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The Impact of Information Technology (It) and Information and Communication Technology (Ict) On Education and Research in Commerce and Management

Bekzod Ochilov Bakhadirovich [1]

[1] Senior teacher, Information Technologies and Management University, Uzbekistan

Abstract:

Information Technologies (IT) and Information and Communication Technologies (ICT) have been pivotal in driving global transformations over the past few decades. The advent of the World Wide Web has revolutionized access to information and educational resources, providing a scope of knowledge acquisition that was inconceivable just a few decades ago. In recent years, web-based applications such as social networking platforms, collaborative virtual environments, blogs, and spaces for publishing creative content have become integral to both personal and professional domains. This rapid evolution has led to a growing disconnect between the external world, where knowledge production, dissemination, and learning are dynamically reshaped, and traditional educational institutions, including schools, universities, and research centers, which have been slower to integrate these changes.

The integration of ICT in teaching, learning, and research has made significant progress, particularly with the growing adoption of diverse web-based tools. However, to keep pace with this rapidly evolving knowledge landscape, researchers and educators must adapt to new methods of knowledge creation, distribution, and application. Understanding and navigating today's complex, fast-changing knowledge base is crucial in remaining relevant in fields such as education, commerce, and management.

This article seeks to explore the role of ICT in enhancing knowledge acquisition and facilitating resource development, specifically within the domains of commerce and management. It examines how ICT tools have reshaped the ways in which researchers and professionals access, gather, and

utilize information, and highlights the necessity of embracing these technologies to stay competitive and innovative in an increasingly digital and interconnected world.

Keywords: Information Technologies (IT), Information Communication Technologies (ICT), Research, Commerce, Management.

Introduction

In contemporary research and information dissemination, the use of Information and Communication Technology (ICT) tools has become more prevalent. However, the most effective application of these tools lies not merely in gathering information but in enhancing cognitive abilities to critically evaluate, differentiate, and create new knowledge. Given that the research process often involves complex datasets and extensive analytical demands, ICT tools that facilitate meaningful interpretation, precision, and added value to the generated information are considered superior to those that only aid in information collection.

Information Technology (IT) and ICTs have long been acknowledged for playing dual, often contradictory roles in society. On the one hand, they hold vast potential for advancing development goals, while on the other, they risk exacerbating the digital divide between the information-rich and the information-poor, thereby deepening existing socio-economic inequalities. These technologies encompass a wide range of meanings, approaches, and applications, from capacity-building initiatives aimed at eradicating persistent poverty to the rapid expansion of back-end processing offices (BPOs) in urban areas, creating significant employment opportunities. Despite these contradictions, IT and ICTs are generally perceived as vital drivers of societal progress.

The concept of "ICT for Development" has become a central theme in efforts to transform developing countries into global superpowers or to improve the living conditions in underdeveloped regions, making them cleaner and healthier. India, for example, has experienced a rapid IT-driven socio-economic boom, with its GDP reaching unprecedented heights. The country's urban landscape is now characterized by IT parks, global support centers, and Special Economic Zones (SEZs). Proactive government policies have sought to accelerate this economic upswing, yet these developments represent only a small part of a much larger picture. Despite the growing economy, the benefits of IT remain largely confined to urban areas, with vast suburban, peri-urban, and rural regions still awaiting the fruits of this prosperity.

Looking back at the history of the internet in India, the government launched its first international telecom carrier in 1995, marking the nation’s early steps toward becoming part of the global "information age." Since then, successive government policies have aimed at fostering development and progress through digital inclusion, with the ultimate goal of achieving "Internet for All." Yet, the implementation of these policies has been hampered by operational, procedural, and regulatory challenges, as well as by the absence of a robust legal framework. These obstacles have limited the widespread accessibility and impact of the internet, particularly among marginalized communities.

In conclusion, while ICT holds great promise for enhancing research, development, and societal progress, its success depends on addressing the digital divide and ensuring that its benefits are accessible to all sectors of society. As India and other developing nations move forward with ICT-driven initiatives, it is crucial to focus on inclusive and sustainable growth that bridges socio-economic gaps and fosters digital literacy across diverse populations.

Literature Review

In 1995, Thong and Yap defined information technology (IT) as the combination of computer hardware and software designed to support management, operations, and strategic decision-making within organizations. The authors emphasized that the primary objective of information technology,

including systems like MRP/EDI, CAM/CAD, is to enhance organizational productivity. Boar (1997) expanded this definition, characterizing IT as the technologies involved in managing, collecting, transporting, retrieving, storing, accessing, presenting, and transforming information in various forms. Furthermore, according to Hollander et al. (1999), information technology can be understood as the technological aspect of information systems, primarily aimed at creating computer-based systems that facilitate organizational processes (Sarosa & Zowghi, 2003).

In the context of business relationships, Carr and Smeltzer (2002) described IT as the use of automated procurement systems, electronic data interchange, and computer-to-computer links with key suppliers to improve information systems. A year later, Sarosa and Zowghi (2003), in a study on IT in Indonesia, defined information technology as encompassing all technologies utilized by organizations to collect, process, and disseminate information. This includes hardware (e.g., scanners, printers, computers), software (e.g., operating systems, application development tools, office applications), and various other components. Attaran (2003) also contributed to this understanding, defining IT as the capabilities provided to organizations through computers, software applications, and telecommunications to deliver data, information, and knowledge to individuals and processes.

