

INNOVATIONS IN HIGHER TECHNICAL EDUCATION IN INDIA: A STATUS REPORT

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The objective of this research paper is to examine the status of educational innovations in the field of higher technical education in India by looking at some of the successful innovations and provide some insights into widening the scope of educational innovations to reach the teeming technical institutes of India.

KEYWORDS : innovate; institutionalise; controlled autonomy.

1. CHANGE OF LANDSCAPE

The higher technical education landscape in India has changed dramatically in the last decade. The rigorous demands of a surging economy, increased services mindset, cut-throat competition from within and outside the country and higher expectations from the student community have resulted in institutes of higher technical education, trying to reinvent themselves in order to survive and excel in this changed scenario. The need to constantly innovate has become a significant reality for these institutions; to create a Unique Selling Proposition (USP) by way of creating world-class infrastructure, attracting and retaining quality faculty, up-to-date curriculum catering to the requirements of the Industry, experimentation with new teaching methodologies, institute-industry partnerships for facilitating student trainings and placements, imparting value-added skills to the student community, implementation of international quality standards, focus on cutting-edge research and research promotion programs, partnerships with foreign universities and the like. Although all stakeholders in the Indian technical education system realize the importance of Educational Innovation, and are vocal in advocating this concept, clearly not enough is being done on the ground to handle this paradigm shift. Before educational innovation can be institutionalized, the issues of quality and effectiveness of our current system of technical education need to be handled (Tulsi, 2005). [1]

2. INNOVATIONS IN HIGHER TECHNICAL EDUCATION IN INDIA

There have been some pioneering innovations on the Indian academic landscape which have pushed the boundaries of imparting technical education. Some of these initiatives have been listed below:

1. The Practice School [2] program operated by BITS, Pilani provides an excellent platform for final year undergraduate students in all engineering disciplines to spend one semester engaged in off-campus projects in various partner organizations across Industry verticals. Since, this program is a part of the curriculum; it provides the students an opportunity to supplement their theoretical knowledge by actual practical experiences, thereby learning in advance the practices and methodologies employed in the Industry, while being paid for it. Many of these trainee students are absorbed by the training organizations during the program. In recent years the PS program has gone global with organizations from US, Europe and Middle East, participating in the program. Although, there are many industrial training programs in place at various engineering institutes, few can rival the widespread reach and impact of the Practice School program of BITS, because it has managed to institutionalize the Industry-Academia linkage.
2. BITS, Pilani's, Virtual University [3] program is a significant innovation in the distance learning pedagogy and instructional design as it allows employed professionals, who cannot meet the full time requirements of traditional programs, to complete the coursework requirements for various programs and ensures continuous skill development for professional and intellectual growth. Students can log into the virtual university portal and participate in lectures using multimedia content and web-based delivery mechanisms, which simulate a real classroom and laboratory environment. As this model matures, it is expected that traditional degree programs will be offered entirely through the virtual university program in an off-campus mode, which will fulfill a major requirement of providing online higher degree programs to millions of employed professionals in India, leading to greater capacity building for the country.
3. Intel's Higher Education [4] program in partnership with the Government of India and some of the premier Institutions and Universities, aims to raise the standards of higher technical education in the country, by operating programs which aim at curriculum

development, knowledge sharing by leading experts from the Industry during interactions with students and equipment grants to raise the standard of technical infrastructure. This is a unique program and demonstrates the power of the Industry-Academia collaborations to influence and enrich not only the quality of technical education but also the technical human resources produced by the Indian higher technical education system.

4. The Brihaspati initiative [5] launched by IIT, Kanpur, is an Institute of Wide Learning Management System (LMS), which provides a common environment for interaction between students and faculty on academic matters. Faculty members can post their lecture notes, presentations, assignments and lab details on the internet and students can access these at their convenience and post online queries, which are clarified by the faculty and are available to all students for reference. This initiative represents another significant innovation in creating web-based content delivery mechanism to promote e-learning.
5. The HP Labs–BITS Pilani collaboration, [6] which allows Computer Science students admitted to the BITS PhD program to conduct advanced research at HP Labs, Bangalore, with a handsome monthly stipend, is a landmark research promotion program. Programs like these will definitely encourage outstanding students to pursue research work and resist the lure of lucrative jobs in the IT industry. Moreover, the research conducted will be of direct relevance to the Industry, which increases its value immensely.
6. The All India Council of Technical Education (AICTE), the apex body of the country devoted to promotion and quality improvement of Technical Education, operates Research Promotion Schemes (RPS) [7] to encourage faculty in engineering institutes to pursue research activities by providing financial assistance. The Industry Institute Partnership Cell (IIPC) scheme provides grants covering the setting up of centres of innovation and excellence in various engineering disciplines and creation of research facilities with industry collaboration. Also, the Quality Improvement Programme (QIP), [8] is designed to generate Masters and Doctoral degree candidates to build a pool of researchers in the country and strengthen the faculty of engineering institutes in India. These innovative programs have proved extremely effective in capacity building and resource generation for engineering institutes in India.
7. The Eklavya project, [9] initiated by IIT, Bombay, provides a virtual

