New Trends, Opportunities and Challenges in Technical Education—Perceptions and Perspectives… Indian Scenario

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ABSTRACT

India is demonstrating many features in characteristic emergence of a commitment towards outcome based accreditation towards quality assurance in technical education with the signing of Washington Accord. This has brought a great opportunity, challenge and scope for high quality global engineering. This paper has two interlocking purposes. The one is to present the new era by the adoption of outcome based international accreditation methodologies on par globally. The other is to provide global context within which Indian technical institutions need to sustain and excel the high degree of high quality technical education through constant monitoring analysis at regular intervals to continuously improve using the outcome based accreditation process. This paper aims to emphasize the need for a new learning paradigm of open and flexible learning that enables wider access to higher technical education, and highlight the role of technology in implementing teaching-learning schemes. The paper examines issues related to requirements, concerns and challenges, in the synergistic, scalable use of technology, and networking approaches for implementation of technology enabled learning model. The paper bridges the digital divide and foster digital citizenship; creating and motivating learning interest, and Learning achievement. This aims at improving learning processes for the outcome based perceptions on quality based outcome accreditation in technical education.

Keywords: Information Technology, Graduate Attributes, Washington Accord, Learning Outcomes.

INTRODUCTION

Institutions of higher technical education are facing new challenges as well as opportunities in delivery and access of technical education, due to a variety of factors.[1] While political, social and economic factors have always remained relevant to the issue, recent developments in technology, globalization and changing demand for new skill sets in the job market have necessitated a need for a new teaching and learning paradigm.[2] Policy, finance, role of state and institutional management are some of the critical issues that have to be addressed for developing a sustainable model of education for achieving this goal.

The scope of issue of access and delivery of higher technical education goes beyond the question of funding [3]. Widening access to higher technical education is more than just an economic necessity. UNESCO, for instance has related the issue with diversification of education, through diversification of:

- contents to avoid monolithic model,
- the types and paths of education, as regards systems and structures, so that they spread virtually throughout the life of each individual,
- the methods and places of learning, notably for practical reasons[4].

This paper aims to emphasize the need for a new learning paradigm of open and flexible learning that enables wider and equitable access to higher technical education, and highlight the role of technology in implementing open learning.

There is a need to look at the issue of access and delivery of higher technical education in a new perspective, [5] which is characterized by,

- The Knowledge Society and need for lifelong learning
- Globalization
- Changing role of the state in higher education
- Quality and customer focus in delivery of educational services
- Developments in information and communication technology and its potential for delivery of education
- Emergence to new jobs, frequent changes in job requirements in one's life time and consequent demand for different skills.

Table 1: Traditional and New Learning Categories

Traditional Learning Environment	*New Learning Environment*
Teacher-centered instruction	Student-centered learning
Single sense stimulation	Multi-sensory stimulation
Single path progression	Multi path progression
Single media	Multimedia
Information Delivery	Information exchange, Knowledge development
Isolated work	Collaborative work
Passive learning	Active inquiry based learning
Factual thinking	Critical thinking & decision making
Reactive response	Proactive planned action
Isolated, artificial context	Authentic, real-world context
Classical method of assessment : Testing of bookish knowledge	Test of knowledge, skills, problem environment
Geared to predefined jobs	Adaptable to new job requirement in a rapidly changing knowledge economy

Open learning, resource-based learning and e-learning approaches have been advocated which can address these requirements [6, 7, 8, 9].

TECHNOLOGICAL CHALLENGES

Technological challenge relate to development of infrastructure, coping up with fall outs of too much use of technology, technology for learning material development, particularly for engineering and technology subjects, and technologies for educational management. Development of

communication and computing infrastructure, such as local, national and international networks, hardware, peripherals and support services is the foremost issue that needs to be addressed by the country. Rajasingham reports some of the predictable problems in use if technology, such as the fears teachers had to information technology, lack of institutional support from conservative educational management, the need of students to have social contact with people in real time.[8]

Apart from ICT infrastructure, in the specific context of technical education, development of laboratory infrastructure for open distance learning for the purpose of wider access is an issue of utmost importance. In a vast country like India, a dual reality scenario is predicted, where two different generations will be living at the same time. Information being the most strategic weapon in the era of global economy, two new social classes of haves and have-nots will emerge, the former with good access to information and the latter with poor or no access to information [9]. Therefore, spread of technology is an essential prerequisite for widening the access to education in the new learning paradigm.

Contents development is another major concern in ICT enabled open education. The relevant issues are technology for courseware development, quality assurance, and suitability of the contents for an open and flexible learning environment. There are some commercially available software suites for contents development and delivery of courses [10]. Therefore, there is a critical need for development of learning materials, educational management - software, electronic information/libraries, and teaching and research databases.

