CHAPTER 1
INTRODUCTION

Education is a set of processes and outcomes that are defined qualitatively. The achievements of universal participation in education will be fundamentally depending upon the quality of education available. Education just changing human tendency to develop gradually and to spread upon it till last breathe form “cradle to grave”. Human beings continue to learn and develop gradually “to be”. Education facilitates this evaluation of the individual.

Different people have different opinion about quality. But in education we gain when students are learning, schools and universities create value for those they serve and those who serve them. These broad concepts can guide improved teaching and learning in way those teachers; students, administrators and the community will notice and appreciate on a daily base.

A direct correlation exists between the quality of education, institutions and the quality of life. The development of the technical education thus stand out as the single most important factor where investment would have immediate returns for socio-economic development and would brighten the future of the county. Highly educated manpower can handle advanced technology. Thus, without the participation of highly qualified manpower, the process of economic development is very difficult to be accelerated. The nation needs to assure itself only through appropriate higher, scientific and technological education. We can achieve a respectable human development and an impressive status in the community of nations. It is, therefore, important that decision-makers recognize that technical education is an important factor of development.
Technical education is a crucial input for access to better opportunities in life. This thesis seeks to explore the dimensions of the existing quality in institutions imparting Technical Education, identify the opportunities arising from it for the country, and recommend strategies to restructure the existing system.

The chapter presents the following sections

1.1. Engineering education
1.2. Engineering colleges
1.3. Quality assurance, Accreditation and ISO: 9000
1.4. The issues of technical education
1.5. Need for the study
1.6. Objectives of the study
1.7. Hypothesis
1.8. Limitations of the study
1.9. Organization of the thesis

1.1. ENGINEERING EDUCATION

Engineering education consists of three well-defined aspects of knowledge, know-how and character. Knowledge enables one to understand what one learns in relation to what one already knows. It can be organized into intellectually tight compartments that can be conveniently taught as courses in a conventional curriculum. Each knowledge-area has four components:

a. An invariant core
b. Exploding volume of empirical knowledge
c. Constantly changing applications

d. Rapidly changing tools

The invariant core consists of fundamentals based on universal laws that provide a phenomenal and logical description while the outer layer consists of constantly improving and rapidly expanding empirical knowledge of particular systems and of constantly changing applications of increasing sophistication and complexity\(^1\). The invariant core provides the continuity in education while the applications provide the excitement and the education relevant to the current demands of the industry. Although the fundamental theory is itself invariant it should be emphasized that applications often provide new insights into the working of the theory. The rapidly changing tools have a very significant effect on education not only in terms of problems that can be tackled but to our entire approach to a subject.

Know-how is the ability to put knowledge to work. It requires the purposeful organization of knowledge from many different areas of learning. Know-how is taught through design courses, project work, industrial training and other opportunities for individual initiative and creativity. Elective courses on technology often provide descriptions of successfully implemented know-how while those on emerging technologies more insight is required.

Character traits are easy to recognize but character building processes are difficult to define and implement. Character traits such as honesty, truthfulness, integrity, initiative, competitiveness, self-esteem, leadership and the ability to work both alone and as part of a team have an invariant value. But it is not all clear how these get imbibed in educational systems that cater to very large and diverse clientele. This is no longer true and the trend is that with technological advancement the secular intelligentsia plays an increasing role in social and ethical
development. The educational institutions now, more than ever before, have been assigned the responsibility of character building using secular tools. The Humanities can play a central role.

1.1.1. Engineering Education in a Knowledge Society

Rapid advances in Information and Communication technologies have helped nations all over the world in accessing information and knowledge created anywhere in the world and using them for the prosperity and well being of its people. They have also given a major fillip to the creation and dissemination of knowledge inside the country and using it extensively for economic, social, cultural and other human activities. Knowledge Society normally refers to any society where knowledge is the primary production resource instead of capital and labour and where due importance is given to the use of knowledge and information in all economic activities. Creation and utilization of knowledge has been a feature of all modern societies and have always received due importance and respect, but has remained mostly localized in the community. Current technologies have eliminated the constraints of localization and geographical proximity and have provided increased opportunities for sharing, storing and retrieving knowledge and for marketing domain specific knowledge and skills both inside the country and also across the globe.

