

# Implementing Strategies for Technology Enabled Technical Education in India

Dr. M. Narendra Kumar, Mr. David Voraganti

**Abstract**— This paper aims to highlight the need for a new approach of learning and the role of technology in implementing e-learning. This paper also emphasizes the need for technical education to prepare individual with skills necessary to find and maintain employment. This will involve the provision of skills such as critical thinking, problem solving, career development, and lifelong learning. The paper also examines issues related to requirements, concerns and challenges. Synergistic, scalable use of technology, hybrid model of delivery and networking approaches have been suggested for implementation of technology enabled open learning model. The paper concludes with some suggestions for implementation of a technology enabled open learning model. A list of tools and resources for e-learning has also been appended

**Index Terms**— Contents Development, E-learning, Infrastructure Development, Technological Challenges, Socio-economic Challenges

## I. INTRODUCTION

In recent times, the economic, technological, demographic, societal and educational context in which technical education is practiced has changed. These changes suggest an immense challenge to the delivery of technical education. Engineering education must respond appropriately to these changes in order to remain relevant in preparing individuals to be able to take advantage of the opportunities for the kind of workforce needed in today's world of work. Institutions of higher technical education are facing new challenges as well as opportunities in delivery and access of education, due to a variety of factors

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.

In a democratic society, making higher technical education accessible to all without time, space, gender, and class barriers is a noble goal. Policy, finance, role of state and institutional management are some of the critical issues that

**Manuscript received Feb 04, 2015**

**Dr. M. Narendra Kumar**, Vice-Principal and Professor, Department of Electrical and Electronics Engineering, Guru Nanak Institute of Technology, Hyderabad, Telangana, India

**Mr. David Voraganti**, Assistant Professor, Department of Electrical and Electronics Engineering, Guru Nanak Institute of Technology, Hyderabad, Telangana, India

have to be addressed for developing a sustainable model of education for achieving this goal. 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.

## II. THE NEW PERSPECTIVE

Some of the limitations of the conventional education model have been described as, geographic and time inequality, unsuitability for lifelong learning, high cost of infrastructure, shortage of faculty, high cost of staff, inefficiency in assessment system, cost of cost material. One can add lack of flexibility and customization, failure to use analytical and exploratory capability of the students to the list. The need to look at the new perspective for higher technical education 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.

## III. THE NEW LEARNING PARADIGM

To prepare knowledge workers and make higher education widely accessible, a new paradigm has been suggested with flexible, open, self paced, student centered learning based on collaborative two way processes. In a learning society, learning is an essential part of life. Learning takes place at all points of time and space. The facility for learning should be accessible to everyone, everywhere and at all the time. The balance of convenience should be in favour of the learner. Therefore, education should be made available as per the specification of the learner. The time, location and pace of learning should also be decided by the learner. The contents are guided by the needs of the society, which largely vary from person to person, and also need frequent changes. Therefore, there should be a gradual shift from standard education to customized service. The following table compared the two learning models in the following table

Conventional Learning Environment	New Learning Environment
Teacher-centered	Student-centered learning

instruction	
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

**Table (1): Comparison of Conventional & New learning models**

**3.1 Open Learning:**

The term open learning is often used interchangeably with flexible learning. Both the terms are used to express an approach which provides students with the opportunity and options to take greater responsibility for their learning with provisions to meet individual needs. A scrutiny of the processes and approach suggests that in open learning ‘autonomy’ and ‘choice’ are the main elements. Ideally, learners have a better understanding of negotiated objectives; they take individual routes, adopt individual styles and work at their own pace. In the specific context of technical education open learning could be interpreted as an approach to promote students autonomy and learning priorities. It is about reorganizing teacher’s role as collaborators and promoter of learning autonomy for optimal learning experiences. These experiences are achieved through the provision of well-thought, pre-designed course material, negotiating of objectives, mentor support and group tasks. Open learning can be applied to technical education in the following learning situations

- Conventional lecture situation
- Small group unsupervised work
- Laboratory classes
- Independent study on/off site support
- Group learning, and
- Industry learning.

**3.2 E-learning:**

An open learning environment enabled with Information and Communication Technologies (ICT) can be called e-learning environment.

