and administrative decisions

To account for variances in Universities, colleges and Departments being assessed, differential weight ages have been assigned to above criteria is mentioned in Table-2
Chapter 1: Technical Education system in India

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>UNIVERSITY</th>
<th>COLLEGE</th>
<th>DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curricular aspects</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Teaching learning and evaluation</td>
<td>25</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Research, Consultancy and extension</td>
<td>15</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Infrastructure and Learning resources</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Student support and progression</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Organization and Management</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Healthy practices</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total weights</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Score of any College is calculated as \( \text{Sum of } W_i * C_i \) where \( C_i \) is the score given by peer group and \( W_i \) is the weight of 1st criterion.

**Based on the weighted scores, the colleges are graded as follows:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>A *****</td>
<td>&gt;=75</td>
</tr>
<tr>
<td>A ****</td>
<td>70-75</td>
</tr>
<tr>
<td>A ***</td>
<td>65-70</td>
</tr>
<tr>
<td>A **</td>
<td>60-65</td>
</tr>
<tr>
<td>A *</td>
<td>55-60</td>
</tr>
<tr>
<td>Not accredited</td>
<td>&lt; 55</td>
</tr>
</tbody>
</table>
**Duration:** The Accreditation award by NAAC is for a period of 5 years.

**Source:** Various Reports of NAAC

**Accreditation of Technical Education Institutions: Role of NBA**

The National Board of Accreditation (NBA) has been constituted by the All India Council for Technical Education, as an Autonomous Body, under Section 10(u) of the AICTE Act, 1987 in order to periodically conduct evaluation of undergraduate and postgraduate degree Programs being offered in various approved technical institutions, on the basis of specified guidelines, norms, benchmarks and criteria (NBA Reports).

**The basic objectives of Accreditation are:-**

- To assist all the stakeholders in Technical Education to identify those Institutions and their specific Program which meet the Norms and Standards and Criteria prescribed by the Council.
- To provide guidelines to the Technical Institutions for the improvement of existing Programs and also for the development of new Program:-
- To stimulate the process of continual improvement in the Technical Education system in our country.
- To develop a Quality Conscious system of Technical Education where excellence, relevance to market needs and participation by all stakeholders are prime the major determinants.
- NBA is dedicated to building a technical education system, as vendors of human resources, that will match the national goals of growth by competence, contributions to economy through competitiveness and compatibility to societal development.
NBA will provide the Quality benchmarks targeted at Global and National Stockpile of human capital in all fields of technical education.

Though the processes of arriving at the final Accreditation decision are substantially objective, they do involve an element of subjective assessment. The providers outlined here are neither exhaustive nor prescriptive, and the strengths and weaknesses of each Program are to be examined in the context of the overall goal of quality assurance. The underlying philosophy and the approach should be to assist the Institutions to achieve and maintain the quality of their Programs, and not to condemn or stifle their efforts.

**The basic criteria have been formulated to ensure that:-**

- The Programs provide their grades with a judicious mix of Basic Sciences, Engineering Sciences, Professional Theory, Engineering Design, Laboratory Experience, Workshop skills, Management, Humanities and social Sciences, Oral, Written and Graphical Communication skills, Computing techniques and Project work.
- The Programs give the graduates the capabilities to formulate and solve engineering problems through the application of basic and engineering sciences appropriate to their discipline; to design components, systems and processes to satisfy identified needs; to apply experimental or computational techniques in their professional tasks; to communicate effectively with peers and other relevant groups; to understand the impact of engineering slotting in the context of real-life constraints involving economic, social and safety, health and environmental considerations; and to sustain their professional competence through life-long learning.
- The postgraduate Programs prepare their students to acquire mastery in a specialized area through inputs in theory, practice and a project which results in a substantial contribution to research, development or design.
The Management of the Institution displays the requisite vision and commitment and provides the necessary resources and support to enable the achievement of the above educational Objectives. This is one of the most crucial and important requirements for securing Accreditation of the academic Programs.

Basic concepts of Accreditation:

Literally Accreditation means Recognition and guarantee of minimum quality

For the NBA it means:

A process of quality assurance, giving credit where it is due for some clearly visible and demonstrable strategies of academic activities and objectives of the institutions, known to be honestly pursued and efficiently achieved by the resources currently available with a potential for continuous improvement in quality for effective growth.

Benefits to institutions to go for Accreditation by NBA: If an institution and its Programs are accredited by NBA, it enables Identification of the Programs with excellence in technical education be assured of conformity to good practices and bench marks of global requirements. Rating the Programs on a national platform to attract better students should intake.

Enable an appraisal of Institution’s facilities, faculty vis-à-vis performance, be a satisfied vendor of human capital to world-class employers and other stake holders.

Significance of Accreditation for Various Stakeholders

Accreditation signifies different things to different stake holders for the parents; it signifies that their child goes through a teaching-learning environment as per accepted good practices. For the students, it signifies that he has entered the
portals of an institution, which has the essential and desirable features of Quality Professional Education.

For the employers, it signifies that the students passing out has competence based on well grounded technical inputs

For AICTE, it signifies that the institutional performance is based assessment through a competent body of Quality assessors, with of Strengths & Weaknesses emanating as a feedback for policy-making.