While all knowledge is important and useful, engineering education plays a very dominant role in developing knowledge and skills which are vital to the growth and maintenance of knowledge, knowledge-based and knowledge processing industries. Apart from providing specific domain knowledge in different engineering disciplines and producing experts in computer science and engineering and information and communication technologies, all engineering graduates irrespective of their fields of study are given education and training to acquire a reasonable level of competence in problem solving skills, software development, computer applications, modeling and simulation, and environmental impact analysis areas, which
are important in creating new applications for knowledge and in marketing them both for domestic applications and for export. In recent years with the advent of the knowledge age, there has been a significant increase in enrolment in engineering programs all over the world including India in computer and information sciences, software engineering and information and communication technologies. India has taken a major lead in this area and is exporting both manpower and skills in IT to most countries in the World. To maintain its leading position in this area the engineering education system in the country has to continuously improve quality, upgrade facilities, and produce graduates with globally marketable skills.

1.1.2. Social Concerns of Engineering

Engineering is the profession in which knowledge of mathematical and natural sciences, gained by study, experience and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind. Engineers turn ideas into reality; they create useful products and systems through playing with imagination and possibilities, leading to new and meaningful connections and outcomes while interacting with ideas, people and the environment. Since in their professional activities engineers are constantly interacting both with people/society, the environment and their awareness of societal concerns alone can help them in becoming successful in tackling and solving technological problems faced by society. There are many social concerns that we in India face: energy development, fight against terrorism, environmental protection, waste management, transportation, technological literacy, digital divide, and protection of intellectual property rights. The task before the engineering fraternity in building a new India free from hunger and illiteracy is indeed very daunting but the faith of the society in the ability of its scientists, technologists and economists will urge them to solve these and other problems. There is a need for commitment, co-operation
and dedication of the people to the task of reconstruction of our country and our economy.

1.2. ENGINEERING COLLEGES

Engineering Education as the instrument of socio-economic transformation of both individuals and the nation is well understood now. Consequently, there have been greater interest and investment in engineering education than in the past. In the knowledge driven economy, there is a demand for large number knowledge workers with a variety of skills for which technical education is the only source. It is observed that when the academic and intellectual pursuit was the main focus of the university education, only a small fraction of the population indulged in leisurely learning. It was not difficult to maintain a small Engineering education system. But now, when engineering education has become the interest and destination of the relevant age group of the masses, finding the resource for developing a large educational infrastructure and sustaining the same has become a formidable task particularly for third world countries. India is no exception.

Most engineering colleges are privately owned and administered and are affiliated with the State universities. Over 85% of the engineering graduates today are the product of these colleges. The affiliated colleges have no academic autonomy since all academic matters related to admission of students, curricula and examinations are decided and dictated by the affiliating state universities, often without their active involvement in decision making bodies set up by the universities. Although the exact situation varies from university to university, very few colleges in some states have been given the Academic Autonomy Status on the basis of their infrastructure and academic achievements. In fact, many states have no rule permitting an autonomous status. Though guidelines for academic programmes in the colleges have been circulated by the AICTE, the affiliating university departments have imposed their own curricula and academic structures.
The private colleges are tightly controlled by the private Trust or Investor and the administrative and financial autonomy rests with the owners. Since maximizing the profit is an all important goal for the owner, all academic and administrative actions are tuned to this philosophy. However, tough competition between colleges to get the best and maximum number of students has recently resulted in some improvements in the quality of faculty and the teaching-learning process in some (about 20%) colleges. Very few private colleges have started PG programmes for lack of facilities, faculty and potential for making money.

The basic components of engineering college are the students, the infrastructure i.e. the building and equipment, the teachers, the curriculum, the teaching and learning material, the linkage mechanism with industry and other user system, the management system, the support services, the guidance and counseling, mechanism, the internal and external evaluation system, the feedback system, etc. There are other important components which are called the process components. These include the way the teachers teach, the way the students learn, activities of students beyond the regular time table, the motivation of faculty and that of students, the attitude of the management, the overall academic climate, the opportunities and encouragement for innovations and development and of research, the openness of communications, the leadership qualities of head of institutions and of departments, the sense of involvement of faculty and staff in providing quality services, the structure of the organization, the quality of team work, the reward and recognition system, the faculty development programme, the appraisal system of faculty and others, the clarity of vision and objectives and the stress laid on internal and external customer satisfaction.

