

**ROLE OF ICT IN HIGHER EDUCATION: PROSPECT AND CHALLENGES*****¹Shabbir Hassan and ²Arshad Iqbal**¹Department of Computer Science, ²K. A. Nizami Centre for Quranic Studies
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Abstract

Education has been an important tool for social and economic change since time immemorial. Higher education in India is currently undergoing a major change in terms of accessibility, affordability, and efficiency. The rapid developments in Information and Communication Technologies (ICT) around the world are highly influencing this transition. Information and Communication Technology is a paragliding term that includes electronic-based communication devices or applications, including radio, television, cell phones, computer and network, hardware, software, satellite systems, and several related services and applications this includes Command Over the Internet (COI), chatting, video conferencing and distance learning. When such technologies are used for educational purposes, it much help enhance student learning and build learning environments ICT can be considered as a subfield of Educational Technology. ICTs in higher education are used for course material development, content delivery, and content sharing, establishing contact between learners, teachers, and the outside world. Presentation and lecture production and delivery, academic research, administrative support, and student enrolment are some major undertakings that make it easy to use ICT. The implementation of ICTs in higher education has profound implications for the entire process of education, especially in addressing key issues of access, equity, management, performance, pedagogy, and quality. At the same time, the best use cases of resources resulting from the proliferation of ICTs in the higher education system pose a significant challenge for higher education institutions. In this context, this paper discusses some opportunities and challenges presented in the present-day scenario by the introduction of ICTs into various aspects of higher education.

Keywords: Higher Education, Accessibility, Planning Commission, Blended Learning, Women's Enrolment, MHRD, ICT, UGC, ODL, CDOE, AMU.

INTRODUCTION

In the last five decades, higher education systems have grown exponentially to meet the demands of quality education for everyone. Information and Communications Technology (ICT) has played a significant role in revolutionizing higher education in general and in particular Open and Distance Learning (ODL). ODL is also known as a hierarchical kind of teaching-learning method in which both the teacher and peer group are segregated from a learner. This trend has gained more traction thanks to rapid developments in ICT. In a contemporary globalized society, demand for skilled and skilled employment is growing. Access to quality higher education for all has emerged as a determinant factor in economic growth and development in this context [1, 12]. The contribution of open and distance learning facilities is on the rise to expand access to higher education and boost its reach to the remotest parts of the country. It also tackles life-long learning goals at affordable prices through several internet-based platforms. The last two decades have seen advances in ICTs being integrated into higher education systems around the world [13]. Even then the task of creating a scalable and diverse higher education system in order to incorporate the technology holistically into the management and delivery of learning programs is overwhelming [2, 3]. The first section briefly discusses the current profile of Indian higher education. The second section addresses the role of ICTs in higher education and the areas where they can be incorporated to play a prominent role. The last section discusses the challenges of expanding the role of ICTs in future higher education growth.

Higher education development in India

Though higher education is very old in India, with the establishment of Hindu College in Calcutta in 1817, modern higher education has begun in India. By 1855 a total of 281 high schools and 28 colleges were built in. The British Indian Government created three universities; the University of Bombay, the University of Calcutta, and the University of Madras in 1857. Growth continued unimpeded and by 1947, 19 universities, 496 colleges with 2,40,000 students were founded [3, 8]. The University Education Commission 1948-49 popularly known as the Radhakrishnan Commission stressed the need to create an apex body to oversee the growth and development of tertiary-level education and the maintenance of educational standards. Thus the University Grants Commission (UGC) was created in 1956 by the act of Parliament [4, 5, 8]. Higher education growth in the last five and a half decades presents a very impressive picture [5]. Quantitative growth has been commendable in terms of student enrolment, number of teachers, schools, universities, and awarded research degrees.

Institutions in India

After independence, the higher education sector has seen a huge increase in the number of Institutions and Colleges at the university level. University numbers grew approx. 34 times from 20 to 677 in the academic year 1950 to 2014 respectively. In this period, the sector boasts 45 Central Universities, 40 of which are under the control of the Ministry of Human Resource Development (MHRD), 318 State Universities, 185 State Private Universities, 129 Deemed Universities, 51 National Importance Institutions (established under Parliamentary Acts) under MHRD (IITs-16/23, NITs-30/31