For the institution, it signifies its strengths, weaknesses and opportunities for future growth.

For the industry and infrastructure providers it signifies identification of quality of institutional capabilities and Skills & Knowledge.

For the country, it signifies confidence in the Suitability for sustaining stockpiles of market sensitive human capital and a pragmatic national development perspective.

For the alumni, it signifies attachment through the pride of passing out with credentials. Market sensitivity of Program output, to avoid imbalance in supply of qualified manpower.

Accreditation of the Institutional Programs by NBA is based Availability of potential for sustaining and improving upon assessment criteria Recognition by all stake holders like the end-users, institutional products and the community at large Demonstrated capability of the institution and Program to adhere to the qualitative criteria of Accreditation.

**Accreditation criteria employed:**
The visiting Team assesses the following criteria and the weight ages listed below:

**For undergraduate Programs:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Resource Faculty</td>
<td>200</td>
</tr>
<tr>
<td>Students</td>
<td>100</td>
</tr>
<tr>
<td>Finance &amp; Physical Resource</td>
<td>100</td>
</tr>
</tbody>
</table>
## Chapter 1: Technical Education system in India

<table>
<thead>
<tr>
<th>Mission, Goals</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research &amp; Development</td>
<td>30</td>
</tr>
<tr>
<td>Industry Institute Interaction</td>
<td>70</td>
</tr>
<tr>
<td>Supplementary Process</td>
<td>50</td>
</tr>
<tr>
<td>Teaching Learning Processes</td>
<td>350</td>
</tr>
</tbody>
</table>

### For postgraduate Programs:

<table>
<thead>
<tr>
<th>Human Resource Faculty</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>100</td>
</tr>
<tr>
<td>Finance &amp; Physical Resource</td>
<td>80</td>
</tr>
<tr>
<td>Mission, Goals</td>
<td>70</td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>150</td>
</tr>
<tr>
<td>Industry Institute Interaction</td>
<td>100</td>
</tr>
<tr>
<td>Supplementary Process</td>
<td>50</td>
</tr>
<tr>
<td>Teaching Learning Processes</td>
<td>250</td>
</tr>
</tbody>
</table>

The visiting team also assesses parameters, which are not obvious from quantitative data or statistics supplied viz.,

- Academic ambience and Institutional morale
- Level & relevance of facilities and student work.
- Capability of staff and their knowledge/practices
- Review of student assessment in theory, practical, design and project work.
- Comprehension by management, Staff and Students of the issues, problems vide the goals.

### NBA's Quality Grading Format

The Visiting Accreditation Team provides scores on the basis of their assessment and the Programs are finally accorded Quality Grading as below:
Accredited for 5 years:
Signifies that Program meets and in most cases exceeds the criteria, when the cumulative score exceeds 750 on a 1000 point scale the Program is accredited for 5 years.

Accredited for 3 years:
Signifies that Program meets the minimum criteria but has marginal deficiencies which can be rectified in a short time. When the cumulative score is between 650 and 749 on a 1000 point scale, the Program is accredited for 3 years.

Composition of visiting Accreditation Team:
The Visiting Accreditation Team consists of a chairperson and two Program experts, one of them being from industry or end-user organization. The team members are either senior academics or engineers, who are selected on the basis of their high standings in the profession.

The team of the above is selected from neighboring states other than the state in which institute is located.

Experts themselves withdraw from the accreditation exercise if they are involved with the institution in other capacities such as Advisor, Consultant, research, etc.....

CHAIRPERSON
The Chairperson once the Accreditation Team is constituted is an autonomous authority, who has the overall responsibility for the visit at the end of which to prepare the consolidated Team report for submission to the Sectarian Committee.

PROGRAM EXPERT
The Program Expert are responsible for assessing the individual Programs with reference to the criteria laid down for Accreditation of the undergraduate / past-graduate Programs.
Eligibility Criteria for Applying for Accreditation by NBA

If an institution and the Programs are approved by the AICTE and if at least two batches of students have passed out of the Program.

Programs covered under Accreditation by NBA

Under the provisions of the AICTE Act of 1987 all diploma, degree and post graduate Programs coming under the following disciplines are covered under Accreditation by NBA

Criteria used in Accreditation

One of the objectives of the NBA is to encourage the Institutions to continually strive towards the attainment of excellence. Its evaluation processes are so designed as to facilitate identification of strengths and weaknesses of the Programs under Accreditation. The NBA hopes that this will help the Institutions in improving the quality and effectiveness of their Programs.

The evaluation process is based on a set of eight broad criteria developed through a lengthy participatory process involving more than 1000 participants concerned with Technical Education.

This Chapter describes these criteria in some detail. Each criterion serves to assess a principal feature on the institutional activities and Program effectiveness. Each of the Criteria is described in terms of carefully identified parameters, amenable to a substantially objective and quantitative assessment.

