CHAPTER – 1

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Swami Vivekananda\(^{(1)}\) said, ‘Education is the manifestation of perfection already in man. … Strength must come to the nation through education. A nation is advanced in proportion as education and intelligence spread among the masses.’

In today’s scenario, the above quote though most relevant has regrettably lost its meaning among the learning community, as most of the students under the meaning of education, pick up their bags containing some curriculum based books, learn within the four walls something to show case in the examination papers, secure some high class quantified results, get a well paid job and live for the sake of living.

While Swami Vivekananda mentions that perfection is not somewhere outside, but it is well within every human being and the system of education should help in making that perfection simply evident and obvious thus leading to a pure life, blossoming of the self and contributing to the society and the nation to enrich on a constant basis. Relating this with our Engineering Education in India, we find majority of our fresh engineers come out of the university annals with attractive marks cards but found unemployable for the field in which they are specialized.

1.1 Background of the Industrial Revolution:

The First Industrial Revolution\(^{(2)}\) spanned between the late 18th and early 19th centuries. Most of the historians cite that the period of first industrial revolution was the time when Britain witnessed rapid industrialization activity. However, clear evidences show that industrialization was not the domain of Britain, parallel developments happened in both Asia and Europe. In between 15\(^{th}\) and 17\(^{th}\) centuries, many European artisans and professionals migrated to Britain to utilize their skills and technological methods in order for survival and employability. Evidences are showing that exchange of skills & technologies between Britain and Europe was happening for many centuries before the first industrial revolution took place. Dutch helped Britain in creating the foundations of the development of textile industry especially in cotton & silk.

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\(^{(1)}\) Swami Vivekananda (12 January 1863–4 July 1902), born Narendra Nath Datta, was an Indian Hindu monk. He was a key figure in the introduction of Indian philosophies of and Yoga to the western world and was credited with raising interfaith awareness.

\(^{(2)}\) Dr. Richard Evans, chapter 2 - the industrial revolution and the role of science and technology in the development of technical education, http://www.technicaleducationmatters.org/publications/shorthistory/chapter2
While France helped to build blast furnace technology, Germans played role in improving the smelting and refining of non-ferrous ores. The French improved the chemicals industry in dying and bleaching. In parallel, Britain helped Belgium and France in modernizing the industries with the transfer of technology.

First industrial revolution brought a great change and transformation in life styles of Britishers, and a great change happened in areas like agriculture, demographic trends, manufacturing and transportation, which were the main areas, which effected the cultural, economic and social environment of the country. Important transition was economy of the country changed from labour based to machine based and scientific methods stepped in. The scientific methods brought changes in recruitments in the form of recruiting unskilled, women and children for operating machines in order to cut down the cost and many skilled workers lost employment. Coal production and usage occupied major role as its production rose from 2.5 million tons in 1700 to 10 million tons in 1800. Three important technologies iron production, steam engine and textiles were the foundations of the first industrial revolution.

In late 18th and 19th centuries, Britain’s production performance came down and economic and industrial decline happened with reasons like the lack of an effective and comprehensive technical and commercial education system, the continuing negative attitude towards competitiveness, entrepreneurialism, practical and technical activities. In the same time the United States of America took the right approach to enter into world markets and many of its businesses became very large with worldwide brands and product differentiation which ultimately gave them a competitive edge over England towards the end of the 19th century.

As technological advances significantly influenced the Industrial Revolution, the development of scientific ideas in turn influenced technology and made major contributions to the first and second industrial revolutions. In the earlier times, the development and implementation of technological finding were more focused on craft and trade skills. On an apprenticeship model, the skills and the nuances of technology were handed over to the next gen on a personal and individual basis. The true secrets & techniques were held close to chest and severely guarded and many times the valued knowledge has gone into mystery rather than history.

Generally, new area of material science had to be established in order to deal with the challenges of the existing technology. The development of technical education during most of the 19th century had to overcome many prejudices and problems in order to gain recognition and
credibility. Until possibly the 1860s, negative attitudes and behavior continued from managers towards technical education fearing the loss of process and trade secrets if the workers understood the industrial technologies and techniques.

1.2 Indian education system in brief:

Education in India in its traditional form was closely related to religion\(^3\). In Hindu culture child used to undergo a formal ceremony known as 'Upanayana'\(^4\) before leaving for ‘Ashrama’\(^5\) where he would receive education.

The academies of higher learning were known as 'Parisads'\(^6\). And the education system was in three basic processes, called as ‘Sravana’\(^7\), ‘Manana’\(^8\) and 'Nidhyasana'\(^9\). In the initial stages of education i.e. in 'Sravana', the education was all about the 'shrutis'\(^10\) - gaining knowledge by listening, in second stage 'Manana', students had to think themselves about what they have listened. They have to make their own inferences and assimilate the lesson taught by their teacher into the life. The third stage 'Nidhyasana' means complete comprehension of truth and its use in the life. Men and women were given equal rights in education and teaching. Education was mainly given to Brahmins\(^{11}\) & Kshatriyas\(^{12}\). Apart from the caste-based education, kings and princes were educated in the arts and sciences related to government: politics (danda-niti), economics (vartta), philosophy (anviksiki), and historical traditions (itihasa).
The major source was Kautilya’s (13) Arthashastra (14). However, the education and society of the era continued to be dominated by educated male population. If one did not learn gather honey without being stung by it, sow maize and harvest, or make tools and implements, the society would have perhaps gone without food or shelter. It is wrong to say that the teaching existed only in schools run by the upper caste teachers in their so-called Gurukuls (15). The society was teaching its subjects the required skills in the exact way as appropriate to the times. It is widely acclaimed now that the classroom education does not teach the actual required skill sets either for life as it is perceived now or add value to the humanity at large.

Few of the most important universities of India in the ancient times were Taxila, Vikramshila and Nalanda (16). Taxila University of 7th century BC was famous for medical studies and a galaxy of eminent teachers such as Panini, the well known grammarian, Kautilya, the minister of Chandragupta Maurya, and Charaka, a medical teacher of repute. Nalanda was the highest learning center not just of India but also of the entire South Asia. Students from foreign countries like China, Japan, Korea used to come here for higher studies. It had around 10,000 students and teachers on its roll cards. The University had eight colleges. And one of the colleges had four-storied building. It was one of the earliest examples of residential cum learning complex. Varanasi was famous for religious teachings. In the South, Kanchi was famous for its studies while the Vallabhi University was no less. Huan Tsang (17) in his records mentioned the university to be at par with Nalanda and Vikramshila universities. India had several great minds at work, which contributed in every aspect of life. The concept of zero, decimal and Pythagoras Theorem were all developed here.

(13) Kautilya, originally a professor of economics and political science at the ancient Takshashila University, also referred as Chanakya managed the first Maurya Emperor Chandragupta's rise to power. He authored the ancient Indian political treatise called Arthaśāstra. and he is considered as the pioneer of the field of economics and political science in India.