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and IISERs –5/7) and four Institutions (established under various State legislations). As of March 31, 2013, the number of colleges also reported a multiple increase of 74 times, with only 500 rising to 37,204 in 1950. After 10th Planning Commission of India (31.03.2007), there were 363 universities and 21,170 colleges in the country (20 Central, 229 Municipal, 109 Deemed to be Universities, and 5 Institutions under Special State Legislature Acts). At the end of the third year of the 11th Planning (2009-10), the number of universities increased to 493 (42 Central, 130 Deemed and 316 State Universities and 5 Institutions founded under the Special State Legislature Acts), and the number of colleges to 31,324, resulting in an increase of 36% in the number of universities and 48% in the number of colleges compared to the number of colleges in the 11th Planning Commission of India (2009-10). The Following Table (refer to Table I) indicates the number of universities as of **05.10.2023** from the archive of the **UNIVERSITY GRANTS COMMISSION** of MHRD, India which is a statutory body set up by the Indian Union government in accordance with the UGC Act 1956 under MHRD and is charged with coordination, determination and maintenance of standards of higher education [14, 16].

Table I. Number of Universities as of 05.10.2023

INSTITUTIONS	NUMBERS
State Universities	459
State Private Universities	430
Deemed to be Universities	127
Open Universities	13
Institutions of National Importance	167
Central Universities	56
Private Universities	430
Total :	1682

Students enrolment ratio

Higher education enrolment has recorded a steep hike in the last 60 years. During the academic year 2009-10, there were 146.25 lakhs (provisional) students enrolled in different courses at all levels in universities/colleges and other higher education institutions compared with 136.42 lakhs in the previous year this figure shows an increment of 7.2 percent a total of 60.80 lakhs female students were enrolled out of 146.25 lakhs that representing 41.6 percent of total data. Nevertheless, this rapid expansion of higher education masks the tale of the extreme inequalities that exist across states in accessing higher education. Different states are at different evolutionary stages [15]. There are states where the higher education access ratio is much lower than the national average of about 20%. There are 14 states against that in which the access ratio is higher than the national average. Out of the overall enrolment in higher education, 86% of students are enrolled in undergraduate programs 12% in postgraduate programs, 1% in diploma/certificate programs, and 1% are enrolled in study programs this record is taken from the available statistics of ICT in Government of India [6, 13]. It shows a highly skewed Higher Education image of the country. The scale of postgraduate education is a matter of great concern as well as that of science. Diploma and diploma-level program conditions, which make up only 1% of higher education, leave much to be desired.

Research Degrees

The number of research degrees (Ph.D.) awarded by different universities dropped from 13,237 to 10,781 in the academic

year 2007-2008 to 2008-2009 respectively. This results in a decrease of 18.5% of overall records. The Faculty of Arts had the highest number of such award of Ph.D. degrees with 3496 followed by the Faculty of Science with 3317, out of the total number awarded in 2008-2009. Together, these two faculties provided 63 percent of the total number of research degrees awarded. The Faculty of Engineering and Technology had topped up with as many as 1141 Ph.D. degrees in the technical disciplines followed by 423-degree Faculty of Agriculture and 403-degree Faculty of Education.

Growth in Enrolment of Women in Higher Education

After the independence of India, there had been a phenomenal increase in the number of female students enrolled in higher education. In the academic year 2009-2010, the female enrolment that was less than 10 percent of the total enrolment on the eve of Independence had risen to 41.6 percent [19]. The pace of growth in the last two decades has been particularly rapid. As the data shown in Table II, is just opposed to the records found in the academic year 1950-1951. Number of women enrolled per hundred men was recorded nearly five times in 2009–2010. The number of women enrolled per hundred men in the year of 2018-19 was recorded nearly 13 times in 2018–2019 [7, 19, 22] as represented in Table II.

In this paper, the acronym “**WE**” refers to **Women's Enrolment** in a given academic year. As per the above record, a graphical representation is drawn that shows the relation between the rate of increase of women enrolment and women enrolment per 100 men. The above record represents an average of 30.62 times the increment of women enrolment as per every 100 men enrolment found from the year 1951 to 2019.

Table II. Number of “WE” as per every 100 men

Year	WE	WE/100 Men
1950-51	40	14
1980-81	315	71
1995-96	783	56
2000-01	12011	312
2015-16	19343	608
2018-19	32492	1061
Total:	64984	2122

It indicates that an average of 45% increment in women enrolment as per 100 men enrolment is regulated every contiguous year from 1951 to 2019. However, a rapid increment of 812.30% is noted from year 1951 to 2019 directly.

