Delhi Business Review ✠ Vol. 13, No. 2 (July - December 2012)

Keynote Address

GLOBALISATION AND HIGHER EDUCATION IN INDIA
CHALLENGES AND STRATEGIES

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PURPOSE
TO understand and evaluate current status of higher education in India, underline lacunae, and recommend proper strategies to bridge the gaps in terms of quantity and quality of higher education as obtaining in developed countries of the world and in India matching with global standards by bringing synergy through research and innovations compatable with the sustainbility.

Design/Methodology/Approach*: Descriptive, based on authentic secondary data.*

Findings*: Indian Technological Universities and institutions both at UG and PG level need serious relook at processes employed for creation of knowledge and dissemination of knowledge to prepare both teachers and students resulting into wholistic personality development.*

Research Limitations/Implications*: Limitations of keynote address.*

Practical Implications: *If properly implemented, it would go a long way in value addition in terms of knowledge, skill and applicability.*

Originality/Value: *Provides a window of a fresh look at the existing scenario of higher education both in India and globally.*

Key Words: Higher Education, Knowledge Management, Educational Reforms, Industry Institute Interaction, Integrating Capabilities with Values, Global Outreach.

Introduction

India's emergence as third largest economy of the world in terms of purchasing power parity is largely attributable to the impressive growth of science & technology, management education and their impact on nation's economy. Be it the Green Revolution of late 60's or the IT Revolution of the late 90's, or the Space Revolution of the recent times, India's Science and Technology manpower has stood test of time and demonstrated exemplary capabilities of meeting requirement of quality manpower in tune with the requirements of technology and innovative support providing to India's industrial R&D. Sustainability in terms of ever growing number of engineers and technologists, who hold the key for future hope to turn the potentials of Indian economy into a World economy surpassing even China in about 10-12 years times, and US in 15-20 years time.

The sound foundation of science and technology education provided by the Indian Universities and institutions of engineering and technology has given the necessary platform to Indian Scientists, Engineers and Technocrats to tackle the challenge of globally competitive industry and work environment.

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The impressive track record of growth with quality of India's leading R&D organizations such as ISRO, DRDO, BARC, IARI, Institute of Genomics, Institute of Immunology and the pre-eminence position attained by India's leading science and technological universities such as IISc, TIFR, AIIMS, IITs, DTU (formerly DCE). BITS Pilani, Thapar Institute, Jadhavpur University, Anna University speaks volume for India's impressive growth of science and technology prowess. This has been further strengthened by high quality management education provided by the IIMs and a host of other leading management institutions in India to provide the necessary managerial talent for India's rapidly growing industry and technology base. Indian engineers, technologists and techno-managers have received worldwide recognition for their innovativeness as well as their creative abilities. This is our core strength and we need to further revitalize it to meet the challenges of globalised higher education in India. The focus has necessarily to be on worldclassness, techsavvyness and for creating capable human resource to meet the requirements of the industries of today as well as to create the industries of tomorrow.

This however should not overshadow the concern raised by the industries and industry associations at home about low employability of engineering and technology graduates nor should it negate the serious concern raised by very many about erosion of science and science education in India. These concerns are primarily based on India's highly impressive yet largely uncontrolled expansion of technical education during the last one decade and science education taking a backseat in the rush for admissions to engineering and technology courses.

The present paper addresses the issue of meeting the challenge of the Knowledge Age in India's Higher Education as also to create an upsurge for synergy between science and engineering and the necessary thrust on the troika of education, research and innovation in Indian Universities and institutions of higher learning.

India's Higher Education System

India's Higher Education today comprises of over 500+ Universities including over 150 deemed universities and State Technological Universities in addition to a highly impressive management and technology education system which has received worldwide recognition for the quality of its graduates from IITs, IIMs and a good number of other premier institutions including Delhi College of Engineering now Delhi Technological University, BITS Pilani, Thapar Institute of Technology now Thapar University, Jadhavpur University, Anna University and good number of NITs and other premier management institutions such as FMS of Delhi University, XLRI Jamshedpur, S.P. Jain Institute of Management and Research Mumbai, MDI Gurgaon and many others established under self-financing arrangement which include the Delhi School of Professional Studies and Research established by Prof. B.P. Singh himself an eminent Management Professor of Delhi University.