collaborative workspace for Industry experts, software professionals, research scholars and members of faculty to extend help to the final year B.E/MCA students for their project work. The idea is to provide expert guidance to these students and alleviate their problem of having to arrange for the projects on their own, since the Industry-Institute linkages are non-existent for a majority of engineering institutes in the country.

8. The External Registration program [10] offered by the IITs is another landmark program which offers Industry professionals to obtain Masters and Doctoral degrees while conducting research in their employing organizations, after fulfilling minimal residential requirements at the IIT campus. This allows research to be conducted by the employee which is relevant to the employing organization and is a strong motivating factor for the organization to sponsor its employees for this program.
9. The EDUSAT [11] program aims to disseminate high-quality technical education to the various institutes via satellite broadcast. This is especially needed for engineering institutes in the non-metro states of India, who struggle to attract top-notch faculty. This program will allow distinguished professors, industry experts and other professionals to share their knowledge and expertise with engineering graduates to be all over the country and extend the reach of quality engineering education. By setting up virtual electronic classrooms with video-conferencing facilities at the receiving end, this program attempts to create technology-rich learning environments which overcome the shortcomings of one way broadcasts by making the teaching-learning process interactive.

3. THE ROAD AHEAD

As is evident, educational innovation remains the domain of the few top institutes in India, which have the necessary financial and intellectual capital, in addition to academic freedom allowing them to experiment and innovate. Moreover, these initiatives are too few and isolated to make an immediate impact at the grassroots. The need of the hour is to initiate and sustain innovation throughout the engineering institutes in the country. Some of the possible approaches towards achieving this goal are:

Firstly, technical teachers, who are the custodians of the knowledge gateway, need to be brought up to keep pace with the emerging technical education trends. A full time technical teacher development program needs to be initiated, which is akin to the current B.Ed program for

prospective secondary school teachers and a prerequisite to be employed as a teacher in many states in India. Enrolment in such a program implies genuine interest of the candidate in the teaching profession, since many young Engineering College teachers use their job as a stepping stone to perceived greener pastures (better paying jobs in the IT industry or Government jobs offering greater security). The proposed MTech.Ed program with suitable specializations, could be on the lines of a traditional two-year Masters program, but with additional curriculum for teacher training; development of teaching, communication and presentation skills, research supervisory skills, exposure to latest technology to be used in imparting education, experimentation with educational innovations, evaluation and assessment techniques, curriculum development, conduct of lab work etc. These programs could also be offered as a part of the dual-degree, five-year programs, with a first degree in engineering to produce trained technical lecturers. Such a program would ensure a constant supply of quality technical teachers to the Technical Institutes in India, alleviating the problem of shortfall of trained faculty.

Overhaul of the current curriculum would be a second important step in the right direction. This is especially needed for Engineering Institutes in less developed states in India. Here is where the AICTE, would need to aggressively step in. As the apex body in the field of Technical Education, it is not enough for it to qualitatively prescribe the infrastructure or faculty requirements for a Technical Institute, but to extend its reach in ensuring the quality of the imparted technical education as well. Curriculum to be followed should not be prescribed by the affiliating Universities, which in many instances are not competent enough to do so. This should be under the purview of the AICTE, to ensure basic quality and a level playing field for all Engineering Institutes. Granting controlled autonomy to Institutes in the matter of curriculum development and implementation can also help, as the cut-throat competition and demands of the market in this sector would require these Institutes to shape-up or ship-out.