1.2.1. Quality

The recent large-scale expansion in engineering education has come at the cost of the
quality of the educational offerings. The affiliating University system, outdated curricula, inadequate academic infrastructure, shortage of qualified teachers, poor teaching/learning processes, lack of innovative and creative activities, outdated evaluation system, absence of proper academic ambience, and non-participative and bureaucratic governance mechanisms have all contributed in different degrees to the lowering of standard of the educational offerings of a large proportion of the 1700 engineering institutions in the country. Apart from the IITs, the IISc and a few well renowned engineering colleges and University institutions that are comparable in quality to the very best in the world, most of the engineering institutions, both in the public and the private sectors, are facing enormous problems in satisfying international quality standards. The affiliating university system kills all faculty initiative of improving and modernizing curricula to meet emerging market demands. Shortage of teachers coupled with the long time taken in filling faculty vacancies makes the contact load of teachers so high that they have no time for introducing innovation in the teaching-learning processes or to indulge in creative research and development activities. The situation is so bad that a recent Nasscom-Mckinsey report (2005)\textsuperscript{2} has mentioned that only 25-30% of engineering graduates in India are employable in the IT/ITES sector. However the growing demand of the economy has compelled the Engineering Industry to recruit even the low quality output from the education system and makeup the deficiency in education and training through specialized training programs which may last from 12 to 18 months. Some enterprising high-tech firms have come up with innovative schemes through which they influence both the curricula and competency level of teachers of selected institutions and thus improve the competency level of the graduating engineers.

The Government is in a situation where it must expand engineering education to meet anticipated shortages and yet keep the output standards at a minimum acceptable level even when
trained teachers are not readily available. Large-scale training of existing engineering teachers and improving the academic infrastructure were given high priority in the 10th five-year Plan and are likely to continue in the 11th and 12th plan periods along with new incentives to graduates for doing post-graduate work and entering the teaching profession. Improvement of the quality of educational offerings would need concentrated effort not only on autonomy and training of teachers but also on improving curricula and course contents, motivating teachers and students towards innovative and creative activities, equipping students with the four important skills of problem solving, design, self-learning and communication, and developing active interaction with industry and community.

1.3. QUALITY ASSURANCE, ACCREDITATION AND ISO: 9000

While there are several quality assurance and quality management systems available in commerce and industry, accreditation of educational program offerings by independent agencies is recognized as the most valuable tool for quality monitoring and certification in the educational system. Before the establishment of Accreditation agencies, the Universities themselves through an internal mechanism, which included among others the following, assured the responsibility of ensuring the quality of education imparted by Institutions/Departments under the jurisdiction of Universities:

i. Visit to the Institutions by an expert team for ensuring adequate facilities for imparting education.

ii. Review of proposal by a Peer group.

iii. Curriculum control through University Academic Council.

iv. Performance evaluation of students through University Examinations

v. Prescribing the qualifications for teachers.
vi. Ensuring through regulations the educational attainments of students at the time of admission

vii. Linking grant of public funds to institutional performance.

The Universities made mandatory inspections before the starting of the programmes, during the running of the programmes and at subsequent intervals as deemed appropriate. With the growth in numbers of Universities running similar programs, it became desirable to ensure that all programs satisfied at least some minimum quality norms. Such assurance would permit acceptance of degrees awarded by one University by another and also help employers to assess the market value of the University degrees. This requirement led to the establishment of coordinating agencies/ accreditation councils, which laid down specific and transparent criteria, which must be satisfied by all institutions for ensuring quality of the educational process. In India, the University Grants Commission, the All India Council for Technical Education and the Association of Indian Universities performed the major co-ordination role for ensuring equivalence of achievement of similar University Degrees awarded by different Universities in India and abroad. Later two autonomous bodies the NAAC and NBA were established to recognise programs in general higher education and engineering education respectively. Both the NAAC and NBA used the well-tried detailed input criteria to grant accreditation of programs. These were based on the then internationally accepted norms which included faculty qualifications, student/teacher ratio, adequate infrastructure facilities in terms of classrooms, laboratories, equipment, library, sports and cultural activities, hostel accommodation, teaching/learning methodologies, relevant and effective up-to-date curricula, a transparent and fair evaluation mechanism, and a supportive management. The main difference between NAAC accreditation and that of the NBA is that while the former is Institution based certifying all
programs of the University/Institutions, the NBA accredits individual program offerings of an institution.

a. The present NBA accreditation process with which most of engineering institutions are concerned, suffers from many inadequacies, which include:

b. Failure to cope up with the requirements of accreditation of a very large system. Inadequate NBA staff, large processing time, not very effective use of online processing of data, and slow pace of decision making are all contributing to the pile up of backlog of programs to be accredited.

c. Output oriented criteria for accreditation has not yet been fully developed yet and implemented. Abilities in knowledge, skills, and attitudes that accredited programs must ensure in their graduates, need detailed specifications, circulation and implementation.

d. Very little concern for learning outcomes.

e. Accreditation remaining voluntary, poor quality institutions do not usually apply for accreditation for fear of being refused accreditation of program offerings.