The vast technical education of India comprises of 11 IIMs, 12 IITs, 30 NITs, State Technological Universities in major states of Indian Republic and a large number of self-financing institutions spread across the country, admitting today **over 10 lakhs at UG and over 50000 at PG levels**. The impressive growth of technical education in India is given by Chopra and Sharma (2009) in their RETA Report to NAM Centre in Delhi (2009). The growth of engineering institutions amounts to 257 % over a period from 2000 to 2010 while the intake at UG level in these institutions has grown by 540% over the same period. While the growth is highly impressive so is the concern being voiced by the industry quarters and industry associations in respect of employability of engineering graduates. This becomes all the more important as the employability is being rated as low as 30% by the industry sectors. We need to seriously ponder over the areas of improvement both in respect of admissions as well as the teaching-learning processes employed to produce for the industry, ready to run professionals who would besides working in a knowledge intensive tech-savvy work environment will have the capability to excel in the knowledge age. While the communication skills are a major area of concern, it cannot be denied that the curriculum, teaching learning processes and quality of teachers form an important area which could have been addressed while planning for such an impressive growth.

Table 1: Growth of Degree Level Engineering Institutions (1947 to 1990)

Year	No. of Institutions	Students Intake	Intake per Institution (Average)
1950	50	3700	74
1960	110	16000	145
1970	145	18200	125
1980	158	28500	180
1990	337	66600	198

Source: AICTE Annual Reports and Technical Education in Independent India, 1947-1997.

Table 2: Growth of Degree Level Engineering Institutions (post-liberalization era 1991 onwards), updated from Chopra & Sharma 2009

Year	No. of Institutions	Students Intake	Intake per Institution (Average)
1990	337	66600	198
2000	776	185758	240
2003	1208	359721	298
2004	1265	404800	320
2005	1346	452260	336
2006	1511	550986	364
2007	1668	65290	392
2010	>2000	1000000 approx	500

Imperatives of the Knowledge Era

The knowledge has descended on the strength of the power of mind, power of connectivity and the power of networking unleashed by the IT revolution sweeping across the globe for the last two decade. In this new knowledge era it is imperative for the higher education sector to innovate its curriculum and teaching learning processes on one hand and adopt good practices which have enabled the rise of world-class universities in the developed countries. The important point to realize that it is the flexibility and the freedom of choice that has been the hallmark of the growth of the world class universities in the advanced countries. Compared to this we in India have worked with rigidity as being the hallmark of our university system.

It is ironical that we rigidly control our admission process based on the merit ranks in the entrance examinations for engineering and leave no space for consideration of the interest and aptitude of the candidate in a particular area of engineering activity. Once the discipline or branch of engineering is allotted that becomes the pathway for the growth in higher education, be it admissions to post graduate programs or even the job market. What we do not acknowledge is the fact that excellence emerges only when one is engaged in an activity in which he is interested and is capable of. The lack of engineering excellence in India is largely because of our efforts in the universities to push our students pursue studies in areas in which they may not be genuinely interested. This leads to cross over from engineering

to other non-engineering pursuit once a candidate graduates from a university. This is as far as the rigidity in admissions is concerned.

Likewise, our examination system and our teaching-learning processes also lack flexibility. Being too much tight-jacketed they tend to undertone the interest in engineering sciences and engineering technologies. This has a direct bearing on the lack of growth of innovations and new technology development in our higher education system. This is an area we need to address seriously to rejuvenate our technical education system to meet the challenge of the New Knowledge Era.