Institutions seeking Accreditation of their Programs are expected to satisfy each of the criteria individually. They are expected to adhere to these criteria during the full term of the Accreditation. They are also encouraged to periodically review the strengths and weaknesses of their Programs and strive for continuous improvement.
Chapter 1: Technical Education system in India

Criterion I: Mission, Goals and organization

This criterion applies two aspects: Management and Organization & Governance. Every Institution should have a mission and a set of goals. Every Program offered by the Institution should also have its objectives and goals. The mission and goals should be articulated and made known to every one in the Institution.

The successful pursuit and realization of the mission and goals and the means adopted to accomplish them brings out the quality of the Institution and its Programs. The goals should be concrete and realistic within the context of the committed resources. They should define the educational and other dimensions, including scholarship, research, public service and customer satisfaction. The effectiveness and extent of achievement of goals depend on the commitment, attitude, planning and monitoring capacity, incentives and self-appraisal policies of the management. Similarly, Organization and Governance depend on the qualities of leadership, motivation, transparency of the operation, decentralization and delegation of power, involvement of faculty in management and planning, and general efficiency indices.

Criterion II: Financial and Physical Resources and Their Utilization

There is a need for the Institution to be financially stable. The financial resources should be adequate to sustain not only the achievement of current educational objectives but also provide for improvements for the foreseeable future. There should be a mechanism to ensure proper financial management and a well-organized process.

There must be available adequate space and appropriate physical resources, including building, laboratories, equipments, materials, library, and other ancillary facilities. While examining the physical resources mentioned above, there is a need to ensure provisions for safety, security and hygiene. All these need capital resources, an operational budget, a maintenance budget, a development budget and an infrastructure budget for land, building, hostel and support services, office equipment, transport and medical facilities.
Criterion III: Human Resources: Faculty And Staff

The Faculty Strength, cadres, qualification and level of competence and performance should be adequate to accomplish the institutional mission and goals. The commitment, attitudes and communication skills of the faculty play an important and crucial role in successfully running the academic Programs. This, in turn, depends upon the recruitment procedures, incentives, exposure to industrial activities, faculty development Programs and workload of the faculty. Each institution should have self-appraisal and in-house performance-appraisal mechanisms to monitor and ensure continued effectiveness.

The qualifications of the faculty relevant to the Program area are generally measured by the advanced degrees held, scholarship, creative activities and professional experience. The faculty is expected to act not only as instructors, but also as student advisors, academic planners and curriculum developers, and also to assist in institutional administration.

Faculty selection reflects the effectiveness of the management’s commitment. The Institution is expected to adopt an open process for recruiting its faculty members. Adequate employment security, salaries and benefits to commensurate with the position, provision for continued professional development, and periodic evaluation for their vertical mobility should be ensured and made known to the faculty.

The workload of the faculty should be such that it should not hinder their effective performance. The Institution should protect and foster academic freedom for each member of the faculty and develop mechanisms to ensure that the faculty act responsibly, ethically and in conformity with the prescribed conditions of the employment. The faculty members should strive to maintain professional competence and scholarly pursuits.

In case of supporting staff, besides adequate numbers and appropriate qualifications, the requirements are: hands-on experience, skills, attitudes, commitment and involvement with the institutional objectives. The recruitment procedures, performance appraisal, and incentives and rewards should be
transparent and objective. The inter-personal relations and interactions among and between faculty, supporting staff and students constitute an important ingredient in achieving the institutional goals.

**Criterion IV: Human Resources: Students**

The administration policies and procedures should be objective and transparent. The number of qualified candidates in national/state level tests, the number admitted and dropouts are some of the factors that reflect the institutional effectiveness. The evaluation procedures, academic results and time taken for completion of these requirements are important parameters. The graduation requirements should be made known to every student. The degree awarded should appropriately reflect the student’s attainments. Information with regard to employment of the graduates and feedback from the employers help the institution to reorient its goals so as to enhance effectiveness.

**Criterion V: Teaching-Learning Processes.**

Each undergraduate Program should embody general and specialized professional content of adequate depth and breadth, and should include appropriate Humanities and Science Components. The core of the main Program should concentrate on acquisition of knowledge and skills in the specific discipline, and also ensure exposure to inter-disciplinary areas. There should also be an effective relationship between the curricular content and practice in the field of specialization. In addition, the graduates successfully completing the Program should demonstrate their competence in oral communication, scientific and quantitative reasoning, critical analysis, logical thinking, creativity and capacity for self-learning.

Postgraduate degree Programs should be designed to give students mastery in their specialized field of study. They should have coherent curricula and should enable the students to advance substantially beyond the educational requirements of the undergraduate degree Programs.
The Institutions offering both undergraduate and postgraduate degree Programs should assess the relationship and interdependence of the two levels, and utilize the resources of both for collective improvement. Postgraduate Programs should not be offered unless resources and expectations greatly exceed those required for the corresponding undergraduate Program.

The academic calendar, number of instructional days, contact hours per week, student evaluation and feedback are some of the important aspects in evaluating teaching-learning processes. Effective teaching-learning processes include the development of practical skills through laboratory experiments, workshop practice and operation of modern equipments. They also require the inculcation of computing skills and availability of extensive library and educational technology facilities. The budget provision to meet the expenditure for the consumables required in the Laboratories and the Workshops is one of the indicators of the extent of hands-on practice that can be given. Implementation of the instructional Programs, lectures, tutorials, student-teacher interactions, group discussions, seminars and laboratory work have a direct bearing on the effectiveness of the teaching-learning processes. Maintenance of the course files by the teachers will help in assessing the effectiveness of the teaching and learning processes.

