2. EXPANDING HORIZONS IN TECHNICAL EDUCATION TO REACH TO WORLD CLASS STANDARDS : A CHALLENGE

*B M Naik * W S Kandlikar***

Synopsis

People, in globalization, want world class education. They are ready to pay for it. But Universities and colleges are not able to give this. Why? This needs examination in depth. Their frame work is old, out dated, primitive, and dysfunctional. They lack in creation of new knowledge. Discoveries, and creative endeavors are now the integral components of modern institutes. They lack in organizational capability. They lack in global visions and missions. From experience elsewhere in the world, it can be said that education has to be coupled with research and innovation. Multifaceted research, incubation, patent and IPR, entrepreneurship, start ups, Research Park are now the integral components. They are observed to have a deeper impact on quality of education.

Institutions must now change their orbit of operation and jump up to creating hi- tech enterprises, hi-tech world class entrepreneurs, producing not just engineers but more of M Tech and PhDs. Institutes must take active role in corporate development, become a light house for industry. The center of gravity of operations must be shifted from UG to PG, PhD and post doctoral studies. This is what National Knowledge Commission has recommended. Without them India can not hope to become a super power, which is its declared dream.

Attempts for reforms are being made in India through TEQIP. Techniques of industrial management like TQM are being implemented. Leaders in industry are being appointed as chairmen and members of board of governors. These efforts are good but not enough. Hi- breeding by way of transnational collaboration is necessary. Role of academicians in reformation is crucial. The paper says leadership skills on the part of academicians to establish and run institutes in world class manner need urgently to be developed. It is ultimately their responsibility. First class professors need to be recruited and enabled to grow to international standard.

EDUCATION IS POWER. IT CHANGES LIVES OF PEOPLE. IT CONVERTS A LIABILITY IN TO AN ASSET.

The world, due to rapid advances in science and technology, is changing fast. Change is accelerated by globalization, privatization, and liberalization. Survival of fittest in competitive world is tending to become the law. People have to cope with high velocity environment on local and global planes. Institutes of technical education, under these stormy changes, have not to perform the way they performed in the past. They have to enable the people to assimilate emerging, technological advances

**Former Principal SGGS Nanded e-mail- naikbm@yahoo.com -91-0240-2443184 and*
**Senior Design Engineer in DOEACC institute at Aurangabad*

and use them so as to get jobs. They have to facilitate increase in scientific and technological capability of people. It is they who produce scientific and research personnel. Institutes must have to be adaptive, constantly changing, and using world class strategies. Courses, curriculum and methods of teaching must change with time. Their visions and missions, policies and practices, systems and procedures must be constantly changing to fulfill local as well as global needs. Global experience tells us that Institutes ought to provide economic stimulus for regional development. Development of nations depends on capacity of institutions to educate people.

Scientific knowledge matters not the resources No longer well being of a nation and its future destiny are constrained by its geography, population, natural resources like land water, minerals etc. Knowledge especially of science and technology has become the prime mover. Science and technology represent the new driving force. Economic prosperity, energy supplies, manufacturing capacity, health, public safety, military security, and environmental quality all these and more will depend on knowledge possessed by the people, women and men in the community. India will be strengthened by learning to compete in S & T in this world.

Education must be compatible to globalization Technical education ought to be qualitative and cost competitive not only by local standards but by international standards. Many opportunities and challenges are arising in the areas of research, innovation, manufacturing, sales etc on global plane. The borders of education are expanding. How to prepare people to cope up with technical education? Do the policy makers have to be inward looking or out ward looking? Do they have to take in to account the global dynamics in respect of technology, industry, economics etc? Yes, certainly they have to. It is essential. People can harvest opportunities ably only if they are well aware of what is on horizon and how to prepare in advance? They can make most of the situation if they are educated and technically trained. On the whole to be on forefront in world economy technical education must have to be compatible to globalization.

ROLE MODELS OF STUDENTS NEED TO SHIFT TO BECOMING NARAYAN MURTHY, BILL GATES

An institute exists basically for two purposes. First, to educate people, that is to say to make them more competent to do jobs using the state of the art technology and secondly to conduct research, innovation and use their findings in various vocations and professions. The purpose of education is to instill knowledge in those who undergo education. The purpose of research is to discover, to create new knowledge, new theories, new technologies etc. so as to raise human civilization to greater heights. Institutes are also expected to train professionals to do professional practices more efficiently, to do consultation, technology transfer, assist students in career planning and contribute to broader social agenda among other things. They must promote entrepreneurship. The role models of students should shift to becoming world best entrepreneurs. But these are not the things; they were expected to do in the past. These are now the new additions in their roles. Modern institutions unlike in the past have now to target to build a learning society consisting of learning organizations and continuously learning individuals. They have to play different roles in a variety of ways. All institutes however need not do all that. They may choose to do what in their visions and missions, and in their respective resources.