In the current scenario, the Industry spends considerable amount of time and resources to re-skill fresh engineering graduates, simply because their skill levels and awareness is not up to the mark. Consequently, fresh graduates take up valuable time to become productive members of their employing organizations. Technical Institutes need to understand these training requirements and provide customized curricula which can effectively meet these needs. For instance, prospective employers visiting the campus for placement should be encouraged to select engineering

candidates in the beginning of the seventh semester. The Institute could then train the selected candidates based on the inputs on training needs required by the employer. This would require redefining the scope of the Industry-Institute collaboration, but would also help the Industry cut training costs to a large extent. This amounts to outsourcing the training requirements of the Industry to various technical institutes. Another, approach could be to introduce industry accepted certifications in the curriculum itself. A case in point is the MSc (IT) program offered by many Universities in U.K, which allows students to acquire Microsoft (MCSE) and Cisco (CCNA) certifications as part of their curriculum. Producing Industry ready specialists, in collaboration with the Industry, should be the focus of every Technical Institute in India as well.

In order to promote research, what is needed are innovative programs which encourage and motivate prospective candidates to take up research by exposing them to research methodologies, guiding them in possible areas of research and allowing the candidate's, rather than the guide's interest to dictate the topic of research. Research programs should be designed to attract candidates with an inclination towards research rather than candidates with prior research experience. Emphasis needs to be placed on developing the research capabilities and skills of a candidate through innovative means. [12] Plus, exposure to the world of research needs to be provided to students at the Under-graduate level to be able to influence the attitude and aptitude of students towards research. Institutes of higher learning and the research community need to reach out to the Industry and become more flexible to attract prospective researchers from the Industry. There are a large number of people in the Industry who would be interested in innovative research programs, which offer flexibility and build on their Industrial experiences. The Indian Industry on its part needs to allocate the time and resources for its employees to re-skill themselves after every few years in research methodologies and skills, latest trends in technology and product management if they need to be competent. The community of researchers in India would also do well to undertake research which is relevant to the Indian Industry – research which forms the basis of creation of new products, technologies or even the killer applications which drive businesses, fuelling profits and ensuring that more R&D rupees are pumped back into research activities, thereby creating a sustainable eco-system of research and business. The world of cutting-edge research in India needs to be de-mystified and mainstreamed compared to the perceived elitist existence it enjoys today.

The use of technology to supplement the traditional instruction

methodologies can help improve the overall teaching-learning process. This can be achieved by bringing teachers of technology subjects and educational technologists on a common platform, so that best practices and methodologies can be formulated to benefit the large student community by creating technology rich learning environments.

Educational Policy makers too need to take cognizance of the fact that Technical Institutes in India would soon be competing in the global marketplace, with a host of foreign universities lined up to set shop in India. These Universities with their global perspectives, deep purses, intellectual capital, professional management and strong business fundamentals pose a real threat to their poor Indian cousins. Protectionism is passé and equipping Indian Institutes to survive this onslaught is the best way forward. This can be effectively achieved by decentralizing control over Technical Institutions (both state run and in the private sector) and creating an environment conducive for Institutional development. These Institutions will then need to innovate and differentiate themselves from the rest, in order to be competitive. Decentralization needs to be undertaken at two levels – administratively, the Government needs to loosen control over the admission process and fee structures. Institutions which want to offer their students the very best in terms of infrastructure, facilities and faculty are put off by the unattractive ROI (Return on Investment) figures due to the limitation on the fee that can be charged. To encourage the creation of state-of-the-art Technical Institutions, the spirit of free enterprise needs to be promoted. Institutions after all offer a product (education) and the success of that product will depend on the product quality and the perceived worth by the consumers of that product. Market forces should be allowed to rationalize the fee structures rather than Government control. Moreover, the various quota systems in force need to be abolished to ensure fair play. Whereas, minority religious Institutions are eligible to make up to 50% admissions under the management quota, implying greater autonomy and financial gains, others are permitted a measly 5%, putting them at a distinct disadvantage. Academically, autonomy should be granted to Institutions in introducing new Industry relevant courses, new assessment and evaluation techniques, new methodologies of teaching and introducing innovations in technical education in general. Vesting academic and administrative control with the affiliating Universities has not yielded the desired results and therefore calls for a drastic change. The impact of decentralization of post-secondary education in Sweden, [13] is a case in point. This study in Sweden found a direct correlation between decentralization of universities and increase in

regional development through local innovation and increased creativity, measured by increase in aggregate output of the “knowledge industries” in terms of intellectual property generated.