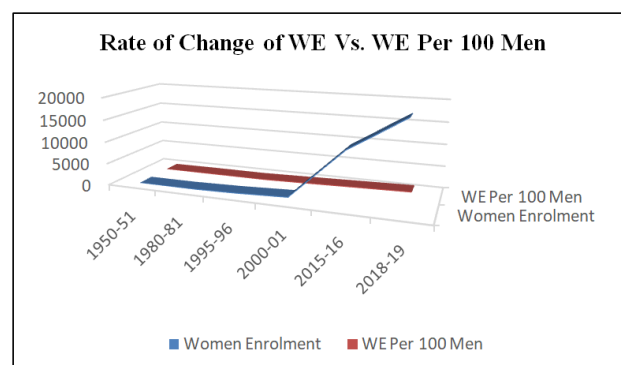


Figure I. Rate of change in WE w.r.t. WE per 100 Men

As we can observe from the Graph (refer to Figure I) the rate of increase of women enrolment per 100 males increased exponentially. Whereas the increment in women enrolment is linearly non-inherent and very large. In the same way, the growth of women enrolment starting from the year 1951 till 2019 is represented by a two-dimensional graphical representation (refer to Figure II). It shows a rapid change from the year 1995-96 and has grown exponentially from the year 2019 to the present. However there is a slight fall in enrolment can be seen in the years 1997, 1998, 1998 and 2000 after a tremendous outcome.

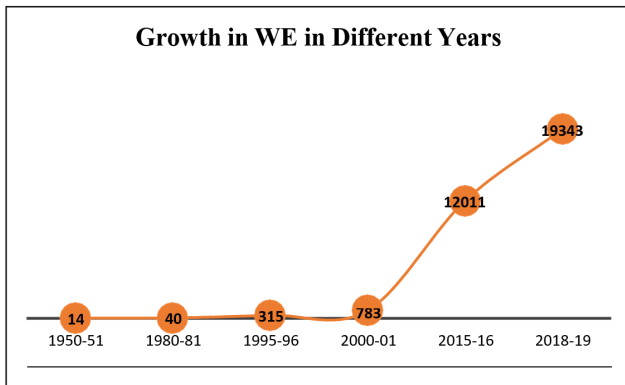


Figure II. Growth in WE in different years

ICT enabled education

Information and Communication Technology (ICT) is a paragliding term that includes any communication device or application including radio, television, cell phones, computer and network, hardware, software, satellite systems, and several related services and applications, such as video conferencing and distance learning. When such technologies are used for educational purposes, i.e. to help and enhance student learning and to build learning environments, ICT can be considered as an Educational Technology subfield [8, 9]. *The United Nations Educational, Scientific and Cultural Organization (UNESCO)* claims that ICT has great potential to promote the diffusion of knowledge, improve learning, and help develop more effective education services. ICT can expand educational opportunities to marginalized groups, improve the quality of education, and reduce gender, class, ethnicity, age, and disability-based inequalities. Today, the smartphone is used for contact by a large population. Nowadays, several experts point out that mobile learning for current scenarios is an integral part of the educational process and the best device. We have to dedicate ourselves to the age of ICT so that everyone gets an education without any hurdles. We commit ourselves to the provision of reading as part of the education system. The rapid proliferation of mobile technology offers the opportunity to establish participatory and social inclusion policies [23, 24].

In higher education, ICTs are used for course material development; content delivery and content sharing; contact between learners, teachers, and the outside world, presentation and lecture production and delivery, academic research, administrative support, student enrolment, and many more. In today's information era, people must access awareness through ICT to keep pace with the latest developments [16]. In such a scenario, education becomes even more necessary. Which always plays a critical role in any country's economic and social growth. Figure III represents some important classes of services provided by ICT.



Figure III. Important classes of services provided by ICT

Training not only improves the individual's competitive skills but also his / her ability and earning power. This gives them a sense of well-being and the ability to absorb new ideas that improve their social interaction and provide access to improved health and offers several more intangible benefits. The various types of ICT products available and applicable to education such as teleconferencing, email, audio conferencing, television lectures, radio broadcasts, interactive radiotherapy, interactive voice response systems, audio cassettes, and CD ROMs were used for various purposes in education (Bhattacharya and Sharma, 2017). Table III represents various rationales of ICT.

Four Rationales of ICT in Education are listed as follows:

Table III. Summary of various rationales and dimensions of ICT

1	Social	The perceived role now played by technology in society and the need to familiarize students with technology.
2	Vocational	Prepare students for jobs where technology skills are required.
3	Catalytic	Technology is valuable for enhancing performance and efficiency in teaching, management, and other social activities.
4	Pedagogical	Use technology to improve instructional delivery in terms of learning, accessibility, and performance.