NO EXCELLENCE WITH OUT RESEARCH AND INNOVATION

Institutes which engage themselves simultaneously both in research and teaching are found to show excellence and hence are preferred by scholars. It is this kind of institution which tends to excel in competition and attains the world class status. People want world class

education. They recognize that knowledge is power. They are ready to pay the necessary cost in terms of effort, time and money. But where do we find world class education? It is available in only a few institutions like IITs. Many universities and colleges are not able to provide quality education. Students are going abroad by spending huge sums of money. According to one estimate the total drain on foreign exchange, every year is equivalent to the cost of establishment of 20 IITs. The purpose of education in changing global context must therefore be understood by people who matter most to bring about changes. Only those who realize this win.

WHY TEACHING AND RESEARCH OUGHT TO GO TOGETHER?

An investment in research in an educational institute has a double role. Firstly, it produces research output in the form of new knowledge, new technology, contributing to human civilization. It enhances economic competitiveness. The students at younger age are more agile and productive in research. Catch them young strategy is possible. Secondly, it results in elevating the educational standard of students and thereby quick dissemination of the findings of research to society. It is thus giving double profit. Research funding in an education institute is adding greatly to human capital making them innovative life long. Developed nations follow this strategy and hence they are found to be more progressive. India should therefore learn to invest with priority in research in institutes of technical education. There is lot of potential lying idle in youths in institutes, which needs to be urgently harnessed.

Research subsidizes education, and education subsidizes research A modern institute is a place where teachers simultaneously do research, and where researchers do teaching. It is observed that in these institutions teachers teach the latest. The new sunrise knowledge, which they discover automatically, flows to class rooms. They tend to teach tomorrow's knowledge today. Professors conduct research with the help of students at a cheaper cost and in lesser time. Students acquiring research skills is the main advantage. It is found from experience that teaching subsidizes research and research subsidizes teaching. It is, as much desired, an economic proposal for the nation. Teaching and research are thus found to be complementary to each other. Hence they must go together. Students learn to cultivate habit to dream high and possess tenacity to fulfill the dream. In the absence of research in an educational institution professors tend to teach sunset technologies i.e. yesterdays knowledge today, throwing the new generation behind time.

Resources are flowing from developing to developed countries because of level difference in technology. This however does not mean that teaching institutions and teaching professors are not necessary. They also have a place in society. There are jobs which do not require research skills. Working knowledge is required to handle in marketing, purchase and manufacturing. They are quite large in number. Teaching institutions do important job of providing people for them. Such institutions and professors however need continuous updating.

Nations with higher knowledge level are found economically more secure. As per World Bank report resources are flowing from developing to G-20 nations on account of superior technology. As observed 90% of the world's wealth is possessed by G-20 nations. Where as rest of the 150 nations live with only 10 % of the resources. Emphasis on technical education in developing countries to elevate technology level therefore achieves high importance.

ARE RESEARCHING PROFESSORS PASSIONATE TO TEACH?

Students ought to learn not only the known knowledge and known professional practices but learn to create new knowledge and new skills. They ought to learn to discover unknown, to

elevate professional practices constantly to newer heights. The professors and students rightly form a wider community of close knit researchers; build a team to become think tanks for the society. Thus an institution fulfils both teaching and research functions in a most efficient manner. It is this intimate connection- the idea that professors bring cutting edge knowledge and expertise to the class room that makes the institution relevant and purposeful. Institutions which are involved in only teaching remain teaching shops teaching "parrot like" that which is obsolete, irrelevant and comes to them from other researchers mostly from foreign courtries. They have therefore no first hand experience and hence lack force in teaching. Researching professors are found highly passionate to test and teach new knowledge to students. Institutions are thus the testing grounds, of forthcoming technologies.

Teaching and research have no force without being tied together Under the present day fast moving circumstances it is desirable that the research is incorporated in teaching in professional institutes. However, there is a school of thought that those who pay more attention to research tend to neglect teaching. They believe students are put to disadvantage. However, this is a myth. How much time a professor should devote to research and how much to teaching is an art. This has to be left to the judgment of individual professor. It is observed on the whole that students prefer to have instruction at the hands of researching professors. All world class institutions excel simply because professors are research oriented. They have excellent bond with students. They function in an autonomous manner. In such institutions there is always a tension between teaching and research. The tension is like the tension in rope of a bow on account of which arrow moves forward with force. Education gets force on account of this tension.

