Integration of ICT and Education: A Roadmap for Quality Education in the 21st Century

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ABSTRACT

Information and communication technologies (ICT) have become commonplace entities in all aspects of life. Integration of Information and Communication Technologies (ICTs) into education has been an important concern in many countries. Information technology is an amalgam of some wonderful inventions of the 21st century in electronics and communication. During a very short span of time it has acquired an important place in almost all aspects of human life and particularly in the field of education. In this paper, an attempt has been made by the authors to discuss how Information Technology has revolutionised the Higher Education system. Besides, the scope of web based learning in the 21st century and the role of Technology in the delivery system has also be an epoch task of this paper. In addition, the paper addresses the integration and convergence of ICT and education. In introduction section, it explains the ICT, education, and ICT-enhanced education. In next section it describes need of ICT in education, relationship between ICT skills and education, and stages of teaching learning process. The next two sections describe opportunities and challenges in integrating ICT in education. Finally the concluding section summaries the idea and its usefulness.

Key words: Education, Learning, Teaching, Information and Communication Technology, Higher Education, E-Learning.

Introduction

It is a gospel truth that knowledge, teaching and learning are strongly linked with society and its evolution. One cannot teach or learn nowadays the same way as a century ago. More particularly, the quick and deep changes brought by ICT (Information and Communication Technologies) have a strong influence on knowledge, teaching, learning. In terms of information, communication, computers, and technology, youngsters have new abilities, new approaches, new concepts. Certainly education has to take this into account, particularly at a time when students seem to be more competent than teachers in technological abilities. Initially, we began to use the term IT, or Information Technology, to describe computers and these various peripheral devices. Then the internet arrived together with computer networks, the World Wide Web, email and search engines. A new term entered the language – ICT. The term ICT, short for Information and Communication Technologies, embraces the many technologies that enable us to receive information and communicate or exchange information with others. You see what some of these many technologies (both devices and functions) are in Figure 1

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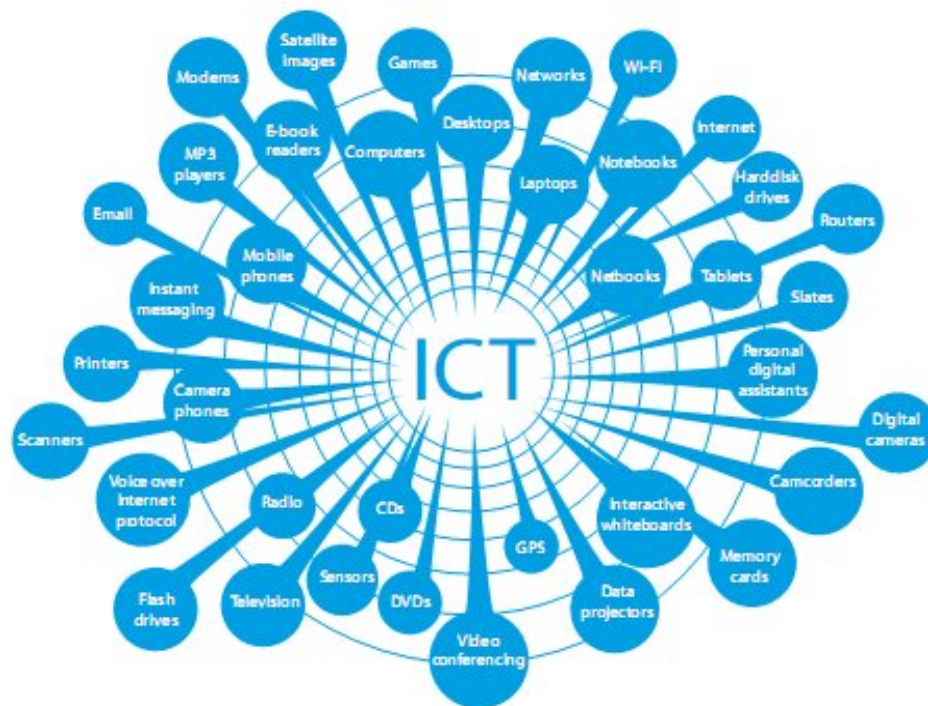*Assistant Professor Education, Directorate of Distance Education, University of Kashmir, Srinagar.