The Accreditation issue has become more important now that NBA-AICTE is a provisional member of the Washington Accord, which permits member countries to give mutual recognition of their degree level engineering qualifications. The NBA while becoming a provisional member has agreed to bring its accreditation policy and procedures to fall in-line with those of other countries. Once the NBA implements fully its reported output/outcome based criteria for accreditation and brings all engineering institutions under its umbrella, it would become eligible for full membership of the accord which would in effect give an international accreditation to NBA accredited programs. Strengthening the NBA, making it fully autonomous and linking quality improvement incentives to accreditation would bring a sea change on the
quality horizon of the Indian Engineering Education system.

Among other management tools used for ensuring quality management in Higher Education, ISO 9000 series, Baldrige National Quality Award (BNQA), and the European Foundation for Quality Management (EFQM) have often been adapted and used for the Higher Education System. There has been some debate on the utility of ISO 9001-2000 certification for higher education, but more and more institutions are applying for such a certification to ensure that institutions adhere to normal quality standards in all its processes similar to those of a manufacturing organization. ISO/IWA 2: Quality management systems has published specific guidelines for organizations in the education sector wishing to benefit from the implementation of ISO 9001:2000, the latest, improved version of ISO’s quality management system standards that have been adopted by more than half a million users in all sectors worldwide. While ISO 9000 users already include educational establishments of all types, the guidelines will facilitate implementation by the sector of ISO 9001:2000. The guidelines are intended for organizations at all levels, providing all types of education, including: elementary, medium and higher; special and adult education; distance and e learning.

Indian Institutions have been very slow in the use of applying management quality standards for their educational processes and systems. However there has been some movement in this regard in the last few years when many engineering polytechnics and engineering colleges have obtained ISO 9001 certification. This has enabled these institutions to declare their quality policy and philosophy, document all their processes, rules and regulations from admission, recruitment, promotion, curricula, purchase, contract, to consultancy and industry interactions, and develop a system for continuous improvement to achieve excellence and
stakeholder satisfaction. This movement must accelerate and cover more engineering Institutions in the country. The AICTE should develop a National Educational Excellence model by incorporating the main thrusts of ISO, Baldrige and EFQM models and propagating the same for adoption by all Technical Institutions in the country. It could also institute National Quality Awards on the lines of the Rajiv Gandhi National Quality Award, instituted by the Bureau of Indian Standards in 1991, to encourage well performing institutions to achieve excellence in their educational offerings.

1.3.1. The Purpose of Quality Assurance

At system level, the purpose of quality assurance has to be determined and communicated to higher education institutions. There is continuous debate as to whether the emphasis of external quality assurance should be on accountability or on improvement and how an appropriate balance between these two purposes might be struck. It might be appropriate in certain circumstances, for instance, if addressing the rapid growth of unregulated private education or the introduction of new types of institutions or qualifications, to put an emphasis on accountability and compliance. However, as institutions develop more effective and sophisticated internal quality assurance mechanisms, pressure will grow to move the balance from compliance to improvement. Moreover, if external requirements, for example, in respect of programme approval and design are very rigid, there may be limited scope to demonstrate improvement and institutions may not have the flexibility to respond either rapidly or in an innovative manner to new demands.

1.3.2. The Scope of Quality Assurance
The scope of quality assurance is often determined by the shape and size of the engineering education system itself. The tendency is for a single national agency to evaluate all engineering education provision but there are some notable exceptions in which there are separate agencies that are responsible for different types of programmes, institutions, regions, or purposes. These exceptions reflect not only the different stages of development within engineering education systems but also political and cultural preferences. Definitions of the scope of quality assurance can be narrow or broad. An example of the broad scope might include the following dimensions:

a. Regulation: including legal frameworks, governance, responsibilities, and accountabilities.

b. Educational process: admission of students, registration or enrollment, curriculum design and delivery, support for learning, assessment of students.

c. Curriculum design and content: approval and accreditation levels and standards.

d. Learning experience: user protection, student experience, complaints, and appeals.

e. Outcomes: qualifications, certificates, transcripts, the Diploma Supplement, transferability, recognition, and value.

The respective roles of the national system and institutions need to be addressed. While both may have a role in all of these dimensions of quality assurance, it may not be of equal weight.

1.3.3. Need for Quality in Technical Education

Technical education today is recognized as a capital investment and is of paramount importance for economic and social development of the country. Institutions imparting Technical education have the main responsibility for equipping individuals with advanced knowledge and skills required for positions of responsibility in government, business, and other professions.
Only highly educated manpower can handle advanced technology. Thus, without the participation of highly qualified manpower, the process of economic development is very difficult to be accelerated. It is, therefore, important that decision-makers must recognize that high education is an important factor of development.