**Criterion VI: Supplementary Processes**

The Institution should provide the environment, which fosters not only the intellectual, but also the personality development of its students. It should have personality development opportunities provided through co-curricular and extra-curricular Programs and student services. These opportunities are to enable the students to become responsible members of the society. The services and facilities must be readily accessible to the students.

The students undergoing the Program should have access to facilities for career development, counseling and health education. Opportunities to develop leadership qualities and participation in seminars and group discussions should be created.
The Institution offering the Program should ensure that individuals responsible for co-curricular activities are well trained with work experience and possess personal qualities required to deal with the needs of the students effectively. Facilities and Funding should be adequate to create and maintain the student services. Policies concerning student responsibilities and grievance-readdress procedures are to be clearly stated and publicized. There should be a mechanism for regular and systematic evaluation to assess the fulfillment of the co-curricular goals and student needs.

Counseling and Guidance, professional society activities and entrepreneurship development are some of the supplementary processes, which need to be promoted. Substantial feedback from employees and alumni should be obtained to assess the effectiveness of the academic Programs.

**Criterion VII: Industry-Institution Interaction**

Industry participation in curriculum planning, consultancy, project work and extension lectures are essential to achieve the professional goals of the academic Programs in Engineering and Technology. For effective exposure to the world of work this interaction is vital.

The curriculum has to be updated at regular intervals, keeping in view the needs of industry and the profession, particularly in the context of rapidly changing technologies. There is considerable expertise available with teachers which can be utilized by the industry for consultancy. This, in turn, will help the teachers to gain knowledge of the latest industrial practices.

The fast-changing technologies also call for Continuing Education Programs for personnel from industry. Similarly, industrial-internship for faculty will give them a sound exposure to the industrial practices.

Industrial visits and industrial training are essential for creating professionalism in the students, and will help them in securing placement in appropriate industries. A Placement & Training cell is necessary for placement of the students and for arranging their industrial training. Feedback from the industry
through this cell to the faculty will go along way in improving the quality of the teaching-learning processes.

**Criterion VIII: RESEARCH AND DEVELOPMENT**

In the case of Undergraduate Programs, teachers should be involved in projects and quality improvement Programs in research institutions/university departments. Such an involvement will not only improve the teaching-learning processes but also enhance the quality of project work.

In the case of Postgraduate Programs, the aim should be to attain the stature of a Centre Excellence. Receipt of Special Assistance Department support Program/COSIST or other such support is an indication of the quality of the Postgraduate Programs. The department should also undertake academic/sponsored industrial R&D projects. Joint guidance with industry/R&D laboratory/other institutions for Ph.D. these/M Tech. Projects will not only develop close interaction between department, industry and R&D labs but will also enhance the quality of research. The criteria for evaluation of the Ph.D. these and M Tech. projects are important indicators of the quality of research work. Publications, citations, patents and resource allocation are other indicators of the effectiveness of research work relevant to the postgraduate Programs.

**Performance of Accreditation mechanism of India**

There has been an impressive growth in the number of colleges and variety of Programs offered at Diploma, Undergraduate and Post Graduate Engineering level since independence as follows:

**Source: Various Reports of AICTE**

For a healthy and effective growth, what is required is a sort of continuous and objective assessment aiming at higher and still higher standards. To strengthen the system, a mechanism was needed for identifying the weaknesses and strength of particular sector/course/institutions so that there is adequate...
motivation and direction for further improvement. To achieve these objectives two bodies NBA and NAAC were set up by MHRD

The National Board of Accreditation (NBA) has been constituted by the All India Council for Technical Education, as an Autonomous Body, under Section 10(u) of the AICTE Act, 1987 in order to periodically conduct evaluation of undergraduate and postgraduate degree Programs being offered in various approved technical institutions, on the basis of specified guidelines, norms, benchmarks and criteria.

The basic objectives of Accreditation are:-

- To assist all the stakeholders in Technical Education to identify those Institutions and their specific Program which meet the Norms and Standards and Criteria prescribed by the Council
- To provide guidelines to the Technical Institutions for the improvement of existing Programs and also for the development of new Program.
- To stimulate the process of continual improvement in the Technical Education system in our country.
- To develop a Quality Conscious system of Technical Education where excellence, relevance to market needs and participation by all stakeholders are prime the major determinants
- NBA is dedicated to building a technical education system, as vendors of human resources, that will match the national goals of growth by competence, contributions to economy through competitiveness and compatibility to societal development
- NBA will provide the Quality benchmarks targeted at Global and National Stockpile of human capital in all fields of technical education.