The private technical Institutions also need to gear up to meet the requirements of a demanding knowledge economy on one hand and the onslaught by foreign universities on the other. What is needed is a fresh perspective in managing educational establishments and also in imparting technical education. Educational management is clearly the way forward. Academicians who have traditionally managed these Institutions need to become business savvy and hire trained professional managers who are equipped to understand the requirements of the institution to survive and succeed in a rapidly changing environment. Management institutions in India would do well to introduce a MBA program in Educational/ Technology Management to cater to the needs of the Education Sector. Also leadership development programs for existing educational administrators would provide the necessary re-orientation for them and enable them to keep pace with global trends and adapt to the uncertainty caused by strategic educational change, [14-15].

Another, approach to raise the overall standards of technical education in India, is to promote the concept of adoption or mentoring by premier technical Institutes of India. Upcoming or recently established Institutions would derive the maximum benefit if they could receive training in resource generation and capability building by some of the top Institutes in India, who have the necessary expertise in this regard. In fact, consultancy in Technical Education Management represents the next big business opportunity in developing countries which are trying to emulate the success achieved by many Indian technical Institutions.

Awareness needs to be created about Educational Innovation. and Institutions need to be empowered to enable and sustain innovation in the long run. A forum which helps bring educators together to share the best-practices could be a way forward. Research in this area by Choudhury and Sherry [16] targeted at elementary school teachers reveals that innovation occurs in isolation and needs to be mainstreamed so that maximum benefit can be extracted for the entire community of educators. It is not hard to imagine that a similar situation exists for higher technical teachers as well and the idea of creating a “clearing house” which scouts for and validates educational innovations devised by technical teachers or Institutes, making them available in a usable form to the technical community, sounds entirely feasible.

To promote lateral or out-of-the-box thinking, students need to be

exposed to events such as idea-fests, where an environment is created for students let lose their imagination and creativity to come up with unique ideas for novel products, services and solutions to known problems or innovative approaches applied to traditional methods. These ideas could be validated by researchers, industry experts and even venture capitalists to generate funds for promising ideas to be taken to the design and production stage or taken forward to generate intellectual property or further research. This will help the students realize their own potential and expose them to the power of “thinking-big”. Aspects like technology management, financial management, market research and marketing need to be included in the curriculum to produce well-rounded engineers who can not only come up with good ideas, but also take them to their logical conclusion. This will boost entrepreneurship amongst engineering graduates, although support from the Institute, Government agencies, Entrepreneurship Development Institutes/bodies, financial institutions etc. is necessary to make this initiative a success.

4. CONCLUSION

To cater to the manpower requirements of a growing economy, there is a dire need to enlarge the scope of educational innovations to the thousands of institutes of higher technical learning in the country, especially in the smaller cities and towns. These institutes face issues which include, but are not limited to non-availability of qualified and experienced faculty, outdated curriculum, lack of academic freedom for educational institutes, poor student satisfaction levels, lack of research and research supervisory skills among faculty, outdated teaching methodologies and evaluation and assessment techniques, lack of industry-institute linkages and lack of professional managers in the field of education. Addressing these issues using novel approaches and institutionalization of educational innovation would allow these institutes to progress from just conducting classes and churning out engineers to centers promoting quality education and producing well rounded engineers with the skills to succeed in the industry or sufficiently motivated to pursue higher education and research. This would lead to the creation of a pool of highly skilled manpower and higher degree holders, who would cater well to the demands of our knowledge-driven economy. To achieve this, it is imperative to have the buy-in of all the stakeholders in the technical education system of the country – educational policy makers from apex bodies like the Ministry of Human Resource Development, University Grants Commission and the All India Council of Technical Education, affiliating universities,

administrators, technical education experts, representatives from various institutes and the industry and finally the student community. Strategies to promote and implement innovations in the education system will need to be formulated and propagated. According to Silva and Sheppard,[17] educational innovation results due to pressure from external stakeholders, by recognizing an important need or seizing an opportunity. These findings are equally applicable in the Indian context, making a strong case for educational innovation to be promoted. Their research findings identify resources, passion, commitment, faculty buy-in, risk-taking and out-of-the-box intellectual simulation as the enablers for educational innovation. Further, sustainability of innovation occurs through creating a sense of community and ownership, by changing the existing culture, by enhancing and closing feedback loops and rewarding the actions of one's peers through a public reward system. To make educational innovation sustainable in the long run in India, individual institutes need to be nurtured and motivated to innovate in their local contexts, by decentralizing academic and administrative control over them. This would allow them to build resources and capacity to survive in the world of free enterprise and globalization.

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