

## **Information and Communication Technology & increasing use of its tools in Higher Education**

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### **Abstract**

*Information transmission from one place to another place between human beings is essential component for continuous development of the civilization. In ancient time, it was done through the traditional methods which include oral, face to face and also written literature in form of books. But it changed with the passage of time and invention of technology. At present Information and communication Technology (ICT) become powerful tool for information transmission. This research paper focuses on the impact of ICT on various aspects of contemporary life, including healthcare, social interactions, business, and most importantly, higher education. Specifically, it explores the integration of ICT tools in higher education and how they have transformed the traditional classroom setting into a dynamic and interactive learning environment. The study evaluates the effectiveness of various ICT tools such as Learning Management Systems (LMS), online collaboration tools, educational apps, and virtual reality technology in enhancing student learning outcomes. The paper provides empirical evidence to support the use of these tools in higher education.*

*Furthermore, the paper examines the challenges and possibilities that come with the adoption of ICT in higher education. Lastly, it explores the future trends and potential implications of ICT in shaping our education system and ultimately our world.*

**Keywords:** *ICT, Tools, Higher Education, Environment, Opportunities, Challenges, India.*

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### **I. Introduction**

Information and Communications Technology (ICT) refers to a vast array of technologies and tools that enable the processing, storage, retrieval, and transmission of information. The adoption of ICT has revolutionized modern life, transforming the way we live, work and communicate in today's digital era. Figure-1 shows important sectors using ICT. ICT encompasses a wide range of uses, from hardware devices like computers, mobile devices, and servers to software applications, databases and networks that connect them. Due to its constant evolution and development, there is no comprehensive definition that encompasses all aspects of ICT. Nevertheless, its widespread adoption has a significant impact on almost every facet of our existence<sup>[1]</sup>.

In the field of education and especially in higher education, ICT has become an essential requirement, enabling improved accessibility, flexibility and convenience, as well as enhanced collaboration, engagement, and communication. The incorporation of intelligent or advanced features into existing technologies has expanded the range of ICT applications, having a profound impact on educational growth, both directly and indirectly. The advent of modern communication networks has opened up new avenues for the promotion and expansion of education, providing innovative teaching and learning methods that offer personalized and engaging learning experiences. The use of ICT tools in higher education has increased significantly in recent years, with many institutions adopting these tools to enhance teaching and learning processes. By utilizing technology effectively, students can be motivated, classes can become dynamic and interesting, and teacher enthusiasm can be renewed as they acquire new skills and techniques. Additionally, technology can help students understand complex and abstract concepts more clearly.

This research paper aims to review the literature on the use of ICT tools in higher education, examining the benefits and challenges of their use and exploring some of the most popular ICT tools employed in higher education.

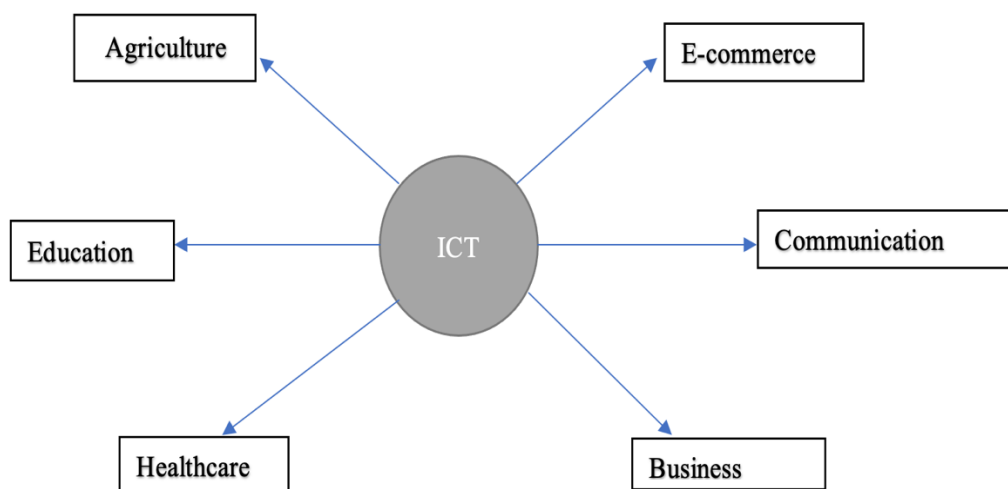


Figure 1: Various sectors using Information Communication Technology.