Today ICTs including wireless internet-connected computers, personal digital assistants, low-cost video cameras, and cell phones have become affordable, available, and embedded throughout the world in broad sections of society. It can restructure institutions, promote cooperation, increase citizens' democratic participation, enhance government agency's openness and responsiveness, make education and health care more widely available, foster cultural innovation, and enhance social integration growth. In this age of rapid change, it is only through curriculum and the application of ICT in education that one encourages students to be participants in the growth process. ICT also allows digital services, such as digital libraries where students, teachers, and practitioners can access research material and course material from anywhere at any time (Bhattacharya and Sharma, 2017). Such facilities allow academics and researchers to network and exchange academic content. This avoids duplication of physical hard work. Training can be divided into three main categories in terms of ICT.

- a. e-learning
- b. Blended Learning
- c. Self-Paced Learning
- d. Collaborative Online Learning

a. e-Learning

A general term used to refer to computer-enhanced learning is e-learning or electronic learning. It is commonly associated with the field of Advanced Learning Technology (ALT), which uses networked and/or multimedia technologies to address both technologies and associated methodologies in learning. Online learning is also known as learning. Online education was the basis for the advancement of e-learning. It can be e-learning on call or anything else. It surmounts difficulties in timing, attendance, and travel. e-learning facilitates internet distribution, conversation, and feedback. It allows for mass customization of the content and tests. e-education can provide access to best gurus and accessible best practices or information (UNESCO 2012). The online environment can be leveraged to facilitate teaching techniques such as role-play over time and distance. It may also promote scenario creation that can seldom be seen in reality. ICT can play a valuable role in tracking and recording student's progress through time, location, and a range of activities [10, 12].

e-learning encourages greater involvement and interaction. This contradicts the idea of superior mainstream face-to-face schooling (Bhattacharya and Sharma, 2017). The web and the internet are the key ICTs for e-learning to spread the knowledge. The elements include e-portfolios, cyber infrastructures, digital databases, and collections of items to be studied online [11, 17]. All of the above components build the student's digital identity and link all the educational stakeholders.

e-learning has the following advantages:

- It provides a combination of education while balancing work and family life.
- Enhanced group collaboration facilitated through ICT.
- It is strengthening the international aspect of education services.
- New approaches to education can be used.
- It can provide speedy dissemination of education to target disadvantaged groups.
- Reducing time and regional obstacles in learning for both teachers and learners alike.

b. Blended Learning

Blended Education is the combination of multiple modes of education. It is typically used to describe a situation where different methods of delivery are combined to produce a given course. These methods may include a mixture of face-to-face learning, self-learning, and online classroom learning that involves:

- i. *Face to Face-to-face interaction*: It refers to education that takes place in a traditional classroom environment where a member of the faculty provides instruction to a group of students. This could include seminars, courses, classes, tutoring, conferences, and more.

- ii. *Self-Paced Learning*: It allows the freedom to learn according to the availability of the learner's own time and speed, it occurs in a variety of ways such as: reading specific chapters from a textbook, reviewing course material provided through a web-based or CD-based course, attending pre-recorded classes or sessions, reading articles referred by faculty member, working on assignments and projects.

c. Collaborative Online Learning

It requires interaction through the web between learners and faculty members; this interaction can occur in one of the following modes:

- *Synchronous interaction*
- *Asynchronous interaction*

Synchronous learning refers to a learning experience in which a group of students are concurrently engaged in learning. Instant messaging or live chat, webinars, and video conferencing, for example, allow students and teachers to collaborate and learn in real time. Synchronous means communicating in real-time with a faculty member and other learners through the Internet using technology such as virtual classrooms and/or other chat rooms as shown in Figure IV.

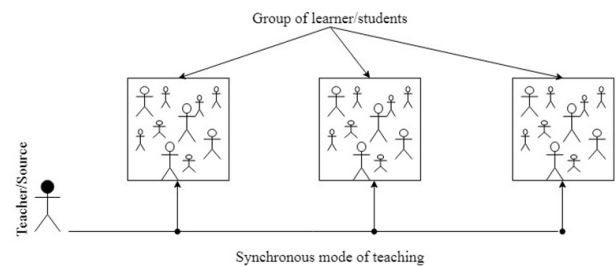


Figure IV. Schematic model of “synchronous” mode of teaching”

Asynchronous learning is a student-centered teaching method that uses online learning resources to facilitate information sharing outside the constraints of time and place among a network of people. Asynchronous means not at the same time; it allows learners to communicate with their peers and faculty members at their convenience, such as communicating by telephone and other media as shown in Figure V.