Though the processes of arriving at the final Accreditation decision are substantially objective, they do involve an element of subjective assessment. The providers outlined here are neither exhaustive nor prescriptive, and the strengths
and weaknesses of each Program are to be examined in the context of the overall goal of quality assurance. The underlying philosophy and the approach should be to assist the Institutions to achieve and maintain the quality of their Programs, and not to condemn or stifle their efforts. The Program being evaluated is rated on a 1000 point scale for 8 basic criteria and the categorized as Accredited or NOT Accredited against a 550 points cutoff.

In pursuance of the policy declaration of the National policy on education (NPE) in 1986, NAAC (National Assessment and accreditation Council) was set up by the UGC in 1994 at Bangalore by the UGC which observed that “Excellence of Institutions of Higher education is a function of many aspects. Self evaluation and self improvement are important. By setting up of a mechanism to encourage self assessment and accreditation by a council, the quality process, participation, achievements etc will be constantly monitored and improved”

Thus the mandate of NAAC is to accredit institutions to help them to work continuously for quality improvement. Assessment is accomplished through a self study by the University, followed by a peer group review which ends with a grade of Accreditation.

The unit of study in the NAAC process is either a University or a College or a department. Thus the scope of process will be decided by the applicant first.

Based on the unit of study, formats have been designed to get information from applicants and also self study formats have been prepared. The general theme in these formats is that information captured is used subsequently to provide inputs to the peer group on Identified 7 criteria The University or College is then rated as Single to Five stars depending on the weighted score achieved from a minimum of 55 to maximum of 100.

**Performance of the Indian system of quality audit: It would be beneficial to explain the performance by way of a SWOT analysis:**
Table No. 3

<table>
<thead>
<tr>
<th>Body</th>
<th>Strengths</th>
<th>Weakness</th>
<th>Opportunity</th>
<th>Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBA</td>
<td>AICTE support</td>
<td>Lack of Legal status as separate Identity</td>
<td>Global networking</td>
<td>Low number of Accredited Programs (5 %)</td>
</tr>
<tr>
<td>Action started on Washington Accord</td>
<td>Branch offices not available</td>
<td>Use of Information Technology for receipt, processing and Database Management</td>
<td>While fees charged are reimbursed by UGC in case of assessment by NAAC, no AICTE support for fees</td>
<td></td>
</tr>
<tr>
<td>Action started on Asian Accord</td>
<td>Duration of visit being 3 days, has to rely more on retired academicians</td>
<td>Simplification of Application Form to include self Assessment part</td>
<td>Low participation in NBA exercise by Industry professionals</td>
<td></td>
</tr>
<tr>
<td>Necessary condition for deemed</td>
<td>Lack of a bulletin or Newsletter</td>
<td>Incorporation of a periodic monitoring system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 1: Technical Education system in India

Universities and Autonomous Status.

Funding for Research grants by AICTE linked

Including of TQM practices in Assessment

Benefits to applicants for new courses or extension of AICTE approvals.

<table>
<thead>
<tr>
<th>Body</th>
<th>Strengths</th>
<th>Weakness</th>
<th>Opportunity</th>
<th>Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAAC</td>
<td>Autonomous status</td>
<td>Does not perform Program based evaluation</td>
<td>Collaboration with Washington Accord Countries</td>
<td>Rating might reflect popular past perceptions rather than current situation since number of experts are less while universities</td>
</tr>
</tbody>
</table>
Chapter 1: Technical Education system in India

<table>
<thead>
<tr>
<th>Assessment linked to UGC funding</th>
<th>Variation within an university or College not reflected</th>
<th>Inclusion of TQM practices in Assessment</th>
<th>Stakeholders like employers and students require Program wise information of quality prevalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existence of Publicity measures like Bulletin, coverage through journal of AIU</td>
<td>Since rating is for 5 years periodic follow up required.</td>
<td>More number of colleges to be covered (42 %)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of information Technology in Assessment procedure</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Higher Education in India comprises of the following colleges/institutions: Arts, Science and Commerce colleges (general college education), Engineering,
Technical and Architectural colleges, Medical colleges, Teacher Training colleges, Polytechnics, Others (Law, etc.), apart from education directly delivered by Universities, Institutions of National Repute (such as National Institutes of Technology).

### Table No.: 4 Educational Institutes Statistics in India

<table>
<thead>
<tr>
<th>Institution</th>
<th>No. of institutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Universities and other institutions</strong></td>
<td></td>
</tr>
<tr>
<td>Universities*</td>
<td>270</td>
</tr>
<tr>
<td>Deemed Universities*</td>
<td>130</td>
</tr>
<tr>
<td>Institutes of National Importance *</td>
<td>83</td>
</tr>
<tr>
<td>Central Universities*</td>
<td>42</td>
</tr>
<tr>
<td>Private Universities*</td>
<td>81</td>
</tr>
<tr>
<td><strong>Higher Education Institutions</strong></td>
<td></td>
</tr>
<tr>
<td>Arts, Science, and Commerce Colleges *</td>
<td>11,698</td>
</tr>
<tr>
<td>Engineering, Management, Pharmacy, Hotel</td>
<td>10,364</td>
</tr>
<tr>
<td>Management and Architecture Institutions #</td>
<td></td>
</tr>
<tr>
<td>Medical and Dental Colleges *</td>
<td>951</td>
</tr>
<tr>
<td>Teacher Training Colleges *</td>
<td>1,669</td>
</tr>
<tr>
<td>Polytechnics #</td>
<td>1,274</td>
</tr>
<tr>
<td>Others (Law, etc.) *</td>
<td>2,513</td>
</tr>
<tr>
<td><strong>Total Higher Education</strong></td>
<td>28,469</td>
</tr>
</tbody>
</table>