## II. Impact of ICT on Higher Education

Over the past three decades, higher education systems have experienced remarkable growth to cater the rising need for quality education accessible to all. As technology continues to advance, the use of Information and Communication Technology (ICT) in education is expected to become increasingly prevalent, fundamentally changing how education is delivered and transforming the roles of educators and learners.

ICT has revolutionized education by enabling students to learn at any time and from anywhere. Online learning platforms have made educational resources available globally, facilitating real-time interaction between students and teachers. The use of ICT tools in education has also allowed for personalized teaching and assessment methods, enhancing engagement and effectiveness. Furthermore, to improve access to higher education, open and distance learning facilities are increasingly contributing to reaching the remotest parts of the country. Henceforth, ICT had a profound impact on education [2].

The integration of ICTs in higher education has far-reaching implications for the entire educational process, from the adoption and implementation of technology to the resolution of critical issues such as research, access, equity, effectiveness, development, quality, administration and teaching methodology. By leveraging ICT applications, educational institutions can gain a competitive advantage by delivering better services to students and staff, improving operational efficiencies, and creating enhanced and personalized learning experiences. ICTs are also tools that enable and bring about transformation which, when used properly, can encourage the shift to an environment which is learner-centered. Several ICT tools are used to achieve and to facilitate the purpose of higher education in which few important are discussed here.

### 2.1 Learning Management Systems (LMS)

Learning Management System tools<sup>[3]</sup> have also made it easier for educators to create and manage online courses, allowing them to reach more students and provide more flexible learning opportunities. With the help of LMS tools, educators can create and share multimedia content, host virtual discussions, and provide real-time feedback to students. Additionally, LMS tools have features that enable educators to track student progress, identify areas of difficulty, and provide targeted support where needed.

Furthermore, LMS tools can also help institutions to reduce administrative costs and streamline workflows. Automating tasks such as grading, attendance tracking and course registration, which as a result gives more time for instructors and administrators to focus on more meaningful activities such as teaching and student support. Overall, the use of LMS tools in higher education has revolutionized the way courses are delivered and managed, resulting in improved student outcomes and greater institutional efficiency.

### 2.2 Online collaboration tools and educational apps

Online collaboration tools and the use of educational apps such as discussion forums, wikis, and social media platforms, Byju's etc have become popular in higher education. These apps provide students with access

to learning resources, interactive simulations and assessments on their mobile devices. For example, YouTube and unacademy are popular online video platforms that offer a vast array of educational content for learners of all ages and backgrounds. These platforms provide access to a diverse range of courses, lectures and tutorials on various subjects including science, technology, engineering, mathematics, humanities, and social sciences. One of the primary benefits of using platforms like YouTube and Unacademy is their convenience and accessibility. Learners can access these platforms from anywhere and at any time using their desktop or mobile devices. They also offer a range of features that can enhance the learning experience, such as pause, rewind and fast-forward options, subtitles and transcripts. They also provide opportunities for students to practice and develop their digital literacy skills which are becoming increasingly important in today's digital age.

Moreover, they offer a cost-effective alternative to traditional forms of education. Many of the courses and resources available on these platforms are free or offered at a much lower cost than traditional education options.

The use of online collaboration tools has been found to enhance student engagement and improve their critical thinking and problem-solving skills. Studies have shown that students who use online collaboration tools in their coursework demonstrate higher levels of motivation and satisfaction with their learning experience.

### **2.3 Virtual Reality**

Virtual Reality (VR) technology<sup>[4]</sup> is a powerful tool that is being increasingly adopted by higher educational institutions to create immersive learning experiences. Using VR, students can engage with educational content in a simulated environment that closely mimics real-world scenarios. This provides them with a unique opportunity to apply theoretical knowledge in practical situations, which can significantly enhance their understanding and retention of complex concepts.