Figure 1: ICT comprise many technologies for capturing, interpreting, storing and transmitting information.

Source: Adapted from Anderson, J. (2010) Anderson, ICT Transforming Education a Regional Guide, UNESCO Bangkok.

Information and Communication Technologies (ICTs) are often associated with the most sophisticated and expensive computer-based technologies. But ICTs also encompass the more conventional technologies such as radio, television and telephone technology. While definitions of ICTs are varied, it might be useful to accept the definition provided by United Nations Development Programme (UNDP): 'ICTs are basically information-handling tools- a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the 'old' ICTs of radio, television and telephone, and the 'new' ICTs of computers, satellite and wireless technology and the Internet. These different tools are now able to work together, and combine to form our 'networked world' – a massive infrastructure of interconnected telephone services, standardized computing hardware, the internet, radio and television, which reaches into every corner of the globe'.

When we talk of ICTs, we refer not only to the latest computer and Internet based technologies, but also to simple audio visual aids such as the transparency and slides, tape and cassette recorders and radio; video cassettes and television; and film. These older and more familiar technologies are referred to under the collective heading of "analogue media" while the newer computer and Internet based technologies are called the "digital media".

As we are in the womb of the 21st century, there has been considerable international attention given to the role that ICT can play in economic, social, and educational change. The United Nations and the World Bank both advocate the use of ICT to support the development of the world's poorest countries. A World Bank (2003) report cites the potential that ICT has to improve efficient delivery of resources to the poor, to bring markets within reach of rural communities, to improve government services, and to transfer knowledge needed to meet the Millennium Development Goals.

ICT in education is an area which is in turmoil and in which many participants play a role. Forces that operate on the micro- and meso-level of the education system (that is at schools and in classrooms) may be influential in bringing about changes that are beyond the direct control of ministries of education. Therefore, it is important for educational decision making to periodically assess the actual situation of ICT in educational practice.

Tinio (2002), states the potentials of ICTs in increasing access and improving relevance and quality of education in developing countries. Tinio further states the potentials of ICT as follows:

> *ICTs greatly facilitate the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance educational systems, improve policy formulation and execution, and widen the range of opportunities for business and the poor. One of the greatest hardships endured by the poor, and by many others, who live in the poorest countries, in their sense of isolation, and ICTs can open access to knowledge in ways unimaginable not long ago.*

The integration of ICT into education has been assumed as the potential of the new technological tools to revolutionize an outmoded educational system (Albrini, 2006). In the last 20 years, initiatives, projects and implications related to use of Information and Communication Technologies (ICTs) into education motivate teachers to gain necessary knowledge and skills in using ICT in their instruction. Pelgrum (2001) has noted that:

> *ICT is "not only the backbone of the Information Age, but also an important catalyst and tool for inducing educational reforms that change our students into productive knowledge workers" (p. 2).*

ICT plays a critical role in shaping the educational systems of different societies around the globe. In these societies, the stakeholders of educational policy, redesign and reconstruct their educational systems based on the new educational paradigms such as constructivist theory so that both teachers and students develop the necessary knowledge and skills sought in this digital age. Hence, most countries around the world are focusing on approaches to integrate ICT in learning and teaching to improve the quality of education by emphasizing competencies such as critical thinking, decision-making, handling of dynamic situations, working as a member of a team, communicating effectively (Anderson & Weert, 2002). Also governments especially in developing countries have tried to improve their national programs to integrate ICT into education. India has also launched a national mission on ICT and Education under the name of Saksharat.

Not only in India, the whole world realized the importance of ICT in education sector especially in the area of higher education. A motivational remark by one of the illustrious sons of Africa summarizes the need for ICT as a facilitator for socio-economic development and to bridge the digital divide:

> *"We paid the price of not taking part in the Industrial Revolution of the late eighteenth century because we did not have the opportunity to see what was taking place in Europe. Now we see that*

information and communication technology has become an indispensable tool. This time, we should not miss out on this technological revolution"

Classification of Learning on the Basis of ICT

In view of ICT, education can be classified in three main categories- E-Learning, Blended Learning, and Distance Learning.

