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Role of Information and Communication Technology (ICT) in Development of Higher Education in India

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Abstract - The modern learning paradigm of constructivism is greatly aided by the use of ICT into educational settings. Integrative technology that promotes greater use of ICT in teaching has been shown to have a beneficial effect on students' academic outcomes. The study used a descriptive research approach to look at the connection between ICT and progress in higher education. This study is an effort highlight the government policies/initiatives to enhance higher education among all eligible and interested persons of India and to bring focus on execution of policies concerning the integration of ICT and the efficiency of the classroom. It is firmly highlighted that use of technology should increase online and interactive education opportunities for all students. Teachers can do their jobs well with the ongoing education and development. The educational environment as well as administrative system in higher education sector of India can be more efficient, transparent and inclusive through introduction and wide uses of ICT.

Keywords - Information and Communication Technology ICT), Gross Enrolment Ratio Development, Higher Education, Adoption

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INTRODUCTION

The role of education in economic development has been identified in various ways such as; increasing productivity through increasing human capital stock and through diffusion and transmission of knowledge. The education is also regarded as an important factor for social and cultural development. Access of higher education by all is an important condition for inclusive development. In a diverse country like India availing equal opportunities of education to all has been an important challenge. Here comes the role of technology and information and communication technology (ICT) in order to make every eligible person avail the access to higher education. Higher education since long has been treated as a public good and the state was responsible to provide all level of education to those who wanted it. With development of modern knowledge and the emergence of knowledge-based economy, the demand for knowledge and skill multiplied. The increasing demand is unmatched by supply response, so crisis started to appear on the supply side. The debate on the nature of education also emerged with this increasing demand. Although, there is consensus on primary education being merit good but this is not so in higher education. Therefore, in this scenario, the smart use of technology may come to rescue us to spread the fruits of higher education to all eligible persons without any discrimination based on gender, caste, creed, reason or languages etc. Not only we can spread the reach of higher education to maximum people, we can also provide best quality education to our citizens at very affordable cost using ICT smartly.

The smart use of technology in the classroom has the potential to inspire students, enliven our lessons, and revitalize our teachers as they acquire new knowledge and methods. The use of technology is also facilitating pupils' comprehension of previously incomprehensible ideas. The use of ICT in today's classrooms is ubiquitous. There is an urgent need to include ICTs into the training of educators. First, ICT-enhanced lessons have a profound impact on students because of the many ways in which information is represented. Second, since information is so widely available and simple to acquire, it may alter the dynamic between educators and their students. Technology in education may also get significant aid from ICT. Over the last several decades, there has been a dramatic rise in the percentage of young people who are able to pursue postsecondary education.

Public schools are the backbone of any nation. If anything goes wrong at this juncture, it might set the nation back. Teachers may benefit greatly from the use of ICT in the classroom since it allows them to present their students with higher-quality learning materials and more efficient instructional strategies.

With the use of ICT, students are better able to learn and retain information since they have access to more engaging learning resources. Computer programs, overhead projectors (OHPs), films, television (TV), smart classrooms, etc. all contribute to a more stimulating and stimulating learning environment for students in elementary and secondary school. Learning skills for the twenty-first century highlight the need of moving away from teacher-centered pedagogy and toward a more learner-centered approach. To put it another way, ICT and related gadgets allow for a more dynamic, interactive, and cooperative learning atmosphere. The use of ICT may enhance not only the educational learning system but also the administrative system.

LITERATURE REVIEW

Ratheeswari, K. (2018) The modern world is profoundly affected by ICT. They play a significant role in many fields, including business, education, and the arts. In addition, many people see ICTs as agents of transformation; Improvements in the Workplace, in Education, in Student Learning, in Scientific Research, and in the Availability of Information and Communication Technologies. In order to equip today's pupils with the knowledge and abilities they'll need to succeed in the information era, it is crucial that teachers make use of ICT in the classroom. With the use of ICT, educators at any level may make their lessons more engaging and accessible to their students. ICT has made India's training programs for teachers more practical and engaging than ever before. The internet and other forms of interactive multimedia are only two examples of the kinds of Information and Communication Technologies (ICTs) that need to be properly incorporated into traditional classroom instruction if we want to prepare today's students for tomorrow's jobs in education.