The other important imperative of the New Knowledge Era is that we must acknowledge that in the New Knowledge Age it is not just enough to know what is more important but how we keep our knowledge updated, share our knowledge with other like minded individuals and network with people and organizations to create a larger collective good by pooling of mind and pooling of brain-ware for the growth of New Knowledge and New Technologies. Creation of knowledge, sharing of knowledge and management of knowledge requires a tech-savvy education and research environment in our universities. A deeper penetration of knowledge systems for curriculum design, ICT enabled systems for curriculum delivery and e-Governance processes is required to empower all the stakeholders including the students and the faculty to meet the challenge of knowledge revolution in the New Knowledge Age. Further, the new knowledge age requires synergy between the world of learning and the world of engineering profession in the campuses of our universities more so in technological universities and institutes of technology. This would call for a renewed effort on enhancing institute - industry partnership both for improving the quality of curriculum as well as quality of education and research.

We need to seriously examine the issue of networking between Universities and Universities (U&Us), Universities and Institutions, Universities and Industries (U&Is) and Institutions with Industries (I&Is). In the new knowledge age neither the universities nor the industries can excel without the power of networking and collaborative working. Lastly, it is important to realize that in the new knowledge age the academic integrity, research integrity, and conformity to ethical and moral dimensions of the professionals has to be given a renewed focus to build tomorrow's society excelling on fair prosperity on one hand and joy, excitement, thrill and happiness of science and technology led development on the other.

This calls for emphasis on quality assurance through output/outcome based criteria and through developing attributes which would enable graduates to work in a global environment, would permeate to all countries and will help restructuring engineering curricula towards increased innovation and creativity and equipping all graduates with skills of cooperative and harmonious working in multidisciplinary and multicultural teams, Jha (2010). Indian institutions have been very slow in the use of applying management quality standards for their education processes and systems nor have many aspired for global accreditation, Chopra (2010). This has resulted into building of island of higher education in India and not a globally accredited higher technical education system as would be required for India of tomorrow, specially that tomorrow's India is being conceived as the Knowledge and Innovation Hub of the world. It is also important for us to understand that multiplicity of controls and over dozes of regulations are impediments to growth, progress and advancement of what is regulated, Singh (2010).

These imperatives of the New Knowledge Age have to find a place in the agenda for reform in the Universities in India if we have to prepare ourselves to greet the challenges of the New Knowledge Age.

Best Practices in Tech Education

Leading technological institutions and universities, in India have demonstrated some of the best practices in technical education. A brief of these practices is given below:

i) Teachers Evaluation by Students: This practice is prevalent in all IITs and in a number of reputed institutions wherein every teacher is evaluated by the students for the subjects he/she teaches. The evaluation is specific and is aimed to assess the academic performance of the faculty, his command

on the subject, his communication skills and the way he greets the teaching learning environment. This is done both for theory as well as practical subjects. The evaluation is on a 5 point scale ranging from excellent to not satisfactory. Because of this practice, the teachers in IITs and other reputed institutions in India have always been exhibiting high levels of teaching effectiveness and have been keeping themselves abreast with the latest developments in their respective fields. The quality of teaching will be significantly improved if this practice is introduced in technological universities and engineering institutions across the country too.

ii) Regular Review of Course Contents & Course Curricula: This practice is prevalent in all IITs and other reputed institutions wherein at the end of the semester all members of the faculty are required to submit any change/revision in the course content, deletion of the course/introduction of a new course in their subject schemes. The department academic committee examines these recommendations, which are further evaluated and approved by the course curriculum committee of the academic councils. This way each year the course contents and curriculum are reviewed and updated. What we need of course is to establish system of curriculum watch at the institution/university level and use the capabilities of the knowledge management systems for curriculum updation and curriculum innovation, Agarwal, Sharma and Kumar (2008).