1. **E-Learning:** Electronic learning or e-learning is a general term used to refer to computer-enhanced learning. It is commonly associated with the field of advanced learning technology (ALT), which deals with both the technologies and associated methodologies in learning using networked and/or multimedia technologies. It is also known as *online learning.* Distance education provided the base for e-learning's development. E learning can be "on demand". It overcomes timing, attendance and travel difficulties.

2. **Blended Learning:** Blended Learning is the combination of multiple approaches to learning. It is usually used to define a situation where different delivery methods are combined together to deliver a particular course. These methods may include a mixture of face-to-face classrooms, self-paced learning and online classrooms as shown in Fig. 1:

i. *Face to Face Learning:* Face to face learning refers to learning that occurs in a traditional classroom setting where a faculty member delivers instruction to a group of learners. This could include lectures, workshops, presentations, tutoring, conference and much more.

Fig. 2: Blended Learning

ii. *Self Paced Learning:* Self paced learning provides the flexibility to learn according to the availability of learners' own time and pace, it occurs in a variety of ways such as: reading specific chapters from text book, studying course material presented through web-based or CD-based course, attending pre recorded classes or sessions, reading articles referred by faculty member, working on assignments & projects, and searching & browsing the internet.

iii. *Online Collaborative Learning:* Online collaboration involves interaction between learners and faculty members through the web; this interaction can occur in one of the following modes:
   - Synchronous interaction
   - Asynchronous interaction

Synchronous, means "at the same time", it involves interacting with a faculty member and other learners via the Web in real time using technologies such as virtual classrooms and/ or chat rooms. On the other hand, Asynchronous means "not at the same time"; it enables learners to interact with their colleagues and faculty member at their own convenience; such as interacting through email.

3. ***Distance Learning:*** In this type of learning, ICT plays a crucial role in bridging the gap of time and space via e-mail, electronic forums, videoconferencing, chat rooms, instant messaging and other forms of computer-based communication. It is also known as open learning. Most distance learning programs include a computer based training (CBT) system and communications tools to produce a virtual *classroom.* Because the Internet and World Wide Web are accessible from virtually all computer platforms, they serve as the foundation for many distance learning systems.

ICT and Learning

In this section, the need of ICT in computerization of educational institutes, relationship between different kinds of ICT use in learning, and model for teaching – learning process are accessed**.**

1. **Assessment of ICT Need:** ICT needs for successful nationwide institutes computerization program can be described as a hierarchy, as shown in Fig. 2. The first visible part of the pyramid shows the ICT needs in education and corresponding second visible part of the pyramid hints what are required to fulfill corresponding ICT needs.

- Access to modern and stable ***ICT infrastructure*** by all teachers and students.
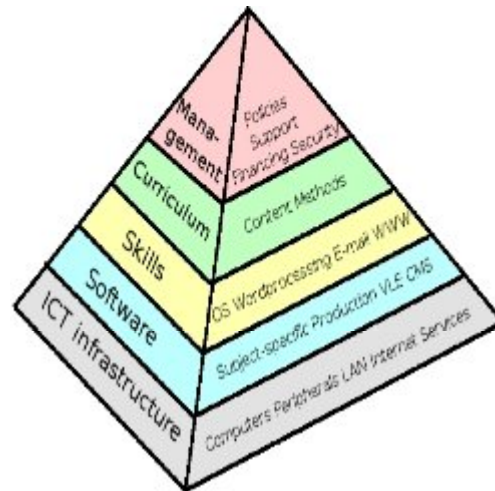

Fig. 3 Pyramid of ICT needs in education

- Multifunctional, licensed ***software*** tools and services for educational use (including Virtual Learning Environments and Content Management Systems).

- ICT ***skills*** of students and institute staff.

