



# Information and Communication Technology and Higher Education

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## I. INTRODUCTION

Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now understanding the importance of ICT and mastering the basic skills and concepts of it as part of the core of education. Organizations, experts and practitioners in the education sector increasingly recognizing the importance of ICT in supporting educational improvement and reform. The paper highlights, with current trends in the use of ICTs and the new dynamics that they are creating in higher education. This paper also examines the role of technology (ICT) in shaping the future of higher education.

## II. APPLICATION OF ICTS IN HIGHER EDUCATION

The use of information and communication technology (ICT) in all spheres of human endeavour has become increasingly evident over the past decade, with people of all ages making use of computers and the Internet to interact, communicate and do business on a daily basis. The use of ICT in higher education has also been shown to increase the channels of communication and facilitate collaborative learning, creating a framework for the social construction of knowledge. These characteristics of the use of ICT in higher education allow students to take greater responsibility for learning, and for educators to act as facilitators of learning.

Applications of ICTs are particularly powerful and uncontroversial in higher education's research function. Four areas are particularly important. First, the steady increases in bandwidth and computing power available have made it possible to conduct complex calculations on large data sets. Second, communication links make it possible for research teams to be spread across the world instead of concentrated in a single institution. Third, the combination of communications and digital libraries is equalizing access to academic resources, greatly enriching research possibilities for smaller institutions and those outside the big cities. Fourth, taking full advantage of these trends to create new dynamics in research requires national policies for ICTs in higher education and the establishment of joint information systems linking all higher education institutions. For these applications high bandwidth is the key priority since it allows computing power to be aggregated by linking equipment together.

## III. MODERN INFORMATION TECHNOLOGY AND QUALITY IN HIGHER EDUCATION

The modern information technology has greatly extended the possibilities of enrichment of information, knowledge and skill. Development of e-books, e-journals, e-libraries, e-encyclopedias, e-photography, electronic audio-visual aid, etc. has opened up a world of possibilities before us. Internet can be used to download a variety of reading materials, often illustrated by means of audio-visual aid. Illustration may be static with different color schemes or dynamic with the use of animation. Thousands of books, if in e-form, can be scanned to search and retrieve the required information in no time. Scores of thousands of books can be carried in a small external hard disk or a laptop computer and they can be copied on to other storage devices. Student can store in a pen drive all their textbooks covering the entire syllabus for a semester or even for two years' program. Internet and the World-Wide Web have opened up the entire world for the seekers of information. Now we need not depend on the availability of printed books in the traditional libraries. Visiting traditional libraries, searching the right type of book, reading its content, taking notes, etc. are now the practice of the olden world. Internet can give us an access to any library in the world if it exists on a node of the World-Wide Web. Thus it helps in reducing the knowledge and skill gap among the regions and the nations and consequently fostering greater equalities in socioeconomic and technological opportunities and achievements.

## IV. REMOVING OBSTACLES TO LEARNING

A variety of software and soft-ware based teaching aid are available now. Software can read out the text loudly (if, for example, the text is in the PDF format and the Acrobat reader is used) and thus visually impaired persons can also 'read' the text without the help of Brail or a human reader assisting them. There are a number of software programs that teach mathematical concepts,



numerical methods, problem solving and such arts step by step. Certain exercises that earlier were highly labour and time consuming and error prone too, can now be done and redone within no time to get at them.

#### V. SUPPORT TO CREATIVITY

Teachers can search out on the relevant web sites the reading materials best suited to their students and hyperlink those websites in their own web pages. They can compile, edit, write, illustrate, vocalize and animate the illustrations so as to make the reading materials rich, lively and student friendly, and post them on web pages that may help not only their own students but the students anywhere in the world. This is being done vigorously in the West, but India is still lagging much behind the more developed and web-conscious nations. Research students can now easily scan through the contents of journals relevant to them. They can contact the experts via email, arrange an e-conference and discuss their findings with them. They can also ventilate their ideas to others and benefit by the comments and observations made by others living far away in the distant lands.

#### VI. REMOVING OBSTACLES TO CREATIVITY

One may note that the traditional method of ventilation of one's ideas through printed journals is not only outdated, costly, time-taking and restrictive; it is also so often biased. The referee system does not always work in favour of a healthy development of science. The journals and the referees have their own biases. This bias of the traditional method against putting on record one's own scientific ideas and findings can be overcome by the use of the internet which allows web publishing. Archives that publish working papers on their web pages are also useful.

#### VII. ADDING TO RELEVANCE OF EDUCATION

Initially land and other natural endowments were the most important sources of social and economic development of the nations/people. After the Industrial Revolution, manufacturing and therefore physical capital overtook the prominence of agriculture and remained in throne for centuries. However, for a century now, the role of education in shaping development has come into the forefront. Education has been the major contributor to making of the human capital, and thus it has been the most important factor in promoting growth and welfare of the modern society. However, it may be noted that natural endowments and human resources as well as the historical forces together with social institutions of a region/nation determine as to the kind of knowledge which would be more suitable to attain a higher level of development with social wellbeing. This is to say that different regions/nations have different kinds of knowledge and skill appropriate and suitable to them.

