MANAGEMENT OF TECHNICAL EDUCATION

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A step ahead to reclaim and relive the glory of beacons that India once had in Taxila & Nalanda as seats of Academic Excellence.

(Anonymous)

ABSTRACT: *The role of technical education is crucial in a nation's development as it is the major producer of human capital. It may be emphasized that education is not so much as what is learnt by students in the classrooms, but as how they learn it. The environment where the potential of this human capital is to be tested and harnessed is changing constantly with time. Therefore, the education process of the technical institutes has to be directed such that the students are able to give their best, both in terms of intellectual and skillful efforts.*

This paper attempts to analyze the structure of the centers of higher technical education and suggests strategies to improve their performance. It also highlights the importance of participative learning exercise, which stresses on the equal and interactive participation of students in the teaching process, in conjunction with well-trained faculty, technical manpower and infrastructure. Realizing that the present education system is highly conceptual greater emphasis needs to be laid on laboratory classes, so as to give true understanding of tools, techniques and concepts covered in the curriculum. It is recommended that the Institutes need to build up interface with industries and research laboratories, for a win-win situation. Such a joint venture between the collaborating Industry and the Institute offers the industries an increased scope of finding solutions to the problems of their interest, with the help of specialists/experts available at the Institute. The institute on the other hand gains in terms of providing its faculty and students exposure to the real life engineering problems. It is envisaged that such interactions would help in reducing the big conceptual gap between theories taught in the institutions and the practice adopted in industry. The paper also discusses the necessary, technological advances, which need to be implemented /added to the traditional system, so as to cater to the demands of the future generations. It is hoped that the recommendations made in this paper would also motivate and help the faculty in adopting new teaching methodology to remove obsolescence, leading to quality education in these Institutes.

Introduction:

Education is the foundation of any developed country. The progress of a country centers on technology, technological development and the application of technology to improve life. Its success is directly dependent on its ability to educate its human capital in a manner so as to prepare them to sustain and flourish in a rapidly changing world. The technical education, therefore, has to be redefined as the path to gain new skills and to enhance the ones already acquired. It needs to stress on "innovation", since, the generation of new ideas is one of the key drivers of global economies. The environment where the students have to work and contribute is changing constantly with time. What is new today becomes obsolete tomorrow. The system therefore, has to become more relevant to the needs of a global knowledge-based and continuously evolving economy. It needs to include activities that enable the students to give their best, both in terms of dexterous and cerebral efforts.

The National Policy on Education [1] also talks of "reorganization of the technical education taking into account the anticipated changes in the economy, social environment, production and the management processes, rapid expansion of knowledge and great advances in science and technology". It further stresses on updating and renewal of curriculum so as to systematically phase out obsolescence and introduce new disciplines of technologies. The current technical education system has failed to produce adequate number of engineers suitable for Industrial requirements. Consider the example of software Industry. In the year 1998 the top 10 companies together employed about 15000 engineers. Assuming a modest growth rate of 40% per year for these companies, their current requirement is to the tune of 2.5 lakh graduates. The supply of the engineers from the top institutes like IIT's and NIT's has always been negligible in comparison to this demand [2]. The technical manpower that is supplied by the majority of other institutes is not technically sound. In a study by the National Association of Software and Service Companies (Nasscom), an influential trade group, and McKinsey, an international management consultancy, the number of workers required by the information technology (IT) and "business process outsourcing" industry will increase from 700,000 to 2.3 million between 2005 and 2010. However, by current estimates, there will be a shortfall of almost 500,000 workers, as only 1.05 million suitably qualified students will have graduated in that timeframe. This shortfall would be because nearly 75% of the engineering graduates and 90% of the graduates with general degree fail to meet the industry standards both in terms of technical and soft skills [3].