Source: [www.ugc.ac.in](http://www.ugc.ac.in), [www.aicte-india.org](http://www.aicte-india.org), [www.education.nic.in](http://www.education.nic.in)

**Future steps needed:**
While both NBA and NAAC have been given the mandate to cover one cycle of Accreditation for all Programs and Universities by 2005, the current coverage achieved indicates that a supplementary mechanism needs to be evolved if the benefits of Quality control have to be dispersed uniformly and the average Quality of Technical system output is to conform to international Standards of Equivalence particularly the Washington Accord countries to enable mobility of Technical manpower and collaboration in fields of Research.

Accreditation while being time consuming and costly, is also carried out after a gap of 3 to 5 years for previously covered Programs. A self-Assessment method which could be applied say every 6 months, to gauge the direction of movement of Key processes contributing to the output of a Program would be welcome. Another advantage would be that corrective action could be initiated earlier by the management, through a system of Continuous Improvement in line with the philosophy of TQM. A proposed model for comparing colleges in one discipline say, Electronics Engineering could be prepared; data collected from a variety of colleges could then be subsequently analyzed, by appropriate statistical techniques, for benchmarking colleges and later on for purposes of self-assessment.

Globally there is a continuous shift in the needs of the consumer or the stakeholder, his expectation from the Education system and market forces of availability of Finances, declining Government support, availability of new technologies like internet and multimedia challenging the conventional Talk and Chalk model, computer simulated self paced learning techniques etc require that the institution also function with a degree of efficiency like Industry which faces global competition. The concepts of Benchmarking, TQM, transfer of experience gained by application of TQM in other service organizations like Health Care, Hospitality and the study of Universities abroad who tried to implement the TQM model should ideally be combined to result in a method which while objectively aiding self assessment moves the management towards integrating best practices applicable in the field of Quality management.
Chapter 1: Technical Education system in India

There exist a wide variety of Criteria employed by popular awards like Malcom Baldrige, Deming award, Rajiv Gandhi award, works of Deming and Juran, incorporation of some of these criteria along with existing NBA/NAAC models needs to be explored.

A country wide Program of action which could include workshops, seminars and publicity through media to educate the stakeholder is required to enable a differential treatment by the consumer to act as a guiding force for Managements to embrace Quality concepts is required.

Despite being mandatory the lack of response received indicates that the government should improve the incentives offered for colleges to come forward for accreditation. A scheme of lead institutions to act as mentors for surrounding colleges could be initiated. Successful practices need to be disseminated for generating interest in a mass quality movement. A forward step has been taken by the Department of Collegiate education of Karnataka which with the involvement of CII, NAAC aims to transform the education scenario for the pure science and arts in Karnataka.

Quality Assurance implementation by Washington Accord Countries

Globalization “is the flow of technology, economy, knowledge, people, values, ideas…across the borders. Globalization affects each country in a different way due to a nation’s individual history, traditions, culture and priorities.” To cope with the ‘Globalization’, the higher education system has to re-orient its structure and function to meet the challenges of Globalization.

The globalization of economies brings in the mobility of knowledge workers and seekers across the world which could translate into an influx of skilled labor to meet growth in Industry needs in a Country or migration of jobs due to relocation to comparative advantageous locations of plant and Machinery for economies of scale.

Globalization has increased the tendency of engineering practice to be international in scope, and thus has led to the need for the credentialing of graduate engineers who want to practice in venues other than the one in which
they were educated and initially licensed. **Accreditation** of engineering education programs had evolved as the primary basis upon which mutual recognition across national borders is based – both for educational equivalency, and increasingly for practice mobility.

---

**Trends in engineering accreditation**

A quick examination of developments in engineering accreditation in several countries around the world can illustrate various ways in which it is having major impacts upon engineering education.

Germany – In response to declining interest in engineering study by both natives and international students, and to pressures from the Bologna Declaration and other sources to harmonize its engineering programs with those of other developed countries, universities in Germany are developing new engineering education systems in the bachelors plus masters pattern. At present these new programs are being offered in parallel with the traditional long programs leading to the Diplom-Ingenieur, and students are given the choice of which pattern to pursue. To assist in the development of these new programs, and to evaluate and certify their quality, a new **Accreditation** Agency for Programs in Engineering and Computer Science (ASII) has been established.

Japan – In the recent past, graduates of engineering programs in Japan were readily hired by its major corporations, given significant additional training by those corporations both initially and throughout their careers to enable them to contribute effectively to the economic goals of their employers, and then almost guaranteed lifetime employment and security by those employers. But the economic downturn in recent years has made job security a thing of the past, and globalization has made it imperative that Japanese engineering graduates are prepared for more self directed career development, and that they are prepared for practice in the global marketplace. A new Japan **Accreditation** Board for
Engineering Education has been established to provide quality assurance as new engineering programs are developed and implemented.

