Employability of Engineering Graduates and the Challenges faced in India

Anusudha Krishnamurthi
Assistant Professor
Department of Electronics Engineering
School of Engineering and Technology
Pondicherry University, India.

Abstract: Employability refers to a new graduate possessing a set of skills that enable him or her to compete and secure employment, whether in formal employment, self-employment or any career. Besides the skills, employability also includes various attributes and experiences obtained through higher level learning where prerequisite knowledge and skills at lower levels are important .Employability of engineering graduates is a global issue and it has been of concern in recent years for both developing and developed nations. Various nations across the globe poles in addressing this issue by developing the standard required for the reforms in engineering education .This paper discusses the Employability status of engineering graduates in India by identifying factors towards employability that are significant in applying theory to practice and the challenges faced by the engineering graduates. The study also discusses the methods to overcome the challenges as to address the employability issues.

Index term: **Education, Engineering, skills, Employability.**

I. Introduction

Education in its general sense is a form of learning in which the knowledge, skills, and habits of a group of people are transferred from one generation to the next through teaching, training or research. It frequently takes place under the guidance of others or may also be autodidactic. Any experience that has a formative effect on the way one thinks, feels, or acts may be considered as educational. It is really a means to discover new things which we don't know about and increase our knowledge.

Education is also regarded as one that contributes to social, political, cultural and economic transformation of a country. The social sector of a country, namely, health, rural development, education and employment generation has assumed great significance in the new economic regime. The prosperity of any nation is intrinsically linked to its human resources. Human capital is one of the most important assets of a country and a key determinant of a nation's economic performance. An increase in the human development index would lead to high levels of economic growth of the country.

Though education tries to cope up with the needs of the society, it has to meet the challenges of unpredictable changing civilized population. This involves a structured system to prepare the young minds to face the challenges. Higher education helps an individual to lead a better life, develops new technology which helps to increase the economy of the country. An individual with education has a better life style as he/she will be able to solve any problem with a broad mind set.

India being a country of opportunities should have skilled people to meet any challenges. This can be developed only through education which should be structured to meet the developing technologies. A country with a population of skilled people will be able to operate and develop new technologies. There is a general consensus among engineering educators, entrepreneurs, industry and business leaders that engineering education in India is heading towards crises. It is a known fact that the graduating engineers want to be placed in a software firm or in core industry. However very less percentage of grandaunts have the required skill to get placed in software industry or has the capability to handle core engineering task.

According to the MHRD, India has 6,214 engineering and technology institutions which are enrolling 2.9 million students wherein in 1.5 million engineers are released every year for job. Engineering concepts are explained through theoretical examples in India's education system as most of the courses are held in a classroom environment.

This paper discusses the employability status of Engineering graduates in India, reforms required in the education system, the challenges faced and the solution to overcome the drawbacks. In section I, an introduction to education system has been discussed; Section II discusses India's higher education system and the accreditation and recognition of higher education in India ; Section III briefs the engineering education in India and the key challenges faced ; The solution to the challenges faced are discussed in Section IV and the Section V gives the conclusion.

II. India's Higher Education System

The Indian education system has conquered a strong position in international circuit. India is today recognized as a world centre for higher education amongst foreign students as the country has an unparalleled variety of academic courses. The present education system in India mainly comprises of primary education, secondary education, senior secondary education and higher education. Elementary education consists of eight years of education. Each of secondary and senior secondary education consists of two years of education. Higher education in India starts after passing the higher secondary education or the 12th standard. Depending on the stream of graduation it can take three to five years. Postgraduate courses are generally of two to three years of duration.

The institutional framework consists of Universities established by an Act of Parliament (Central Universities) or of a State Legislature(State Universities), Deemed Universities (institutions which have been accorded the status of a university with authority to award their own degrees through central government notification), Institutes of National Importance (prestigious institutions awarded the said status by Parliament), Institutions established State Legislative Act and colleges affiliated to the University (both government-aided and –unaided).

Currently the activities of Department of Higher Education are focused towards developingIndia as a knowledge society. The Department's constant endeavour is to improve and expand education in all sectors, with a view to eliminate disparities in access and lay greater emphasis on the improvement in the quality and relevance of education at all levels. The role of Department, therefore, includes policy formulation, programme implementation, coordination with other stakeholders, knowledge management, research and innovation, creation of intellectual property, training and capacity building, reaching out to disadvantaged sections, women and minorities in the higher education sector. Improvement of access along with equity and excellence, the adoption of state specific strategies, enhancing the relevance of higher education through curriculum reforms, vocationalisation, information technology, and quality of research, networking and distance education are some of the main policy initiatives of the higher education sector.