Tilak (2020) despite significant progress and changes, the Indian higher education system continues to face a number of problems from both internal and external factors. There will soon be a dramatic increase in the number of people enrolled in higher education in India. The distribution of college opportunities has become much more equitable. There have been numerous positive developments in India's higher education system, but they have not been without their fair share of challenges. Despite the higher education system's meteoric growth in size, only a quarter of the youthful people choose to pursue a degree. For the economy to go to the next level, the present enrollment rate of 26% is not good enough. There are large disparities between rural and urban areas, as well as across regions and states in terms of access to higher education, and these disparities are only slowly beginning to narrow. Recent research has shown that a common fear exists that India's higher education levels are dismally poor and declining. Significant change is needed to solve these numerous challenges in India's higher education system, which is part of a larger effort to build a long-term strategy and plan for the system's growth.

Dahiya, Brahm (2018) The focus of this study is on how ICTs, or information and communication technologies, have altered today's educational institutions. Specifically, the article has argued that information and communication technologies (ICTs) have had a little impact on educational practice in education training to date, However, it is expected that this influence will increase dramatically over the next several years, and that ICT will develop into a potent agent of change in a variety of pedagogical approaches. Evident from the research is the rapid growth of ICT use in India's higher education sector throughout the country's many states. One of the most frequently acknowledged problems with using ICTs in education is making judgments based on creative possible results rather than instructional requirements. In poor nations, where higher education is laden with actual challenges on a number of levels, there is an increasing need to make sure that the outcomes of creative potential are seen in relation to instructional demands. While student-centered classrooms benefit greatly from the use of ICT, the transition there may be difficult for educators and those being educated. The importance of information and communication technology (ICT) in higher education is growing as the world becomes more reliant on digital media and information, and its relevance will grow and evolve throughout the 21st century.

Habib, Hadiya & Shah, Ghulam & University, Badshah & Rajouri, Jammu (2017) a highly social endeavor, education has long been linked to effective educators who maintain close relationships with their students. The use of ICT in today's classrooms is ubiquitous. The smart use of technology in the classroom has the potential to inspire students, enliven our lessons, and revitalize our teachers as they acquire new knowledge and methods. The 21st century will see a further increase in the significance of ICT's involvement in higher education. In addition to enhancing traditional classroom instruction, ICT's usage in schools paves the way for more convenient online courses. Teaching, learning, and study all benefit from the increased usage of ICTs in schools. The usage of ICT will improve the classroom experience and better equip the next generation for success in the workplace and in life. This study describes the effects of information and communication technologies (ICT) on higher education and speculates on their possible future evolutions.

Pujari, Vinayak & Sharma, Dr. Yogesh & Jathar, Mahesh & Jhabarmal, Shri (2020) Activity is fundamental to education, and excellent teaching is often associated with close, one-on-one relationships between instructors and their students. The use of ICT in today's classrooms is ubiquitous. By teaching us new skills and approaches, technology has the potential to rekindle teachers' enthusiasm for the classroom and invigorate their pupils. The 21st century will see a further increase in the significance of information and communication technologies in higher education. When it comes to

education, ICT not only improves the quality of classroom instruction, but also provides the convenience of online study. Education benefits greatly from the widespread adoption and use of ICTs in teaching, learning, and research. The usage of ICT will improve the classroom experience and better equip the next generation for success in the workplace and in life. This study describes the effects of information and communication technologies (ICT) on higher education and speculates on their possible future evolutions.

RESEARCH METHODOLOGY, STATISTICAL TECHNIQUE AND DATA BASE

To examine how information and communication technology (ICT) and higher education contribute to progress, this study used a descriptive research approach. All India Survey of Higher Education report were used to compile the data. In order to gather information regarding the need of use of ICT in higher education, we have compiled and analyzed government initiatives started recently.

Descriptive statistics and tabulation were used to analyze and evaluate data . We have used the data from All India Survey for Higher Education (AISHE) 2017-18

Gross Enrollment Ratio: It is defined as the ratio of total enrolled in higher education to the population in the age group 18-23.

Role of ICT in Higher Education Sector of India

The introduction of ICT into every sector or field is essential in today's modernized and digitalized world. Every day, new technological advances benefit every industry, institute and individual. The education sector welcomes technological advancements with open arms. Education technology has become a hot topic in recent years. EdTech, or education technology, is a blend of educational theory and computer software. The introduction of modern technological tools and processes in education has brought many benefits to educational institutions. Colleges and universities are among the educational institutions that are adopting innovative and technologically-advanced ways of teaching and learning. Education technology has combined classroom learning with digital tools and media, which have made the learning process engaging, inclusive and tailored for the students. It has improved the quality of education and the performance of students.