Additionally, Tan et al. (2009) further refined the concept of information technology by emphasizing its reliance on Information and Communication Technology (ICT) tools, including computer networks, software, and hardware essential for internet connectivity. Drawing on this body of work, it is clear that the term "information technology" encompasses a broad range of information processing and computer applications within organizations. This includes information systems, the internet, ICT infrastructure (e.g., software, networks, and hardware), and tools that transmit or process information to improve organizational efficiency. Moreover, IT encompasses specific applications and hardware packages, such as Computer-Aided Manufacturing (CAM), Computer-Aided Design (CAD), Electronic Data Interchange (EDI), and Enterprise Resource Planning (ERP), all of which contribute to the overall productivity of organizations.

The Computer and Computer Technology

A computer, by definition, is a device designed to perform computations. In this broad sense, any tool that enables mathematical calculations can be considered a computer, regardless of its complexity. However, when we refer to computers today, we typically mean sophisticated electronic machines that carry out a wide range of operations, including data analysis, editing research work, and simplifying complex tasks. Computers have not only reduced human effort but also enhanced the quality of research and education. They have become essential tools for researchers across disciplines, from the physical and behavioral sciences to the humanities, enabling the use of complex research designs and large-scale data analysis that would be impractical otherwise.

In the digital age, it is imperative for researchers and students to become proficient in using computers and related technologies. A foundational understanding of how computers function allows users to leverage these tools effectively. Computers serve multiple roles in education: they can act as "teachers" by delivering content, as "learners" by adapting to students' needs, and as "assistants" in organizing and managing tasks. Key areas where computers have been successfully integrated include Computer-Aided Learning (CAL), distance learning, online assessments, and student progress monitoring.

Information technology (IT) and ICT have revolutionized education, making learning more engaging and effective. The use of technologies such as smart classrooms, LCD projectors, EDUCOM platforms, laptops, digital drawing boards, and memory sticks has transformed traditional education methods, allowing for more interactive and dynamic learning experiences.

Haddad et al. (2002) identified five levels at which technology is employed in education: presentation, demonstration, drill and practice, interaction, and collaboration. These technologies have enhanced student engagement by reducing boredom and frustration in the learning process.

The transformative role of IT and ICT became especially evident during the COVID-19 pandemic from 2019 to 2020. Universities, schools, and educators around the world quickly adapted to virtual teaching environments using online platforms and digital tools to conduct seminars, conferences, workshops, and lessons. A report by UNESCO (2020) noted that over 1.6 billion students worldwide were affected by school closures during the pandemic, with a surge in the use of digital tools such as Zoom, Google Classroom, and Microsoft Teams for education. This shift not only highlighted the importance of IT and ICT in maintaining educational continuity but also underscored their potential to shape the future of learning.

As of 2023, a global survey reported that 70% of educational institutions have permanently integrated online learning tools and hybrid models into their curricula, recognizing the long-term benefits of digital learning environments. The rapid adoption of ICT in education has, thus, significantly altered traditional teaching methods, opening up new possibilities for personalized, flexible, and accessible education across the globe.

Conclusion

Despite the remarkable advancements in computing technology, it is essential to remember that computers are fundamentally tools designed to perform computations; they do not possess the ability to think or reason independently. The human brain, with its capacity for critical thinking, creativity, and judgment, remains irreplaceable and will continue to hold primacy over machines. Researchers must be cognizant of the following limitations associated with computer-based analysis:

Resource-Intensive Setup: Conducting computer-based analysis requires establishing a comprehensive system for data collection, monitoring, and input. This process demands considerable time, effort, and financial investment, which may render it inefficient or impractical for smaller research projects with limited scope or funding. The costs associated with software, hardware, and skilled personnel may outweigh the benefits in such cases.

Loss of Unspecified Data: One of the inherent limitations of computerized analysis is the potential for losing important details that are not explicitly fed into the system. Computers rely on specific inputs, and anything not included in the data entry may be overlooked, leading to incomplete or less nuanced results. This underscores the importance of thorough data preparation and careful consideration of all relevant variables.

Dependence on Human Input: Computers can only execute the instructions provided by the user. If flawed data or incorrect algorithms are input, the resulting analysis will be equally flawed, no matter how advanced the system is. This is encapsulated in the phrase “garbage in, garbage out,” which highlights the importance of accurate data collection and programming. A researcher’s critical thinking and expertise are essential to ensure that the analysis is meaningful and valid.

Contextual Awareness: Users must remain mindful of the context in which their research is conducted. The environment, including the specific cultural, social, and economic factors, should be considered when interpreting data. Computerized systems lack the ability to account for these nuances, and it is up to the researcher to integrate contextual understanding into their analysis. Blind reliance on computer-generated data without considering the broader environment may lead to misinterpretation or oversimplification of complex phenomena.

In addition to these points, researchers should recognize that while computers can process vast amounts of data with speed and accuracy, they cannot replace the role of human intuition and

insight. For example, qualitative judgments, ethical considerations, and the exploration of new theoretical frameworks remain domains where human intervention is indispensable.

Moreover, as technology continues to evolve with artificial intelligence (AI) and machine learning, there is growing concern over the ethical implications of relying on algorithms for decision-making processes in research. Although AI can enhance data analysis by identifying patterns and trends, the interpretation of these findings still requires human oversight to ensure responsible and ethical application.

In conclusion, while computers and information technology offer powerful tools for research, their effectiveness is contingent on human input, expertise, and judgment. Researchers must strike a balance between leveraging technology's capabilities and applying their intellectual rigor, ensuring that computerized analysis is used as a complement to, rather than a replacement for, human thought and insight.

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