(14) Arthashastra is an ancient Indian treatise on statecraft, economic policy and military strategy which identifies its author by the name Kautilya.

(15) Gurukuls, type of schools in ancient India, residential in nature, with shishyas or pupils living together near the guru or the master, often within the same house.


(17) Huan Tsang was a Chinese Buddhist monk, scholar, traveler, and translator who described the interaction between China and India in the early Tang Dynasty. He became famous for his seventeen-year overland journey to India, which is recorded in detail in the classic Chinese text Great Tang Records on the Western Regions.
As India progressed from ancient to medieval, its education system deteriorated, with multiple parameters being responsible.

**1.2.1 Universities**

India established a dense educational network (very largely for males) with a Western curriculum based on instruction in English. To further advance their careers many ambitious upper class men with money, including Gandhi, Nehru and Muhammad Ali Jinnah went to England, especially to obtain a legal education at the Inns of Court. By 1890, some 60,000 Indians had matriculated, chiefly in the liberal arts or law. About a third entered public administration, and another third became lawyers. The result was a very well educated professional state bureaucracy. By 1887 of 21,000 mid-level civil service appointments, 45% were held by Hindus, 7% by Muslims, 19% by Eurasians (European father and Indian mother), and 29% by Europeans. Of the 1000 top -level positions, almost all were held by Britons, typically with an Oxbridge degree(18).

The Raj(19), often working with local philanthropists, opened 186 colleges and universities. Starting with 600 students scattered across 4 universities and 67 colleges in 1882, the system expanded rapidly. More exactly, there never was a "system" under the Raj, as each state acted independently and funded schools for Indians from mostly private sources. By 1901 there were 5 universities and 145 colleges, with 18,000 students (almost all male). The curriculum was Western. By 1922 most schools were under the control of elected provincial authorities, with little role for the national government. In 1922 there were 14 universities and 167 colleges, with 46,000 students. In 1947, 21 universities and 496 colleges were in operation. Universities at first did no teaching or research; they only conducted examinations and gave out degrees(20)(21). The British established the Government College University in Lahore, of present day Pakistan in 1864. The institution was initially affiliated with the University of Calcutta for examination. The prestigious University of the Punjab, also in Lahore, was the fourth university established by the colonials in South Asia, in the year 1882.

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(19) Raj refers to the British Raj (literally "reign" in Sanskrit) was British rule in the Indian subcontinent between 1858 and 1947.
(20) C.M. Ramachandran, Problems of higher education in India: a case study (1987) p 71-7
(21) Zareer Masani, Indian Tales of the Raj (1988) p. 89
Mohammedan Anglo-Oriental College (MAO College), founded in 1875, was the first modern institution of higher education for Muslims in India. By 1920 it became The Aligarh Muslim University and was the leading intellectual center of Muslim political activity. The original goals were to train Muslims for British service and prepare elite that would attend universities in Britain. After 1920 it became a centre of political activism. Before 1939, the faculty and students supported an all-India nationalist movement\(^{(22)}\).

### 1.2.2 Engineering in India

The East India Company in 1806 set up Haileybury College in England to train administrators. In India, there were four colleges of civil engineering; the first was Thomason College, founded in 1847. Their role was to provide civil engineers for the Indian Public Works Department. Both in Britain and in India, the administration and management of science, technical and engineering education was undertaken by officers from the Royal Engineers and the Indian Army equivalent, (commonly referred to as sapper officers). This trend in civil/military relationships continued with the establishment of the Royal Indian Engineering College (also known as Cooper's Hill College) in 1870, specifically to train civil engineers in England for duties with the Indian Public Works Department. Indian Public Works Department, although technically a civilian organization, relied on military engineers until 1947 and after\(^{(23)}\).

Growing awareness for the need of technical education in India gave rise to establishment of institutions such as the Indian Institute of Science, established by philanthropist Jamshedji Tata in 1909. By the 1930s, India had 10 institutions offering engineering courses. However, with the advent of the Second World War in 1939 the "War Technicians Training Scheme" under Ernest Bevin was initiated, thereby laying the foundation of modern technical education in India. Later, planned development of scientific education under Ardeshir Dalal was initiated in 1944\(^{(24)}\). While some science related subjects were not allowed in the government curriculum in the 1850s the private institutions could also not follow science.

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\(^{(23)}\) John Black, "The military influence on engineering education in Britain and India, 1848-1906," Indian Economic and Social History Review, (Apr-June 2009), 46#2 pp 211-239

courses due to lack of funds required to establish laboratories etc. The fees for scientific education under the British rule were also high. The salary that one would get in the colonial administration was meager and made the prospect of attaining higher education bleak since the native population was not employed for high positions in the colonial setup. Even the natives who did manage to attain higher education faced issues of discrimination in terms of wages and privileges\(^{(25)}\).

The present educational system of India is an implantation of British rulers. Wood's Dispatch of 1854 laid the foundation of present system of education in India. Before the advent of British in India, education system was private one. With the introduction of Wood's Dispatch known as Magna Carta\(^{(26)}\) of Indian education, the whole scenario changed. The main purpose of it was to prepare Indian Clerks for running local administration. Under it the means of school educations were the vernacular languages while the higher education was granted in English only. British government started giving funds to indigenous schools in need of help and thus slowly some of the schools became government-aided. Even today, we can find quite a few aided schools and colleges in many of the states of India.

### 1.2.3 Education Governing Bodies

**The Central Board of Secondary Education (CBSE):** This is the main governing body of education system in India. It has control over the central education system. It conducts exam and looks after the functioning of schools accredited to central education system\(^{(27)}\).

**The Council of Indian School Certificate Examination (CISCE):** It is a board for Anglo Indian Studies in India. It conducts two examinations 'Indian Certificate of Secondary Education' and 'Indian School Certificate'. Indian Certificate of secondary education is a k-10 examination for those Indian students who have just completed class 10th and Indian school certificate is a k-12 public examination conducted for those studying in class 12\(^{th}\)\(^{(27)}\).

**The State Government Boards:** Apart from CBSE and CISCE each state in India has its own State Board of education, which looks after the educational issues.

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\(^{(26)}\) Magna Carta required King John of England to proclaim certain rights (mainly of his barons), respect certain legal procedures, and accept that his will could be bound by the law. It explicitly protected certain rights of the King's subjects.

The National Open School: It is also known as National Institute of Open Schooling. It was established by the Government of India in 1989.

The International School: It controls the schools, which are accredited to curriculum of international standard.

1.2.4 University Education
This massive system of higher education in India constitutes of 342 universities (211 State, 18 Central, 95 deemed universities) 13 institutes of national importance, 17,000 colleges and 887 polytechnics. University Grant Commission (UGC), a national body, coordinates and looks after the maintenance of standard of university education in India. The university education in India starts with undergraduate courses. Depending upon the nature of course pursued, its duration may vary from three to five and a half years\(^{(27)}\).

