A Need Based Approach for Technical Education in India

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Abstract

Technical education in the country has been tuned for a great amount of acceleration and is galloping towards a target in tune with the International level. On spring of such rapid progress, the concept of quality of education requires more attention. Corporatizations has emerged as a supplementary measure for complementing the governmental initiatives, this introduced a new arena of profit oriented education. This necessitated an imperative need for the evaluation of the situation and to assess the fact that whether the out turn from these educational institutions are absorbed by the economy for the effective utilization and/or for the research needs of the country. The results throw light to the reality of ever widening gap between the supply and the demand, polarizing phenomena of educated Professional unemployment. A probable solution for confronting this challenge is by fine tuning the professional education system to a result and research oriented one with active participation of different sectors of the economy.

Key Words: Professional Technical Education, Corporatization, Professional unemployment

Abbreviations:

KAM	= Knowledge Assessment Methodology
POA	= Programme of Action
NPE	= National Policy on Education
BC	= Before Christ
AD	= After the Death of Christ
IIT	= Indian Institute of Technology
NIT	= National Institute of Technology
IIM	= Indian Institute of Management
IISc.	= Indian Institute of Science
BITS	= Birla Institute of Technology and Science

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1. Introduction

In India, technical education is imparted through the curriculum drawn to work education. This is aimed at to promote greater understanding of the student on both theoretical and practical aspects of technical education. The implementation of the national policy on education enacted by Ministry for Human Resources Development (1986) and the subsequent Programme of Action (POA) resulted development of technical education with a greater emphasis. In the same line the vice-president of India Hamid Ansari (2007) in his speech asserted that scientists study the world as it is, engineers create the world that has never been. Throughout history, engineering has been a key driver of human development and, along with technology in the wider sense, impacts on and shapes culture.

1.1 Evolution

Each nation develops its own system of education to express and promote its unique socio-cultural identity and also to meet the universal challenges. The prime focus of the country is the economic and technical development to meet global competition. The country had a rich heritage originated from the world renowned universities of Nalanda and Taxila. According to Needham (2004) when the men of Alexander the Great came to Taxila in India in the fourth century BC they found a university there the like of which had not been seen in Greece, a University which taught the three Vedas and the eighteen accomplishments and was still existing when the Chinese pilgrim Fa-Hsien went there about AD 400. However, the momentum of growth underwent an unprecedented setback for about a century even during the colonization. Table 1 shows the modern higher education in India during British rule (1857-1947).

In the post independence India has enacted the national policy on education by the Ministry for Human Resources Development (1986), which is considered as a significant step. It was aimed to promote national progress, sense of common citizenship and culture, and to strengthen national integration (Ministry for Human Resources Development, 1988). During this era the stress was on the necessity of a radical reconstruction of education system by improving its quality at all levels and giving special attention to science and technology. Besides the national policy on education of 1986, a number of policy initiatives have been taken by the Government, some of these are: (a) National Technology Policy Statement (1983) by Ministry

of Science & Technology (1983), Technology Policy Vision for India 2020 (TIFAC Government of India, 1996), Information Technology Policy of 2000 (Ministry of Communication and Information Technology India, 2000) and the strategy for transformation (Planning Commission of India, 2001) noteworthy to mention.

Table 1 : Modern higher education in India during British rule 1857-1947.

Year	Universities	Colleges (General)	Enrollment
1857-58	3	27	250
1881-82	4	68	6000
1891-92	5	137	13000
1901-02	5	187	17650
1911-12	5	182	29650
1921-22	14	226	45200
1931-32	16	310	79140
1941-42	15	422	118750
1946-47	17	466	193400
1947-48	20	496	215000

Source: Selected Educational Statistics, (MHRD, 2007)

1.2 Changing Phase

The 42nd amendment to the Indian Constitution in the year 1976 had a far reaching affect on sharing of the responsibilities between the union government and the states. This amendment to the Indian constitution re-affirmed the status of education, which was included in the Concurrent list. Even though, the role of State on higher education remain untouched, the central government had to accept a larger responsibility in terms of reinforcing the national and integrative character of education, ensuring quality and standards of education. It also entrusted the central government to study and monitor the educational requirements of the country in total, particularly with respect to manpower for development, needs of research and advanced study, international aspects of education, and to promote excellence at all stages of education.