The communication and digital revolution have opened wide vistas of the world, especially for institutions. The rise of internationalization, globalization of economies, knowledge and culture, and the concept of lifelong learning give a distinctive character to higher education both in international and national contexts. Internationalization has put university education in the forefront of the world educational map. Our universities and institutions of Technical education will have to meet international standards and produce graduates who can compete internationally. Accordingly, institutions must be responsive to the challenges of a rapidly changing and challenging new world; an expectation of society and growing demands of the rising student population. Technical education as a source of great potential for the socioeconomic and cultural development of the country and believes that through quality Technical education nation can be transformed into a developed nation within the life-time of a single generation. Factors such as the distinctive nature of Technical education based learning, pursuit of research and scholarship, globalization of economy and emerging challenges of the 21st Century have a direct impact on the future development of higher education.

1.3.4. Quality Assurance in Technical Education

The quality of engineering and technology education is complex and challenging due to various reasons, and can be analogous to industry, as illustrated in Figure 1.1. Any standard industrial activity includes three different stages, such as the input, the process and the output,
where feed-back closes the loop. In this process, feedback gained from the output can be utilized to improve the quality of the process. This model has also been adopted for the quality assessment of education structures. The three stages of an educational process cycle are further elaborated below:

**Educational Process**

![Diagram](image)

**Fig.1.1: The block diagram of an educational cycle**

1. Educational Input

   The Input parameters relate to various components, including the student's intake or student's enrollment into an engineering educational process, etc, and may be comprised of the following aspects: Societal needs; New knowledge; Advancing technologies; Human and material resources; Student enrollment process; Student fees structure and Student eligibility criteria, etc.

2. Educational Process

   The educational process lies in between the input and the output, and this is where teaching/learning is facilitated. It may consist of the following important factors: Curriculum
design; Learning styles; Learning methods; Teaching/learning facilities; Assessment methods and Staffing, etc.

3. Learning Outcomes

The Output component is associated with the student output after finishing the course curricula. It consists of the following elements: Academic results; Professional profile; · Employability; On-the-job success rate and Social and workplace activities, etc. The quality of engineering education can be controlled and assessed according to three different approaches:

a. On the exit where the knowledge, skills, arrangements, values acquired by the students at the time of training are verified (absolute quality assessment).

b. Method of added value, at which the difference between the input and output level is sought. From this difference is rated about the effectiveness at the process of training and the quality of educational product.

c. About quality is rated indirectly on separate parts, elements and processes, conditions and preconditions, through which the educational process passes. The presumption of this approach is that if all these ones responds at the most to the quality requirements then the quality will possess a high assessment.

Every college, institution and university is trying its level best to provide quality education. But practically it is observed that very few students can perform satisfactorily in the placement due to lack of confidence, communication and presentation skill. Today students are being equipped with knowledge for merely getting through examinations and the total quality of a student remains a secondary option. Unfortunately, the general concept of classroom teaching is related with the teachers and the quality of their teaching. The classroom teaching is in fact is two-dimensional involving expression and communication to receptive audience. If there is
dearth of quality either in speaker or in listener, the communication is incomplete. the improvement in class room teaching, means improving the quality of teacher as well as that of students which will bridge the communication gap between the two.

Quality of teaching does not mean efficiency in book teaching; rather it stands for effective teaching; efficiency is different from effectiveness, efficiency means’ doing things in the right manner’ whereas effectiveness stands for ‘doing right things’. Efficiency is defined as ratio of output to input and is related with optimization of resources such as faculty, staff, infrastructures and cost-benefit ratio. At the same time, effectiveness is defined as ratio of actual output to planned output and as a matter of fact, effective teaching is the function of the extent to which the student has actually achieved the instructional objectives. Effectiveness of technical education system of any country towards nation building in global competitive environment is viewed as a closed loop function.

Much of the best writings on the teaching method advocate the subject competency, style of teaching and the inter-personnel relationship of the teacher and the student. One of the important conceptual insights is that it is first necessary to understand the dynamics of learning before one can carry out effective teaching. What is required is to make the learners adaptable to alternatives, stimulant to learning and capable of assimilating the information.

1.3.4.1. Curriculum

Engineering education is expected to produce trained manpower for maintaining and advancing technological growth in the country. The relevance and usefulness of engineering education have a strong bearing on the technological growth and the prospects of the country. The educational strategy should help to develop a knowledge economy. The systems involved in this endeavor should strive for furtherance of knowledge. It is needless to say that the engineering
education should equip the people with new and relevant skills to embark on innovation with new ideas.

