INCLUSION OF ICT IN HIGHER EDUCATION

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Abstract

Educators everywhere have long looked to rising technologies of their time to advance the delivery of teaching in the classroom and to reach students in distant locations. In the early days of technology use, the focal point was on the delivery of direct teaching. The increased use of technology in education has generated considerable innovation and debate over benefits and disadvantages. The economic oriented motivation of ICT relates to the possible increase of efficiency in educational tasks, saving labor. The emergence of networked computers marks a significant development in educational opportunities with teachers and learners beyond the classroom, school, university or college. As a result, higher education's reach now extends far beyond what was once possible or even imaginable. This transformative process will undoubtedly continue as broader band width gives faculty and students, as well as Administrators, access to new opportunities.

Technology has fundamentally altered how we live and works as well as we learn. In the world of higher education, for example, virtually every aspect of scholarship from conducting research to communicating ideas has been influenced by technology. Wider availability of best practices and best course material in education, which can be shared by means of ICT, can foster better teaching. Use of ICT in education develops higher order skills such as collaborating across time and place and solving complex rear world problems. It improves the perception and understanding of the world of the student. Thus, ICT can be used to prepare the work force for the information society and the new global economy.

Rationale of the Paper

Technology has fundamentally altered how we live and work as well as how we learn. In the world of higher education, for example, virtually every aspect of scholarship–from conducting research to communicating ideas-has been influenced by technology. Not only has the nature of classroom learning been changed, but also the very concept of the classroom itself has been redefined by the proliferation of distance education and e-learning. As a result, higher education's reach now extends far beyond what was once possible or even imaginable. This transformative process will undoubtedly continue as broader bandwidth gives faculty and students, as well as Administrators, access to new opportunities.

Information and communication technologies (ICTs)-which include radio and television, as well as newer digital technologies such as computers and the Internet-have been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life.

Wider availability of best practices and best course material in education, which can be shared by means of ICT, can foster better teaching. ICT also allows the academic institutions to reach disadvantaged groups and new international educational markets. Thus, ICT enabled education will ultimately lead to the democratization of education. Especially in developing countries like India, effective use of ICT for the purpose of education has the potential to bridge the digital divide.

The focus of the paper is on the benefits that ICT integration in education can provide, right from breaking time and distance barriers to facilitating collaboration and knowledge sharing among geographically distributed students. The findings reveal that it also facilitates sharing of best practices and knowledge across the world.

Table 1 : The four main rationales for introducing ICT in education

Rational	Basis
Social	Perceived role that technology now plays in society and the need for familiarizing students with technology.
Vocational	Preparing students for jobs that require skills in technology.
Catalytic	Utility of technology to improve performance and effectiveness in teaching, management and many other social activities.
Pedagogical	To utilize technology in enhancing learning, flexibility and efficiency in curriculum delivery.

ICT can be used as a tool in the process of education in the following ways:

- Informative Tool: It provides vast amount of data in various formats such as Audio, Video, documents.

- Situating Tool: It creates situations, which the student experiences in real life. Thus, Simulation and virtual reality is possible.

- Constructive Tool: To manipulate the data and generate analysis.

- Communicative Tool: It can be used to remove communication barriers such as that of space and time.

Use of ICT in education develops higher order skills such as collaborating across time and place and solving complex real world problems. It improves the perception and understanding of the world of the student, thus, ICT can be used to prepare the workforce for the information society and the new global economy. Institutions must promote ""learning to learn," i.e., the acquisition of knowledge and skills that make possible continuous learning over the lifetime. "The illiterate of the 21st century," according to futurist Alvin Toffler, "will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn."

Technological fluency with E-Learning

- Eliminating time barriers in education for learners as well as teachers.

- Eliminating geographical barriers as learners can log on from any place.

- Asynchronous interaction is made possible leading to thoughtful and creative interaction.

- Enhanced group collaboration made possible via ICT.

- Fresh education approaches can be used.

- It enhances the international dimension of educational services.

- It allows for just in time and just enough education for employees in organizations.

- It can also be used for non-formal education like health campaigns and literacy.