However, the national policy on education (Ministry for Human Resources Development, 1986) laid importance on the radical reconstruction of the education by improving quality at all

stages. It also had given greater attention to science and technology. The Programme of Action (POA) was perceived as a charter for action for the nation in total for a combined effort of the centre, states, union territories. This programme was spread over the years from the seventh five year plan to the tenth five year plan and beyond as bigger schemes of quantitative expansion and qualitative improvement was the demand of time. The progress made by the country in the field of higher education since 1947 till date has been shown in the Table 2.

Table 2: Modern higher education in India post independence 1947-2010

Year	Colleges	Enrollment
1947	496	2,15,000
2010	16,885	99,54,000
% change	3304 %	4529%

Source: Selected Educational Statistics (MHRD, 2007)

Different scholars like Sen (1989) assereted that planning for future necessities not only to generate a judicious study of the bygone, but also to examine the overall psyche of the people accountable for formulating development policies, to comprehend difficulties of development process and to identify the factors responsible for achievements and failures.

In the beginning of the 21st century India is a nation of young people – out of a population of above 1.1 billion; 672 million people are in the age-group of 15 to 59 years, which is usually treated as the "working age population". It is predicted that India will see a sharp decline in the dependency ratio over next 30 years, which will constitute a major demographic dividend for India. In the year 2001, 11 per cent population of the country was in the age group of 18-24 years which is expected to rise to 12 per cent by the end of the XI five year plan. This young population should be considered as an invaluable asset which if equipped with knowledge and skills, can contribute effectively to the development of national as well as the global economy (Ministry of Human Resource Development India, 2010). Hence it is the time to have a deep introspection into existing systems of management and to build new foundations for a successful tomorrow.

To make a comparison on the knowledge level of the biggest democratic countries in the world the World Bank published te KAM scorecards for India and China that demonstrate their performance on key knowledge economy indicators for the most recent period for which data is available. The variables are normalized on a scale from zero to ten relative to other 131 countries in the comparison group of the World Bank Study. The KAM score card, generated by the World Bank is also given in the Figure 1.

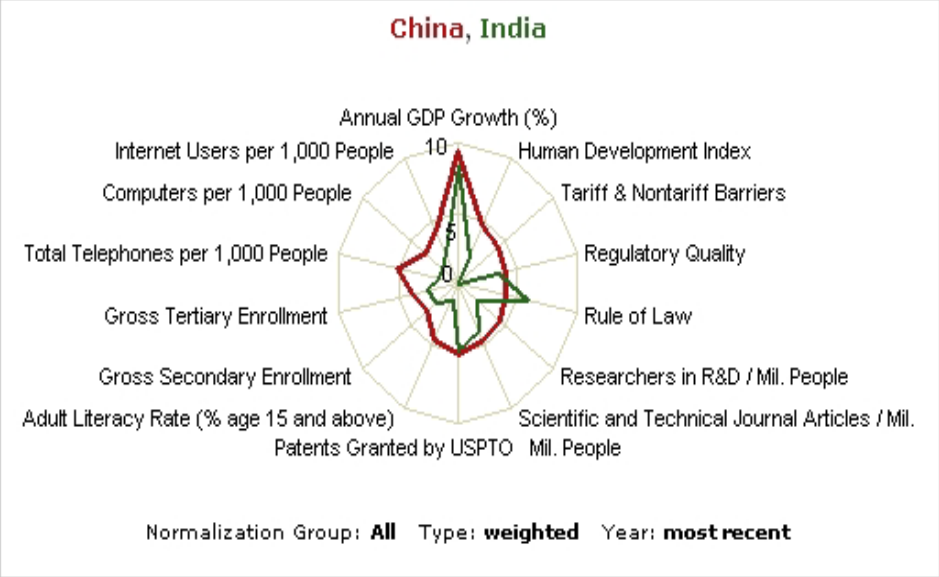

Figure 1: KAM Scorecard for India and China
Note: GDP growth and Patent Applications Granted by the USPTO are the annual averages for 2001-2005 (most recent)
Source: The World Bank (2005)

