
Role of ICT in Higher Education **(A mechanism for Improving the quality and Accessibility)**

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India has significant advantages in the 21st century knowledge race. It has a large higher education sector, the third largest in the world (in student numbers) after China and the United States. It uses English as a primary language of higher education and research. It has a long academic tradition. Academic freedom is respected. There are a small number of high quality institutions, departments, and centers that can form the basis of quality sector in higher education (Bundy, 2004). The fact that the States, rather than the Central Government, exercise major responsibility for higher education creates a rather cumbersome structure, but the system allows for a variety of policies and approaches.

Information and communication technology (ICT) has become an essential entity in all aspects of human life. The use of ICT has tremendously changed the ways and practices of all forms of endeavor within business as well as governance. Education sector is also not an exception either though the impact is not as extensive as in other fields. Also all experts and practitioners in the educational sector i.e. primary, secondary and higher. ICT is changing the way we work, communicate organize, conduct business, gather and process information, even how we play and entertain. It is not a revolution in concepts (Reddy, 2010). But when one looks at education, there seems to have been an uncanny lack of influence and far less change than other fields have experienced. A number of people have attempted to explore this lack of activity and influence (Soloway and Prior, 1996; Collis, 2002).

The last two decades have witnessed a revolution caused by the rapid development of Information and Communication Technology (ICT). ICT has changed the dynamics of various industries as well as influenced the way people interact and work in the society (UNESCO, 2002; Bhattacharya and Sharma, 2007; Chandra and Patkar, 2007). Internet usage in home and work place has grown exponentially (McGorry, 2002). ICT has the potential to remove the barriers that are causing the problems of low rate of education in any country. It can be used as a tool to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (McGorry, 2002).

But in recent times, factors have emerged which have strengthened and encouraged moves to adopt ICTs into classrooms and learning settings. These have included a growing need to explore efficiencies in terms of program delivery, the opportunities for flexible delivery provided by ICTs (Oliver & Short, 1996); the capacity of technology to provide support for customized educational programs to meet the needs of individual learners (Kennedy & McNaught, 1997); and the growing use of the Internet and WWW as tools for information access and communication (Oliver & Towers, 2000). As we have entered into the 21st century, with the strong bearing of ICTs in contemporary education, we will soon see a huge change in educational planning and delivering system.

Considering this, it is necessary to find ways to make education of good quality, accessible and affordable to all, using the latest technology available. The purpose of this paper is to promote integration of Information and Communication Technologies (ICT) in higher education for imparting easily accessible, affordable and quality higher education in India.

Quality of higher education is a multi-dimensional concept. It lies in effectiveness of transmitting knowledge and skill; the authenticity, content, coverage and depth of information; availability of reading/teaching material; help in removing obstacles to learning; applicability of knowledge in solving the real life problems; fruitfulness of knowledge in personal and social domains; convergences of content and variety of knowledge over space (countries and regions) and different sections of the people; cost-effectiveness and administrative efficiency. With the advent of ICT and Internet, Physical boundaries are vanishing, distances are shrinking and the world is connecting itself into a single global village. In order to become developed country, ICT play a vital role because the revolution in information Technology has opened new horizons for education.

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Learning's is no longer an initial activity preparing one for the productive life, but rather a continuous necessity to cope with the demands of the society, such information communication technology provides opportunities for flexibility interactivity and accessibility through multi-channel applications.

Profiling the Higher Education in India

Higher education means different things to different people. It generally includes colleges, universities and university level institutions. The specific features of higher education are: imparts in-depth knowledge and understanding so as to advance students to new frontiers of knowledge in different walks of life; develops students' ability to question and seek truth and makes him/her competent to be a critique on contemporary issues; broadens the intellectual powers of the individual within a narrow specialization and gives the students a wider perspective of the world around.