Benefits of e-learning are anytime, anywhere learning, access to more information, enhances the retention, consistent delivery, and enabling knowledge management. Internet can be used as an effective medium for delivery of education and related services. Developments in internet applications such as email, list-serves, discussion groups, voice mail, chat groups and video conferencing can be generally used for educational purposes, a number of applications software-commercial, freeware as well as open source, are now available.

Broadly, ICT application can be used in the open learning environment in the following:

- Course delivery or access to learning material
- Tools for laboratory training
- Evaluation tools: assignments, tests and quizzes
- Tools and technology for development of learning material
- Interaction, collaboration and development of learner communities for counseling and discussions
- Library and information services: digital libraries
- Assistive technologies for physically challenged, and.
- Educational administration

A typical e-learning model will include delivery of courseware in a web environment, from a repository using tools for enrolment, evaluation, counseling and peer networking. Teacher is able to create a virtual class, hosting interactive course material, schedule, learning plans, assignments etc, on a web server and providing access to the class participants enrolled for the class; all assisted by a single web based tool. The site would be supporting other applications such as user groups, student groups’ work, and links to learning helps etc. A student will need to access the resources using an internet enabled PC either from home, work or a service centre. E-learning need not necessarily be used only for distance learners. In a large number of universities in USA and elsewhere e-learning application are used for in-campus programmes.

**IV. CONCERNS AND CHALLENGES**

From the point of view of institutions of higher technical education, the major concerns in implementation of open learning are:

- Cater to increasing and diverse student population
- Nurture effective learning environment
- Sustainability
- Effective IT deployment and adaptation
- Quality assurance Rationalization of contact time
- Strengthen industry-institute linkage
- Need-based curriculum
- Support mechanism for special needs
- Staff development for adjustments to new role

Major challenges in developing e-learning are-

Technological,

- Infrastructure Development,
- Policy Making,
- Human Resources Development,
- Contents Development, and Managerial
- Socio-economic issues.

**4.1 Concerns and Challenges:**

From the point of view of institutions of higher technical education, the major concerns in implementation of open learning are:

- Cater to increasing and diverse student population
- Nurture effective learning environment

- Sustainability
- Effective IT deployment and adaptation
- Quality assurance Rationalization of contact time
- Strengthen industry-institute linkage
- Need-based curriculum
- Support mechanism for special needs

Major challenges in developing e-learning are-

- Technological,
- Infrastructure Development,
- Policy Making,
- Human Resources Development,
- Contents Development, and Managerial
- Socio-economic issues.

#### **4.2 Technological Challenges:**

Technological challenge may 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.

Another aspect of technological challenge is fall out of too much technology. Technology is double edged sword. Technology offers us visions of hell as well as the more widely promised glimpses of heaven.

#### **4.3 Infrastructure Development:**

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. A suitable strategy that enables replacement of laboratory training with virtual modules, automation and networking laboratories, and development of laboratory kits may facilitate spread of technical education to masses. Another aspect of infrastructure development is support services such as Access Centers, Learning Centre (Libraries), particularly digital libraries.

#### **4.3 Socio-economic Challenges:**

Other concerns in technology enabled open learning are socio-economic, political and cultural consequences, if the virtual class becomes the dominant mode of instructions. 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. Therefore, spread of technology is an essential prerequisite for widening the access to education in the new learning paradigm. It is heartening to note that India has undertaken several initiatives to develop ICT infrastructure at the national level by the government as well as through public private partnerships.

#### **4.4 Contents Development:**

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. Several institutions have embarked upon web based courseware development. Most of the available courseware is little more than digitized printed material. There are some commercially available software suites for contents development and delivery of courses. Therefore, there is a critical need for development of learning materials, educational management software, electronic information/libraries, and teaching and research databases.

#### **4.5 Managerial and Policy Challenges:**

Some of the issues that confront the institutions of higher education in implementation of e-learning. Assessment and accreditation, demand and supply, employability, relevance of open learning, management of access, transparency, human resource development, institutional management, funding, and management of change are some of the policy and managerial issues that need to be addressed. A fresh framework of qualifications needs to be evolved at the policy level. Teacher's role should include gradually more and more as content developer and facilitator rather than deliverer of the instruction. Introduction of collaborative learning style will require intensive HR efforts.