Academic Degree Course
This undergraduate course in India is generally of three years' duration. After completing this course, students get a Bachelor's degree in the subject studied such as Bachelor of Arts, Bachelor of Commerce or Bachelor of Science\(^{(27)}\).

Professional Course
There are large numbers of professional courses at the undergraduate level. Student may opt for any of it depending upon their interest and condition of eligibility.

Medical Courses
This course at undergraduate level is known as MBBS (Bachelor of Medicine and Bachelor of Surgery). It is of four and a half year's duration plus one year of obligatory internship. Various medical colleges conduct entrance examination for admission to this course. An all India level examination is also conducted by CBSE for admission to colleges all over India based over 15% reserved seats\(^{(27)}\).

Engineering Course/Technical Education:
Specific details of technical and vocational education in medieval India are not available. However, there is ample evidence that vocational skills were highly developed\(^{(28)}\). Elegance and excellence of articles such as fine fabrics of cotton and silk, embroidery, painted and enameled wares, swords and knives and gold and silver jewellery, are well known.


Such high quality could not have been achieved and sustained for centuries without a dependable system of technical education.

A crucial recommendation of CABE\(^{(29)}\) was the constitution of a central agency to ensure an all-India coordinated and integrated growth and spread of technical education. The Government of India, thus, established AICTE\(^{(30)}\) to supervise all technical education above the high school stage. The Council had its inaugural meeting under the Chairmanship of Sarkar in May 1946.

### 1.3 Higher Education in India:

India's higher education system is the third largest in the world, after the United States and China. The main governing body at the tertiary level is UGC - the University Grants Commission, which enforces its standards, advises the government, and helps coordinate between the centre and the states. Accreditation for higher learning is overseen by 12 autonomous institutions established by the University Grants Commission.

Indian higher education system has expanded at a very fast pace by adding nearly 20,000 colleges and more than 8 million students in a decade from 2000-01 to 2010-11. As of 2011, India has 42 central universities, 275 state universities, 130 deemed universities, 90 private universities, 5 institutions established and functioning under the State Act, and 33 Institutes of National Importance\(^{(31)}\)\(^{(32)}\)\(^{(33)}\). Other institutions include 33,000 colleges as Government Degree Colleges and Private Degree Colleges, including 1800 exclusive women's colleges, functioning under these universities and institutions as reported by the UGC in 2012. The emphasis in the tertiary level of education lies on science and technology. Indian educational institutions by 2004 consisted of a large number of technology institutes.

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(29) CABE, the Central Advisory Board of Education, the highest advisory body to advise the Central and State Governments in the field of education, was first established in 1920, dissolved in 1923 and again revived in 1935 and functioned till 1994. CABE has been reconstituted in 2004 and is actively involved in the review of the National Policy on Education and development of higher and technical education in India.

(30) AICTE, All India Council for Technical Education is the statutory body and a national-level council for technical education, under Department of Higher Education, Ministry of Human Resource Development, and Government of India. Established in November 1945, is responsible for proper planning and coordinated development of the technical education and management education system in India.

(31) "Higher Education", National Informatics Centre, Government of India". Education.nic.in. Retrieved 2010-09-01


(33) Deemed University - University Grants Commission". ugc.ac.in, 23 June 2008.
Distance learning and open education is also a feature of the Indian higher education system, and is looked after by the Distance Education Council. Indira Gandhi National Open University is the largest university in the world by number of students, having approximately 3.5 million students across the globe.

Some institutions of India, such as the Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), National Institutes of Technology (NITs) and Jawaharlal Nehru University have been globally acclaimed for their standard of education. The IITs enroll about 8000 students annually and the alumni have contributed to both the growth of the private sector and the public sectors of India. However, India has failed to produce world-class universities like Harvard or Oxford\(^\text{(34)}\).

Three Indian universities were listed in the Times Higher Education list of the world’s top 200 universities — Indian Institutes of Technology, Indian Institutes of Management, and Jawaharlal Nehru University in 2005 and 2006. Six Indian Institutes of Technology and the Birla Institute of Technology and Science - Pilani were listed among the top 20 science and technology schools in Asia by Asiaweek. The Indian School of Business situated in Hyderabad was ranked number 12 in global MBA rankings by the Financial Times of London in 2010 while the All India Institute of Medical Sciences has been recognized as a global leader in medical research and treatment.

Driven by market opportunities and entrepreneurial zeal, many institutions are taking advantage of the lax regulatory environment to offer 'degrees' not approved by the state authorities. In addition, many institutions are functioning as pseudo non-profit organizations, developing sophisticated financial methods to siphon off the 'profits'\(^\text{(35)}\). Regulatory authorities like UGC and AICTE have been trying hard to extirpate the menace of private universities, which are running courses without any affiliation or recognition. We are living in the modern age of science and technology. Today, the standard of life is defined by the goods and services developed by the application of science & technology. Technology is just not helping the humanity to improve the lifestyle with comforts but also aiding the nation in its overall development in the fields of Agriculture, Manufacturing, Defence and rather in every field without any exception.

\(^\text{(34)}\) Higher Education- Central University of India,
http://educationneed.wordpress.com/tag/education-universities

No nation could increase its Gross Domestic Product (GDP) - the indicator of its economic prosperity, unless it accepts and promotes science & technology in all the fields. Technical education produces technicians and technologists for all types of industries in turn leading the country to a highly industrialized state. Further, this would promote better international trade and hence trade surplus. In addition, India being a thickly populated country, basic needs and other needs related to transportation, communication, etc could be well met with advancement in science & technology that would further demand a high degree of quality technical education.

With fast industrialization of the West, the importance of accelerated growth in technical education has increased than ever before. Historically, the industrial revolutions brought about great changes in the total education structure. The growing use of technology has increased the need for technical training. For developing any technology, it calls for highly skilled human resource, relevant and sufficient data for the theme backed by R&D, strong financial resource and the will to succeed. To fulfill these, technical education is necessary that too of international level. All countries of the world, without exception, have begun to provide specialized training for their youth by providing the required resources. In India, now we find increasing use of communication tools, computers, on-line reservations, on-line trading, increasing consumerism and the list is simply endless. To sustain this and to grow further, the importance of the need for technical education and training call for no exaggeration. On the other hand, our Indian education system promises to produce the needed manpower through technical institutions. In addition, these institutions have been starting new courses based on the need of the industry. Here, institutions like IITs, NITs and few other private institutions lead the pack.