The system of higher education now existing in India was originally implanted by the British rulers in the mid-19th century to serve the colonial economic, political and administrative interests, and in particular, to consolidate and maintain their dominance in the country. Though higher education is very old in India, modern higher education in India began with the establishment of Hindu College in Calcutta in 1817. By 1855, there were 281 High Schools and 28 Colleges. To regulate them, three universities; Bombay, Calcutta and Madras were established in 1857 by then British Indian Government. The growth continued un-impeded and by 1947, there were 19 universities, 496 colleges with 240000 students. University Education Commission, 1948-49 (popularly known as Radhakrishnan Commission) emphasized the need for setting up an apex body to coordinate the growth and development of education at the tertiary level and maintenance of standards in education. Thus, the University Grant Commission (UGC) came into existence by an Act of Parliament in 1956.

In the last five half decades, the growth of higher education presents a very impressive picture. There has been commendable quantitative expansion in terms of students' enrollment, number of teachers, colleges, universities and research degrees.

Institutions: At the end of X Plan (31.03.2007), there were 363 Universities (20 Central, 229 State, 109 Deemed and 5 Institutions under Special State Legislature Acts) and 21,170 colleges in the country. At the end of the third year of XI Plan (2009-10), the number of Universities has gone up to 493 (42 Central, 130 Deemed and 316 State Universities has gone up to 493 (42 Central, 130 Deemed and 316 State Universities and 5 Institution established under Special State Legislature Acts) and the number of Colleges to 31,324, thus registering an increase of 36 % in the number Universities and 48 % in the case of Colleges in comparison to the figures at the end of X Plan. The type-wise number of universities and colleges as on 3.03.2010 is indicated in the Table 1.

Table 1

Type-wise number of University/ University Level Institutions and Colleges as on 31.03.2010

Sl No.	Type of Institutions	Number of Institutions (As on 31.03.2009)	Number of Institutions (As on 31.03.2010)
1.	Central Universities	40	42
2.	State Universities	231	256
3.	State Private Universities	21	60
4.	Institutions established through State Legislation	5	5
5.	Institutions Deemed to be Universities	128	130
	Total	425	493
6.	Colleges	25951	31324

Source: Annual Report 2009-10, UGC

Students Enrolment

During the academic year 2009-10, there had been 146.25 lakhs (Provisional) students enrolled in various courses at all levels in universities/ colleges and other institutions of higher education as compared to 136.42 lakhs in the previous year, registering an increase of 7.2 percent. Out of 146.25 lakhs, 60.80 lakh and been women students, constituting 41.6 percent. The enrolment of women students, in terms of absolute numbers, had been the highest in the state of Uttar Pradesh (8.4 lakhs), followed by Maharashtra (7.8 lakhs), Andhra Pradesh (6.1 lakhs), Tamil Nadu (5.2 lakhs) etc. in terms of percentages, Goa accounted for the highest percentage of 59%, followed by Kerala (57%), Punjab & Meghalaya (51%) etc. indicating the dominance of girl students over boys in these states and Andaman & Nicobar Islands (52%), Chandigarh (51%), Puducherry (50%) among the Union Territories.

Faculty-wise Enrolment

The distribution of students, across various faculties, during the academic year 2009-10 had been as under:

Out of the total enrolment of students (146.25 lakhs), 42.01% students had been in the faculty of Arts, followed by 19.30% in Science and 17.83% in Commerce/ Management. Thus, 79.14% of the total enrolment had been in the three faculties of Arts, Sciences and Commerce/ management while the remaining 20.86% had been in the professional faculties indicating the highest percentage in Engineering /Technology (10.33%), followed by the Medical courses (3.48%), etc. In a country like India, Where Agriculture and allied occupations are the main occupations, the enrolment in agriculture courses had been just 0.55 percent and in Veterinary Science, it is miniscule 0.14 percent. Thus, it is evident from the faculty-wise distribution of enrolment that the ration of professional to non-professional enrollment has been 1:4 and hence there is a need for an appropriate policy change which may rationalize and reduce the disparity.