2. Challenges

2.1 Privatisation

After independence, about one third of the higher education institutions has been run by private enterprises, religious organizations, societies or trusts. The majority of these Institutions receives grants, but about one fourth of them are un-aided and autonomous. However, no uniformity in their policies, planning, resources, structure, administration and management has been recognized. All these institutions, under private controls followed the rules and regulations of academic input such as curriculum, teaching methods, and examinations, set by the affiliating university. Such institutions of higher education and affiliated to the universities which in turn

follow the rules and regulations of the university grants commission (UGC), or any other monitoring body.

The number of Institutions of higher education run by private enterprise varies from area to area, and from state to state. Some institutions of higher education, sponsored by private enterprise, follow the same rules and regulations. Some registered or unregistered academies also engaged in promoting higher education, survive on tuition fees. These academies attract regular students, who could not prove themselves in the competitive entrance examinations. This paved the way for academic exploitation of the students, financial exploitation of the parents and defeated the national vision on affordability for every Indian citizen. There are a number of other institutions run by private enterprise/societies/trust which are neither aided nor recognized by the government. The quality of deliverables from the private institutions is not uniform, even though some private Institutions have good brand equity.

2.2 Threats of Privatisation

In order to augment the technical manpower skill output of the country to meet the challenging global needs and to remove financial incapability as its bottleneck, the government resorted to privatization on a war footing basis. This generally focuses on the de-financing of recurring public expenditure. The entry of these institutions had brought a real advantage to the aspirants of technical education, at the same time it has created a greater stress on the quality of education. Probably privatization may be a reality in the 21st century, it had turned down to a mere business of education, creating a mind set to log the output in terms of money. In order to survive in the competition these institutes took the challenges of offering diversified interdisciplinary courses by overlooking the infrastructural facilities and expertise required for the conduct of such programmes. During the year 1947 the total intake for degree level engineering colleges were 2,520 which has increased to 1.5 million in the year 2010 (shown in Table 3).

Table 3: Development of degree level engineering colleges

Year	No. of Institutions	Intake
1947	28	2520
1955	47	4875
1960	102	13825
1966	117	19140
1974	138	27000
1992	200	40000
2002	1195	3,56,268
2008	2388	8,41,018
2009	2872	10,71,896
2010	2686	10,50,604

Source : Compiled from various government reports by authors

All institutions have the positive advantage of freedom to appoint the teachers and minimizing the bureaucratic intervention of teachers and employees by paying them, the bare minimum, which automatically distract the real talents from the teaching profession in these institutions. This caused a great amount of erosion in the quality of technical education. The after effects of these phenomena are that the talented, bright students will automatically clustered only in institutions of national repute, like Indian Institute of Technology (IIT) first, also National Institute of Technology (NIT) etc.

The need of the hour is not to augment the technical manpower skill, but the focus should be on the development by providing quality education and producing qualified graduates with international acceptability in terms of skills and competence and who can work in multi-racial and multi-cultural environment.

2.3 Quality Education

Universities have the means to teach tomorrow's decision makers as to how the interrelationships among society, economy, and the environment determine our destiny, our success or failure to achieve long-term prosperity for all human beings on the earth (Zilahy, 2006). While Universities have to prepare their students to cope with the problems arising in hundreds of diverse and highly specialized professional fields, they also have to show the way towards co-operation, understanding and more specifically the benefits and tools of collective problem solving through team works. The recent interest in sustainability also calls for well thought out future plans for social development.

The depth of the knowledge and skill of the faculty determines the quality of course delivery to the aspirants. Hence, attracting the real talents for the noble profession of teaching is an inevitable task. Manpower pooling to this sector is a troublesome and time consuming process. As usual, all these so called institutions depend on national level advertisement. The response of these advertisements is really meager. There are various determining factors that restrain the new blood enters into the teaching profession and to stay back in the profession of teaching in a long term perspective. A detailed scrutiny of these aspects would give us a clear picture on the seriousness of the problem. Recently it has been reported that IITs all over the country need 2,500 faculty members immediately to catch up with the standard student-to-teacher ratio of 10:1 and every IIT is short of 30% faculty (Shevgaonkar, 2011).