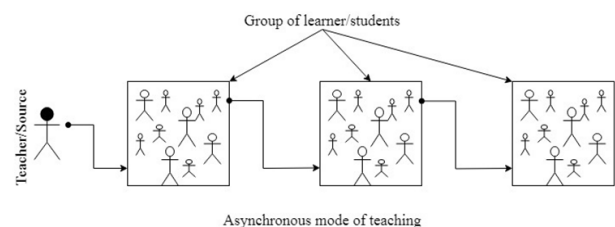


Figure V. Schematic model of “asynchronous” mode of teaching

A quick review of *Collaborative Online Learning (COL)* is shown in Figure VI, it represents a common point of consent that indicate that both synchronous and asynchronous model of learning are based on a common pillar of belief, which is consent. Consent is nothing but the other form of dedication towards the intended goal.

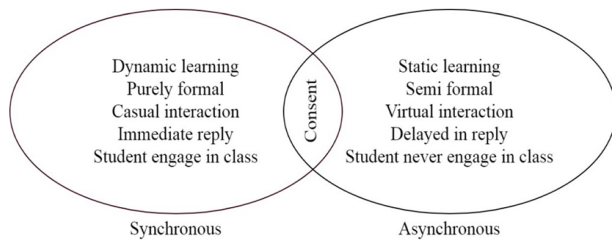


Figure VI. Schematic Diagram of Collaborative Online Learning

From the above Figure (refer to Figure VI), one can conclude that consent and dedication is the central part of either mode of the learning process. Table IV represents some pros and cons of the synchronous and asynchronous modes of learning. Some important places where COL is more applicable are:

- Applies small-group activities as strategies to develop higher-order thinking skills and enhance individual abilities to master knowledge
- Encourages the laissez-faire approach for higher-level, less-foundational knowledge content
- Assumes that knowledge is socially constructed
- Applied in college-level education

Table IV. Pros and cons of Collaborative Online Learning

Synchronous		Asynchronous	
Pros	Cons	Pros	Cons
Classroom engagement of students is a must	Students are bounder with a rigid schedule	Provide flexibility in routine, schedule, and study time	Student faces some isolation problems that further impair their group and tear workability
The learner goes through an interactive session of dynamic learning	Learners may face some technical difficulties like power supply, low bandwidth, etc.	As per the need, a learner can pace the learning content such as video, GUI, mobile apps, etc.	If contents are not grasped well, the learner may suffer the risk of apathy
Instructional depth	—	Affordability	—
—	Comparatively slow due to a large mass	Comparatively fast	—
Expensive	—	Cost-effective	—
Scarce	—	Ubiquitous	—

Distance learning

With a population of over 1.21 billion people (census for 2011) and 50 percent of its population below 25 years of age, education is a major challenge in India. Universities that offer distance education such as national open universities, state open universities, universities of dual mode, and autonomous institutes in India have made a great contribution to the upliftment of Open Distance Learning (ODL). In addition to the only National Open University such as Indira Gandhi National Open University (IGNOU) and 13 State Open Universities such as Yashwantrao C. Maharashtra Open University and Dr. BR Ambedkar Open University (BRAOU), regular universities are also now offering distance learning programs through their Directorates of Distance Education (DDE) and Centers for Distance Education (CDE). *The Center for Distance and Online Education (CDOE) is an integral part of Aligarh Muslim University (AMU) established under University Act Section 5(9A) in 1920. Adopting versatile and creative training methods to ensure 'independent learning' for anyone, anytime and anywhere, the CDOE-AMU provides research programs that are designed to meet the learning needs of information seekers, as well as ensuring that they learn at their own pace and convenience.*

Distance learning is a type of education in which students work at home or the office on their own and interact with teachers and other students through e-mail, online forums, video

conferencing, chat rooms, instant messaging, and other types of computer-based communication, sometimes called open learning. Many distance learning programs include a computer-based training system (CBT) and communication tools designed to create a critical classroom. Because the Internet and the World Wide Web are available from nearly all computer devices, many distance learning programs are built on them. ICTs also allow digital resources to be developed such as digital libraries, where students teachers, and professionals can access research material and training material from anywhere at any time. These facilities allow the networking of academics and scholars and thus the sharing of scholarly content leading to improved teaching and learning ability.

a. Synchronous Distance Learning

Synchronous distance learning occurs when teachers and learners communicate in different locations but at the same time. Students enrolled in synchronous courses are generally required to log on to their computer at least once a week during a set period. Multimedia elements such as group chats, online conferences, video conferencing, and phone call-ins may include synchronous distance learning.