### 1.3.1 The Structure of Higher Technological Education in India

In the Indian system, the completion of the senior secondary examination is the stage from where higher education begins (ten years of primary and secondary education plus two years of higher secondary education). The first degree, the bachelors' degree is obtained after three years of study in the case of science and liberal arts and four years in the case of engineering and technology. The masters' degree program was of two years duration earlier but is currently of one and a half year duration. The research degree (Ph.D.) takes variable time but can be completed in

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three years. In addition to degree courses in engineering and technology a number of discipline-oriented and certificate courses are also available. Their range is wide, some being undergraduate diploma courses and others postgraduate courses with duration of one to three years.

**1.3.2 The System of Governance of Technical Education**

Education is a concurrent subject under the purview of the Central Government as well as the State Government. In addition, statutory bodies like All India Council for Technical Education and the University Grants Commission have their empowerment by the Acts of Parliament to regulate higher education. Professional Bodies such as the Council of Architecture, Pharmacy Council of India and the Institution of Engineers (India) have their roles, some of which are well defined and some others not so. The universities and deemed-to-be universities exercise various controls arising out of their statutes. The Bureau of Technical Education (BTE) in the Ministry of Human Resource Development provides grants to centrally funded institutions such as the Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), School of Planning and Architecture (SPA), New Delhi, Technical Teachers Training Institutes (TTTIs), Indian School of Mines (ISM), Dhanbad, and Indian Institutes of Information Technology (IIITs). BTE processes the programs of these centrally funded institutions, monitors and evaluates them. UGC allocates and disburses funds to the central universities and has the mandate with reference to norms and standards of education in the universities.

AICTE was originally constituted as an advisory body in 1945 for all matters relating to technical education. Although AICTE had no statutory power, it played an important role in the development of technical education in India. In the late nineteen fifties, early sixties and eighties there was a large scale expansion of technical education. Whereas the earlier growth occurred with the approval of AICTE and the Government of India, the expansion of eighties was brought about primarily in the self-financing sector without the approval of AICTE and the Government of India, and was localized in four States Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. It was in this period that the National Policy on Education (NEP), 1986 envisaged that AICTE be made a statutory body and be vested with the authority for planning, formulation, and maintenance of norms and standards. Even as early as 1964, the Education Commission under the chairmanship of D. S. Kothari had made similar recommendation for proper administration.

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of technical education. AICTE was made a statutory body in 1987, by an act of Parliament, for appropriate planning and coordinated development of the technical education system throughout the country. AICTE functions through its various statutory bodies to comply with the mandate provided by the Act.

1.3.3 Expansion of Technical Education\(^{(28)}\): When India attained Independence in 1947, there were only 38 degree-level and 52 diploma-level engineering/technical institutions with a total intake of 2,500 and 3,670 students, respectively. To carry out development plans, the country required expansion of the system of technical education, especially to provide human power for industries and technical services. The Central and State Governments provided funds to increase the technical education facilities in the 1950s and early 1960s, which resulted in the establishment of a large number of Government, and Government-aided private institutions in the country. The Government also adopted a policy of heavily subsidizing the technical institutions to attract meritorious students. The aided institutions received 50 to 70% of the capital cost and 80 to 90% of the recurring cost.

Regional Engineering Colleges\(^{(28)}\): A large number of industrial projects were contemplated in the Second Five Year Plan (1965-61). To ensure the supply of trained personnel for these projects, an assessment of demand and supply was made. It was estimated that a shortage of engineers and diploma holders would occur. Therefore, a scheme was formulated for the growth of the existing engineering colleges and polytechnics. The scheme was reviewed for capacity expansion. As a part of this initiative, eight Regional Engineering Colleges (RECs) were established in the first phase. It was decided to have one REC in each of the major states, thus adding up to seventeen. RECs have a national character and each college is a joint and cooperative enterprise of the Central Government and the State Government concerned.

Technical education has always been and continues to be one of the more preferred areas of study with expectations for better career opportunities. During the last two decades, the growing demand for expansion of technical education and the inability of the Government (which traditionally has been establishing and running technical institutions), to meet the social aspirations, has resulted in private initiative to provide the alternatives. In recent years, private registered societies and trusts have established a phenomenally large number of technical institutions.

institutions. The self financing technical institutions now account for more than two-third of the admissions to engineering colleges and nearly half in polytechnics. Research and postgraduate education in engineering and technology is confined to only a few institutions. Despite attractive scholarships, nearly 60 per cent of over 19,000 postgraduate seats approved in 191 institutions remain vacant while less than 7,000 complete the courses. Annually less than 400 research scholars complete their Ph.D. in engineering and technology. The low out-turn of postgraduates who constitute the supply source of teachers, is a major concern of technical education system, which suffers from 12,000 vacant positions, a number which is growing. Significant percentages of degree holders in engineering, particularly from better institutions, take up management and administrative jobs or go abroad.

1.4 Education Policy

National Policy of Education (1992) laid down many objectives for the development of education system in India but it has not been successful in achieving all of them. It has specified that the examination system should discourage the memorizing but it is what is going on. The education in India seems to encourage rote learning instead of experimentation and questioning. There is some disparity in assessment as all the State Boards have different standards of evaluation. The reservation based on caste and religion is a negative point in Indian education. Corruption is visible in the allocation of seats of institutions of higher studies and student politics is another sore point. These are some of the issues, which need to be worked upon. Though there are disparities between the objectives and their implementation in education but still education system in India has come a long way and will continue to improve in the future.

1.5 Employability

The Confederation of British Industry (CBI) defines employability as “a set of attributes, skills and knowledge that all labour market participants should possess to ensure that they have the capability of being effective in the workplace – to the benefit of themselves, their employer and the wider economy.” It is just not a person's capability of gaining initial employment alone, but also maintaining the employment gained and if required, getting new employment too.

(36) Staff Guide to Embedding Employability in the Curriculum, https://intranet.londonmet.ac.uk/studentservices/careers/university-staff/employability/employability_home.cfm
Competencies are generally understood as a composite product of one’s knowledge, skills and attitudes in understanding the concept, working out a systematic and skilled plan of action and executing to (close to) perfection. Conceptual understanding and building further calls for subject knowledge. Plan of action will call for the sequence of steps to be followed with sense of result and time. This in turn calls for developing skills, while execution is only a reflection of abilities with right attitude.

Competencies may be trifurcated into:

a) **Technical / Functional competencies** such as Conceptual clarity, Logical thinking, Methodical approach, Systematic Analysis, Verbal & Numerical Aptitude, Problem solving, Practical sense, Design knowledge, Machine / Equipment acquaintance, Industrial Processing, Processing tools, Programming & Debugging, Program execution, Production & Assembly details, Instrumentation knowledge, Testing & Inspection procedures, Result Analysis, Environment Management, etc.

b) **Generic competencies** such as Language & Communication, Self Management, Holistic Health Practices, Time Management, Relationship Sustenance, Stress & Emotions Handling, Independent Working, Corporate Etiquette, Positive Attitude, Multiple Tasking, Social Responsibility, Ethical Practices, etc.

c) **Managerial Competencies** such as Decision Making, Analytical Ability, Planning & Organizing, Mobilizing & Controlling, Team Membership & Leadership, Adapting to Changes, Change Management, Administration, Human Resource Management, Customer Care, Investment Management, Financial Management, Waste Management, TQM(Total Quality Management), Risk Management, etc.