The Universities and Institutes have a major responsibility of analyzing and understanding the state of existing knowledge and its future perspectives, creating new knowledge, and assimilating the new knowledge that is being generated world over. The students have to understand the effect of globalization on the society. The students should be encouraged for creative activities, be it in the realm of esoteric world, or in the area of hands-on experience.

The future engineers will have to be more analytical and creative. Engineering practices based on empirical studies and data alone, will not be enough to give us cutting edge advantage. The engineers will be depending more on general analysis rather than relying on specific fault identification. They will have to be innovative; growth oriented and will have to respect entrepreneurship. The present generation has greater inclination for informal learning and is fond of flexible job market.

Taking an overall view, engineering education in the country must have a minimum but essential common structure and features. This will be necessary to assess the level of competence, which the education system enables the graduating students to have for their mobility and for the recognition of their degrees and diplomas. The common structure should prescribe the duration of the course of study, the minimum number of course credits and a flexible framework of distribution of the courses in terms of minimum requirements for humanities, science, core engineering subjects, electives for specialization and other requirements such as projects, foreign languages and value addition courses. These courses should also have coherence and reflect a unity of purpose.
1.3.4.2. Examination and Evaluation System

To ascertain the effectiveness of learning process there is a need for strictly implementing a continuous evaluation system that can facilitate the systematic growth of mind and also brings about regularity of the students. The university examination should not carry the full weight for the purpose of evaluation. In educational institutions, mid-semester examinations, quizzes and assignments must carry significant weight so that the final examination does not play a massive role in deciding the grades. Laboratory courses are to be evaluated during the laboratory classes. Usually in the university system, separate examinations are conducted for the laboratory courses. However, some weight is expected to be there for the regular laboratory classes as well. The examination procedure should be overhauled to encourage conceptual understanding of the subjects and creativity of mind.

1.3.4.3. Basic Infrastructure

There should be adequate number of the class rooms; with proper air circulation and lighting. The teaching aids, such as, blackboard, multimedia projectors, computers etc. are to be modern. The faculty rooms should have availability of computers and internet access. Size of the laboratories should be large enough to accommodate the students per section. The number of students per experimental facility should not exceed four. All the equipment should be in working condition to run experiments smoothly. Laboratory manuals; list of experiments etc must be well arranged.

1.3.4.4. The Educators

As per the AICTE regulations it is expected that the faculty student ratio is at least 1:15
and the faculty members should have a post graduate degree. Even if any specific program becomes bound to recruit some faculty members with Bachelor’s degree due to the pressing need of the program, those faculty members should be given opportunities to complete the postgraduate degree on a priority basis. There should be additional encouragement from the college authorities to have at least some faculty members with a PhD degree. The faculty members should have a decent track record.

There has to be emphasis on having adequate number of faculty members in the Basic Sciences and Humanities. In many engineering colleges, the faculty members in Basic Sciences are overburdened with teaching responsibilities. It should be understood by the authorities that a well balanced faculty is key to the growth of the Institution. There should be formal and informal collaborations between the faculty members of the Engineering stream and Basic Science and Humanities.

1.3.4.5. Library Facilities

The libraries must have adequate number of titles in all the subject areas. The volumes per title have to be sufficient and made available to the undergraduate students, post graduate students and the faculty. The libraries should subscribe to the leading journals in the subject area nurtured in the college/university. The librarian should be well qualified and should have adequate background in Library-Science. It is desirable that the printing and reprographic facilities are created within library premises.

1.4. THE ISSUES OF TECHNICAL EDUCATION

Engineering education is passing through a critical time in India. The general perception in public mind is that most of the employment opportunities in our country are in the area of
Information Technology. This has resulted in reduced interest of students in hardware related disciplines. Attracting students to core engineering is becoming difficult. At the same time, enormous changes in all disciplines of engineering and technology are taking place around the world, which are so vast and rapid that keeping pace with them is becoming increasingly difficult. An engineering education must include both hardware related as well as soft engineering knowledge and skills and also interpersonal skills. There is a far greater emphasis now to make the curriculum broad based and flexible to meet the greatly increased diversity of needs. Over and above, it should have a national perspective covering the economic and industrial growth.

1.4.1. Faculty shortage

The technological education system in India is facing an acute shortage of teaching staff in most engineering colleges and universities. The question of quality is the most important issue. The quality of faculty, staff and students constitute the core competence of any educational institution. In India, the quality of faculty is a matter of utmost concern. Since the size of the student body is very large, the need for faculty is also high. At present, it is estimated that about 120,000 faculty members are needed for various engineering colleges. The educational qualification for these teachers is desired to be at the doctoral level.