Compared to the industry the remuneration offered to the faculty in engineering is not at all comparable. Whereas, in the developed countries the case is just opposite. As the Corporate world is offering an excellent salary, perks and benefits to the talented technical skill acquired by them, the real brilliance needed for the exchange of knowledge from one generation to the other has more or less drained away from the education sector. Mobility is another aspect contributing to this crucial situation. The people who prefer teaching profession is more or less highly immobile. Hence a possible method, where we can share the scarce talents, is given complete autonomy to institutions in matters relating to faculty engagement in terms of remuneration, promotion and superannuation. The calibre required for the faculty is the inclination for teaching and quest for innovation and research. In a nutshell the inflow of inferior quality of intelligence plays a major role in the disintegration of the quality of our technical education.

In the same line, detailed study has to be made on the student availability to these technical institutions. Earlier as the seats were very low and the admissions were restricted to only those students with high talents. The students aspiring for the technical education should have a very good background in physical science and mathematics. Without some amount of intrinsic talents in the students the learning is quite obsolete. Presently most of the students are pursuing engineering education not because they are inclined to that subject or specialization, but because of the easy access and availability of engineering education. An easy passport to a lucrative job is another side of opting technical education. In order to have quality output from the technical institutions, the quality should be ensured at output level. The major achievements made by IITs, IIMs, IISc., BITS are not alone based on the quality of their deliverables, but major element is the quality and skill of the students they are admitting.

Table 4: Indian Students Studying in United States

Year	No. of students going to the USA	% of total foreign students in the USA	No. of abroad students coming to India
2009-10	104,897	1.6%	n/a
2008-09	103,260	9.2%	2,690
2007-08	94,563	12.8%	3,150
2006-07	83.833	9.6%	2,627
2005-06	76,503	-4.9%	2,115
2004-05	80,466	0.9%	1,767
2003-04	79,736	6.9%	1,157
2002-03	74,603	11.6%	692
2001-02	66,836	22.3%	627
2000-01	54,664	29.1%	750
1999-00	42,337	13.0%	811
1998-99	37,482	10.8%	707
1997-98	33,818	10.4%	684
1996-97	30,641	-3.5%	601
1995-96	31,743	-	470

Source: Institute of International Education (2011)

On account of the Open Door policy from 1997-98 the students from India have been largely migrating to the United States for the higher studies. In the year 2001-02 India surpassed China and become the largest segment of international students in the U.S. (Institute of International Education, 2011).The data have been shown in the table 4.

3. Need Based Approach

Major issue to be considered is that whether there is a need for more engineering colleges in the country. As at present we have around 0.7 million of engineering graduates, being passed out from different engineering institutions in the country in every year. The number of engineering graduates per million population is shown in Figure 2.

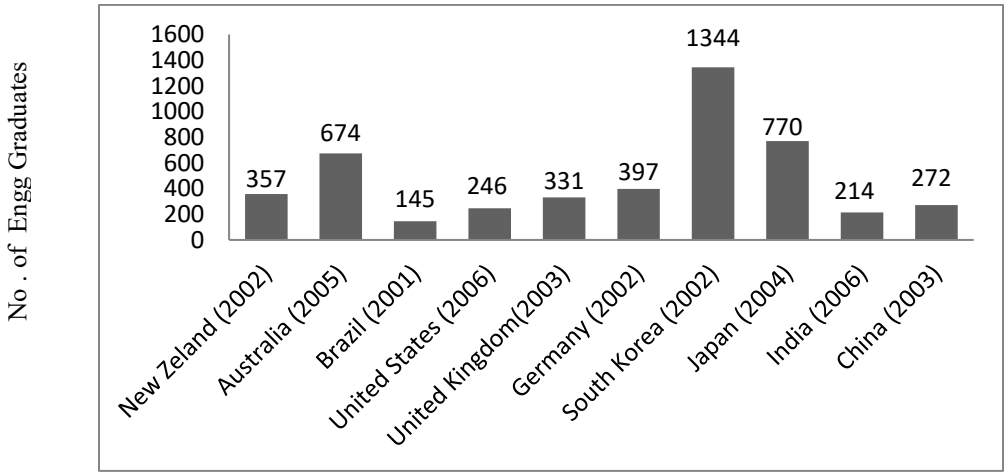

Figure 2: Engineering graduate per million population
Source: National Science Board (2007)