Jordan – In many developing countries, public university engineering programs do not have sufficient capacity to educate all those students who want to prepare themselves for employment in hot technological areas such as information technology. Private universities – often of questionable quality – typically spring up to meet the demand. In Jordan, the government has taken two steps to meet these challenges – the establishment of a new engineering program at a new public university, and the establishment of a stringent accreditation system for private universities. The Council on Higher Education has developed and implemented detailed prescriptive specifications for areas such as faculty/student ratios, laboratory equipment and space, libraries, and financial stability in order to assure that quality is provided in private universities offering degree programs within its borders.

United States of America – The Accreditation Board for Engineering and Technology (ABET) has been the major quality assurance mechanism for engineering education in the US since the 1930’s. It is mature, and covers essentially all of the engineering, technology, computer science, and related programs in the country. It also has served as a model for engineering accreditation developments in other countries, and it has developed major international thrusts such as substantial equivalency reviews of engineering programs in foreign countries where it has been invited. In the past several years, ABET has made a major change in its evaluation criteria – moving from technique specifications to outcomes assessment. Its ‘Criteria 2000’ is based upon institutional self study and goal setting against which it will be evaluated, continuous improvement requirements for accredited programs, and detailed assessment of the outcomes of the engineering programs as the fundamental criterion for accreditation.

Latin America – As engineering programs have developed in Latin American countries, several countries have moved toward the establishment of accreditation programs. Both ABET and the Canadian Engineering
Accreditation Board (CEAB) have conducted workshops and training efforts in Latin America to assist in the development of engineering accreditation systems there. One major system recently developed is the Consejo de Accreditación de la Enseñanza de la Ingeniería (CACEI) in Mexico, at least partially stimulated by the North American Free Trade Agreement. A new ‘Western Hemisphere Initiative’ has recently been announced by ABET, CEAB and CACEI – aimed at further assisting Latin American countries in the development of effective engineering accreditation systems, and furthering regional mutual recognition efforts.

Outcome of assessment

Education as a whole, particularly in developed countries, has in recent years focused on outcomes assessment for quality assurance and evaluation of educational programs. This trend has been driven both by educators and by publics interested in quality education – parents, legislators, funding agencies, etc. In engineering education, ABET has been a leader in moving to outcomes assessment as the primary mechanism for accreditation of engineering programs, in its ‘Criteria 2000’. The following statement of outcomes from the ABET criteria was developed with substantial input from employers of engineering graduates, and other organizations concerned with quality assurance in engineering education:

“Engineering programs must demonstrate that their graduates have:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs
d) An ability to function on multi-disciplinary teams
e) An ability to identify, formulate and solve engineering problems
Chapter 1: Technical Education system in India

f) An understanding of professional and ethical responsibility

g) An ability to communicate effectively

h) The broad education necessary to understand the impact of engineering solutions in a global and societal context

i) Recognition of the need for, and an ability to engage in life-long learning

j) Knowledge of contemporary issues

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”

These statements of desired outcome could serve in many engineering education venues.

International agreements

International agreements on engineering education and practice have been developed in recent years, based upon engineering accreditation. One such agreement, establishing full reciprocity for engineering graduates between ABET in the US and the CEAB in Canada, has been in place for several decades. It is based upon essentially identical accreditation systems, and extensive reciprocal visits between them. A much broader mutual recognition agreement, the Washington Accord, was developed several years ago among several English speaking countries: Australia, New Zealand, Canada, the United States, Ireland, and the United Kingdom.

While there are significant differences in the engineering accreditation systems in these countries, it was agreed – after extensive reciprocal visits – that the resulting engineering graduates were essentially equivalent. Thus graduates from each of the Washington Accord countries are accepted in all of the other countries as equivalent, for purposes such as graduate study and licensure applications. In recent years two additional countries have joined the Washington Accord – Hong Kong and South Africa – and several more have recently applied
Educational equivalency agreements can be the basis for cross-border practice agreements, and the groups of countries involved in the Washington Accord have set in motion a parallel effort – the Engineers Mobility Forum – which is developing an international register of engineers approach. In Europe, the European Federation of National Engineering Associations (FEANI) has established an international practice system, based upon a seven year formation process for engineers, which leads to EurIng status.

In North America, the three countries which have entered into the North American Free Trade Agreement (NAFTA) have attempted to develop a mechanism for the mobility of practicing engineers across their borders. Canada and Mexico have agreed on such a system of mobility, but efforts to include the United States have been stymied by licensure issues controlled at the state level by 55 separate jurisdictions. In the Asia-Pacific area, several countries have developed an agreement on engineering practice mobility, the APEC Engineer Register.
<table>
<thead>
<tr>
<th>Course</th>
<th>Compulsory Studies</th>
<th>Engineering Studies</th>
<th>Foundation Studies</th>
<th>Environment Studies</th>
<th>Professional Skills</th>
<th>Communication Skills</th>
<th>Core Content</th>
<th>Non Quantifiable</th>
<th>Minimum Duration</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800 All</td>
<td>South Africa</td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>225 All Subjects</td>
<td>Canada</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>125 All</td>
<td>Ireland</td>
</tr>
</tbody>
</table>