VR can be used in a variety of ways in higher education, from creating virtual simulations and labs to providing interactive tours of historical sites, museums and other cultural landmarks. For example, medical students can use VR simulations to practice complex surgical procedures in a safe and controlled environment, while engineering students can use VR to design and test new prototypes before manufacturing them. Research has shown that the use of VR technology in higher education can lead to increased student engagement, motivation and learning outcomes.

### **2.4 Some other ICT tools used in higher education**

There are several other ICT tools that can support and enhance education. For example, email enables the easy sharing of knowledge and information with anyone, anywhere in the world<sup>[5]</sup>. Other tools such as WhatsApp and Power Point presentations can also be utilized to facilitate communication and deliver engaging presentations. Blackboard is a web-based learning system used by educational institutions to manage and deliver online course content to the students. It provides tools for course management, communication, assessment and collaboration, allowing instructors to create and manage course materials, grade assignments and tests, and communicate with students through announcements, discussion boards and messaging. Blackboard is widely used by colleges, universities and K-12 schools in all countries.

Kahoot is a great tool for creating quizzes to test students' knowledge or to review content that has already been taught in the classroom. The four types of tests available are contest, puzzle, debate and survey. The game can be projected on a screen, allowing the entire class to participate, with students responding from their computers or mobile devices.

Dropbox offers more than just a storage space for documents, images and presentations. It also provides tools for synchronizing folders with classmates, students, and family members. Additionally, users can communicate with each other using the feedback system and access their files from various devices. Trello is the ultimate tool for organizing your life, with the ability to manage notes, emails and reminders in a highly visual manner. Feedly is a great way to keep up to date with new content and news in the world of education, which can be used in classes to keep students informed and engaged<sup>[6]</sup>.

ICT serves as a connecting link by facilitating communication between people worldwide through various devices such as pagers, faxes, mobiles, and social networks, which allows both students and educators to share their knowledge, research and their way of teaching with whole the world. And this also allows individuals to access resources as needed and promotes the emergence of new trends in society in response to changing environments. In addition, ICT brings value to the organization and management of learning institutions, with the internet being a major driver of innovation and development for individuals, businesses, educational institutions and society as a whole.

The integration of ICT in higher education<sup>[7]</sup> has a profound impact on the quality of research work and the number of individuals involved in research across various fields. ICT tools provide opportunities for global collaboration and networking, allowing researchers to connect with colleagues and experts from all over the world. This not only enhances the quality of research but also promotes knowledge exchange and cross-cultural learning.

Additionally, the use of ICT tools in research saves time, money, and effort, making research studies more efficient and effective<sup>[8]</sup>.