The use of ICT can improve performance, teaching, administration, and develop relevant skills in the disadvantaged communities. It also improve the quality of education by facilitating learning by doing, real time conversation, delayed time conversation, directed instruction, self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and learn.

ICTs Help Expand Access to Education

ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies-scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus.

Anytime, Anywhere Learning

One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, maybe accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational

programming broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location.

Access to Remote Learning Resources

Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. ICTs also facilitate access to resource persons-mentors, experts, researchers, professionals, business leaders, and peers-all over the world.

Learner-Centered Model

Research has shown that the appropriate use of ICTs can catalyze the paradigmatic shift in both content and pedagogy that is at the heart of education reform in the 21st century. If designed and implemented properly, ICT-supported education can promote the acquisition of the knowledge and skills that will empower students for lifelong learning. When used appropriately, ICTs-especially computers and Internet technologies- enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way. These new ways of teaching and learning are underpinned by constructivist theories of learning and constitute a shift from a teacher centered pedagogy-in its worst form characterized by memorization and rote learning-to one that is learner-centered.

Competency and Performance Based Curricula

The moves to competency and performance-based curricula Table 2 are well supported and encouraged by emerging instructional technologies (eg. Stephenson, 2001). Such curricula tend to require:

- Access to a variety of information sources; forms and types
- Student-centered learning settings based on information access and inquiry;
- Learning environments centered on problem-centered and inquiry-based activities;
- Authentic settings and examples; and
- Teachers as Coaches and Mentors rather than content experts.

Table 2: A Comparison of Traditional Pedagogy

Aspect	Less (Traditional Pedagogy)	More (Emerging pedagogy for the information society)
Active	• Whole class instruction • Little variation in activities • Pace determined by the programme	• Working in teams • Heterogeneous group • Supporting each other
Creative	• Reproductive learning • Apply known solutions to problems	• Productive learning • Find new solutions to problems
Integrative	• No link between theory and practice • Separate subjects • Discipline-based • Individual teachers	• Integrating theory and practice • Relation between subjects • Thematic • Teams of teachers
Evaluative	• Teacher-directed	• Student-directed
	• Summative	• diagnostic

Contemporary ICTs are able to provide strong support for all these requirements and there are now many outstanding examples of world class settings for competency and performance-based curricula that make sound use of the affordances of these technologies. For many years, teachers wishing to adopt such curricula have been limited by their resources and tools but with the proliferation and widespread availability of contemporary ICTs, many restrictions and impediments of the past have been removed. And new technologies will continue to drive these forms of learning further. As students and teachers gains access to higher bandwidths, more direct forms of communication and access to sharable resources, the capability to support these quality learning settings will continue to grow.

India is making use of powerful combination of ICT s such as open source software, satellite technology, local language interfaces, easy to use human-computer interfaces, digital libraries, etc. with a long-term plan to reach the remotest of the villages. Community service centers have been started to promote e-learning throughout the country.

To summarize, the Table 3 shows the main benefits of using ICTs in education to the various stakeholders.

Table 3: Benefits of Using ICTs in Education

• Stakeholder	• Benefits
• Students	• Increased access, • Flexibility of content and delivery,
	• Combination of work and education, • Learner-centered approach, • Higher quality of education and new ways of interaction.
• Employers	• High quality, cost effective professional development in the work place, • Upgrading of employees skills, increased

	productivity,
	• Development of new learning culture,
	• Sharing of costs and of training time with the employees,
	• Increased portability of training.
• Governments	• Increased the capacity and cost effectiveness of education and training systems,
	• To reach target group with limited access to conventional education and training
	• To support and enhance the quality and relevance of existing educational structures,
	• To ensure the connection of educational institutions and curricula to the emerging networks and information resources,
	• To promote innovation and opportunities for lifelong learning.

Major Initiatives and Policy for Introducing ICTs in Higher Education

- Indira Gandhi National Open University (IGNOU) uses radio, television, and Internet Technologies.

- National Programme on Technology Enhanced Learning: a concept similar to the open courseware initiative of MIT. It uses internet and television technologies.