The people who can visualize the knowledge and skill requirements of a specific society (intelligentsia) can also plan for a suitable educational policy, write extensively to mould the public opinion in favour of such knowledge and skill, create and disseminate knowledge and give direction to others for creating relevant knowledge. Conventionally it has been done through the printed media and personal contacts. The modern information technology can help in a great way to promote such activities fast and inexpensively with much larger coverage and better appeal. As the impact of television is much more than the older newspaper based or radio-based media, so will be the impact of education if it is based on the modern information technology. A television (or any mode of relaying audiovisual plus textual information together) uses more number of sense organs (eyes, ear, mental capacity to read) than a textbook or a radio broadcast that (often) uses only one of them.

#### VIII. COST-EFFECTIVENESS AND IT-BASED EDUCATIONAL MATERIALS

Electronic documents (e-books, journal articles, etc.) are very easy and inexpensive to search, download, duplicate and distribute. Communication by e-mail is extremely fast and inexpensive. It is easy to arrange conferences. Storage of e-materials is extremely space-saving, resource-saving and safe. It is also aligned to the benefits of the paperless economy with far-reaching favourable effects in terms of saving energy and environment.

#### IX. FAVOURABLE EFFECTS ON COOPERATION, EMPATHY AND COMPASSION

Partly due to its inexpensive nature and a new "give-and-take" culture emerging due to the spread of the IT based culture, there is an increased sense of reciprocation, coordination, empathy and compassion among the scholars working in and across different disciplines. Information technology has given rise to the "blog" culture which has proved to be very effective in solving problems of those who participate in it. A participant posts a problem on the 'blog page' and numerous others respond to solve the problem.

A new culture of crowd-sourcing is emerging. This culture is based on the premise that the urge to solve the problem of others is not tied with the expectation of any material gain except the satisfaction derived from solving the problems and, occasionally, an acknowledgment of appreciation for doing so. It has also been found that use of IT methods for educational and research purpose promotes the sense of value of time, mutual dependence, reciprocation and cooperation. Although carried out with the expectation of long-run gains, IT professionals and firms provide many software/programs free of cost to the users. It may be noted that while many of us want to read, there are many who aspire for being read. The IT culture has brought them together for



gratification of both the desires. It has also been found that due to increased visibility the e-based reading materials are read and referred more frequently than the print-based reading materials.

## X. IMPACT OF ICTS ON HIGHER EDUCATION

The impact of ICTs on higher education has been second only to their impact on business practices around the world. A broad survey of national efforts shows that the use of ICTs in higher education is as extensive as it is diverse. ICTs can provide marginalized groups access to schools and educational resources, enhance the quality of teaching and learning, and improve administrative and instructional efficiency. The potential benefits of ICTs are more likely to be realized when ICTs are introduced in the context of system-wide reform in higher educational policies and practices. Real learning gains and the improvement of an education system will take place only when all of the elements of educational change, from policies and practices, to teachers, learners and other stakeholders, come together.

With many developing countries envisioning a future in which they hope to become learning societies built on knowledge economies, higher education has a signal role to play in development strategies in the pursuit of such aspirations. The accounting firm KPMG recently released research which estimates, conservatively, that the real rate of return on investments in the education and research functions of universities yields 15% or more for university training and 20% - 40% for public university research. This finding should give countries confidence to increase their investments in higher education.

No knowledge economy can function without ICTs. Therefore, it is imperative that higher education institutions afford their graduates the literacy and competencies that their future work environments are likely to demand of them. Furthermore, being ICT-rich gives an HEI a competitive advantage in recruiting students. In many countries, demand for higher education far outstrips supply and Governments and institutions are turning more and more to the use of ICTs to bridge the access gap. It is too early to say whether the role of ICTs in the teaching function of higher education is truly transformative, or whether it is simply a repackaging of previous pedagogy.

The importance of overarching and guiding telecommunications and ICT policies at the national level, particularly as they relate to ICTs in education, cannot be overemphasized. Not only do such policies enable institutions and networks of institutions to generate their own internal ICT policies, strategies and plans, they also foster an appropriate allocation of resources. In institutions, they determine staffing issues and faculty roles and how these can be made sustainable. In response to increased demand for higher education, many countries are witnessing the mushrooming of higher education institutions, both private and public.

Bricks and mortar may be a necessary part of the accommodating infrastructure for this expansion but they are not sufficient to meet and address all the access issues in the sub-sector satisfactorily. Nationally, where the infrastructure exists, many institutions working together could tap into an ICT network to facilitate collaboration and sharing to cut down on costs and optimize the returns gained in the use of ICTs. ICT networks are critical for the successful implementation of ICTs in education; well-articulated policies will ensure that such access is possible.

## XI. CONCLUSION

The role of and potential for ICTs in the higher education sector is not an issue separate from educational reform efforts, but rather inextricably intertwined. ICTs are important tools to meet Millennium Development Goals of access to and quality improvements of higher educational programming for all children. Evaluation is a crucial process to assess how and when to use ICTs to achieve desired outcomes and to what degree perception and reality align. The perception of ICT impacts however among stakeholders is mostly positive and whether ICTs can meet the expectations is dependent upon how such solutions are implemented.

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