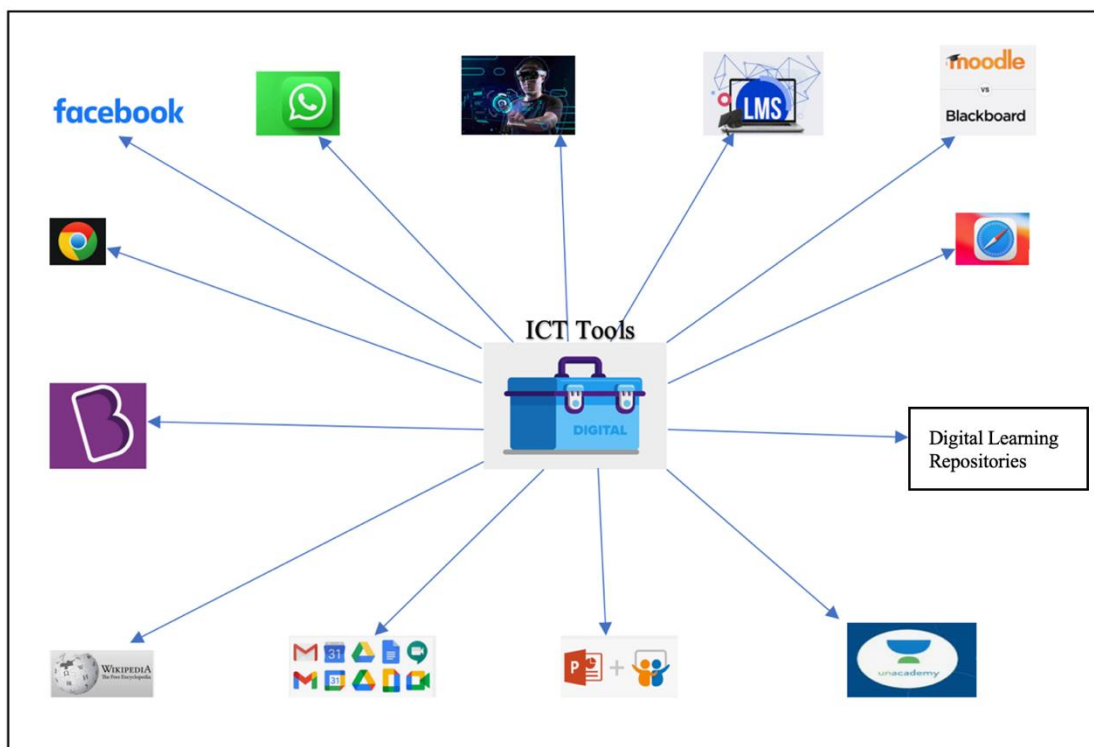


Figure 2: Various ICT tools useful in higher education.

### III. Impact of ICT on other Sectors

#### 3.1 Business

One of the most significant impacts of ICT has been also on the business world. ICT has enabled businesses to automate many of their processes, making them more efficient and cost-effective. The use of ICT has also facilitated the rise of e-commerce which has transformed the way people shop and do business.

#### 3.2 Healthcare

ICT has revolutionized the healthcare industry as well. With the help of electronic medical records, doctors and nurses can access patient data quickly and easily, improving the quality of care. ICT has also enabled the development of telemedicine which allows doctors to diagnose and treat patients remotely.

#### 3.3 Social Interactions

It has become more convenient for individuals to connect with each other and share information with the advent of social media platforms like Facebook, Instagram and Twitter.

#### 3.3 Agriculture

E-agriculture, which refers to the utilization of information and communication technology in agriculture, aims to improve agricultural and rural development by enhancing communication and information processes<sup>[9]</sup>.

Through the assistance of ICT, farmers are able to stay updated with all recent information. This is inclusive of data about weather, agriculture, and newer and more advanced ways of enhancing crop quality and production.

### IV. Growth Status of ICT Sector in India

Information and Communications Technology (ICT) has played a significant role in India's economic and social development. India is one of the world's largest ICT markets, with a rapidly growing IT industry that has become a key driver of the country's economy.

The Indian government has recognized the importance of ICT and has taken several initiatives to promote its growth through various government departments and ministries. The extension of fiber-optic backbones to rural areas and the promotion of greater economies of scale by the government will lead to reduced costs and increased affordability. Furthermore, this is going to contribute to narrowing the disparity in ICT access between urban and rural areas<sup>[10]</sup>.

The ICT sector and Digital Economy are significant economic drivers for India, contributing over 13% to the country's GDP. In recognition of this, India has undertaken significant initiatives to advance education and content delivery through Information and Communication Technology. Education plays a critical role in the economic and social growth of a country. For which, initiatives such as Gyan Darshan, launched in 2000, provide educational broadcasting for school children, university students and adults. Gyan Vani is an important initiative in the field of education in India. It is a community radio station network that was launched by the Ministry of Human Resource Development (MHRD) in 2000. The radio programs broadcasted by Gyan Vani cover a wide range of topics, including education, health, agriculture, social issues and current affairs. These programs are contributed by institutions such as IGNOU, IITs and other renowned educational institutions in India. The radio programs are designed to cater the needs of various target groups, including students, teachers, professionals and the general public. Country-wise classroom initiative taken by UGC involves broadcasting educational programs also on Door Darshan channels and Gyan Darshan. It also helped to promote education and awareness on various issues among the masses.