Synchronous learning generally works better for students, who can plan their study days and times. Persons who like organized courses high on interaction with students also prefer synchronous learning.

b. Asynchronous Distance Learning

Asynchronous distance learning happens when teachers and learners communicate at various locations and at different times. Students who are enrolled in asynchronous courses will finish their research whenever they please. Asynchronous distance learning is often based on technology such as email, e-courses, online forums, and audio and video recordings. Snail mail is a further platform for studying asynchronously.

Asynchronous distance learning is often favored by students with complex schedules. It also tends to work well for self-motivated learners not need overt instruction to complete their assignments.

ICT in ODL

ICTs also have a major impact on Open Distance Learning (ODL) as they facilitate greater access and equity and improve learning efficiency. ODL system deploys ICTs to make education accessible to students belonging to different socio-economic classes, particularly marginalized parts, and those living in remote, hard-to-reach terrains, leading to greater

inclusion. Good quality institutions are made available to students located throughout the country. Digital content from around the world is within everyone's control. The use of ICT in ODL helps to reduce educational costs, increase flexibility by providing access to students anywhere at any time, alleviate space limitations, and allow for greater enrolment in courses. ICT helps improve the quality of education by using additional teaching aids, better and more efficient processes and management systems, access to up-to-date content, enhanced knowledge sharing, leveraging technology for access to new and evolving courses for more students, scientists and other related clients through developing robust, integrated digital repositories. The following graph represents the growth rate of ICT penetration in some emerging countries like Afghanistan, Bangladesh, Pakistan, Nepal, and India as per 100 inhabitants from year 2015 to 2019 [25].

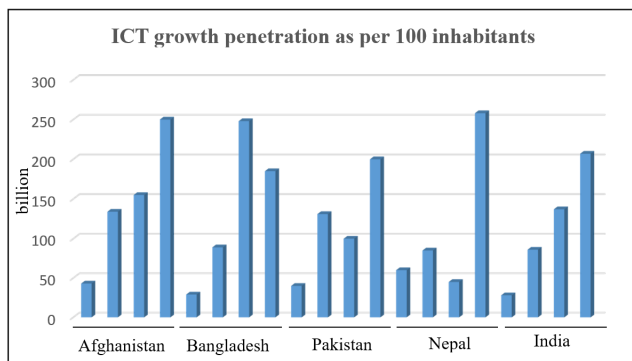


Figure VII. Growth rate of ICT penetration as per 100 inhabitants until 2019

After analyzing the report provided by Chinn D. et. al (2019), it can be concluded that:

The maximum expected hike in practice and use of ICT in India will exceed 260 billion per 100 inhabitants by the year 2021.

a. ICT's Remunerations in ODL

In Open Distance Learning (ODL) and other institutions, ICT is critical as it assists in carrying out their activities and functions such as record keeping, research work, instructional uses, presentations, financial analysis, management of examination results, correspondence, monitoring, MIS, Self-Learning Material (SLM)teaching-learning activities and general functions of the Distance Education. ICT helps Distance Education in several ways such as Peeraer and Petergem (2018).

- Enhance classroom learning.
- Enhance Distance Education management and related tasks.
- Enhance accountability, efficiency, and effectiveness in Distance Education activities
- Introduce the use of PowerPoint presentations and the Internet.

Thus, it compels the education sector to formulate legislation. Literature shows that ICT in Distance Education when used in a well-suited manner has the potential to improve the teaching-learning process in many respects. ICT is learner-centric and thus includes students directly in the learning process. If