- Integration of ICT into **curriculum** that provides valid goals, content and methods for using ICT in institute.

- Management of the ICT innovation on the institute, district, state and national level.

    The hierarchy of ICT needs shown by the pyramid does not imply that the low-level needs (ICT infrastructure and software) should be completely satisfied before high-level needs could be addressed. Suggested approach is to deal with all levels at once, in the systemic, integrated and coordinated manner.

2. **Relationship between Different Kinds of ICT Use in Learning:** The relationship between different kinds of ICT use in learning is shown in Fig. 3. It shows that ICT skills for IT jobs, derived from a partial subset of those needed for enhanced living and employment opportunities; and ICT skills for enhanced living and employment opportunities is derived from subset of those ICT skills which are needed for learning in all curriculum areas.
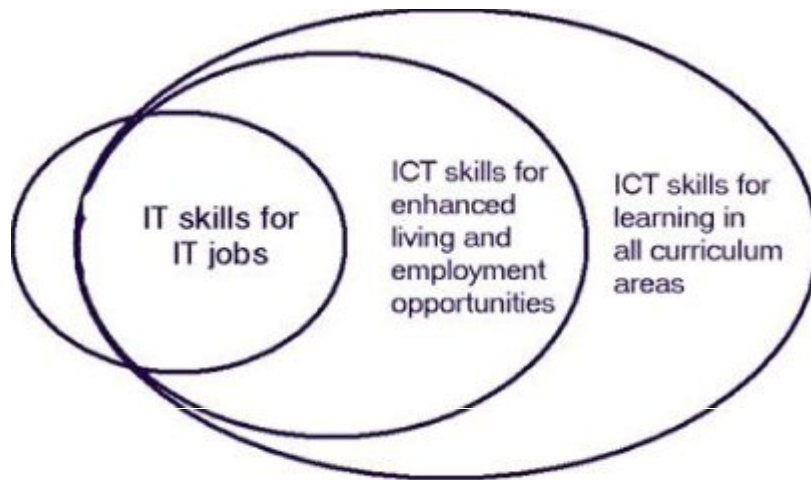
Fig. 4: Relationship between different kinds of ICT use in learning

3. **Stages of Teaching and Learning:** Teaching and learning process is always going together; we cannot consider these two as separate and independent activities. In fact, these are similar as two sides of the same coin, interconnected and interrelated. The process of teaching and learning in institutes around the world can be divided into four main stages. These four stages are shown in Fig. 4.

Source: Adapted from Daniel, J. 2002.

Stage 1 - Discovering ICT tools:

This stage focuses on discovery of new ICT tools by teachers and students. This is linked with the emerging approach in ICT development.

Stage 2 – Learning how to use ICT tools:

Fig. 5 Model of stages of teaching and learning using ICT

This stage emphasizes on learning the use of new ICT tools. It involves the use of general or particular applications of ICT.

Stage 3 – Understanding how and when to use ICT tools:

It focuses on understanding how and when to use ICT tools to achieve a particular purpose, such as in completing a given project. This stage indicates the ability to recognize situations where ICT will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination to solve real problems.

Stage 4 – Specializing in the use of ICT tools:

The fourth and last stage involves specializing in the use of ICT tools. This requires deep knowledge about using ICT tools. In this stage, students study ICT as a subject to become specialists. Such study concerns vocational or professional education rather than general education.

Opportunities of Integrating ICTs in Education

Modern universities and institutes have a mission to make teaching learning process effective and interesting. Study of use of ICTs in education, reveals the following opportunities:

1. **Improved Teaching Learning Process:** The traditional way of teaching learning process can be made more effective and interesting by using information and communication technologies. For example, when a teacher uses audio, video, or power point presentations in his/her lecture, the whole class becomes more attentive about the lecture. Such activities also help students to understand the things easily.

2. **Increased Availability of Study Material:** In traditional learning system, students and teachers are limited to get knowledge on a particular topic through printed materials only. But use of ICT facilitates them to get variety of study materials on a particular topic using internet from any where and any time.