However, such a trained manpower is just not possible in next five years. Most of the institutions are not able to appoint faculty members even with Master’s degree. The perception of the society is that the compensation package in academia is not attractive at all. Many talented individuals do not prefer to pursue an academic career. As a result, we are concerned about adequacy of the numbers of trained faculty for engineering education. Besides the professional degree at a suitable level, the faculty members should have some knowledge of teaching pedagogy. Unfortunately, the knowledge of teaching pedagogy is poor even at the elite
institutions. This results in a teaching community that cannot connect themselves effectively with the students. In short, the faculty members in many cases are inappropriately positioned.

1.4.2. Meeting Increasing Demand

Universities are under pressure to provide education for at least three times the present student population within the next decade while maintaining their excellence and high standards of performance. The most serious challenge in this regard is the dearth of qualified faculty.

1.4.3. Knowledge-Explosion

Institutions have to work out a healthy balance between wholeness of knowledge and specialization that caters to a current technological demand. While the university is the sole champion of the former the industry is more concerned with the latter. Generic industry skills for engineers: In the fast evolving industry requirement regarding generic skills, so necessary for gainful employment, academic institutions must consider an inclusive approach to integrate those skills in the teaching learning process for the holistic development of the individual. Some of these skills include (a). Problem Solving and Logical Reasoning (Analytical Ability), (b). Process Orientation (Attention to Detail), (c). Learning Ability, (d). English Communication (Written and Verbal i.e., non-voice) and (e). Programming fundamentals (the generic domain).

1.4.4. Governance

Institutions of higher learning have traditionally been government financed, ministry directed centre’s of higher education resulting in development of bureaucratic controls that encouraged innovation and creativity. The challenge is to create organizations with well articulated vision and goals that generate revenue by charging the users rationally for their services, through seeking donations, creating endowments and entering into collaborative alliances with institutions in India and abroad in the pursuit of these goals. The challenge is to
move from being another arm of the government to those that cope with contemporary social realities and influence Government policy while remaining apolitical, autonomous, socially relevant and yet sufficiently detached to serve the purposes of objective evaluation and constructive criticism. The challenge is to be able to actively protect themselves from all outside efforts to wear away their autonomy and academic freedom while playing an active and fulfilling role in societal development.

1.4.5. Accountability

Another current issue which seems to be prevalent in most institutions is a demand for accountability. Maintained to be related to the increase in costs, since the funding bodies, either governmental agencies or students want to get ‘value for money’. A more general approach is that these demands for accountability are caused by the fact that norms for organizations and individuals have to be “constructed, and frequently reconstructed, in the light of the interaction between abstract systems and actual environments”. “Engineering education no longer has the luxury of using narrow definitions of quality.”

1.5. NEED FOR THE STUDY

The study is conducted to ascertain the quality of engineering education, as it is important for the sustainable development of Indian economy. The growth in number of institutions cannot guarantee the quality in engineering education. There is a need for continuous evaluation of policy initiatives, institutional initiatives including practices of assessment of quality and quality assurance mechanisms to be maintained to further engineering education.

It is expected that the study will further enhance the concept of quality in technical education from stakeholders’ perspectives. A better understanding of definitions of quality in
Technical Education will help shape quality assurance mechanisms in institutions offering Technical Education.

1.5.1 Scope of the Study

The area of the study involves institutions offering technical education. It’s focused on the dimensions of quality from institution, faculty and student perspectives, particularly in the context of management commitment to quality, quality of teaching, students, examination system, and infrastructure. It does not focus on the university context as a whole as this will require broader evaluations of the technical education system.

The study was conducted in affiliated colleges offering technical education in the region of JNTU, Hyderabad. The populations of this study were head of the institutions, senior and junior faculties and the undergraduate students of private JNTU, Hyderabad affiliated colleges. For the convenience of the study University affiliated colleges were classified into four categories i.e., Urban Accredited, Rural Accredited, Urban Non-Accredited, and Rural Non-Accredited, to compare among them the perceptions of management, faculty and students.

1.5.2. Significance of the Study

The growth in number of institutions cannot guarantee the quality in engineering education. There is a need for continuous evaluation of policy initiatives, institutional initiatives including practices of assessment of quality and quality assurance mechanisms to be maintained to further engineering education.
It is expected that the study will further enhance the concept of quality in Technical education from stakeholders' perspectives. A better understanding of definitions of quality in Technical Education will help shape quality assurance mechanisms in institutions offering Technical Education.