While Technical / Functional competencies are groomed during one’s regular academic career, Managerial competencies are generally learnt, developed and imbibed during his / her professional career. As there is no specific focus on non-technical competencies in academics, a great deal of attention is called for developing the generic and management competencies of potential employees in general and engineering students in specific.

Employers, when they are interviewing, they are not just looking at one’s grades, test scores, and awards. They are looking for an all-rounded individual who can bring more than just basic skills to the table. Knowledge and experience aren't rooted solely in engineering, computers, and electronics, alone. An engineer must be able to write a competent English composition and have
taken courses in drafting, mathematics, the basic sciences, physics, and a dozen other disciplines and fields.

Once accepted into an engineering program, the curriculum obviously consists of courses in analytical mechanics and engineering analysis, calculus, physics, principles of electricity and magnetism and many more. And to top that all, an employer wants to see a prospective employee involved in extracurricular and not necessarily engineering-related-activities alone. Clubs and groups, competitions, and social and charitable activities are also important and confirm that this applicant is a dedicated, conscientious, energetic, socially engaged worker.

Most colleges and postgraduate schools provide placement assistance for new graduates. Job placement specialists in the high-tech industry are always in search of promising candidates for a wide variety of robotics-related positions. Professional organizations, online job search sites, internships, and personal contacts and networking are all excellent sources for jobs. Candidates can also contact a company or research facility that creates products or services they admire, provide their résumé, and seek an informational interview.

Today’s educational field has grown beyond the traditional national boundaries and hence the internationalization of higher education. As every developing and developed country cannot sustain on its own in every sphere of national life, formation of global village is an accepted concept. This is connected to different internal and external changes in the entire international system.

Internally, ever increasing population, depleting natural resources, growing competition, rural-urban divide, technology penetration, redistribution of the revenue pie, increasing inflation, improving life styles, escalating cost of living and many such other parameters compel the system constituents to grow globally or perish locally.

Externally, there have been constant changes in the area of international trade and employment arena that demands expanded knowledge horizon, different skill sets and dynamic workforce with better understanding of multiple cultures, languages and business practices all over the world.

The whole world is moving rapidly in technological developments and hence we can see reforms in teaching methods and pedagogical aspects. Our country is not an exception and now it is our turn to channelize our efforts and achieve our teaching programs par excellence. It is very unfortunate not to find our universities including the IITs (Indian Institute of Technology) in top
100 universities of the world, according to the findings of one survey made last year. Perhaps, if some of high ranked universities come to India, we will have their standard of excellence to compare with at home that will augur well for our growth & development.

“We need universities to provide quality education that meet international benchmarks. We must change the reality of our universities not figuring in the list of top universities of the world. Indian universities should aim at becoming top educational institutions in the world with global standards of research, teaching and learning. With unlimited demands and limited resources, it is important that the private sector also contributes its best to the provision of higher education in India. The private sector has played a key role in higher education in other countries across the world. Many top universities including Harvard, Yale and Stanford are the result of efforts of private sector. There is no reason why Indian private sector cannot achieve similar results.”

In the growth process of Higher education in India, central government of India has taken many steps and in the process, new IITs and IIMs (Indian Institute of Management) started their operations. The University Grants Commission (UGC) has decided to give more autonomy to state universities in appointing the Vice Chancellors. Two thousand thirteen will witness 12th Five Year Plan being implemented and a good amount of money has already been earmarked for the sector.

The responsibilities of entry-level Engineers in the industry are continuously changing. Getting employment and staying in that competitively requires that a person has the ability to change. Successful Engineers should possess the ability to respond to the changing needs and challenges of their organization. Some of these challenges are due to fast changes in the technology today. Employers like to hire potential leaders who are skilled at stimulating people to take rational initiatives. Employability skills are skills that are basic and generic in nature, but very valuable in assisting every person entering the workforce. Coming to the other side of the discussion about the status of engineering education in India from the beginning of the twenty-first century, it appears that the emphasis of a university education has shifted more towards preparation for work and trying to make their graduates ‘work-ready’ as a result of their program of study and work-experience at their institution. This apparent shift in the purpose of a university education from a value based knowledge system to 'graduating to work ready' system has been caused by

many factors like economic necessity linked to the need to obtain gainful employment. In present scenario, the liberal view of knowledge orientation is replaced by the employment emphasis. From the last decade or so student fees for university education has changed a lot to the tune of 5 to 10 lakh rupees per annum depending on the tier 1, 2 and 3 colleges. Investment at this level by the individual student makes them to feel to get a tangible return, which is the ability to obtain well-paid and fulfilling employment on graduation.

Government with the help of AICTE and UGC commissions is going with an agenda for preparing graduates for the world of work and is encouraging embedding employability skills into work experience.

In India, the brightest students opt for engineering after the 12th standard. This has resulted in a spurt of engineering colleges, mainly in the private sector. Yet, there is significant unemployment among graduating engineers, due to their poor quality.

The problem is also compounded by the quality of students that come into these colleges and their interest levels. Institutes like IITs take great care in the quality of students they select and hence produce good engineers. Other institutions select the "second-tier" students and produce mediocre engineers, with very little value addition in terms of thinking and problem solving ability. Besides, getting an engineering degree has become a default course of action in many instances, rather than a thoughtful decision, as it should be.

“First, we're all born with deep natural capacities for creativity and systems of mass education tend to suppress them. Second, it is increasingly urgent to cultivate these capacities -- for personal, economic and cultural reasons -- and to rethink the dominant approaches to education to make sure that we do. People and organizations everywhere can see that current systems of education are failing to meet the challenges we now all face and they're working furiously to create alternatives(38).” The students are frequently propelled into an engineering career by peer pressure, family pressure and poor guidance in high schools. Creativity and original thinking are often acquired qualities and not necessarily inherent and they are certainly some of the most important qualities, a good engineer must possess. Creative thinking is rarely encouraged in high school system of education, which encourages memorizing. If schools and colleges do not take a creative and problem solving approach to teaching engineering, how is it reasonable to expect to

produce quality engineers? Very often, one finds that students from large cities and those who come from families with educated parents are able to find jobs a lot more easily than students from rural areas, mostly because of their communication abilities and not necessarily due to their technical superiority. If the system of education continues as it is, India will merely be "mass producing" engineers, at best.

The academic world in India has been relentlessly producing thousands of graduates & post graduates, scholars, prospective entrepreneurs and potential employees who are failing to find employment, and regulators are under pressure to improve standards to meet the industry needs.