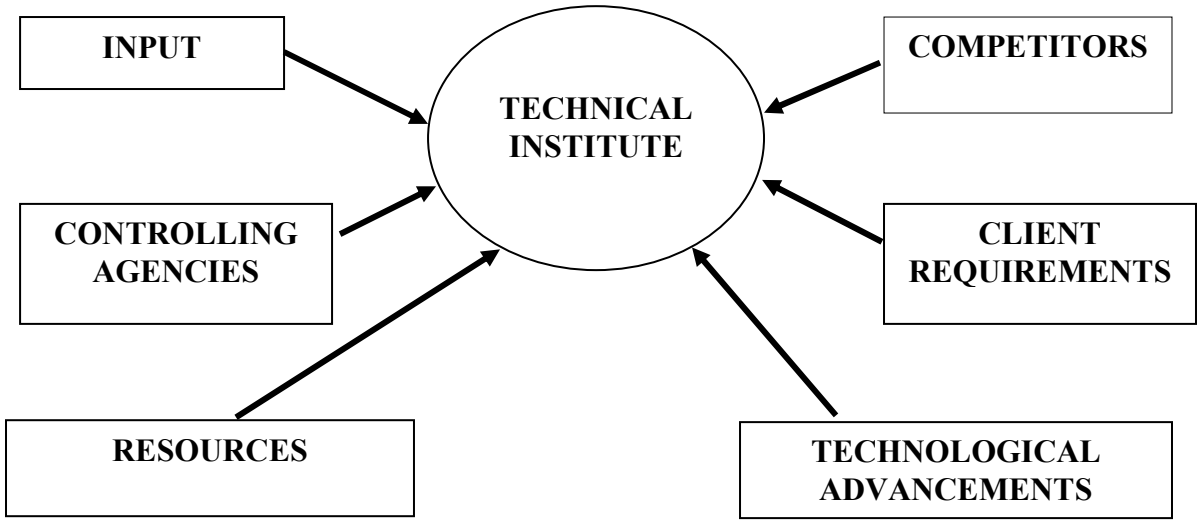
In the year 2005-2006 nearly 4.41 lakh engineers graduated. In the current year the number is expected to increase to 5.36 lakhs .In fact the last five years have seen a phenomenal increase of 130% in the number of engineering seats [4]. But still, the engineering industry in the country is finding it difficult to find an adequate number of engineers suitable for their requirement. This definitely calls for a review and reframing of the technical education system. In the

present paper we have made an attempt to discuss the various drivers which determine the structure of a technical Institute. Within the constraints of these drivers remedial actions/policies have been suggested. In fact the paper stresses on the need for identifying the forces which have the potential to revolutionize the technical education system. The intention is to provoke the readers to realize that the status quo may no longer guarantee the survival or the success in the future.

STRUCTURE OF HIGHER TECHNICAL EDUCATIONAL INSTITUTES:

To bridge the existing gap between the technical know how of the engineering graduates from the private institutes and the industry expectations from these graduates, authors, as a faculty of the private technical institutes, have identified the following six main building blocks of the technical institute structure.

Fig. 1: Structure of Private Technical Institutes



Having identified the major forces capable of driving a change in the higher technical education system, the methodology devised includes systematically analyzing the impacts of each one of these forces. Care has been taken not to emphasize upon the repackaging of the system i.e. *superficially altering it but barely modifying the core*. The system needs redesigning and re-composition, which at many places would require a radical shift in the delivering of technical education.

INPUT: ***Student profile***

The majority of the student intake by these Institutes is through All India Engineering Entrance Examination (AIEEE). The AIEEE ranking of the students in a private college usually varies from few hundred to lakhs. This projects the disparity in the mental capabilities of the students thrown together in a single group or branch. Having no control over the intake process, a self financing Institute is left with no option but to carry forward with this constraint.

However, the forward looking Institutes can take some steps directed towards reconfiguring the class statistics so as to assimilate the students in a single coherent group. For this the students need to be involved directly into the teaching process [5]. A proactive approach which motivates the students to deliver and discuss the subject topics of their choice, guided by a faculty member, can be very effective. The student group benefits from the presentations and course material prepared by the group members, who know the need of fellow students. Such kind of peer to peer communication is more effective. The exercise also helps in developing the soft skills such as communication skills, leadership qualities, working in a team etc. This serves the twin purpose of strengthening the fundamental concepts of the subject and also developing the overall personality of the student thereby helping them move forward a big step in the direction of acceptance by the Industry.

CONTROLLING AGENCIES: ***AICTE, Affiliating University and State Government***

The structure of technical education system in India consists of several sub-systems such as the Central and State governments, Universities, All India Council for Technical Education (AICTE), professional bodies such as Council of Architecture, Pharmacy Council of India and the management committees of individual institutions [6].

The Government constituted the AICTE in 1948 as an advisory body in all matters relating to technical education. In 1988, the AICTE was vested with statutory authority for planning, formulation and maintenance of norms and standards, accreditation, and ensuring the coordinated and integrated development of technical and management education. Other than AICTE, at the State government level, there are three agencies which deal with technical education - Directorates of Technical Education, State universities to which colleges are affiliated and the State Board of Technical Education.