A 'knowledgeable' workforce, one that is both highly skilled in a particular occupation and also exhibits flexibility, is seen as the most important human capital required for the development of a country. India's workforce is characterized as having low skills and poorly prepared to compete in today's globalized world. Rapid technological changes now require individuals to *learn and relearn skills throughout their working lives by ensuring its relevance and effectiveness.* [11] Hence it is inevitable to increase the knowledge, the skills and the institutional capacities within a time frame at the national and state levels. It's true that skilled workforce, impacts positively on economic growth, raises productivity levels and reduces unemployment. The Technical and Engineering Education is considered as an important measure for the development of trained labour force required for the socio-economic development of a country. More specifically, it is believed to be an effective answer to reduce unemployment and migration to urban centres.[12] Technical education develops 'skill culture' in contrast to pure academic culture and preferences for white collar jobs and 'to serve simultaneously the 'hand' and the 'mind', the practical and the abstract, the engineering and academic'. Skills development is an increasingly important factor in adapting societies to changing economic and environmental conditions. It can bring innovation, enhance productivity, stimulate economic competitiveness and underpin inclusive approaches to development[13].

In this age of liberalization, Engineering training is to impart specialized skills and knowledge, and instilling social and political attitudes and behavioral patterns essential for successful economic activities by people engaged in dependent employment, self-employment or subsistence work.[14] The Government of India in recent years has laid a lot of emphasis on streamlining engineering education so that it fulfils the emerging need of the market by focusing on employability skills.

The Prime Minister of India has suggested that India should set a goal to create 500 million certified and skilled engineers in the country by 2022. As we have the largest population of young people in the world, we need to invest adequately in their education and employability, to become the largest pool of technically trained manpower in the world.

Demand – Supply Gap in India

Skill Development

- India over the next five years will have surplus of un-trained and under-educated people 1.3 million
- India will fall short of real talent by about - 5.3 million
- Further crises to be caused by mismatch between jobs available and skill shortage

Thus there is a Gap between the Needs of the Industry and the Availability.

Future of Labour Ecosystem in India

As per the Team Lease Services Labour Report 2006 (The report mainly predicts the future of labour ecosystem in India, state wise.)

- The potential working age population (20-59yrs)
  – Currently - 567 million
  – In 2020 - over 761 million *(estimated)*
- The govt. is talking about creating 10 million jobs every year
- However, the requirement is more than 15 million in a year.
- Even if we find 100 million new jobs, 170 million will be out of employment in 2020, this is nearly 30%.
- Only around 2.5-3% of persons aged 15 years or more had technical qualifications of even the most rudimentary kind
- 152 million persons who enter the in-formal sector for their livelihood have no access to engineering training
- The biggest challenge will be to provide formal education and employment to the huge work force in 2020.

Even though enrolments in engineering education in India are small when judged by international comparisons, expanding the numbers or re-targeting the program would not be justified unless a model is found that would substantially improve the outcomes.

India's Potential - *Demographic Surplus*

- Working age population to comprise over 63% of the aggregate by 2016.
- India only economy with declining age dependency ratios till 2030.
- A third of India's population below 15 years of age and 20 % of the population in the 15-24 age groups.
- In 2020, the average age in countries will be:

Indian	Chins & US	West Europe	Japan
29 yrs	37 yrs	45 yrs	48 yrs

- India with 69% of its population between 16-29 yrs – youngest country
- India's demographic surplus will be 47 million by 2020
- However Educated without professional skills constitute 69% of the unemployed.

Hence in order to make our Demographic Surplus become Demographic Dividend and not a nightmare it is important [15] that our population is *adequately skilled to meet the growing industry demand and many more avenues of self employment are opened up keeping in view the national and global requirement.*

Constraints and Challenges

- The challenges are immense and in order to achieve the goals there has to be:
- Substantial expansion of quality - technical engineering education & training for raising employability & productivity
- Focus on Self-employment skills
- Models that would substantially improve outcomes.
- The skills provided have to be attuned to:
- New business requirements: in India & abroad
- Improving quality of education and trainings at all levels;
- Make technical / engineering education system more flexible and inclusive for sustainable growth.

Keeping in view these challenges government has taken many initiatives.

LESSONS LEARNT (BEST PRACTICES)

The key to success here however are:

- Leadership provided by the head of the institutions/Industry
- Training & updation of Heads of the Institutes
- Ongoing faculty development & training
- Absorption by Industry concerned with large part of the trainees
- Curriculum continuously updated & Practical Training on updated Industry Requirements
- Exposure to Best Practices for all bodies to collaborate /required state Govt. and other industries to adopt/initiate such partnerships

The key to success here however are the leadership and training. Collaboration is suggested for adoption.