On the other hand, industry has been growing at a fast pace in all its facets giving rise to new & innovative products and services and is finding it very hard to find right number of people with right competencies, especially at the stage of hiring fresh recruits. In spite of the fact that every year the academia delivers around 4 to 5 times the number of graduates / post graduates as required by the industry, the industry is not all that happy about the number of employable graduates. In the entire industry, quite a large number of positions are either kept vacant for want of right and competent people or positions are just filled temporarily with not fully competent persons in order to wade through a critical situation. Here the employability is in terms of competencies as required by the industry and not as generally produced by the academia. Competency is a cluster of Knowledge, Skills and Attitudes that enables one to efficiently perform to a set standards of a given function expected in employment.

The shortage of appropriately skilled labour across many industries is emerging as a significant and complex challenge to India's growth and future.

According to NASSCOM(39), each year over 3 million graduates and post-graduates are added to the Indian workforce. However, of these only 25 percent of technical graduates and 10-15 percent of other graduates are considered employable by the rapidly growing industry. Hence, what we have today is a growing skills gap reflecting the slim availability of high-quality college education in India and the galloping pace of the country's service-driven economy, which is growing faster than most countries in the world. As businesses propose to double and sometimes triple their workforces and India Inc. strives to maintain its position in the global

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(39) NASSCOM, The National Association of Software and Services Companies is a trade association of Indian Information Technology (IT) and Business Process Outsourcing (BPO) industry, established in 1988, to facilitate business and trade in software and services and to encourage advancement of research in software technology
marketplace, it has become imperative to prepare and plan for a world-class, competent, talented and innovative workforce\(^{(40)}\).

With over 400,000 graduates leaving university every year, a graduate has to stand out from the crowd to get employed and answer the questions from the industry like what skills he/she developed whilst at school/college and the university and what experiences has one gained which are essential to execute tasks effectively and efficiently. Satisfying answers give an edge over the next candidates. It is highly essential to be proactive and engaged in interests and work experience alongside the degree to help enriching one’s graduate life and CV. The current situation in India is more of unemployability rather than unemployment.

A good engineer has varied skills and a keen attention to detail. Future engineers are those who take an early interest in how things work and are fascinated by mechanical, electronic and computer devices and gadgets. These include analytical thinking and developed research skills, computer literacy, creativity, patience, the persistence to solve problems logically, an eye for macro observations, micro details, specific accuracy, good communication and interpersonal skills.

A good engineer has varied skills and a keen attention to detail\(^{(41)}\). Future engineers are those who take an early interest in how things work and are fascinated by mechanical, electronic and computer devices and gadgets. These include analytical thinking and developed research skills, computer literacy, creativity, patience, the persistence to solve problems logically, an eye for macro observations, micro details, specific accuracy, good communication and interpersonal skills.

In the graduate employment market, a professional degree carries higher and better credence than a normal degree. A degree awarded by a reputed institute / a university still has a very high prevalence with the industry / employers. In spite of this being very true, there is significant and compelling evidence that degree or the certificate alone won’t be enough in today’s competitive market but employers have been increasingly looking for human resources with appropriate soft skills and right attitude. It is very pleasing to note that India has one of the world’s largest most qualified pools of technical manpower.

\(^{(40)}\) Lokesh Mehra, “Bridging the skills gap with industry: Academia partnerships”, http://www.cisco.com/web/IN/about/network/academia_partnerships.html

However, when we look at the employability of the same pool, we are way behind many countries. According to the survey, jointly carried out by the Federation of Indian Chambers of Commerce and Industry (FICCI) and the World Bank, insufficient supply of quality skills is one of the main impediments to further economic growth in India. The Indian economy grew more than 8% on average, including the year of the unprecedented financial crisis in 2009. However, the skill shortage is still one of the major constraints in most industries in India. 64 percent of surveyed employers are "somewhat", "not very", or "not at all" satisfied with the quality of engineering graduates' skills. The top three most important general skills identified were integrity, reliability and teamwork, while the top three most important specific skills are entrepreneurship, communication in English and use of modern tools and technologies. The survey has said that employers are relatively satisfied with the graduates when it comes to communication skills in English, but not with the graduates' reliability.

Employability certainly depends on one’s competency which is a culminating combination of Knowledge, Skills and Attitude of the individuals. It is a state of being employed and accomplishing the given tasks effectively and efficiently. Employability not only depends on whether one is able to fulfill the requirements of specific jobs, but also on how one stands relative to others within a hierarchy of job seekers.

Engineering colleges are multi directionally mushrooming with full focus on the numbers of graduate engineers churned out rather than the quality of these deliverables. Are we not compromising with quality for the sake of quantity? What ails our educational system? Is our current technical educational system not adding to the miseries of the unemployed youth?

It is reported that employers don’t get the applicants with right skill set, mind set and tool set especially in the engineering and construction sectors. Currently there is wide gulf between what our educational institutions are producing and what the industry expects. Industry looks for a different mix of skills & abilities in potential hires depending on the business it’s in. Industry also looks for multi skilled individuals. This further underlines that today’s major concern is first of unemployability and then of unemployment. Dr APJ Abdul Kalam has rightly said that India does not have the problem of unemployment but unemployability.

Employability skills are the critical tools and traits required to perform tasks at workplace,

which are much sought after by employers and differ from sector to sector and from time to time. However, certain qualities such as communication skills, interpersonal skills, integrity, right attitude, problem solving, decision making and team building skills are essential for all employers cutting across all industries and considered as few common skills or reference base for employability.

All businesses cry for employability skills as these enable their growth and competitiveness. These are the additional skills apart from the core / hard skills. Besides, Indian youth began realizing that without these employability skills, it is very hard to get jobs.

Stringent hiring standards in recent years have thrown the employability gap into sharper focus. Today’s employers are looking for candidates with well-developed communication skills, including proficiency in spoken English. While industry knowledge is vital, companies also value employees who can demonstrate adaptability, innovativeness, and the ability to think on one’s feet. Also high on their wish list are candidates with people-friendly skills who can successfully interact with customers and with their team members. Unfortunately, many among the aspiring candidates lack these critical skills. They find it hard to cope in a fast-paced environment that puts a premium on effective communication and independent thinking.

How do we begin to address this issue? What can we do to ensure that our aspiring job seekers are job-ready from Day One?

The dissatisfaction level of employers toward engineering graduates’ skills confirms that a significant share of graduating engineers does not meet employers’ expected standards. Even if employers demanded unrealistically high skills from graduates, there is a substantial quality gap between institutions (the producers) and employers (the consumers). This quality gap needs to be addressed(42). The answers lie arguably in one direction i.e., our education & training system.