Research Degrees

The number of research degrees (PhDs.) awarded by various universities decreased from 13,237 in 2007-08 to 10,781 in 2008-09, the faculty of Arts had the highest number with 3496 degrees, followed by the faculty of Science with 3317 research degrees. These two faculties together accounted for 63 percent of the total number of research degrees awarded. In the professional faculties, the faculty of Engineering and Technology had topped with as many as 1141 Ph. D degrees, followed by Agriculture faculty with 423 degrees and Education faculty with 403 degrees. It is noted here that there is a decreasing trend in academic research in terms of number of research degrees awarded by the Universities during 20087-09 as compared to the figures for 2007-08.

Growth in Enrolment of Women in Higher Education: There had been a phenomenal growth in the number of women students enrolled in higher education, since independence. The women enrolment which was less than 10 percent of the total enrolment on the eve of Independence had risen to 41.6 percent in the academic year 2009-10. The pace of growth has been particularly faster in the last two decades. As the data in Table 2 shows that the number of women enrolled per hundred men registered almost five times in 2009-10 as compared to 1950-1951.

Table 2

Women Students per Hundred Men Students

Year Enrolment	Total Women Enrolment (000s)	Women per Hundred
1950-51	40	14
2009-10	6080	71

Source: Annual Report 2009-10, UGC.

The above statistics reveal that our higher education system is so large. However, higher education is featured by many weaknesses today. They include continuation of the legacy of British system, over politicization of the higher education sector, mushrooming of institution, lack of leadership, mismatch between enrolment and infrastructure, overcrowding of classrooms, lack of motivation on

the part of teachers and the students, rigidity in subject combinations, inappropriate recruitment policy relating to teachers, implementation of policies without sufficient preparation, poor efficacy of co-curricular and extra-curricular activities, the contradictions between the ruled and the reality, government shirking its responsibility for providing necessary financial support, etc. it is felt that higher education is not yet higher in India.

Quality Issues in Higher Education

We mean by higher education the tertiary or after-school education imparted to the students in colleges and universities (including various institutes). However, we require a discussion as to the quality in education. The issues of quality are becoming critical in this era of rapidly expanding higher education. The term 'quality' is a much debated term. It is like 'beauty' that lies in the eyes of the beholder. It comes from Latin word 'quails' meaning 'what kind of'. Since it has many meanings, it has been referred as 'slippery concept'. Quality itself is an elusive attribute, an attribute of values, which cannot be easily measured or qualified, it is generally described as 'a degree of excellence' or 'superiority in kind'.

The UNESCO Report on Education for 21st Century pointed out four pillars of knowledge for improving the quality of education. They are:

- i. Learning to know (tools of comprehension);
- ii. Learning to do (to be able to interact with the environment);
- iii. Learning to live with others (participate and cooperate with others in all human activity), and
- iv. Learning to be (essential way of integrating the aforesaid three).

The British Standard Institution (BSI) defines quality as "the totality of features and characteristics of a product or service that bear on its ability to satisfy or implied needs" (BSI, 1991). Green and Harvey (1993) identified five different approaches to defining quality:

- In terms of exceptional (exceeding high standards and passing a required standard);
- In terms of consistency (exhibited through "zero defects" and "getting right the first time", making quality a culture);
- As fitness for purpose (meaning the product or service meets the stated purpose, customer specifications and satisfaction);
- As value for money (through efficiency and effectiveness); and
- As transformable (in terms of qualitative change).

Quality has a few central ideas around which the whole concept revolves: Quality as absolute, Quality as relative, Quality as a process, and Quality as culture.