iii) Introduction of Courses in the Emerging Areas: This practice is prevalent in all the leading institutions in the country including the IITs, BITS Pilani, Delhi Technological University etc. wherein courses in the emerging areas of high relevance to science and technology developments and relevant to the country's industrial and economic development are identified, developed and introduced in the course curriculum, both at undergraduate and postgraduate levels. This is a good practice to take care of the advancing frontiers of knowledge and introduction of new technologies in the technical education. It would further be beneficial to promote new programs at UG and PG levels in engineering and technology carefully developed along the concept of synergy between science and engineering. Programs in mathematics and computing, engineering physics, bio-engineering, medical engineering, infrastructure engineering could be well suited at UG and PG levels. While nano-science and engineering, material science and technology, space science and technology, medical engineering, autonomous systems design and such like courses which could be designed for joint deliveries by the science and engineering department should be promoted at the PG levels. This will promote trans-departmental culture so vital for the growth of excellence in science and engineering. This will also help in creating strong ties between science and engineering and will foster scientism, Sharma (2010).

iv) Promotion of Research Culture in the Technical Institutions: Promotion of postgraduate programmes, Ph.D. programmes and a culture of sponsored R&D projects has been the main strength of the IITs and other leading engineering and technology institutions in the country. IITs have been able to develop their own laboratories and excel in advanced areas of science and technology primarily because of the existence of a research culture in all departments of engineering and applied sciences. In the knowledge age it is important to realize that research culture can be percolated to the UG levels in engineering and technology institutions. Undergraduates are talented and possess high creative and innovative potential. Research culture at UG levels shall unleash and ignite the power of innovation and creative research. At Delhi Technological University, formerly Delhi College of Engineering, we have succeeded in percolating research culture to UG levels and a number of innovatively designed products such as Hybrid Car, Super Mileage Vehicle, Unmanned Anal Vehicle, Autonomous Underwater Vehicle and Autonomous Aircraft Systems have been rolled out on the strength of highly innovative genius of UG students from Delhi College of Engineering, now Delhi Technological University. It is a healthy sign that a number of other engineering institutions in India have now taken up the task of research and innovation at UG levels.

v) Industry Relevant Research and Consultancy by the Teachers: Teachers of institutions of engineering and technological universities, besides teaching are supposed to practice their knowledge and expertise for the benefit of the industry and society. This is best done by promoting a culture of

industrially relevant R&D and industrial consultancy projects to be undertaken by the institute's faculty. This practice is highly prevalent in IITs and a number of other premier institutions in the country. In an industrially driven R&D environment, teachers and students engage in industrially relevant knowledge creation and new product development. This way the gap between the laboratory level research and institutional innovations and the new product development in the industry is greatly bridged besides creating a healthy environment for transformation of knowledge into prosperity. The world class universities generate a significant proportion of their R&D budget from industry sponsored R&D projects and from the IPR generated by the teachers of the university. This practice ensures that the process of knowledge creation and industrial R&D go hand in hand in the academic circles of the University. Industry sponsored R&D is also the best way to promote inter-disciplinary research and innovative new product development. The faculty and the research scholars are also adequately rewarded for the intellectual property they generate alongside with their educational activities. This also ensures more effective utilization of the in-house resources and equipments in the laboratories. We in India need to significantly enhance our share of intellectual property and industry relevant research to transform India of today which is largely today a manpower development country to the research and innovation hub of tomorrow. This is all the more important as India is rapidly emerging as the chosen destination for the establishment of research and innovation center by great many multinational industries.

vi) Endowment Professorial Chairs: Industrial organization in the country sponsor creation of professorial chairs in engineering institutions specifically for the purpose of promotion of R&D and HRD in specified science and technology areas. This practice is highly prevalent in all IITs where almost all departments have more than one endowment chairs funded by the sponsoring organizations/ industries. The endowment Chair Professorships also bring in industry relevance in education and research in the institution. The Government may offer attractive incentives to the industries funding sponsored R&D and endowment Professorial Chairs in technological Universities and institutions of engineering in the country.