Traditional colleges are currently not meeting expectations when it comes to delivering quality training. Their textbook approach to education doesn’t provide the practical perspective that students need in order to be workplace ready. The classroom experience in many colleges is stuck with the past and outdated curricula. When course offerings are changed, if it is based on a dialogue with the industry, then the changes become relevant to the business environment of the

day. The single largest and key challenge facing the Indian Inc. is that of building scale-quickly in terms of manpower numbers having the right set of knowledge, skills and competencies. As the industry is growing rapidly, there is a strong need for populating the entry level pipeline-which is normally met through Campus Recruitment. The second challenge is in the ‘up skillling’ of existing employees-to prepare them for the emerging future roles that are likely to be more complex and demanding new set of competencies. Well rounded, experienced and rightly skilled talent is not so easily available in large numbers and is truly expensive. As India Inc. grapples with the supply and quality challenges, there is an urgent need for evolving and implementing innovative, effective & scalable HR strategies, processes and practices.

It is widely reported that the recruiters are finding it tough to find the right skills and right attitude in almost all engineering disciplines. The widening gulf between what the industry expects and what the academia delivers is probably understood by referring to the industry stalwarts stating that only 15% to 25% of current engineers are employable.

Employability skills are the non-technical skills and knowledge necessary for effective participation in the workforce. They can include skills such as communication, self-management, problem solving and teamwork. They are also sometimes referred to as generic skills, capabilities, enabling skills or key competencies. The Australian Government is funding the development of a new framework for employability skills. A new name - Core Skills for Employment - has been proposed and is currently being considered. The new Australian Curriculum includes seven general capabilities: Literacy, Numeracy, Information and communication technology (ICT) capability, Critical and creative thinking, Personal and social capability, Ethical behavior and Intercultural understanding. Based on the industry in which an organization is operating, it looks for different sets of skill sets in potential hires or recruits. Multi skilled individuals are always in demand. Though every organization focuses on its own specific needs, certain common skills such as good communication skills, right attitude, interpersonal skills, integrity, decision making & problem solving ability and team comrade skills are always desired irrespective of the type of business or industry. All employers irrespective of the type of their industry demand high degree of employability skills as that forms the very basis of their survival, sustenance and growth in today’s tough global business environment. In fact, other resources being almost equal it is truly the Human Resource of high

quality skills that differentiates between the market leaders and all others. Employers throughout the world have realized this factual aspect long ago and hence today physical international boundaries do not mean anything when it is the question of hiring the talent. Slowly but of late, even our Indian graduate youth have recognized this global truth, are in right path of keeping themselves abreast, and updated with regard to both core and other employability skills. 

Stringent hiring standards such as 65 to 70% consistent merit right from X standard to the final semester of B E, very good communication skills observed in Group Discussions and detailed technical and HR personal interviews in recent years have exposed the widening employability gap into spot light. Skills like creativity, innovativeness, thinking out of the box, adaptability, time consciousness, corporate etiquette and many more are being observed and valued. Many of the aspiring young graduates despite having good academic records lack the critical skills, which are cited above. Today’s work environment puts a high premium on independent thinking, responsive and effective communication skills.

Most of the colleges and universities are just delivering today the old curricular contents without due regard to what is the current need of the industry. Even the syllabus is not being updated regularly in consultation with the industry. Pure textbook approach without practical exposure and knowledge takes the youth nowhere in terms of industry readiness. Further, the current examination system of giving choice like “Answer 5 out of 8” will not certainly help the cause as there is no choice once a graduate steps on the corporate ladder. It is further alarming to note that first class (60%-70%) students and even quite a few distinction (70% & above) students fail to clear the communication tests, group discussions and personal interviews.

Respondents from the industry revealed that unlike earlier, today, they do not have time to train the fresh recruits on all aspects and rather they expect the fresh hires to be job-ready from day one. With this in background, how can we resolve this issue? Probably and arguably the answer lie in our education system, wherein so far only the core/hard skills are being taught.

One of the key challenges faced by the Indian corporate world today is proper young human resource with right skill sets and competencies to take on global competition in quick time. With the industrial growth being rapid in general (except for the period of recession), rightly populating the entry level pipe line is highly essential. This is generally met with through campus recruitment. The immediate next challenge would be “up-skilling” of existing employees to take higher positions of team leaders and managers of higher order competencies.
In most of the Indian engineering colleges, students hail from different backgrounds in terms of academic standards, urban & rural divide, varied native languages and multi cultural canvas. In order to gain and sustain an employment in today’s challenging scenario, there is a strong need for a common link to make them competent. Communication in English may remove the lingual barriers in corporate world and give them a common medium to communicate. In addition, according to the researcher’s findings the students with skills like positive attitude, problem solving, time management, team spirit, self-confidence, handling criticism, flexibility and a few others, also known as soft skills as a whole, have much better chances of basic survival and successful growth in the tough corporate world compared to others who lack these.

It's worse as over one-third engineers do not possess mathematical skills needed in day-today life for doing simple transactions, counting and arranging. In other words, they have a weak understanding of concepts as elementary as decimals, powers, operations, ratio, fractions and the ability to apply these concepts to real-world problems. Raising serious questions about the quality of education in schools and engineering institute, the study states, 'These skills are required in all engineering and analytics jobs in the knowledge-based industry. For instance, an engineer who cannot multiply/divide decimal numbers (the total being an alarming 42 per cent) would face difficulty in doing basic engineering calculations\(^{44}\).

The study, released by Aspiring Minds, is based on the results of more than 55,000 students from over 250 engineering institutes who took AMCAT test. The engineers had graduated in 2011. The report also raises concern over the language skills of the fresh engineering graduates. Given the importance accorded to a candidates fluency in English during the interview process, the report states that a sizeable chunk of the engineers are far from impressing the recruiters they don't have the 'English comprehension skills to understand engineering school curriculum'. 'Twenty five to 35 per cent engineers cannot comprehend English usage even in day-to-day conversations. 'Since engineering education is in English, this is a key concern for colleges, as such a lack inhibits students from grasping concepts in other subject areas as well,' the report states. To illustrate the weak vocabulary, the study states that more than half the number of students did not understand words such as absurd, generic, cease and adamant, among others. It's

\(^{44}\) Mail on line India, (6 May 2012), http://www.dailymail.co.uk/indiahome/indianews/article-2140434/More-engineering-graduates
probably not surprising why less than 25 per cent of the engineers joining the workforce every year are seen as unemployable by the industry\(^{(44)}\).

‘One third of engineering students are unfit for employment, even with external intervention in the form of training’. These findings are about students who have done well academically; with at least 60% marks, said the PurpleLeap IRIX (Industry Readiness Index) survey. This survey is based on the IRIX employability–readiness test undertaken by students across the country. The company-neutral IRIX test, executed on the Pearson VUE platform, is accepted by diverse organizations for entry level talent, and helps them shortlist from the ‘pre-assessed’ pool of candidates across India. As many as 34000 students from 198 colleges, across the country, took this test which forms the basis of this survey. The criterion to qualify for the test was an academic score of at least 60%. Commenting on the findings of the study, Mr. Amit Bansal, CEO, PurpleLeap opines, ‘Our country’s growth will depend on developing a wider and deeper pool of skilled talent. In the present economic and employment scenario, it is important that engineering education should provide students with the skills and knowledge to be employable. A concerted and combined effort among colleges, corporate and training institutions is needed to address the prevalent employability matrix.\(^{(45)}\).’