Understanding the methods and means by which Indian universities choose to educate their students will help us better understand how they can mould the youth into good citizens with moral values. These universities help students develop their interests, learn new things, and innovate. Indian Universities can use technology to change the existing education system and build a finer education system that can provide superior education worldwide. Indian universities are using technology for a variety of educational activities. They have started to conduct exams and classes online. They have begun replacing traditional teaching methods with the latest and most creative education technologies.

The key operations carried out by universities wherein education technology could prove very helpful. Adoption of education technology would help the educational sector tremendously.

1. **Online Admission Process**

Admission is the most important part of education. The online admission system simplifies the admission process and provides digital options for fee payment and admission. This system allows us to provide information about courses and their details, accept applications, conduct exams, release merit lists, accept payments, and offer admissions in digital format. This online admissions system helps us reduce the tedious manual work such as query resolution and grievance management. It also generates reports, manages data, etc. These tasks are usually performed by administrative staff. The adoption of an online admission system will benefit colleges and universities as it would make the process of giving and receiving admissions, collecting fees and performing admission-related activities much easier. It could also save them a lot of money.

2. **Online Exam software for exam and assessment**

The answer sheets used to have to be brought to the examination centres prior to the exams. The answer sheets had to be transported to the storage location from the exam centre. This process was too physical and there was always a chance of the answer sheets being damaged or lost. In the case of traditional evaluations, there are also many other tedious tasks, such as assigning the examiners to evaluate, traveling by the examiners and moderators in order to collect the answer sheets and submit them, manual evaluation, manually generating the results, etc. Education technology offers universities the opportunity to replace traditional methods of evaluation using answer sheets with digital evaluation or onscreen evaluation process. The introduction of digital evaluation can be extremely beneficial for education technology. A university's syllabus should be dynamic and open-ended due to the constant changes and advances. The syllabus should be based on inputs from industry experts. The syllabus should be created in such a way that new changes can be easily implemented. The syllabus should be available via technology. Knowledge Management can be done online, where students can watch videos and review their course materials. Knowledge Management Tool allows teachers to share research papers, educational

contents. By using education technology to advance the university syllabus, it can be digitally accessible.

The universities should place more emphasis on the practical side of education. The number of theoretical assignments should decrease and the number practical exams should increase. The emphasis should be placed on practical knowledge in the grading system. In the present context, the theory part of the subject is given more weight. Students who lack practical knowledge of the subject are at a disadvantage when applying for jobs. You can now listen to or read the best lectures from the brightest minds in the world on YouTube and other social media channels. Education is now more accessible and open. This calls for a new assessment of education or examination processes. The use of technology in practical exams will help students better understand what they have learned as theory. Practical-oriented assessments using a mix of education technology will ensure that students are well versed in the subject, which is important for future prospects. Education technology is the answer to the problems associated with the traditional education system. It can make learning more meaningful and fun, as well as improve the relationship between students and teachers. It is easier to use technology in education if students are familiar with it.

Rationality for use of ICT in Higher Education in India

The following table 1 clearly exhibit the diverse trend of gross enrolment ratio (GER) in higher education among different major states of India. Bihar is at the bottom with 13% GER and Tamil Nadu at the top with 48.6% GER. The female GER is less compare to male (GER) in almost every state of India. Similarly GER in higher education for the schedules caste is also low.

State-wise Population of age 18-23 years for male, female and persons and number of colleges per lakh population is given in Table 2, which clearly shows that the most populous states such as Uttar Pradesh and Bihar are poorly served in higher education. Whereas the southern states as well less populated states are better served. We need to increase number of colleges all over India, specially in most populous states. We also need to increase number of colleges in rural and far flung and hilly areas of the country. We know that it is not an easy task to increase number of colleges in short run because we have financial as well as physical i.e. trained manpower, building etc. constraints.

Information and Community Technology (ICT) may help us to solve this problems to certain level through Massive Online Open Courses (MOOCs) and online library depository. We can extend quality higher education to eligible and interested persons through ICT. Government and private institution both can play their role in spread of higher education through use of ICT.