The above data shows that among the nations mentioned above, India figures to be the second country after Brazil having a low proportion of engineers to the population. Even though this may be considered as one contributing factor to assess the potential for growth there is a need for the scanning the environment, economy and quality aspects.

In India, engineering has been a safe profession until recent days. Even in the mid nineties, a person who would finish his degree will get an immediate lucrative job. In case he or she belongs to a good engineering school, would head to the USA for a M.S. Ph.D. and then settle down in US pursuing a career in engineering. The nineties also witnessed an influx of software engineers migrating to the USA, not necessarily more specialized but who was hired for less money than the American counterpart.

The Figure 3 shows the growth of engineering education in major developed/ developing countries based on the most recent available data (2004). This shows that among the other countries, India is heading with 9.7% growth.

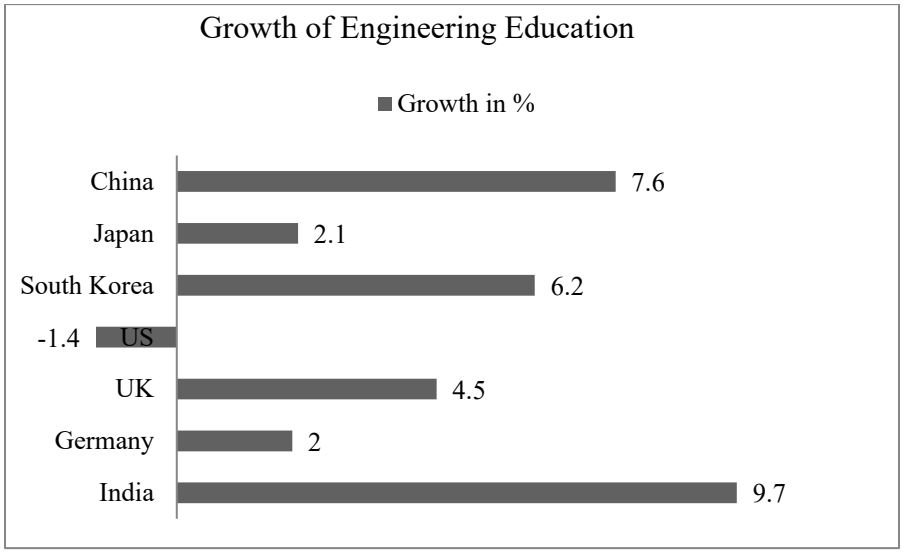

Figure 3: Growth rate of engineering education
Source: National Science Board (2007)

Now let's analyse the reason as to how could India achieved the highest growth rate. The tenth five year plan has given great attention to the technical education and all governmental measures focused on this area contributed to the growth heavily. The liberalisation, privatisation and globalisation (LPG) in the nineties given tremendous impetus for the technical manpower needs both in the domestic and international sector. The boom in the IT Sector, outsourcing and opening of new BPO by the MNCs triggered on the requirement of qualified IT professionals. The investments made by the private sector through Self financing engineering colleges stood as a supplement in filling up of the gap in technical manpower requirement.

The 21st century started with a different trend. At the onset of technical outsourcing to India and other cheap foreign destinations from the USA and Europe, engineering degrees and careers have taken a whole new meaning in India. The last decade has seen a lot of low skilled as well as a software testing work shift to destinations like India due to the lower cost of labour. Several engineers of Indian origin in the USA are choosing to return back as more and more opportunities are emerging in India due to rapid globalization and shifting of technology related work to low cost destinations such as India.