The National Policy on Education, 1986[1], laid specific guidelines for the qualitative and quantitative development of the technical and management education sectors, establishment of linkages amongst the concerned agencies, manpower assessment and technical education forecasting, increasing effectiveness of technical education management system, proper delivery systems, measures to achieve greater cost effectiveness and generation of

resources through suitable means. It also laid emphasis on modernization and removal of obsolescence of laboratories and workshops of engineering colleges and polytechnics in order to enhance functional efficiency. However, the technical institutes are so strongly governed by the above mentioned different agencies that any amendment or improvement in the curriculum, admission process, examinations etc. requires the approval of all the agencies. Institutes are not provided with any autonomy in such matters.

Even with the above mentioned constraints the private institutes can have an edge over their competitors by introducing special additional course modules in collaboration with the industry. Though not carrying any marks weightage in the university exams, the knowledge imparted by these modules being of industrial utility would definitely prove beneficial for the students in the job market. To give credibility to such modules the institutes can take up the matter with the Board of studies of the concerned University and provide some incentive to the students.

RESOURCES: ***Faculty and Infrastructure***

Faculty: In a world of rapidly advancing knowledge the contribution by a faculty member requires life long learning so as to improve continually and keep pace with the changing environment. The major chunk of the present pool of faculty in the private self financing institutes is that of the retired academicians and the fresh graduates. The former having already achieved the pinnacles of their careers look at the present employment as post retirement benefits and hence are least motivated to upgrade their skills. The fresh graduates on the other hand enter the teaching profession as a stop gap arrangement till the time they get a better opportunity in the Industry. As such the sense of belongingness and commitment in these groups is low. The middle group which takes up teaching as career is the real asset of the Institutes and needs to be retained and promoted.

In technical education, the need for in-depth knowledge is intense. The correlation to practice is what gives true understanding of tools, techniques and concepts taught in a course. Without this practical approach, the education is highly conceptual and unsuitable for training engineers. To understand this relationship of education to practice, the teacher must possess a higher and deeper level of knowledge of the subject. Furthermore, in most engineering disciplines, knowledge is dynamic and rapidly changing. In this scenario, to provide any decent instruction, the teacher must constantly update his knowledge and lectures. Provisions such as on the job training which help in continuous up-gradation of skills and schemes facilitating the acquirement of higher qualifications, helps in motivating and retaining the loyal middle group which works dedicatedly in harmony with the organizational goals.

Infrastructure: With the coming up of large number of players in the lucrative field of technical education, the ones spending the maximum on Infrastructure are able to make their presence felt and hence attract the best input of students and faculty. The infrastructure not only means the physical campus but also includes the vital ingredients such as the laboratory facilities, library and the networking facilities etc.

However with the shifting of trend towards distance education and increasing costs of developing the physical campus, the near future will see a spurge in low cost institutes imparting virtual class room education at a marginal cost. To justify the higher course fees and to keep themselves as front runners the present technical institutes will have to build up a brand name for them. Here the visions of the Institutes will be of primary importance. To survive, the Institutes would have to commit and deliver a flawless end product. This is possible only if the Institutes come up as the providers of the skills needed for the life long learning. A process of continuing personal development for the students can help these institutes to hold on to the major share of the technical education market.

Realizing that the present education system is highly conceptual and is fast becoming outdated, greater emphasis needs to be laid on quality education in the lecture as well as laboratory classes [7], which otherwise get lower priority both from students and from faculty [8]. In order to give true understanding of tools, techniques and concepts covered in the curriculum, the write ups in the laboratories should be methodical including various aspects in terms of Motivation behind an experiment, theoretical background, pre-experimental questionnaire to assess the students preparation level, post-experimental questions and result analysis etc.. Although, lecture classes do emphasize on each and every concept, adequate interest among students while working in the laboratory classes can be generated by developing student-friendly laboratory kits. This further helps to strengthen the fundamentals thereby imparting excellent quality education [9].

The technical education differs from other streams of education as it has to foresee the future technological requirements and work for the same. Institutes of the future will have to develop “special forecasting departments” which inculcate in the students the ability to visualize and seek the solutions of the problems of the future as opposed to discovering the past secrets or merely flowing with the current technological stream. Here the significance of the value-added courses has to be emphasized. These special courses, though not a part of the regular curriculum, will equip students to work in the dynamic and competitive environment. Realizing that all the projects before going on the floor are first simulated, a special value added course module based on the information systems aspects of each engineering discipline is a must.