Recommended Initiatives

Capacity Building

- Identify skills needed domestically & globally for designing new courses & setting up new institutes
- Appropriate standards of training for various trades & availability of trained faculty/ trainers/instructors.
- Involve and mobilize retd. professionals from industry willing to contribute

- Retraining of trainers & their regular exposure to industry
- Multiple mode of delivery keeping in view the trained instructors available in the shorter run
- Chambers to keep a data base of retired or working professionals willing to give their time on voluntary or paid basis for training.
- Women not interested to work full time to be roped in on part time basis
- Industry as a consumer in its own interest also need to identify trades,
- Independent assessing bodies for testing skills.
- Encourage extra shifts in institutions of skill development

SUMMARY - KEY GOVERNANCE PRINCIPLES

It is clear that whatever system we evolve and in the process of doing the few key governance principles should be to……..

- Enable individuals to convert their knowledge and skills, through testing and certification, into higher degrees.
- Promote multiple modes of delivery that can respond to the differing situations in various states.
- Multimode Certification system to be instituted by Govt. (Central & State), Chamber of Commerce, Industry, universities, Institutions, International agencies for certifying the skills of trainees graduating from public and private institutions.
- Encourage Testing the skills of trainees by independent assessing bodies.
- Industry Partnership at various Stage.

The need of the Hour is to develop a New Partnership model which allows the use of Industry Infrastructure in terms of Equipment, machinery etc to be combined with Engineering Teaching to enable on one side – Reduce costs acting as the entrepreneur, and get sufficient returns, Industry be able to get assured low cost trainees and the student able to get industry oriented employable training with paying either lower fee or funded by government in the Institution.

Thus, overall aim and objective of the entire exercise is to arrive at a working model with proven concepts and postulating working theories to enable obtain a logical conclusive methodology appreciating and encouraging the new trends thus mentioned above for outcome based accreditation process and derive maximum benefit for the technical education in India.

REFERENCES

[1] Gupta, P.V. Virtual University in the Indian context. University News. Vol 41 No. 37 (September 15, 2003), p. 7.
[2] Hariharan, R. Information technology for teachning and learning. Indian Journal of Technical education. Vol 24 N0. 4 (Oct-Dec 2002). p 30.
[3] International Commission on Education for Twenty-first Century. Report: to UNESCO: Learning the treasure within. Paris, Unesco Publishing, 1996.
[4] Kapoor, M.P. Technology enabled flexible education and development. In ICT enabled education, edited by K.B. Powar, M.D. Tiwari, and H.P. Dixit. New Delhi, Association of Indian University, 2002, pp. 82–94.
[5] Killedar, Manoj. Web based education in India. Paper presented at competition, collaboration, continuity, change-Conference on Open and Distance Education, held at University of South Australia, Adelaid September 11-13, 2000. http://www.com.unisa.edu.au/cccc/papers/non- refereed/killedar.htm
[6] Laurillard, Diana. Recommendation of National Committee of Inquiry in Higher Education (UK) In IT and Dearing: the implications for the HE: Colloquim proceeding, edited by Helen Beetham. London, CTI Support service, University of Oxford, 1997.

[7] Natarajan, R. Promise and prospects of e-learning.Indian Journal of Technical education. Vol 23, No. 3 (Jul–Sep 2002), pp. 1–11.

[8] Rajasingham, Lalita. The virtual university in India. In Education India: the next millennium-report of the World Conference-New Delhi, 12-14 November, 1997, edited by Marmar Mukhopadhyay and other. Udang, Howrah, Institute of Education, Rural studies and Development, 1998, pp. 475–481.

[9] Shukla, Jyoti Kiran. Open learning in technical education: Some conceptual issues. In Education India: the next millennium-report of the World Conference-New Delhi, 12–14 November, 1997, edited by Marmar Mukhopadhyay and other. Udang, Howrah, Institute of Education, Rural studies and Development, 1998, pp. 510–517.

[10] Irvine.Becker, H., Ravitz, J., & Wong, Y. (1999). *computers and software. Teaching, learning, and computing: 1998 national survey (report no. 3).*Center for Research on Infoorganisations (TOT): The designated Programme O University of California, Irvine and University of Minnesota.(ERIC Document Reproduction Service No. ED437927).

[11] Charania, A. & Shelley, M. External and Internal Predictors of Technology Use in Classroom.AERA 2007, Chicago, Illinois.

[12] Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1). Retrieved from http://www.citejournal.org/vol9/iss1/general/article1.cfm

[13] Koehler, M. & Mishra, N. (2009). What Is Technological Pedagogical Content Knowledge? Contemporary Issues in Technology and Teacher Education, 9 (1).

[14] World Bank study (2011). Can Computers Help Students Learn? A World Bank Case Study. Retrieved July 2012 from:http://www.olpcnews.com/commentary/impact/can_computers_help_students_le.html

[15] Zhao, Y., & Frank, K. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal, 40*(4), 807–841.

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