WHY MODERN INSTITUTES SHOULD BE MULTIFACETED?

Technical education institutes have no longer to be simple. They have to be reformed much beyond class room teaching and learning. They have to be necessarily multifaceted complex organizations in part driven by technology and, in part mirroring other organizations in the world. Increasingly, they have to cater to peoples new demands such as research skills i.e. generation of new knowledge, technology innovation, patenting & IPR, life long education, technology incubation, technology transfer, entrepreneurship, start up companies, venture capital etc It is these aspects whose presence in campus is adding to institute's value by creating favorable learning environment. Students at UG, PG, and doctoral levels are thereby inspired to dream high, learn even that which is beyond curriculum and learn to be innovative and creative to take paths not trodden by their predecessors. Research, patent & IPR, entrepreneurship etc. enable to get more value out of investments in an institution. They increase the rate of return. Institutes become financially more viable.

Attracting best talent in P G, PhD matters A nation can not win economic war with only soldiers like B Tech degree holders. Captains and Generals with M. Tech., PhD. degree are needed. In India not many scholars however are found to be attracted to post graduation and doctorate courses. Why? An analysis will indicate that due to poor knowledge capability of institutes, value addition being made through these courses is less than the value addition made by working in industry. Besides, the students have also to forego the salary income. The institutions are deficient in respect of multifaceted activities and scholarships. Many students in competition are going to universities abroad. Indian institutes to that extent are losing talent, and hence lagging behind. They need to be made attractive enough in comparison with their counterparts abroad. Also they must have to offer what industry can not in terms of research, innovation etc. Without innovation infrastructure, institutes will not be able to produce captains needed to win in world economy. Achievement oriented missions in

Indian institutes need urgently to be built on big scale. This is a large challenge in capability building to world class standards. Institutes ought to be empowered with autonomy to do all that and to award degrees of B Tech, M Tech, and PhD. Number of PhDs awarded by an institution has become a differentiating factor of one institution from the other. It is now the critical measure for excellence. By virtue of this they alone tend to become a "light house" for industry and to bring prosperity to the nation. The purpose of an institution thus goes far beyond and extends to nation building and building humanity. Many institutions in the world attract scholars from any where and everywhere in the world.

Do we give research grant to professors at the time of appointment? If yes, it will attract better talent in professorship and increase organization's capability. Education is not necessarily synonymous with teaching. One can acquire knowledge by reading, researching, experimenting, discussions, etc. Being taught in a class room is only one way of learning. Similarly new knowledge can be developed through the simple act of thinking like Gautama Buddha. An institute is one place in society where inquisitive minds assemble, brainstorm, leading to breakthroughs yielding enormous benefits to society. It is a place where a student motivated by questions like why and how can find answers. An institute to be excellent has necessarily thus to be multifaceted. It must grant funds for research right at the time of appointment. Many institutions in the world are doing and so they have become world class.

SHOULD INSTITUTIONS BE AUTONOMOUS AND TRANSNATIONAL IN CHARACTER?

The mandate to an institution is to carry knowledge from one generation to the next. This mandate can not be fulfilled without financial resources and grant of autonomy. It is for the Government to allocate adequate funds out of public exchequer, yet grant autonomy i.e. liberty to think and liberty to act and not intervene in its internal matters. It is obviously because Government is least qualified in academics, it can not steer the direction and hence it should not interfere. Public private partnerships are being evolved to make most of knowledge and financial resources available in society for the cause of technical education. Transnational partnerships for both research and education are also growing. They must grow so as to tap and bring together good work being done every where and any where in the world. World over experience tells us that transnational research linkages are vital to effective teaching. It creates favorable environment for achieving excellence. Nations are prosperous where institutions are autonomous, and transnational in character, multifaceted and free to conduct teaching and research in a multiple combination manner.

Bringing corporate principles of management in academic institutions is a trend. It is good but not enough.

How does an Institute differ from an industry? Can industrial management practices work well in academics?

Management of a small institute worth the name is much more difficult than management of a big factory, so said Pundit Jawaharlal Nehru in 1959 on the occasion of laying the foundation stone of IIT Mumbai.

Institutes are meant to produce leaders, leaders for the nation and leaders for the world. Today's leaders were students yesterday. Some of the students of today are going to be the leaders of tomorrow. An institute deals with human beings who create future engineers to run factories. An industry on the other hand deals with machines and materials for profit. They produce goods and services, which is much different from producing leaders. An institute attempts to unfold the capabilities lying dormant within the students. Students are active and eager to acquire knowledge. Professors are research scientists working for a much broader aim like developing human civilization. Factory managers on the other hand are in service of factory management. Industries do processing

on non living materials. There is thus a vast difference between the two. Skills needed in factory management and institution management are much different.