3. **Support for Distance Education and E-Learning:** The use of ICT supports distance education and e-learning. Each of the different ICTs - prints, audio/video cassettes, radio and TV broadcasts, computers or the Internet may be used for this purpose. There is a minor difference between distance education and e-learning. The use of ICTs is higher in e learning than distance learning.

4. **Improved Admission and Examination Process:** Using ICTs universities and institutes can improve the admission process by putting admission form online and receiving completed form online. They can also generate admit cards for entrance examination online. Even they can conduct entrance and semester/ annual examination online. This will speed up admission and examination process. It also helps in faster result declaration.

5. **Help in Research Activities:** Application of ICT in education enriches the research activities. Researchers can get information about recent developments in different segments, collect variety of information on a particular topic, and can generate innovative ideas and new findings. Using appropriate software we can easily calculate complex calculations and generate variety of graphs.

Challenges in Integrating ICTs in Education

While considering the opportunities associated with ICT enhanced education it can be said that ICT-enhanced education is better than a simple education, but there are many challenges, which hamper the exploration and exploitation of its opportunities. In view of integrating ICTs in education have following key challenges:

- *ICT Infrastructure:* The main challenge for ICT-enhanced education is the availability of information and communication technologies infrastructure. Before any ICT-based program is launched, policymakers and planners must ensure the availability of the followings: appropriate rooms or buildings to house the technology, computers as well as affordable Internet service for on line learning, and availability of electricity and telephony. In developing countries large areas are still without a reliable supply of electricity and the nearest telephones are miles away.

- *Language and Content:* English is the dominant language of the Internet. An estimated 80% of online content is in English (Stephen, 2001). A large proportion of the educational software produced in the world market is in English. For developing countries in the Asia- Pacific where English language proficiency is not high, especially outside metropolitan areas, this represents a serious barrier in maximizing the educational benefits of the World Wide Web. Even in countries such as Philippines, Malaysia, Singapore, and India where English is a second language; it is desirable that teaching and learning materials, preferably be developed in the local languages.

- ***Teachers with ICT Skills:*** Lack of teachers equipped with ICT skills is another problem for the use of ICT in education. The institutes where ICT is going to be integrated in education, first of all their teachers must be well trained about ICT tools in education. Before going to teach to students, teachers must know about how and when to use ICT tools to achieve particular purposes.
- ***Change Management:*** Managing the change is one of the biggest problems, as teachers don't want to accept change easily. Change management issues must be addressed as new work practices, new ways of processing and performing tasks are introduced. In general a large number of teachers in educational institutes are non ICT proficient, and resistance to change.

  Research has shown that the strategy of adding technology to the already existing activities in institutes and in the classroom, without changing habitual teaching practices, does not produce good results in student learning (Thompson, et.al, 1996). The reason for this is due to the fact that the vast majority of teachers are not proficient users of technology, especially computer technology. A number of studies have shown that most teachers consider the two main obstacles to using technology in pedagogical practices to be a lack of resources and training (Pelgrum, 2001).
- ***Leadership:*** Integrating ICT in education is not an easy task, as it requires a wide range of support including higher management, and teachers. Therefore it is necessary to properly convince them for their support, and for this task a leader is required. Leadership is necessary before, during and after project implementation. Before the project is initiated, leadership is needed in order to explain the model, the concept and create awareness; during the project, leadership is needed to manage change and support the project; and after the project, it is needed to pledge the required adaptability and flexibility of the initiative.

Conclusion

The present age is the age of technology, whereby technology plays a key role in daily lives; this also includes the education system. There are endless possibilities with the integration of ICT in the education system. The use of ICT in education not only improves classroom teaching learning process, but also provides the facility of e-learning. E-learning has rendered convenience of online learning to thousands of learners who can not avail the benefits of higher education due to several constraints, such as, time, cost, geographical location, age, etc. ICT has enhanced distance learning. The teaching community is able to reach remote areas and learners are able to access qualitative learning environment from anywhere and at anytime. It is important that teachers or trainers should be made to adopt technology in their teaching styles to provide pedagogical and educational gains to the learners.

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