- Eklavya initiative: Uses Internet and television to promote distance learning.

- IIT-Kanpur has developed Brihaspati, an open source e-learning platform

- Premier institutions like IIM-Calcutta have entered into a strategic alliance with NIIT for providing programmes through virtual classrooms.

- Jadavpur University is using a mobile-learning centre.

- IIT-Bombay has started the program of CDEEP (Centre for Distance Engineering Education Program) as emulated classroom interaction through the use of real time interactive satellite technology.

- One Laptop Per Child (OLPC) programe in Maharashtra (One Laptop Per Child, 2007).

National Mission on Education through ICT

Under this Mission, a proper balance between content generations, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the advancements in other countries is to be attempted. It has three guiding principles.

Human resource development: Talent in the higher education should be identified, trained and utilized in the service of the country.

E-content/ resource development: Quality e-content should be developed and delivered through the network connectivity of NME ICT.

Building connectivity and knowledge network: In order to provide maximum benefit to the learners, the maximum possible inter- connectivity should remain available among and within institutions of higher learning in the country with a view to achieve critical mass of skilled human resource/ researchers in any given field.

The objectives of National Mission on Education through ICT expected to lead to various important steps in planning and implementation as follows:

- Generation of quality e-content, questions bank as modules-based learning.
- Development of interface modules for physically challenged learners.
- Facility of Geographical Information System (GIS) for planning up to the village level.
- Efficient and effective knowledge transfer to learner with proper interaction
- Voice over Internet Protocol (VOIP) supported communication between learner and teacher
- Enterprises Resource Planning (ERP) and e-governance for education, coordination & synergy for implementation of the policies, setting up virtual laboratories and support for creation of virtual technical universities.
- Performance optimization of e-resources

Technology Parks in India

In addition to the Indian Institutes of Technology and Deemed Universities, India has 1346 Engineering Colleges and 1244 polytechnics approved by All India Council of Technical Education (AICTE). These institutions, in addition to other colleges of science and technology, are playing a major role in the development and management of technology parks.

Table 4: Following Table shows the involvement of the HEIs in Technology Parks.

Region in India	Sectors/areas	Universities/HEIs
Bangalore	ICT software, biotechnology, pharmaceutical.	8 Universities, 50 Colleges
Hyderabad	ICT software, biotechnology, pharmaceutical	9 Universities, 45 colleges
Delhi	ICT software, telecommunication,	8 universities, 55 colleges
Mumbai	ICT software, telecommunication	7 universities, 35 colleges

Information Literacy with National Knowledge Network

The Indian government approved the establishment of NKN in 2010. It is a major step towards building a knowledge society without boundary. It is a multi- gigabit, unified, high speed network that aims to connect over 1500 institutions like universities, research,

institutions, libraries, laboratories, healthcare and agricultural institutions, nuclear, space and defense research agencies in the country. The major benefits of NKN described below are-

- The participating institutions can directly or through distribution layer connect to the NKN at speeds of 100 mbps/1gbbps.

- NKN enables creation of virtual private networks (VPN) for special interest group. It also provides international connectivity to its users for global collaborative research.

- The NKN is a platform for delivering effective distance education where teachers and students can interact in real time. The network enables co-sharing of information such as classroom lecture, presentations and handouts among different institutions.

- The NKN enables collaboration among researchers from different Global entities like GLORIAD, TENNS3, GRAUDA, CERN etc. NKN also enables sharing of scientific databases and remote access to advanced research facilities.

- The virtual library involving sharing of journals, books and research papers across different institutions, is a natural application for NKN.

- The network enables a large number of institutions to access high performance computing to conduct advanced research in areas such as weather monitoring, earthquake engineering and other computationally intensive fields.

2002: Vidya Vahini

In 2002, the Indian government launched a project called Vidya Vahini to provide for IT and IT-enabled education in 60,000 schools in India over three years (India has about 1.1 million schools), as part of a Rs. 6,000 crore (USD 1.2 billion) project. Beginning with a pilot covering 150 schools the government proposes to equip each school with a computer lab equipped with Internet, Internet and television to facilitate video-conferencing, Web-broadcasting and e-learning.