Table 1: Gross Enrolment Ratio (GER) in Higher Education in India

States	All			Schedule Caste		
	Male	Female	Person	Male	Female	Person
Andhra Pradesh	34.7	27.1	30.9	29.5	24.4	26.9
Assam	18.6	17.8	18.2	20.1	18.7	19.4
Bihar	14.5	11.5	13.0	11.5	6.9	9.2
Chhattisgarh	18.5	18.3	18.4	18.8	17.4	18.1
Gujarat	21.9	18.2	20.1	29.1	24.3	26.8
Haryana	27	30.7	28.7	18	19.4	18.6
Himachal Pradesh	34	42.2	37.9	25.1	30.4	27.7
Jharkhand	18.4	17.6	18.0	15.1	12.5	13.8
Karnataka	27.2	28.5	27.8	20	19.4	19.7
Kerala	32	40.4	36.2	17.8	32.2	25.0
Madhya Pradesh	21.8	20.5	21.2	20.7	18.8	19.8
Maharashtra	32.6	29.5	31.1	32	29.2	30.6
Odisha	23.8	20.1	22.0	21.8	15.8	18.8
Punjab	27.6	33.6	30.3	19.4	23.8	21.4
Rajasthan	22.7	20.6	21.7	18.2	16.2	17.2
Tamil Nadu	49.1	48.2	48.6	41.8	42.5	42.1
Telangana	37.1	34.2	35.7	30.6	32.4	31.5
Uttar Pradesh	25.2	26.7	25.9	21.1	22.4	21.7
Uttarakhand	36.3	36.3	36.3	26.4	26.7	26.6
West Bengal	19.9	17.6	18.7	14.8	12.8	13.8
All-India	26.3	25.4	25.8	22.2	21.4	21.8

Source: AISHE 2017-18

Note: Data refer to population in the age group of 18-23 years.

Table 2: Population of age 10-23 years and Number of Colleges per lakh population

	Population of age 10-23 years						Number of Colleges per lakh population
State	Male	Female	Person	Male	Female	Person	2017-18
				%ge Population			
Andhra Pradesh	2728267	2766950	5495217	3.73	4.03	3.87	48
Assam	1811017	1918121	3729138	2.48	2.79	2.63	14
Bihar	6011917	5595537	11607454	8.22	8.14	8.18	7
Chhattisgarh	1553735	1574035	3127770	2.12	2.29	2.21	24
Gujarat	3784555	3432529	7217084	5.18	5.00	5.09	30
Haryana	1729377	1455176	3184553	2.37	2.12	2.25	30
Himachal Pradesh	377209	349405	726614	0.52	0.51	0.51	45
Jharkhand	1925870	1904433	3830303	2.63	2.77	2.70	8
Karnataka	3567558	3415075	6982633	4.88	4.97	4.92	51
Kerala	1499642	1492924	2992566	2.05	2.17	2.11	44
Madhya Pradesh	4693864	4211674	8905538	6.42	6.13	6.28	24

Maharashtra	6969675	6300057	13269732	9.53	9.17	9.36	33
Odisha	2309432	2314497	4623929	3.16	3.37	3.26	23
Punjab	1733665	1429163	3162828	2.37	2.08	2.23	33
Rajasthan	4643790	4286822	8930612	6.35	6.24	6.30	33
Sikkim	40090	37533	77623	0.05	0.05	0.05	22
Tamil Nadu	3543854	3531003	7074857	4.85	5.14	4.99	35
Telangana	1979708	2000154	3979862	2.71	2.91	2.81	51
Uttar Pradesh	13122748	11776057	24898805	17.95	17.14	17.56	28
Uttarakhand	618182	585806	1203988	0.85	0.85	0.85	37
West Bengal	5331100	5541698	10872798	7.29	8.07	7.67	12
Jammu and Kashmir	670424	627732	1298156	0.92	0.91	0.92	23
All-India	73121283	68708245	141829528	100.00	100.00	100.00	28

Source: AISHE 2017-18

Some important digital initiative in higher education sector by Government of India using ICT

1. SWAYAM portal

All classes from 9th grade through graduate school are available on SWAYAM, an online gateway that anybody may use at any time. Instructors are among the finest in the nation, thus the courses are engaging and informative. They are also free for any student to use. As part of its "Digital India" initiative, the Indian government is funding the development of MOOCs. SWAYAM is a major initiative that provides an integrated platform for free online courses from India's top-notch institutions such as IITs and IIMs.