The way industry points out at academia and its role in making the fresh engineers as work ready, quoting only 15% to 25% of technical graduates are employable, the academia in turn blames the industry in not taking the role in bringing the change. Academicians insists that industry cannot do away with its part of training responsibility by expecting students to be employable from the first day after graduation and they say that the industry's participation as a key stakeholder is critical to address the employability issue. The argument from the academic side is that the oft-repeated remark that the university syllabus is outdated and not in tune with what is happening in the industry is unfair, considering that educational institutions are meant for making the fundamentals clear and stronger. It is unrealistic to expect a continuous change in the syllabus for a four-year program. Academicians do agree the need for better communication between faculty and students, efforts to retain high-quality faculty, boosting confidence of

\(^{(44)}\) Mail on line India, (6 May 2012), http://www.dailymail.co.uk/indiahome/indianews/article-2140434/More-engineering-graduates

faculty to go for innovative ways of teaching, and introduction of other disciplines, like management and psychology, in the engineering curriculum.

Academicians do agree that few common problems that have been associated with many of the engineering colleges under university education are: Insufficient number of well-qualified and passionate faculty; Lack of Infrastructure, Laboratory equipment, Workshops, etc; Lack of quality reference material in libraries; Minimum Student Faculty Interaction; More emphasis on Theoretical Lectures than Practical Applications; High priority accorded to passing examinations than acquiring knowledge; Lack of Institute Industry Interaction; Lack of or minimum live project works by engineering students; Low self esteem, confidence, and fear of facing Interviews; and Lack of students’ competencies required for employment.

Researchers have studied on the skill sets possessed by fresh engineering graduates and industry expectations in the form of skill gap and given models to bridge the gap. Many have stressed on industry and academia interaction through universities, industries and businesses working more closely together to accomplish mutual goals.

One appreciating feature of modern society is that young people increasingly communicate with each other unlike the olden days through different ways of communication modes. Consequently, educators are happy to find ways of enabling students to better interact face-to-face with others.

India, one of the fast growing BRICS economic powers, recognized by the whole world, is a federal republic nation comprising of 28 states and 7 union territories. Education is managed through a partnership of the central and state governments. The central government establishes broad education policies and is increasingly responsible for regulating and maintaining standards in higher education. Federal policies serve as guidelines to the state governments, which administer most schools and universities within their jurisdictions.

Education policy is formulated by a number of bodies under the Central Advisory Board of Education (CABE). In engineering and other technical disciplines, the central policymaking and regulatory body is the All India Council for Technical Education (AICTE).

(46) BRICS is the title of an association of leading and emerging economies, the group's five members being Brazil, Russia, India, China and South Africa. The Acronym “BRICS” has come into widespread use as a symbol of the shift in global economic power away from the developed G7economies towards the developing world.
The AICTE determines the requirements for new universities and programs of study, and outlines curriculum standards and norms. It also accredits programs through the National Board of Accreditation (NBA)\(^{(47)}\).

The main source of funding for public universities and colleges comes from the central and state government in the form of grants, with a small percentage derived from fees. Indian education observers frequently note that many higher education institutions are underfunded, especially in the technical sector, where labs and classrooms are often under resourced and understaffed.

A booming growth in the number of technical institutions has led to particularly acute issues and concerns for the engineering sector, where colleges are struggling to hire adequately qualified faculty, graduates are failing to find employment and regulators are under pressure to improve standards. Major findings center on:

Too many institutions due to unregulated growth, especially in the private sector, Institutions are proliferating in geographical pockets, leading to oversupply in some markets and shortages in others, Not enough qualified faculty, and not nearly enough doctorates coming through the system, Weak quality-assurance structures, especially accreditation procedures, Lack of cooperation and interaction between industry and the classroom, High levels of unemployment and underemployment among engineering graduates, The graduate growth rate is far exceeding the economy’s growth rate and Colleges are not meeting the skilled manpower needs of industry Exorbitant tuition fees at many private colleges\(^{(47)}\). The findings of an industry-sponsored report tend to confirm that there is a mismatch between the skills students are graduating with and the skills required by the economy’s top revenue-generating sectors\(^{(47)}\). India has some very bright spots of excellence in its technical education sector. The IITs and their alumni command great respect in the global market. India’s second-tier engineering schools are also well-regarded, and have excellent faculty and student bodies. However, with an average of one new engineering college opening its doors a week, the AICTE appears to be struggling to maintain the standards of excellence set by India’s top institutions. As the Rao Committee report has pointed out, the AICTE needs to focus on ensuring that its standards are met at already existing institutions, new institutions are opened in areas that need them, substandard institutions are closed and that

faculty shortages are reversed by investing in postgraduate education and encouraging talented students to remain in India to pursue careers in academia\(^{(47)}\).

The employability is in terms of competencies as required by the industry and not as generally produced by the academia. Competency is a cluster of Knowledge, Skills and Attitudes that enables one to efficiently perform to a set standards of a given function expected in employment. The shortage of appropriately skilled labour across many industries is emerging as a significant and complex challenge to India's growth and future. According to NASSCOM, each year over 3 million graduates and post-graduates are added to the Indian workforce. However, of these only 25 percent of technical graduates and 10-15 percent of other graduates are considered employable by the rapidly growing industry. Hence, what we have today is a growing skills gap reflecting the slim availability of high-quality college education in India and the galloping pace of the country's service-driven economy, which is growing faster than most countries in the world. As businesses propose to double and sometimes triple their workforces and India Inc. strives to maintain its position in the global marketplace, it has become imperative to prepare and plan for a world-class, competent, talented and innovative workforce.

Having gone through the Historical Perspective on Education, Evolution of Education in India, the Current Education System in India including Higher Education, Industrial Revolutions in Global Context, Attributes and Nuances of Employability & Competencies and finally the views of the Academia and the Industry and their possible convergence, the platform is set for the next stages of the research.

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1.6 Statement of the Problem

Is competency gap, a major attribute to today’s low employability of engineering students in India?

Scores of engineers from India are making big names and news both in India and abroad; however, the industry strongly feels that the quality of our engineering graduates, who are our academia deliverables, is truly short of what is supposed to be.

Veteran industrialists have gone on record that a meager 14% to 25% of Indian Engineers only are employable. Then, a big question lies in the form of “whether 75% to 86% of the academia deliverables are unfit for employment? Nevertheless, we also find that a lot of this bigger percentage still find a job whether it is in the relevant field or not. Is this an indicator that the majority is either getting under employed or employed in a field in which they do not have the right proficiency? Or are they getting into a tentative employment always looking for a change?