2007: Digital Library and Information Network

Based on recommendations made by different state open universities and distance education institutions (DEIs), the Indira Gandhi National Open University's (IGNOU) board of management has approved the National Open and Distance Learners Library and Information Network (NODLINET) initiative. The expert committee set up by the ministry for human resource development (MHRD) has endorsed the initiative, which will now be implemented in a phased manner within a period of five years.

Internet and Continuing Education Programme

Very soon open and Distance Learning System (ODLS) is going to use Internet for the launch of continuing education programmes. Efforts have already begun in this direction in private sector. Macmillan India Ltd has recently launched a website "elt.macmillan.com" for teachers of English. The site is focused on the teachers and provides them with downloadable worksheets, assignments and guides them in methods of English language teaching.

2005: Indo-US Collaboration

Indo-U.S. Interuniversity Network for Higher Education and Research is collaboration between over 20 American universities and Amrita University, The Indian Space Research Organization (ISRO) and the Department of Science and Technology (DST) to enhance higher education and research in India through the Edusat e-learning network. The Indo-US collaboration will use Edusat to deliver classes taught by US faculty to hundred of colleges and universities throughout India.

Factor Affecting Adoption of ICT in Education

There is a worldwide need felt for integrating ICT into education in order to improve the pedagogy to reflect the societal change. The main goals of ICT adoption in the education field are reducing costs per student, making education more affordable and accessible, increasing enrollments, improving course quality, and meeting the needs of local employers. The main factors that affect the adoption of ICT in education are the mission or goal of a particular system, programs and curricula, teaching/learning strategies and techniques, learning material and resources, communication and interaction, support and delivery systems, students, tutors, staff and other experts, management, housing and equipment, and evaluation. National vision, supported by coherent strategies and actions is the most important factor in integrating ICT in education. Successful implementation of ICT requires strong national support from government and local support from relevant institutions and education authorities. Cost is an important issue that decides and guides the adoption and growth of Information and Communication Technology especially in developing countries. Ozdemir and Abrevaya (2007) mention that the institutions, which are granted public status and are supported by government funds, as well as those, that are larger in size, are the ones to adopt the new technologies to support education. However, it is also observed that since technology adoption involves high fixed costs, institutes, which implemented such technology, did not upgrade it as time progressed. The presence of an ICT champion is necessary at all levels of the system. The strong presence of such leadership is evident

wherever ICT integration has been initiated successfully. Along with ICT training, one needs and ICT related support mechanism to gradually induce the integration this is needed as many teachers in face of technical difficulties may tend to revert to the older teaching (non-ICT based) methods. Teachers need support in using and integrating ICT into the curriculum and teaching. Teachers, who perceive greater ICT-related support being available to them, use technologies in their teaching much better.

Conclusion

Changes in the curriculum do support fundamental economic and social transformation in the society. Such transformations require new kinds of skills, capabilities and attitudes, which can be developed by integrating ICT in education. The overall literature suggests that successful ICT integration depends on many factors. National policies as well as school policies and actions taken have a deep impact on the same. Similarly, there needs to be an ICT plan, support and training to all the stakeholders involved in the integration. There needs to be shared vision among the various stakeholders and a collaborative approach should be adopted. Care should be taken to influence the attitudes and beliefs of all the stakeholders.

These insights are useful for establishing the ICT learning environment to excel in the higher education. ICT have no doubt transformed the manner in which we consume knowledge, the sheer breadth of the resources at our disposal. The role of ICT in education is significant, as we access and absorb information more quickly than before. Today the 1.7 billion people are online almost a third of the humanity. ICT in education guarantee a long and exciting journey ahead to brush up the level of education in colleges and universities all over the world.

ICT can affect the delivery of education and enable wider access to the same. In addition, it will increase flexibility so that learners can access the education regardless of time and geographical barriers. It can influence the way students are taught and how they learn. It would enable development of collaborative skills as well as knowledge creation skills. This in turn would better prepare the learners for lifelong learning as well as to join the industry. It can improve the quality of learning and thus contribute to the economy.

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