TECHNOLOGICAL ADVANCEMENTS: ***Internet, Broadband, etc***.

Sam Pitroda, Chairman, National Knowledge Commission, very recently emphasized that we can not think of the universities the way we have thought in the past [10]. The entire perception of delivering education has to go a sea change in attitude. The role of a teacher in making and delivering content would be taken over by the information, with teacher as a mentor. The digital environment will have a great impact on the education system as it offers opportunities that empower students to learn and equip themselves with enhanced knowledge. Realizing that the customers of tomorrow may need flexible education schedules suiting their requirements, the Institutes have to reach out to them and be available 24 hours a day, 365 days a year. The use of a virtual classroom, for instance can allow an instructor to teach from a remote location or to reach students placed at isolated locations thus bridging distances. Internet and broadband provide an excellent means of delivering education and enables learning beyond the four walls of a class room. Technologies like e-learning packages, video conferencing, Delnet etc. provide cross-institutional links and value- added curriculum teaching. They are an excellent media for sharing not only the e-learning packages, but also to share expertise of specialists in the respective fields. Online classes that employ chat rooms file transfers, and message boards allow a student to maximize his or her learning experience while maintaining a flexible education schedule. With the increasing speed of transmission and bandwidth it has become possible to stream video in real time thus allowing the imitation of classroom experience without having the physical immediacy. This definitely brings down the cost of education as a limited number of faculties can make available the course to an infinite number of students. Moreover the course material can be transmitted at very low cost with just an initial investment. These technological advances, though not readily acceptable to many of the fraternity, need to be implemented/ added to the traditional system, so as to cater to the demands of the future generations.

The libraries being centers to supplement classroom teaching also have to support independent learning by extending the Delnet facility to their student community. The advantages of such learning techniques are manifold. The usage of the latest techniques helps in increased connection and utilization of outside resources including experts, professionals and other students. Educational institutions like IIT's, IIM's, and NIT's are already using the advanced learning techniques to enhance teaching, learning, and research.

CLIENT REQUIREMENTS*: Industry and Entrepreneurship*

The success of a business depends on the customer satisfaction. Same is true for the technical institutes. The institutes have to realize that their product has to win the approval of their customers i.e. the industry. Institutes have to bridge the big gap created between the theories taught in engineering institutions and the practice adopted in industry. This is possible only if the

fundamentals and physical concepts of the subjects taught include case studies related to real life engineering problems from the Industry. The Institutes have to build up a common platform with the Industry, so that the faculty as well as the students benefit from this direct interaction [11]. Exchange of faculty members from the institute and some engineers from the industry can help the institutes to get acquainted with the industrial requirements and environment. To harness the potential of the highly qualified and efficient faculty, the institutes can set up centers for providing time bound solutions to the problems put forward by the industry. This not only helps in generating revenue for the institute but also helps in utilizing the talents of bright undergraduate and postgraduate students.

Till now most of the research was being done in the west. However, with the knowledge based businesses of the west increasingly shifting their base to India, no longer can this model work. There is a need for setting up of R& D centers so that the innovation required for the businesses does not suffer. The primary objectives of these centers should be to ensure that the research is more aligned to the needs of the business. This is possible only if the centers are built up with the joint efforts of the industries and the technical institutes. Moreover, major R & D projects involve inter-disciplinary activity and specialization of varied nature. No single organization can therefore, be in a position to conduct them by itself. In the technical institutes the skills of varied nature coexist and thus the inter-departmental efforts along with the advantage of development and field testing of the prototype by the collaborating industry can ensure better results.

Along with ensuring the grooming of the students so as to make them more productive and valuable for the industries, institutes of tomorrow have to prepare their students for entrepreneurship also. Realizing the potential of these students to become tomorrow's leaders in innovation for the country, it is essential to prepare these young minds while they have the time and resources to become competent in managing the pressures, tasks and risks associated with entrepreneurship. The institutes not only have to motivate the students to start-up their own enterprise, but also make efforts to provide them with the necessary resources to do so. Students have to be motivated to take initiatives. This is possible only if they are first provoked to flesh out their ideas in business terms and then to convert these ideas into global enterprises that combine technology, vision and business acumen. An intensive mentoring by the Institute is required. Mentoring can help the students to refine their ideas with a broader market perspective and work on a better B-plan. This would help them move a step further in commercializing their idea because different issues involved in planning a business would have already been looked after. Institutes also have to provide the budding entrepreneurs an opportunity to present their business plan to venture capitalists so as to secure funding and incubation. An opportunity to interact with first hand entrepreneurs to share their experiences can help motivate these students a lot.