Another significant aspect of the study will be the administrative impact. The information that will be generated from the study will be significant for the administrators & policy makers. It shall enable administrators and policy makers of technical education to understand the issues associated with the quality assurance system, the process and implementation of the system in general and in the implementation of a quality assurance system for the assessment process in particular. They would have more than raw data on which future policies and practices could be based and further improved because this data has been systematically collected and analyzed and its meaning extracted to make sense of the situation.

The study brings to light the possible constraints to be faced by the regulatory bodies in general and private institutions in particular, in the implementation of a formal quality assurance system. It is anticipated that through the results and recommendations from the study, the relevant authorities will realize that there are a number of important practical considerations which can contribute to the success of the implementation of quality assurance measures. The knowledge from the study findings might help increase the effectiveness of communication among administrators and implementers as well as other stakeholders. The findings of this study will not only enrich the data in this area but it may also stimulate further research studies in institutions located in Andhra Pradesh and India.
1.5.3. Statement of the Problem

The university is seriously committed in fulfilling the requirement of the Quality Assurance Standard regulated by the Ministry of Human Resource Development (MHRD), AICTE and NBA. One important aspect that must be seen and proven is the effort and commitment of the management and faculty to review regularly the quality of education and services given to the students.

This study has attempted to answer the following questions:

(a) What is the level of quality of technical education? Is it poor, moderate or high level?
(b) Are there any differences in the management, faculty and student perception, on the quality?
(c) Does the location (Urban/Rural) and accreditation status create significant difference in the perception of students/faculty/management on the quality?

1.5.4. Definition of major terms.

1. Perception

Perception means the process of acquiring, interpreting, selecting, and organizing sensory information. The word perception comes from the Latin perception-, perception, meaning "receiving, collecting, and action of taking possession, apprehension with the mind or senses.

2. Quality means quality of education

When, we learn something that is useful for us in educational process that is called quality of education. Quality education is a standardize process of learning, training and learning, excellence in education.
1.6. OBJECTIVES OF THE STUDY

1. To study, compare and analyze the perceptions of students, faculty and management, in terms of quality of teaching amongst the four categories of colleges.

2. To study the perceptions of students, faculty and management, that management has a strategic plan to improve the quality of education.

3. To study, compare and analyze the responses of faculty and management of four categories of colleges regarding performance assessment and advancement criterion of faculty.

4. To study, compare and analyze the perceptions of students, faculty and management, in terms of quality of students’ intake amongst the four categories of colleges.

5. To study, compare and analyze the perceptions students and faculty in terms of quality of examination system amongst the four categories of colleges.

6. To study, compare and analyze the perceptions students and faculty for the quality of infrastructure amongst the four categories of colleges.

1.7. HYPOTHESIS

1. There is no association between the responses of students, faculty and management of four categories of colleges in terms of quality of teaching.

2. There is no association between the responses of the students, faculty and management of four categories of colleges in terms management has a strategic plan to improve the quality of education
3. There is no association between the responses of the faculty and management in the four categories of colleges regarding performance assessment and advancement criterion of faculty.

4. There is no association between the response of the students, faculty and management of four categories of colleges in terms of the quality of students.

5. There is no association between the response of the students, faculty and management of four categories of colleges in terms of the quality of examination system.

6. There is no association between the response of the students, faculty and management of four categories of colleges in terms of the quality of infrastructure.

1.8. LIMITATIONS OF THE STUDY

1. One of the most obvious limitations of this study is its very broad approach to the issue of quality Technical Education. A constant concern with this research was to ensure that the scope of the subject matter was contained, and the amount of documentation and information collected was manageable and relevant.

2. Another limitation is related to the context in which the study was conducted. As the researcher and all survey participants are stakeholders of Technical Education, it remains a possible limitation.

3. This study involved only one period for data collection. The patterns of stakeholders' perceptions would have been better described if data had been collected from the same group at several points in time, that is, as a longitudinal study. A longitudinal research design, however, would have placed demands beyond the scope of this study. Due to time constraint a cross sectional research design was the best alternative available.
1.9. ORGANIZATION OF THE THESIS

The Thesis is organized into six chapters, as indicated below:

1. Introduction
2. Review of Literature
3. Engineering Education
4. Research Methodology
5. Data Analysis and Interpretation
6. Findings, Suggestions & Conclusions

The next chapter ‘Review of Literature’ introduces the literature review process adopted and reviews the national and international literature on the concept of quality and quality assurance.