### **V.APPROACHES**

To overcome some of the above mentioned challenges the following three approaches are suggested:

#### **5.1 Use of technology for distance education as well as in-campus courses:**

An approach to make virtual education concept operational internally in the initial case i.e. for in-house or regular courses and then externalize the concept by extending it for distance learners has been advocated. By using available proprietary or free tools and online learning objects, ICT can be implemented in a gradual and phased manner within the existing programmes. For example curriculum may have a combination of online modules and quizzes, assignments and tutorials that can be taken by a students in at a time and place of his choice; classroom lecture and laboratory based learning. Collaboration and discussion forum tools are used for class management, group work and interaction among the class participants, and thus developing an online learner community.

#### **5.2 Delivery of distance learning programmes:**

In order to address the problem of digital divide a hybrid model is suggested for delivery of distance education programmes. Depending upon the access to computer and internet a flexible mix of online, offline (email, CD or printed) delivery of course material, submission of assignments and interaction can be introduced along with a differential fee structure. For those who do not have reliable access at home, access at work place may be allowed by the employers for upgrading their skills and qualifications. Shared resource centers for distance learning at various places may be set up with high speed internet connectivity, where students enrolled in different institutions can come and use the facilities.

#### **5.3 Networking and sharing of resources:**

This approach is useful for fast implementation of ICT in open learning at less cost, and can be used for contents development, and reusability of knowledge and information. Facilities such as libraries and laboratories can be opened for use by multiple institutions. Development of learning material is a highly time consuming and cost intensive work. A cooperative approach may be adopted where standard core modules can be developed by a facilitating agency that can be customized by various institutions using some standards tool for a quick implementation. This will reduce the per capita cost of implementation.

### CONCLUSION

Technology enabled open learning should be an integral part of the educational system in the institutions of higher technical education, and not as a supplemental or alternative model of education. Yet technology enabled open learning model best suits to the requirement of distance learning it its fifth generation, as propounded by some thinkers. In India a few universities have started offering distance learning programmes in e-learning mode. A number of initiatives are reported from some institutions in development of web based course materials.

There is a need to make cooperative efforts to develop e-learning material that can be adopted by the institutions in their curricula. Developing such objects for engineering disciplines use of advance techniques such as simulation and virtual techniques would be challenge. While governments are doing their best in developing the ICT infrastructure, and bodies like UGC and AICTE are providing financial help improving access to internet and electronic resources, there is a need to make concerted efforts to integrate e-learning in the with the existing system.

A framework of qualifications for open learning should be established by the regulatory authorities. Its aim would be to remove confusion about the structure and nomenclature of awards across higher technical education at undergraduate and postgraduate level, to provide clarity on levels of achievements linked to the acquisition of credit rather than duration of study, to show the path-ways of progression for students, and to facilitate credit transfer between institutions and in line with the satisfaction of lifelong learning needs. It provides institutions, students and employers with a standard map for purposes of orientation, with entry and exit points, roads and bridges clearly marked. The framework should accommodate choice of range of specialism and breadth within the programme. Institutions should begin immediately to develop, for each programme, a programme specification

### REFERENCES

- [1] Gupta, P.V. Virtual University in the Indian context. University News. Vol 41 No. 37 (September 15, 2003) p7.
- [2] Hariharan, R. Information technology for teaching and learning. Indian Journal of Technical education. Vol 24 No. 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. p82-94.
- [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, Adelaide 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: Colloquium 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), p 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. Udag, Howrah, Institute of Education, Rural studies and Development, 1998. p 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. Udag, Howrah, Institute of Education, Rural studies and Development, 1998. p 510-517.



**Dr. M. Narendra Kumar** has obtained B.E. degree in Electrical Engg. From Gulberga University, M.S. from BITS Pilani and M.Tech from JNTU Anantapur. Subsequently. He has completed his Research work in the area of Energy Management and awarded Ph.D. From JNTU Hyderabad. He is working at Guru Nanak Institute of Technology, Hyderabad (T.S.) as a Vice Principal & Professor in the Department of EEE. He is a life member of ISTE and Member of IEEE.



**Mr. David Voraganti** has obtained B.Tech. Degree in Electrical & Electronics Engineering from JNTU, Hyderabad University, M.Tech in Power Electronics from JNTU Hyderabad University. Presently he is working at Guru Nanak Institute of Technology, Hyderabad (T.S) as an Assistant Professor in the Department of EEE.