2.1 Accreditation and Recognition of Higher Education Institutions

All universities in India come under the jurisdiction of the University Grants Commission (UGC) and all institutions of technical education (IITs, IIMs, IISCs, IISERs, NITs, SPAs) are regulated by All India Council for Technical Education (AICTE). It is mandatory for all institutions to be recognized by the appropriate national level statutory bodies established by the Government of India for compliance to quality standards.

2.1.1 Higher Education: Department of Higher Education of the Ministry of Human Resource Development is the highest authority in Indian Central government which is responsible for secondary and tertiary education system. More than 100 bodies having different functions and responsibilities fall under Department of Higher Education, for instance - University Grants Commission and All India Council of Technical Education, besides Central Universities and reputed Institutions like IITs, IIMs, IISCs,IISERs, NITs, SPAs.

2.1.2 University Grants Commission (UGC): The University Grants Commission is a statutory organization established by an Act of Parliament in 1956 for the coordination, determination and maintenance of standards of university education. Apart from providing grants to eligible universities and colleges, the Commission also advises the Central and State Governments on the measures which are necessary for the development of Higher Education.

2.1.3 All India Council for Technical Education (AICTE): The All India Council for Technical Education (AICTE) was set up in 1945 as an advisory body and later on in 1987 given the statutory status by an Act of Parliament. The AICTE grants approval for starting new technical institutions, for introduction of new courses and for variation in intake capacity in technical institutions.

2.1.4 National Assessment and Accreditation Council (NAAC): It is an autonomous body which has been established by the University Grants Commission in 1994 in pursuance of the recommendations made by the National Policy of Education, 1986 and the Programme of Action (POA), 1992 which lay special emphasis on evaluating the quality of higher education in India. The prime mandate of NAAC, as envisaged in its Memorandum of Association (MoA), is to assess and accredit institutions of higher learning, universities and colleges or one or more of their units, i.e., departments, schools, institutions and programmes.

2.1.5 National Board of Accreditation (NBA): Similar to NAAC is NBA, another important accreditation body. National Board of Accreditation (NBA) which was set up in 1994 under Section 10(u) of the AICTE Act awards accreditation status to programmes as accredited for five years, accredited for three years and Not Accredited (NA). Accreditation is now based on a 1000 point scale and is an outcome based accreditation system.

III.Engineering in India

According to Barker (1993), Engineering is, "the art of directing the great source of power in nature for the use and the convenience of humans. In its modern form engineering involves people, money, materials, machines and energy. The difference between a scientist and an engineer is that a scientist discovers and formulates into acceptable theories, whereby an engineer requires the creative imagination to innovate useful applications of natural phenomena."

Engineering is 'the creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation or safety to life and property' (ECPD, 1947).

It is the application of scientific, economic, social, and practical knowledge in order to design, build, maintain, and improve structures, machines, devices, systems, materials and processes. The discipline of engineering is extremely broad, and encompasses a range of more specialized fields of engineering, each with a more specific emphasis on particular areas of technology and types of application. In simple words, Engineering is directed to developing, providing and maintaining infrastructure, goods and services for industry and the community. It is therefore essential for engineering graduates to have certain skills to help them apply and practice the knowledge effectively in workplace.

Engineering concepts are explained through theoretical examples in India's education system as most of the courses are held in a classroom environment. In addition to the modalities of classroom teaching, some of the common challenges faced by engineering graduates to pursue higher education are:

1. **Language Proficiency:** Students from rural areas who have got admission for an engineering course are not given special care for improving the proficiency in English as engineering education is completely in English.

2. **Varying Capacity of Absorption**: Having heterogeneous group of students, the absorbing capability of students also varies, as per which the teaching modality as to be changed.

3. **Hands on:** Technical subjects should be explained with real time applications so that the student can understand with in-depth knowledge.

4. **Lack of Industrial Interaction:** Industrial visits arranged by the institution do not meet the effectiveness.

3.1 Key Challenges faced by Engineering Students

The key challenges faced by the engineering students

3.1.1 Language barrier

The most mainstream faced by a majority of individuals in India is the language barrier. Many of the aspiring engineers hail from remote or rural areas with extensively diverse cultural heritage. As the proper engineering education is in the English language, these students alongside many others have to confront the similar problems. The schooling done by these students may be in a different language medium while the entire engineering graduate degree studies are in the English language.