COMPETITORS:

With increasing globalization, facilitated by new technologies, the boundaries between the countries are rapidly diminishing. In the next decade or so the geographical demarcations will cease to exist as far as the education and thereafter the job opportunities are concerned. Even today India is finding itself at the centre of increasing interest of foreign institutes and universities, who want to exploit the tremendous potential of the Indian education sector. Realizing the huge economics involved in the attractive educational market, the foreign institutes have entered into partnerships with Indian institutes or companies. Even the big corporate houses are making an inroad into the education business that has a potentially lucrative payoff [12].

All this competition will force education business to become more efficient and more customer focus. This would create enormous pressure on the private technical institutions to strategically brand their image in order to gain the competitive edge in the race for survival and success. The institutes will have to develop strategies that realistically project the future and create a better chance of success than those merely reflecting the past. The institutes will need to adapt and transform themselves at a pace equal to, or quicker than the world. Having a brand can differentiate them from their competitors and drive customer loyalty. In order to be successful, an institute will have to focus on the above stated various drivers so as to deliver a product that exceeds the competitor's offerings on as many counts as possible.

CONCLUSION:

We have to realize that India has an advantage of a demographically favorable human resource pool both in terms of quality and quantity. To harness the potential of this pool it is essential to gear up the education system through innovative initiatives. A radical change in the policies and mindset with regard to education is the need of the hour. Even with the constraints of having no say in the admission criterion and procedure, over-centralization and therefore the lack of autonomy in deciding curriculum etc. the institutes can definitely improve upon the existing standards. The institutes have to reduce the existing gap between the industry requirements and the technical know-how of the students. For this the reaction time, in terms of changes in the curriculum, teaching methodologies etc has to be reduced. In fact the needs of the market have to be foreseen and the strategies and solutions well developed in advance. This is where the forecasting departments, the value added course modules and the R & D centers at the institute can give it a cutting edge. Here it should be realized that to develop the above mentioned areas an institute has to attract and retain high quality faculty. The efforts of a dedicated and well qualified faculty in conjunction with best of the infrastructure can definitely help an institute to carve a niche for itself.

REFERENCES:

1 "National Policy on Education – 1986 (Modified in 1992)", Govt. of India, Dept. of Education, Ministry of Human Resource and Development, New Delhi.

2 Pankaj Jalote, "Manpower shortages still plague the industry", Economic Times, Feb, 1998

3 "Engineering education in India: A story of contrasts", World Education News and Report. Vol. 20, Issue 1, Jan 2007.

4 India Today, October 2006- 'Aspire'.

5 C. M. Bhatia, Meenakshi S. Khurana, Sanjana Malhotra; "Participative Learning - A Proactive Approach" Indian Journal of Technical Education; Vol. 29 No. 1, January – March, 2006.

6 P. R. Dasgupta, "Technical Education - Contributing To Industrial Development", Secretary, Urban Affairs & Employment, Govt. of India (Website address: http://pib.nic.in)

7 R. Hariharan, "Changing face of Engineering Education", Indian Journal of Technical Education, Vol. 28, No.1, January – March, 2005.

8 "Laboratory Manual for Basic Electrical Engineering", Wiley Eastern Limited, New Delhi, 1977.

9 C. M. Bhatia, Sanjana Malhotra, R. P. Sood; "Design and Development of Network Analysis Kit for Interactive and Effective Laboratory Experiment", Accepted for Publication in Indian Journal of Technical Education.

10 Raj Chengappa and Shruti Maheshwari, 'India Today Aspire', pp 46-48, March 2007.

11 C. M. Bhatia, Meenakshi S. Khurana, Sangeeta Banga; "Institute Industry Cooperation: A Workable Model", Communicated to Indian Journal of Technical Education".

12 Eli Noam, "Electronics and the Decline of Books: The Transformation of the Classroom", in Forum Futures, 1998 Papers, ed. Maureen Devlin and Joel Meyerson (Washington D.C.: Forum Publishing, 1999) Ch. 7.