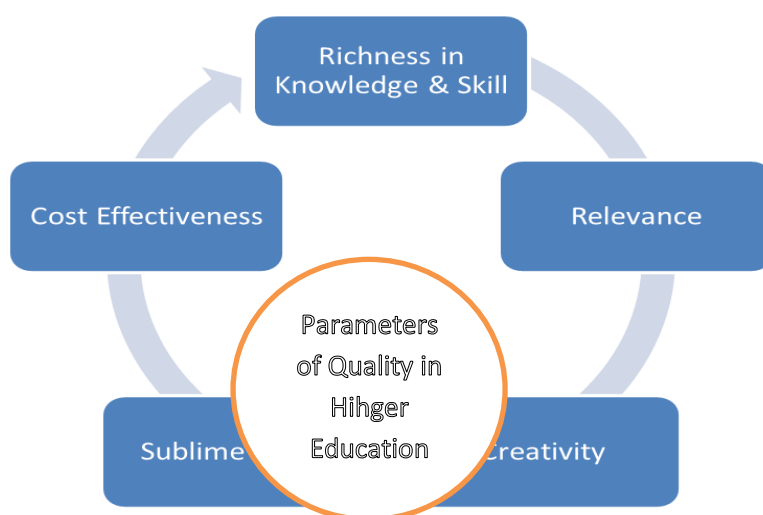
When we consider quality as absolute, it is given and considered as the highest possible standard. For example the picture of "Mona Lisa" by Da Vinci, the Egyptian Pyramids and the Taj Mahal are works of high standards and quality. In product terms, they are attached with high 'brand' values, status and positional advantages. Educational institutions such as Oxford, Cambridge and Stanford in the west have this absolute quality standard, though in the case of education it might still be perceptual. Quality as relative suggests that the quality of a product or service can be described in relative terms. Quality here can be measured in terms of certain specifications. According to Mukhopadhyay (2005) the adherence to "product specifications are actually the minimum conditions for quality, but not the sufficient conditions". The sufficient condition is customer satisfaction and beyond" (p.19). "Quality as a process" suggests that in order to achieve quality of a product or service, it must undergo certain processes and conform to the procedural requirements. Thus quality is the outcome of systems and procedures laid down for the purpose. The last one- quality as a culture – recognizes the importance of organizational view of quality as a process of transformation, where each entity is concerned and acknowledges the importance of quality. In educational institutions we are particularly concerned with the latter, though all other ideas of quality too have their respective places. Subsuming a wide range of discussions, Barnett (1992) quotes a 'suggestive' definition by Barrow (1991) to define 'quality' in higher education." A high evaluation accorded to an educative process, where it has been demonstrated that, through the process, the students' educational development has been enhanced... not only have they achieved the particular objectives set for the course but, in doing so, they have also fulfilled the general educational aims of autonomy of the ability to participate in reasoned discourse,

of critical self-evaluation, and of coming to a proper awareness of the ultimate contingency of all thought and action (p.61)".

From the above discussions we will realize that the concept of quality is amorphous and contextual. It refers from the meaning standard to excellence. Standards can be defined in terms of a minimum threshold by which performance is judged (Ashcroft & Foreman –Peck, 1996.p.21). In this context, quality is assessment in terms of a set of norm-referenced standards (such as the NAAC Criteria) that are built around what is expected at the minimum and beyond. Excellence is a performance stage of exclusiveness that is distinctive from many others and stands out as demonstration of zero defect and highest level of satisfaction of the stakeholders. In higher education, our objective is to achieve the standard and move towards excellence.

Parameters of quality in Higher Education

A general agreement on all the parameters may not be there, but the following aspects of quality may be acceptable to



all.

1. **Richness in Knowledge and Skill:** perhaps the most important parameter of quality in higher education relates to absorption of knowledge and generation of skill among the students. A recipient of higher education in the formal system conventionally chooses a set of disciplines, which at a given time, have a body of extant information and knowledge to practical applications.

2. **Relevance:** the second most important parameter of quality is appropriateness and relevance of the information knowledge and skill imparted by education to the current and the foreseeable techno-economic and social needs and priorities of the nation as well as the region that supports the educational system. UNESCO (1988) rightly views that quality reflects national, regional and global socio economic, cultural and political vision.

3. **Creativity:** the two parameters of quality in education mentioned above often join with the characteristics of students and under favorable conditions lead them to gain courage of facing challenges and conquering the adversities. Inculcation of problem solving ability, creativity innovativeness and such faculties make the third parameter of quality in education. A poor quality of education discourages and subverts these faculties.