3.1.2 Gap between Theoretical and Practical Knowledge

Theoretical education system has been given more influence than practical education thus when it comes to the practical application of their studies, the students face the most crucial issues. To be regarded as a profound engineer, one must acquire substantial knowledge of engineering theories as well as practical application of their studies.

3.1.3 Shortage of Faculty

The responsibility of teaching and the fact that each and every student must contemplate what has been taught lies upon the shoulders of the professors and teachers of the engineering college. The study curriculum is very wide and extensive and due to shortage of teaching faculty causes rise to the issues of arising doubts regarding the topics and indeterminate contemplating of topics.

3.1.4 Different Learning Capabilities

The different students studying at engineering colleges in India possess different levels of understanding of what is being taught. Everyone has as different level of learning and possess different learning capabilities thus when it comes to the factor of understanding what has been taught, there arises indifference.

3.1.5 Limited Exposure to the Applicability

The practical education and is implementation are as significant as the theoretical education is, for the reason the majority of engineering colleges have modified their study curriculum.

IV. Methods to Overcome the challenges

The circumstances facing practicing engineers today are considerably different from those of the past, and the circumstances of the future will be even more different. Significant changes in engineering education will be required if we are to meet the needs of our graduates in preparing them for the challenges of the coming century. Let us consider in somewhat greater detail the knowledge, skills, and values that will be necessary for engineers to deal successfully with these challenges.

4.1 Knowledge

The volume of information that engineers are collectively called upon to know is increasing far more rapidly than the ability of engineering curricula to "cover it." Until the early 1980's, for example, most chemical engineering graduates went to work in the chemical or petroleum industry. Now they are increasingly finding employment in such nontraditional (in engineering) fields as biotechnology, computer engineering, environmental science, health and safety engineering, semiconductor fabrication technology, and business and finance. To be effective across this broad spectrum of employment possibilities, our graduates should understand concepts in biology, physics, toxicology, fiscal policy and computer and software engineering that are well beyond the range of the traditional chemical engineering curriculum.

Many who work in companies that have international markets will also need to be conversant with foreign languages, which have been phased out of both undergraduate and graduate engineering curricula in recent decades. At the same time, the work done by any one engineer tends to occupy a relatively narrow band in the total spectrum of engineering knowledge. Unlike their counterparts of several decades ago, today's engineering students may never be called upon to work with basic elements of the traditional curriculum such as phase equilibrium, thermodynamics, separations, reactions and process design. For these reasons, structuring a four-year or even a five-year engineering curriculum that meets the needs of most engineering students appears to be an increasingly elusive goal.

One solution is to abandon the traditional one-size-fits-all curriculum model and instead to institute multiple tracks for different areas of specialization, relegating some traditionally required courses to the elective category. Designing such tracks and keeping them relevant is a challenging task, but it can be and is being done at many institutions. No matter how many parallel tracks and elective courses are offered, however, it will never be possible to teach engineering students everything they will be required to know when they go to work. A better solution may be to shift our emphasis away from providing training in an ever-increasing number of specialty areas to providing a core set of science and engineering fundamentals, helping students integrate knowledge across courses and disciplines, and equipping them with lifelong learning skills. In other words, the focus in engineering education must shift away from the simple presentation of knowledge and toward the integration of knowledge and the development of critical skills needed to make appropriate use of it.

4.2 Skills

The skills required to address the challenges to future engineers raised in the first section may be divided into seven categories:

- Independent, interdependent and lifetime learning skills;
- Problem solving, critical thinking, and creative thinking skills;
- Interpersonal and teamwork skills;
- Communication skills;
- Self-assessment skills;
- Integrative and global thinking skills, and
- Change management skills.

From another perspective, ABET Engineering Criteria 2000 requires that future graduates of accredited programs should possess

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as analyze and interpret data
- An ability to design a system, component, or process to meet desired needs
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve engineering problems; An understanding of professional and ethical responsibility
- An ability to communicate effectively

V. Conclusion

Engineering graduates are expected to be employable and ready for the workplace when they complete their studies. It is generally expected that graduates should be equipped with a balance of technical knowledge in addition to the relevant soft skills required in the workplace. Engineering students are often equipped with technical knowledge, but lack of soft skills leave them not prepared for the contemporary requirements of workplace. And learning is continuous; not actually gets over by completion of the curriculum. Hence to this regard individual centric approach is needed. The redesigning of the university curriculum with more apprenticeship and live industry projects will facilitate the pre job training which will surely enhance the employability among graduates.

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