A statement reflecting the conditions of criteria employed by Washington Accord countries is placed below:
<table>
<thead>
<tr>
<th><strong>FUNDING</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive faculty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placement monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial links</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PROFESSIONAL CONTEXT</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life to date labs / Computing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honours degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development consultant / Research &amp; Competencies of staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>RESEARCH</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum context</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation of labs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computing / Library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Records</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample of student work</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FINANCIAL RESOURCES</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment total capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ENROLLMENT &amp; ADMISSION</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduation date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective use of physical resources in labs / Library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends of student</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chapter 1: Technical Education system in India**

52
What ever may be the unit or process of assessment used by the national Quality Assurance bodies-institution, faculty, department or program- the outcome of such assessment should ultimately reflect on the Qualifications offered by them.

Nearly all the countries of the world have or in the process of developing quality assessment systems based on the four stage model of external evaluation of higher education, i.e.

1) A dedicated coordinating agency
2) Submission of self-study and self-evaluation report by the institutions to the agency
3) A peer review visit, usually on-site and
4) The preparation of a report accrediting on a two-point scale or on multi-point grade. Apparently, it would appear that this uniformity might provide a basis for a strong system of comparable quality assurance leading to the recognition of the studies and qualifications.

Feedback on Accreditation by ABET:

After nearly a decade, the leaders of the stakeholder workshops were reconvened in 2002 to assess the progress of ABET’s accreditation reform effort. After careful consideration of the progress, observations, and feedback from the institutions, the following specific concerns were identified

- The apparent focus of programs on the quantity of data collected rather than the assessment of quality, which can create heavy workloads and the perception of accreditation as an onerous task;
- Sustainability of efforts at the institutional level;
- Continuity and sustained commitment of ABET, institutional, and professional society leadership;
- Inconsistent quality in selecting, training, and evaluating program evaluators by professional societies;
Confusion regarding processes that ensure not only continuous quality improvement but also that minimum standards are met;

The need for professional societies and ABET to respond to the blurring of disciplines in updating program criteria.

Despite these concerns, the workshop leaders also identified positive factors that portend cautious optimism:

Growing acceptance of the value of the systematic engagement of external constituencies in improving program quality;

The EC2000 Study

To provide a data-based evaluation of the status and impact of its reforms, ABET engaged the Center for the Study of Higher Education at Pennsylvania State University to conduct a study to answer the question “Are engineers who graduated from programs since implementation of the EC2000 standards better prepared for careers in engineering than their counterparts.

Continuing Issues for Engineering Accreditation

Based on the authors’ observations over many years, the following key issues must be addressed continually to ensure that outcomes-based accreditation remains an effective instrument for quality assurance in engineering education. Outcomes assessment and continuous improvement have been foreign to academic experience and culture, leading to a high initial level of discomfort.

Active communication and educational efforts are essential both for evaluators and those undergoing evaluation.

Developing an effective program of outcomes assessment and continuous improvement requires a significant investment of effort. Once established, less effort is required to maintain such a system, but continued, not episodic, attention is required.

Accrediting agencies must resist the powerful human tendency to require excessive documentation.
A much higher level of professional judgment by program evaluators and team chairs is needed for sound evaluation based on outcomes and continuous improvement (as required under EC 2000) than was required with the older prescriptive criteria. As a consequence, the effectiveness of program evaluator training becomes the critical element for the success or failure of the entire process.

ABET must be strongly proactive in recruiting program evaluators and team chairs of the highest quality from industry and a broad spectrum of academic institutions.

**Lessons for India:**

**Accreditation** is an effective mechanism for effecting and assuring ongoing quality in engineering programs within a given country. When the quality of engineering programs in two or more countries has led to similar results in graduates, accreditation programs can provide the basis for mutual recognition of graduates across national borders. Mutual recognition of the quality of engineering programs across national borders can lead to cross-border practice agreements, enhancing the mobility of engineers in the global marketplace.

Internationalization of higher education would involve restructuring of the contents, duration, quality and standards of educational offerings in line with the broad frame of higher educational systems in vogue in most of the countries of the world.

All most all the third world countries have had their institutions built on the pattern in vogue in the countries of their European rulers. On the other hand, the issues of quality and standards are the main concerns, and they need to be ensured to internationally acceptable levels through careful planning.

The National Quality Assurance processes, whether it is assessment, academic audit or Accreditation used to assess and accredit the educational institution/programs should also conform to the international practices. In turn ensure the recognition of the qualifications across the national borders in the long run.
The entire Quality Assurance process should be made open, transparent and interactive with their counterparts from the other countries of the region. This should lead to the evolution of arrangement for Mutual Recognition among National External Quality Assurance agencies on the line of Washington Accord for the technical and engineering education.

A beginning has already been made in this regard in the American Continent and in Europe with success and their experiences can be adapted to the Asia-pacific region as well. Mutual Recognition of National External Quality Assurance agencies of the region can only be a workable answer to the emerging needs for the recognition of qualifications from a particular country by the others.