4. **Sublime values:** nevertheless, there is some sort of conflict between the first two parameters deliberated above. The personal priorities of a college or university graduate of very high quality judged on the first criterion may not be conformal to the priorities of the nation or the regions that imparted excellent to him/her. Or even the priorities of a discipline judged on international norms might be quite unsuitable to the national regional techno-economic and social needs. In order to resolve the conflict pointed out above, it requires the fourth important resolve the conflict pointed out above; it requires the fourth important parameter to be spelt out. Education must inculcate among the graduates certain values such as to appreciate the importance of commitment. Cooperation and compassion in making competence creditable. These values are absolutely necessary for the

establishment, functionality and development of a knowledge based society towards which we are progressing steadily.

5. **Cost effectiveness:** the fifth parameter of quality of education is its cost effectiveness. If two kinds of educational process assure the same quality but they differ in the cost incurred in attaining it, then the less expensive educational process is obviously better than its expensive alternative. After all, resources have multiple uses and every use its opportunity cost.

Scope of ICT and Improvement of quality & Accessibility of Higher Education

In the current Information society, there is an emergence of lifelong learners as the shelf life of knowledge and information decreases. People have to (Pelgrum, & Law, 2007). In such a scenario, education, gives him a sense of well-being as well as capacity to absorb new ideas, increases his social interaction, gives access to improved health and provides several more intangible benefits. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes and CD ROMs etc. have been used in education for different purpose (Sharma, 2003; sanyal, 2001; Bhattacharya and Sharma, 2007).

Table 3

The four 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.

Source: Cross and Adam (2007)

Today ICTs including laptops wirelessly connected to the Internet, personal digital assistants, low cost video cameras, and cell phones have become affordable, accessible and integrated in large sections of the society throughout the world. It can restructure organizations, promote collaboration, increase democratic participation of citizens, improve the transparency and responsiveness of governmental agencies makes education and health care more widely available, foster cultural creativity and enhance the development in social integration. It is only through education and the integration of ICT in education that one can teach students to be participants in the growth process in this era of rapid change.

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

- 1 Informative tool: It provides vast amount of data in various formats, such as audio, video, documents.
- 2 Situating tool : It creates situations, which the student experiences in real life. Thus, simulation and virtual reality is possible.
- 3 Constructive tool : To manipulate the data and generate analysis.
- 4 Communicative tool : It can be used to remove communication barriers such as that of space and time (Lim and Chai, 2004).

The following mediums are used for the delivery and for conducting the education process:

- 1 Voice-Instructional audio tools that include technologies as well as the passive ones.
 - 2 Video Instructional video tools that include still images, pre recorded moving images, and real time images combined with audio conferencing.
 - 3 Print Instructional print formats that include textbooks, study guides, workbooks and case studies. (Bhattacharya and Sharma, 2007; National Programme on technology Enhanced Learning, 2007).
- ICT also allow for the creation of digital resources like digital libraries where students, teachers and professionals can access research material and course material from any place at any time (Bhattacharya and Sharma,2007; Cholin, 2005). Such facilities allow the networking of academics

and researchers and hence sharing of scholarly material. This avoids duplication of work (Cholin, 2005).

Initiatives taken by Government for ICT Access

Information and communication technology is an important instrument that can transfer the present isolated, teacher-entered and centered approach into students centered as well as thought provoking approach. There has been a dramatic shift from the 1980s to the present day in terms of access to technology by the population in general Reddy & Sinha, 2009. Rout and Singh 2010 discussed major initiations taken for ICT access as follows:

- Computer literacy & studies (CLASS) project had initiated in 1984 for senior secondary students. It was an awareness programme but failed due to technological compatibility.
- In 1994, GOI also introduced Computer Aided learning Programme under District Primary Education Programme (DPEP) in 1994.
- In 2000, NCERT in its National Curriculum Framework for School Education had also emphasized on access to global information sources and prescribed text book on ICT.
- In 2002, the GOI 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 Rs. 6,000 crore (USD 1.2 million) project kumara., oct 9, 2002).
- In early 1999, Tamil Nadu state government announced its intention o establish virtual university designed to promote Tamil language, literature & culture integration through medium of Internet linked computers.
- Again in September 2004, EDUSAT as India's first dedicated educational satellite was launched with footprints covering the entire country, EDUSAT makes it possible to receive direct to home quality broadcasts of educational programme using any television set and a low cost receiver.
- Government of India Launched National Programme on Enhanced Learning (NPTEL) in Sept., 2006 which was funded by MHRD to pave the way between multimedia & web technology to enhance learning of basic science and concepts.
- HRD Minister Arjun Singh launched National Mission of Education through ICT (NMEIT), a centrally sponsored scheme, in at Sri Venkateswara University. The main aim is to address the goal of access, equity and quality in Higher Education. And attempt to bridge the digital divide between rural & urban as well as in rich & poor strata of society. Rs. 4612 crore is allotted for this project.
- It has become mandatory for all the higher education institutions in the country to have a website to display their physical and instructional facilities. Even primary and secondary schools are being equipped with the internet and satellite connectivity.
- National Knowledge Network has been set up on April, 9, 2009 by Department of Information Technology. The main aim of NKN is to connect all higher centers of learning and research by bringing altogether all stake holders from science, technology, higher education agriculture & governance to common platform. Recently the Union Minister for ICT Kapil Sibal launched the logo & website of NKN.

Benefits of using ICT in higher education

The following table shows the main benefits of using ICT in education to the various beneficiaries.

Table 4

Benefits of ICT in Higher Education

Beneficiaries	Benefits
Students	Combination of work and education, Learner-centered approach, Flexibility of content and delivery, Increased access, Higher-quality of education and new ways of interaction.
Employers	Developing of a new learning culture, Sharing of costs and of training time with the employees, Increased portability of training. High quality, cost effective professional development in workplace, Upgrading of employee skills, increased productivity,
Governments	To support and enhance the quality and relevance of existing educational structures, To promote innovation and opportunities for lifelong learning.
To ensure the connection of educational institutions & curricula to emerging networks and information resources, To reach target groups with limited access to conventional education and training, Increase the capacity and cost effectiveness of education and training systems,	

Source: UNESCO, 2002.

Potential Drawbacks of using ICT in Higher Education

Although ICT offers a whole lot of benefits there are some risks of using ICT in education which have to be mitigated proper mechanisms. They are:

- It may shift the attention from the primary goal of the learning process to developing ICT skills, which is the secondary goal.
- Also since not all teachers are experts with ICT they may be lax in updating the course content online which can slow down the learning among students.
- Although ICT offers a whole lot of benefits there are some risks of using ICT in education which have to be mitigated proper mechanisms. They are:
- It may create a digital divide within class as students who are more familiar with ICT will reap more benefits and learn faster than those who are not as technology savvy.
- The potential of plagiarism is high as student can copy information rather than learning and developing their own skills.
- There is a need for training all stakeholders in ICT.
- The cost of hardware and software can be very high.

Conclusion

In today's era of technology ICT aids plenty of resources to enhance the teaching skills and learning ability. The integration of information technology in teaching is a central matter in ensuring quality in the educational system. Information and communication technologies (ICT's)-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. 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 beneficiaries involved in the integration. There needs to be shared vision among the various beneficiaries and a collaborative approach should be adopted. Care should be taken to influence the attitudes and beliefs of all the beneficiaries.

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 would enable development of collaborative skills as well as knowledge creation skills. Moreover, wider availability of best practices and best course material in education, which can be

shared by means of ICT, can foster better teaching. However, there exist some risks and drawbacks with introducing ICT in education which have to be mitigated. Successful implementation of ICT to lead change is more about influencing and empowering teachers and supporting them in their engagement with students in learning rather than acquiring computer skills and obtaining software and equipment. Also proper controls and licensing should be ensured so that accountability, quality assurance, accreditation and consumer protection are taken care of. 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.

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