INDUSTRIAL MANAGEMENT STRATEGIES NEED MODIFICATIONS TO FIT IN ACADEMICS

Factory methods and strategies for improvement like TQM do not apply as they are to academic institutions. They need to be modified so as to suit to achieve the humanistic and scientific excellence of an institute. The spirit of academics should not be lost while implementing TQM. The quality of education leading to excellence does not have external reference like in industry. In globalization, links between the institutions and the government are weakening. Links are strengthened with human considerations. Institutes are more in the service of humanity in general. Personnel from industry who are associated with academic institutions in their management should have to bear theory of education in mind.

The strategies employed for successful working of a factory therefore do not necessarily apply to all activities in an institution. Institutes are not for profit making factories. That is why they are registered not under companies act but under charitable trusts and society's act. However, of late institutes for profit are on horizon. They are under debate and discussion.

There is a school of thought that institutes must remain institutes and industries must remain industries. Each has a separate reason to exist. There are some common purposes for which they may have to come closer. Industries need to have a continuous flow of competent manpower, new knowledge and new technology so as to remain competitive globally. It is the institutions which are legitimately meant to supply. Industries have R & D cells. All the research which the industry needs can not however be done all alone by itself. Some research of fundamental nature for public good has to be necessarily done in institutes. Professors need freedom to think and freedom to act much more than in industry. They do research not alone in private interest but also in public interest. They need more mobility and sharing of research experience across the world.

CASE EXAMPLE

The invention of Geographical positioning system [GPS] was initiated in Cambridge University by a UG student named Kleppner under the guidance of his professor. This invention is found to have a high impact in automobile sector. The impact came after a period of 50 years. Universities do not take a short range view like an industry. Return on investment in academics is not immediately apparent. Economic analysis indicates that the returns from research to the institute are about 20%, to the nation 50%, and much greater to global society. The impact of research of an institute's on larger plane from which many industries draw benefits. This is not the case in isolation but there are innumerable cases of them. Larger public interest has to be kept in view in coming of industry and institute together. Industries are benefitted most by conducting research in universities. They must cash on research in universities and support them financially, whenever possible.

To be a successful leader in industry is one thing. To be a successful leader in an academic institution is quite another. The skills, knowledge and mind set needed for each is much different. However, there are commonalities.

TO SUM UP

It is high time for Indian technical education to take a jump start and show a lead in world in creation of hi- tech enterprises, technology and business incubators, entrepreneurship, research parks, Patent & IPR, Venture Capital Fund, Continuing education Centers, etc. These things have a deeper impact on improving the standard of education. Scope of PG, doctoral and post doctoral courses must be widened. Institutes

ought to expand and look beyond conventional horizons to what their counterparts elsewhere in the world are doing. How they have become world class? They ought to study the strategies, visions and missions adopted by them. Internationalization should become the trend.

Increasing capability of institutions in S & T to world class level is crucial. The Role and responsibility of government, industry, and academicians in a combined manner is vital. Key people in academic institutions must be trained to become familiar with global visions and missions

Creating world class engineers today for the complex world of tomorrow is the need of time. India dreams to become a technology power in the world which could be made possible by adopting world best policies and practices and not without them. The sermons of National Knowledge commission must be heard and implemented.

Institutions must be governed, managed and maintained by following academic principles. Permitting mobility of professors and establishing transnational collaborations between the institutions is essential. Professors should be enabled to rise to international standard.

Physical infrastructure, campus development & maintenance, gardens etc could be managed by using corporate principles of management. For improvement in academics modifications in corporate principles, are recommended.

An institute exists to teach not only existing information but to inculcate creative thinking in minds, and to create leaders of national and global standards.

REFERENCES

1. Creating knowledge, strengthening nations- The Changing role of Higher education, Edited by Glen A Jones, Patricia L McCarney, and Michael L Skolnik- University of Toronto Press

2. Global Visions & Missions in Technical Education, By B M Naik, Annapurna Publication, 23 Meher NagarGarkheda, Aurangabad -431005- 2008

3. The Role of American University- creation of the future, By Frank H Rhodes,Cornell University Press

4. Higher Education in Canada, Edited By Charles M Beach, Robbin w Boadway, R Marvin McInnis published by John Deutsch Institute for the Study of Economic Policy, Queens University