learning experiences are stimulating, real, multi-sensorial, and multi-disciplinary, then students get inspired. Because of ICT initiatives and ventures, Distance Education tends to see higher attendance, engagement rates, academic achievements, and effective communication. Teachers are also learning from ICT initiatives. We consider ICT useful both for teaching and for personal and professional work. The application of ICT in teaching makes teaching more innovative, interactive, easier, and more efficient. It supports the conventional method of teaching-learning. When passing on information with the help of ICT, educators find that students are more sensitive and receptive. ICT can also help in a shorter time to convey more information and knowledge to students and allows optimum resource and time usage. Against this background, the study explores the problems and challenges associated with implementing ICT in India's rural Distance Education. The study also makes suggestions for Indian Distance Education to improve ICT-assisted education. In India, ASER (2014) registered a slight increase in the availability of computers at the visited rural Distance Education Centers. The availability of computers has grown from 15.8 percent in 2017 to 19.6 percent in 2014. In this way, many states stand out. In Gujarat, 81.3 percent of Distance Education Centers visited had computers Kerala had a record of 89.8 percent of computer Distance Education Centers; Maharashtra with 46.3 percent computer-enabled Distance Education Centers, and 62.4 percent of Tamil Nadu Distance Education Centers.

Challenges in the implementation of ICT-enabled education

In this section, we have discussed two important dimensions of ICT-enabled education. Figure VIII represents some crucial challenges faced by Higher Education (HE) during the implementation and practice of services provided by ICT.

The major class of challenges is the *unwillingness of some teachers to teach ICT, lack of interest in teaching ICT, lack of ICT literacy among teachers and pupils, lack of pedagogical knowledge, and limited access to ICT facilities* by most teachers and pupils challenges and implementation issues have broadly classified into two phases, as discussed below:

- Challenges in Real Implementation
- ICT Initiatives in Rural Education in India

a. Challenges

Although ICT can greatly improve a country's education system it's not the case in developing countries, there are multiple issues and challenges facing the introduction of ICT education in Distance Education Centers and other educational institutions in these countries and the problems for Distance Education Centers located in remote villages and rural areas are much more magnified.

The implementation of ICT in particular for rural Distance Education Centers faces challenges in the form of internal and other external barriers [21, 22]. External obstacles to the adoption of ICTs in rural Distance Education Centers include:

i. Lack of Trained Teachers

The lack of knowledge and expertise is a major obstacle to using ICT in rural education. There is a dearth of formally trained creative teachers in ICT. In addition, there is hardly any

quality training provided regularly to teachers engaged in ICT education.

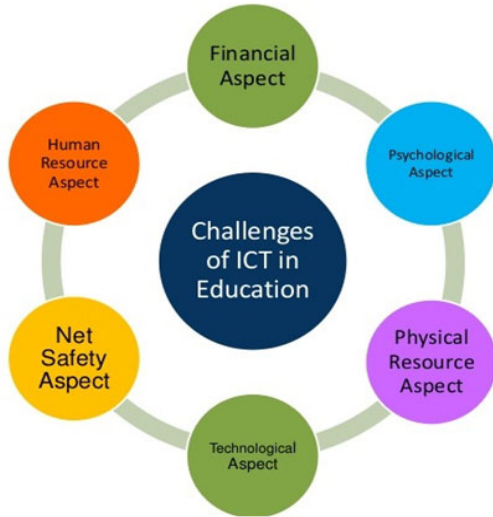


Figure VIII. Challenges faced by HE for the implementation and practice of ICT

ii. Unfavourable Corporate Culture

Educational organizations and Distance Education management still fail to grasp the significance and severity of ICT's role in improving education in developing nations. The attitudes and beliefs of the teachers are also old and conservative. We are unconscious, rigid, and unable to respond to the transition. They hold false beliefs that ICT is primarily intended for the youth, and are skeptical about the effectiveness and usefulness of ICTs in Distance Education [22].

iii. Lack of Time

In classrooms, teachers are typically burdened with many other duties than teaching. In addition, along with ICT, they will teach all types of subjects. They have no time to design build and integrate technology into their teaching and learning activities. The teacher needs time to work with other instructors as well as learn how to use hardware and software while keeping up-to-date with the latest technologies at the same time.

iv. Equipment Maintenance and Improvement Problems

Maintenance and upgrading of ICT equipment in rural Distance Education Centers are subject to their limited financial resources. Largely, budgetary constraints hinder government initiatives. The Rural Distance Education Centre's ICT programs are not self-sustainable. When the projects initiated by the government or any private sector are phased out, the students must bear the maintenance of the equipment. Often students with weak economic backgrounds are unable to finance the costs, maintenance, and computing facilities [21].

v. Insufficient Funds

The availability of appropriate and current hardware and software facilities dictates the effective and efficient use of technology. The introduction of technology into education systems in developing countries is a difficult task, as it needs a huge amount of funds, resources, and services to sustain them.