Additionally, almost 95% of IGNOU's printed material has been digitized and made available on an online repository. The NPTEL(National Program for Technology Enhanced Learning), another joint venture of IITS and IISC, promotes education through technology. Moreover, the Society for Research and Initiatives for Sustainable Technologies and Institutions known as SRISTI, encourages the use of ICT to strengthen the capacity of grassroots inventors and entrepreneurs involved in biodiversity conservation and developing eco-friendly solutions to local challenges. These initiative has also provided a platform for educational institutions to showcase their expertise and share knowledge with the wider community<sup>[11]</sup>.

## **V. Challenges and Opportunities**

The adoption of ICT has brought about several challenges and opportunities. One of the biggest challenges is the digital divide, which refers to the unequal distribution of access to ICT resources among different communities. The digital divide can have significant implications for education, healthcare and economic development. Another challenge is the need for digital literacy, which refers to the ability to use ICT effectively and responsibly. For say, in the education sector, some students and educators may not be familiar with ICT tools or may lack the necessary skills to use them effectively. The possibility of technology becoming a distraction is another issue of concern. Students may be tempted to use ICT tools for non-academic purposes, which can result in reduced academic performance.

ICT has undoubtedly revolutionized the way we work and communicate, offering unparalleled convenience and efficiency. However, the advancements in technology have also given rise to concerns about privacy and security. With incidents of phone signal interception, email hacking and other cybercrimes on the rise, individuals are increasingly wary of the possibility of their personal information becoming public knowledge. Furthermore, the pace at which IT evolves means that staying current and up-to-date is essential for job security. It is no longer sufficient to possess basic computer skills; individuals must continually adapt and learn new technologies to remain competitive in the job market. Along with the benefits come the risks, as computer viruses, trojans, spam, and malware pose a constant threat to the security of our systems.

As technology continues to advance, many students have become increasingly reliant on computers and digital devices for various tasks. Writing by hand has become less common as students/educators or other people rely on tools such as spell checkers to catch errors and improve the efficiency of their writing. Similarly, many students have become accustomed to using calculators for even the simplest arithmetic calculations. The rise of the internet and digital information has also led to a decline in the traditional habit of reading books. With a vast amount of information readily available online, many people have grown accustomed to finding answers to their questions through a quick online search rather than reading through a book and authentic literature. As a result, these changes have led to a decline in handwriting skills, basic math abilities and the habit of reading for pleasure or education. While technology has undoubtedly made certain tasks more convenient and efficient, it is important to consider the potential consequences of relying too heavily on these digital tools and the impact they can have on our cognitive abilities and learning habits.

## **VI. Future Trends and Implications**

The future of ICT looks bright, with several emerging trends that have the potential to transform our world even further. One of the most significant trends is the rise of artificial intelligence (AI), which has the potential to automate many tasks currently performed by humans, from driving cars to diagnosing diseases.

The use of ICT in education is expected to continue to grow in the future, and this will have significant implications for the way education is delivered and experienced. Personalized learning, gamification, artificial intelligence, and virtual and augmented reality are just some of the future trends that are expected to shape the future of education. Educators and learners will need to adapt to these changes and develop new skills and competencies to fully realize the potential of ICT in education.

## **VII. Conclusion**

From business and education to healthcare and social interactions, ICT has profoundly impacted almost every aspect of our lives. While there are challenges to adopting ICT, such as the digital divide and the need for digital literacy, its potential to transform our world is undeniable. Emerging technologies like AI and IoT will continue to shape the way we live, work and communicate as we move into the future.

In the realm of education, the integration of ICT tools has brought about a significant transformation in the traditional classroom setting. Improving and elevating the standards of education and instruction is of utmost importance, especially during times of widespread growth and development in the field of education. The integration of ICTs into education can enhance its quality in various ways, including boosting student motivation and engagement, improving teacher training and enabling the acquisition of essential skills. The use of various ICT tools such as Learning Management Systems (LMS), online collaboration tools, educational apps and virtual reality technology has been found to enhance student engagement, motivation, and learning outcomes. Awareness of various available ICT tools is required with the promotion of the use of these tools among the learners.

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