vii) Student Chapters of Professional Societies in the engineering colleges: Establishment of Student Chapters of National and International Professional Societies such as IEEE (USA), IEE (UK), ASME(USA), SAE(USA) etc. and Institution of Engineers (India), ISTE (India) goes a long way in improving the professional orientation of the students. This practice is prevalent in leading institutions in the country like the IITs, DCE, BITS Pilani and other leading institutions in the country.

viii) Industry sponsored Laboratories in Institutions: In certain areas of technology, industry sponsors establishment of specialized laboratories in the engineering colleges. This practice is prevalent in universities abroad. IIMs and other leading institutions in this country are also paying a greater attention to this aspect. Indian Technical education has opportunities of BHEL, NTPC, Wipro, Infosys, Tata lnfotech and even NIIT, GAIL, Siemens, Hewlett Packard, HCL setting up sponsored laboratories in the colleges of engineering. At least 1 laboratory in each department should be established under sponsorship of the industry. This will promote frontline technologies and bring industries close to the institutions.

ix) Technology incubation and techno-preneurship promotion: Technical education in the knowledge era has empowered both the teachers and the students with the power of connectivity and power of networking. This has created enormous potential for pursuit of innovation and new product development while at studies in an engineering institution. What is needed is to provide in house facilities for ideation, technology incubation and for promotion of student led start up campaign. Establishment of Technology and Business Incubation Unit. TBIP is one such good practice currently in Vogue in institutions like IITs and in other leading institutions in India. Initiatives like TBIP create the enabling environment and provide a systematic support for the growth of techno-preneurship.

x) Technology Enabled Education: In the new knowledge age it is an acknowledged fact that the

science and technology horizons are rapidly expanding. The half life of knowledge as well as of technology and skills is also rapidly reducing. In some areas such as IT and computing, the half life of knowledge and associated skills has been reduced to less than a year. The same is the case with even core disciplines like Mechanical, Electrical, Civil and Electronics. Here also, the change from macro to micro and even nano is impacting the capabilities of all of us to cope up with rapidly changing technology and knowledge base in these core disciplines. Further, engineering is no longer confined to a single discipline as engineering today is and shall surely be tomorrow a highly interdisciplinary pursuit in which human mind shall engage itself to create new designs, new forms, new products, new services, new business and even new strategic framework to work in the connected and networked economy. It is important, therefore, for us to acknowledge that the time has come when we have to declare, and declare boldly that each one of us knows something and no one knows everything. Students have to learn from teachers, the teachers have to learn from students, teachers and students together have to learn from their peers. What more that the students, teachers and peers together have to learn a lot from the vast knowledge reservoir which is being enriched regularly and rapidly by pooling the brainwaves of intelligent people around the world. In this changed paradigm we have to look for solutions to the pressing problems like shortage of quality faculty, design of innovated curriculum, designing and developing new delivery systems for knowledge dissemination and newer ways of developing prototypes, innovated products and services in a highly compressed time frame. It is in this context we have to perceive the role of technology in education specially, the role of ICT in education, more so, in higher technical education if we have to succeed in pooling together the vast body of knowledge and for enhancing the learnability as well as employability of the students.

Conclusion

India's higher education system requires a serious relook at the processes employed for creation and dissemination of knowledge in the institutions of higher learning and technological universities. The imperatives of new knowledge era are to be acknowledged and the challenge of the globalised higher education should be addressed by creating a tech-savvy education and research system. The synergy between science and engineering and creation of the troika of education, research and innovation in the university and institutional campuses holds the promise for preparing India to meet and greet the challenges of globalised higher education both in respect of creating the power of science and the might of technology together in technological institutions as also to create globally employable manpower and technology base to fuel today's as well as tomorrow's industries worldwide.

The opportunity to do so is already knocking at the doors of India's universities and institutions of higher learning. It is important that at this juncture to innovate and adopt best practices to revitalize the universities in India and shape them as world class universities of tomorrow.

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