Financial shortages or insufficiencies lead to obsolete facilities and equipment in rural Distance Education Centers leaving a huge gap in the process of enhancing ICT skills and ICT-based education; thereby making the entire ICT experience meaningless.

vi. Challenge of Language and Content

A large proportion of world market-produced educational software is in English. The majority of content available online is in English. English language skills are not high in developing countries, especially outside urban areas, which become a serious barrier to maximizing ICT's educational benefits [20].

vii. Equipment Shortages

There is a shortage of computers and computer-related resources in rural government Distance Education Centers such as printers, projectors, scanners, etc. The computer per student ratio is not enough, in private Distance Education Centers in these regions are very few or lacking choices. There is a disparity between the complementing resources and the inadequate mix of ICT services resulting in reduced technology diffusion as well as poor understanding of ICT within these educational institutions.

viii. Less Technical Support

Rural Distance Education Centers face many issues related to technical expertise, lack of ICT service centers, and lack of qualified technical staff. Whether provided by the Distance Education Centre's staff external service providers, or both, specialists in technical support are critical to the continued viability of ICT use in a given Distance Education. Without technical support on-site, due to technical breakdowns, a great deal of time and money may be lost. Lack of timely technical support has been one of the major obstacles to improving computer use in classrooms [19, 22].

ix. Resource Related Issues

Many rural Distance Education Centers usually face trouble regarding the availability of ICT-related services such as infrastructure support, uninterrupted power, and additional resources such as computers, projectors, scanners, smart boards, etc. Though an integral component of ICT, most rural Distance Education Centers face a lack of internet connectivity. Most centers are unable to afford the high fees charged by internet providers and even where internet is available, slow or erratic connectivity is destroying the very essence and impact of ICT. Certain external factors that hinder ICTs in various Distance Education Centers are social and cultural factors inherent in those areas' lack of community leadership activity corruption and burglary [18, 20].

b. ICT Initiatives in Rural Education in India

The Indian government has announced 2010-2020 as the decade of innovation with a particular focus on ICT encouraging students to learn and develop ICT skills. The national education policy aims to create an integrated development environment for rural student education and economic empowerment. Important initiatives and strides in rural education have been taken [17, 22].

- *Projects for teachers and students regarding computer literacy.*
- *Mobile classrooms through IT buses E-learning centres and kiosks to improve online education in rural society for social and economic change.*
- *Community Telecentres to address ICT learning needs outside of formal school environment.*
- *Connectivity by bicycle in rural areas.*
- *National award for teachers in the teaching-learning process, using ICT in classrooms.*
- *Information Technology's Curriculum Development.*
- *Innovative "Rural Reach Program" by Infosys to impart ICT information firsthand to children in villages in grades 5-10.*
- *Initiatives of ICT higher education such as E-Gyankosh, Gyan Darshan, Gyan Vani, and various other distance learning programs.*

After going through an extensive insight into the various prospects, practices, and challenges of ICT-enabled mode of education, the following conclusion has been made.

Conclusion

The information and communication technology revolution has reduced national boundaries to arbitrary lines drawn on maps. Education has been described in this scenario as one of the resources that need to be opened up for the free flow of trade between countries. India is evolving as a knowledge-based economy and can't function without ICT help. The disparity between demand and educational supply has forced governments and institutions to devise policies to make more effective use of ICT. To close this gap, collaboration between public and private stakeholders needs to evolve. Four areas of ICT need to be enhanced, usage, economic impact, and social impact. The study makes the following suggestions for improving and facilitating ICT education in rural India: There is a need for a public-private resource mobilization partnership to fund ICT training in rural areas. The growing use of ICTs has brought changes to teaching and learning at all levels of Higher Education Systems (HES) leading to improvements in quality. Traditional ways of learning and teaching are becoming rapidly transformed into online and virtual environments. With the introduction of ICT in the education system there are endless possibilities. Using ICT in education not only enhances the learning process of classroom teaching but also offers e-learning facilities. ICT has been developing distance learning. The teaching group can cover remote areas, and learners can access contextual learning environments from anywhere and at any time. It is important to make teachers or trainers adopt technology in their teaching styles to provide learners with educational and pedagogical gains. Successful implementation of ICT to drive change is more about motivating and inspiring teachers and assisting them in communicating with learners rather than learning computer skills and software and equipment. In the end, ICT-powered education will contribute to the democratization of education.

Our calculated data shows that, majority of students (80%) were below the age of 30 years. To attract more and more learners and thrive in global competition it is important to cater to this large learner population through ICT-based quality educational prospects.

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