According to the NASSCOM (2013) study, industries are already facing a shortage of employable talent and companies are hiring people who lack skills, but can be trained. On an

average, a company invests 16 weeks to train one employee in areas such as technical skills, soft skills, company orientation and process-specific domain skills. As a result the training and recruitment cost of technology services companies has raised steadily in the last few years. Therefore, recruiting a trainable pool is not a sustainable option going forward.

In the recent recessionary trend we are witnessing in the international economic scenario which is leading towards the situation to another totally different scenario. The latest statistics on Indian scenario, describe the fact that almost 40 percent who scout for a job for almost a year, while around 22 percent took almost two years before applying for a job. While the growth of supply of engineering, graduating in India is around 9.5 percent per year, with a current average employability of 26 percent of engineering graduates. Keeping the above aspect in mind, it can be perceived that there is a need for technical manpower in India.

India is an agrarian based nation. Even though the industrial developments are taking place in rapid phase the reality shows that the country is still crippled in front of the stiff competition from the giant multinationals, and finally the country is being settled down as a consumer based economy. Thus the need of the hour is not institutionalized as incubators for employment, but as knowledge centres which can generate future employments.

Right from inception Engineering education in India has been dominated by the Indian Institutes of Technologies and the National Institute of Technologies (NITs). The Indian Institute of Technology's (IITs) has earned this position by producing outstanding graduate engineers who have risen to the top of their profession globally. Critics call it more as a phenomena of admitting the best and not necessarily the institutes have top-notch faculty strength. National Institute of Technology's (NITs) spread over in the whole nation have also made huge strides. But the majority of the engineering colleges in India relies on rote as the teaching methodology. There is an increasing awareness that the engineering education system has to be revamped. Reports reveal that only 26% of the engineering graduates are employable. Several companies have set-up their own training institutes to fill the gap between what the education system delivers and what is needed in the market place. Also, there is a dearth of engineers in areas other than in basic engineering such as civil, electrical, mechanical and software engineering. On the prevailing trends and compensation packages, most engineers gravitate towards software

engineering. This has exposed a gap in engineering skills for other professions – some that are just emerging as competitive areas such as energy systems may be it conventional or non conventional.

Thus, every year the engineering institutions in India pulls out professional graduates without any on job training and to a cluster of certain specializations where there is a high compensation package as a short phenomena. Upon the outbreak of any unprecedented eventuality like the recent recessionary trend in the national and international scenario, the whole system crumbles down and lead to an outbreak of professional unemployment. As these are trained manpower both physically and mentally there will be a resistance from these minds to migrate to other professions, or even they move, they will not be able to compete with the others who are specially trained for that. The dearth of specializations is too conventional in almost every engineering institution, including the great IITs and NITs. Among this IIT Delhi, set a new example with a tremendous amount of vertical integration as a part of their strategic plan. The diploma courses in varied specializations proved highly futile and put them in the top of the ranking based on the performance evaluation.

In a nutshell, what is the need of the economy is a need based structure for professional education and marching towards a planned growth in the nation in terms of technology and growth through a well defined strategic plan.

4. Conclusions

There are several challenges paused ahead of the Indian engineering education system. The most important is access to state of the art engineering education that adheres to international best practices. The second, is the availability of well paying jobs in the field of research and development that help to proper innovation and technology building. Thirdly, on account of globalization and the advent of global villages, the companies become more global, Indian engineers have to figure out a way in which to respond to the challenges thrown by the global economy and acquaintance of project management on a global scale.

Comparison between Indian scenario with the most developed the USA reveals that in terms of education, the inability of school going children to access a relatively decent education,

on strong fundamentals and highly innovative environment is far different. However, this will generate a research inquisitiveness to be nurtured throughout the career. This difficulty is not simply one of quality, but also of *access* to quality, and there is a dichotomy between the two because resources must be addressed to only one problem at a time. In finding a solution Indian policymakers can share the results achieved by other nations who are in the forefronts. The country must debate on education away from a focus on improving quality per se, with one of improving the quality of education supplemented with diversification and integration to cater to the needs of the growing economy with multiplicity of changes.

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