2. SWAYAM PRABHA

SWAYAM PRABHA consists of 34 DTH channels that broadcast educational programmes of the highest quality 24X7 using satellite GSAT-15. The content will change every day for a minimum of (4) hours, and then be repeated five more times a day. This allows students to pick the time that suits them. BISAG-N in Gandhinagar is responsible for uplinking the channels. The NPTEL, IITs, UGC, CEC, and IGNOU all provide content. The INFLIBNET Centre is in charge of the website's upkeep.

3. National Digital Library of India (NDLI),

The National Mission on Educational Through Information and Communication Technology (NMEICT) is responsible for this initiative under the Ministry of Education. This initiative is being led by the Indian government's Ministry of Education as part of the country's National Mission on Education via ICT. Its purpose is to compile metadata from digital libraries all around the world and create a full-text index of these collections. Many books may be accessed without cost through the NDLI. The UI supports the top 10 Indian languages, while the platform itself can handle material in any language. The Indian Institute of Technology at Kharagpur is in charge of its creation, management, and upkeep. The Library was first launched as a pilot in May 2016, and then dedicated to the country in full on June 19, 2018

4. E-SHODH SINDHU

Electronic materials for higher education are brought together in E-Shodh Sindhu. Following the advice of the Expert Committee, the Ministry of Education combined the UGC-INFONET Digital Library Consortium, the National Library of Information Science and Technology, and the INDEST-AICTE Consortium to establish e-Shodh Sindhu. Through its many bibliographic databases, citation resources, and factual databases, e-Shodh Sindhu continues to make available the content of more than 10,000 titles of both core and peer-reviewed journals from a broad range of publishers and aggregators. This includes centrally-funded institutions such as universities, colleges, and specialized colleges that meet the criteria of Sections 12(B) or 2(f) of the UGC Act. The primary objective of the e-Shodh Sindhu is to provide academic institutions with affordable access to high-quality electronic resources like as full-text databases, bibliographic databases, and factual databases.

5. Global Initiative of Academic Networks (GIAN)

The Indian government has officially sanctioned the GIAN in Higher Education initiative. The initiative's stated goal is to increase participation by international entrepreneurs and scientists in India's elite educational institutions. This will increase India's availability of academic resources and hasten the rate of change. Additionally, India's technical and scientific prowess would be catapulted to new heights. Students and teachers need to be able to communicate with the world's leading academics and business minds in order to incorporate the best of global experience into our educational systems. They should be inspired to inspire others to tackle Indian issues by sharing their knowledge and experience.

6. E-PG Pathshala

The UGC is responsible for carrying out the MHRD's E-PG Pathshala program, which is part of the government's larger National Mission on Education via ICT. The quality of the material presented in classrooms is paramount. The personnel for each topic included a lead researcher, paper coordinators, content editors, language editors, and multimedia specialists.

7. ShodhGangotri

Under "ShodhGangotri", university research supervisors and research scholars are asked to submit an electronic version to universities of their approved synopsis that they submitted to universities to register themselves for the Ph.D. program. This repository would allow researchers to see the research trends in Indian universities and avoid duplication. Synopsis from "ShodhGangotri", will be

later mapped to the full-text thesis in "ShodhGanga". Once the full text thesis is submitted, the link from ShodhGangotri will be to the full text theses.

8. ShodhGanga

ShodhGanga, a theses repository, is created using DSpace software. Shodhganga allows researchers to deposit their Ph.D. Theses in an open-access repository. The repository will index and archive any electronic theses and dissertations that are submitted to it.

CONCLUSION

Thousands upon thousands of students who would not have access to higher education for various reasons are now able to do so because to the widespread adoption of ICT in the classroom. The influence on society will be good if the quality of education is improved via the use of ICT. This study is an effort highlight the government policies/initiatives to enhance higher education among all eligible and interested persons of India and to bring focus on execution of policies concerning the integration of ICT and the efficiency of the classroom. The use of technology should increase online and interactive education opportunities for all students. Teachers can do their jobs well with the ongoing education and development. The educational environment as well as administrative system in higher education sector of India can be more efficient, transparent and inclusive through introduction and wide uses of ICT.

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