**Review Article**

# Role of information and communication technologies in educational systems: a systematic review

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**ABSTRACT**

The aim of this study is to investigate the impact of information and communication technology (ICT) integration in the teaching and learning practices of educational systems. The study is carried out by reviewing various literatures and studies on the ideas of ICT and its usage in teaching and learning practices. The study reveals that ICT is vital to transform the teaching and learning process and has a great importance for both teachers and students. It also looks at the definitions of ICT as given by different scholars. Lack of well-equipped ICT tools, beliefs and commitments of teachers as well as students on Technology-based Teaching and Learning practices are the main challenges of ICT implementation in education successfully.

**Keywords:** Information and communication technologies, Perceptions, Challenges, Educational institutions, ICT integration, Teaching and learning

## INTRODUCTION

In this competitive and dynamic world, education plays a vital role in determining the standard of the society. Quality education is a basic need of the society. It aids to authorizing the people in all aspects by delivering new thoughts.[1] As far as quality education is concerned, Information and Communication Technology (ICT) is said to be indispensable. As the world is moving speedily towards digital information, ICT is becoming a powerful tool for transforming the educational systems.[2] The integration of ICT in education has been steadily growing and is becoming compulsory on the educational reform agenda.[3] ICT in education has numerous effects throughout the education system.[4] It can encourage the relationships and collaboration among educators and students lessen long-standing equity; and promote equal opportunities to obtain education & information, adapt learning experiences to fulfil the desires of all learners, increase diversity of educational facilities & medium and promote technology literacy.[2] ICT can also enhance the teaching and learning activities by facilitating the acquisition, storage and transfer knowledge. It has great potential in modernizing the traditional methodologies of teaching and learning systems.[5] ICT tools are proving indispensable in enabling educational institutions' administration more well-organized and reactive to community needs.[6] Thus, the purpose of this review article is to portray the roles of ICT in educational systems.

## CONNOTATIONS OF INFORMATION AND COMMUNICATION TECHNOLOGY

ICT is the use computer hard ware devices and application soft wares for acquiring, storing, manipulating, and communicating information in various forms.[7] It is a technology for sharing information, ideas and knowledge via electronic devices such as computers, and mobiles phones on global and local networks.[8] It

comprises various electronic devices and soft wares which are used to creating, distributing, storing, managing and communicating Information.[9]

## INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATIONAL SYSTEMS

Integration of information and communication technologies in educational systems refers "the use of communication technologies, such as hardware and software packages in the teaching and learning processes". It is the process of using various teaching and learning technologies for facilitating and modernizing the teaching and learning practices in educational institutions. It lets teachers and students to be beneficial from the dynamic digital era. ICT has the ability in creating proactive teaching and learning environment which in turn enables teachers to swap the traditional way of teaching techniques and be competent to the global requirements.[10,11] It also enables to rush, enhance, and deepen skills; encourage and involve students in learning; helps to relate school practices to work practices; helps to create economic viability for tomorrow's workers; backs to radical changes in school; reinforces teaching, and delivers chances for linking between the school and the world.[12]

ICT integration into teaching and learning activities strengthens the interaction and reception of information among the players. By doing so, it is possible to alter the teaching and learning procedures that favor for various modes of teaching and learning practices.

Students and teachers who are familiarized with the advantages of technology integration in their day to day practices will learn better within technology-based environment. Because, the applications of information communication technologies in educational systems can contribute in different aspects of the teaching and learning aspects which lead to effective learning.[10] ICT Provides access to wide range of up-to-date learning and teaching materials that assists students and teachers to grasp new knowledge and skill in their field of study to their future lives.[12] ICT enhances quick sharing of information via various forms of Medias, such as forums, social networks and blogs among students and teachers. Thus, it enables them to exchange valuable and timely resources that can promote learning by doing approach in their respective endeavors.[9] ICT can also improve interactive and collaborative learning and teaching skills that encourages problem solving skills, knowledge retention, self-confidence and the capacity for reflection.[14] Teachers can use different online resources to generate meaningful and engaging learning experiences for their students that enhance the traditional ways of teaching and to keep students more engaged.[15] ICT also plays a vital role in administrative wings of educational institutions. It is used for preparing reports; manage human and material resources information in

education sector effectively. Moreover, it can improve and develop the quality of education by providing curricular support in different subject areas.[16]

Integration of ICT in educational systems not only improves learning environments but also prepare the coming generation for future lives and careers.[17] A teaching and learning process which is supported by technology offers various interesting ways which includes educational videos, stimulation, storage of data, the usage of databases, mind-mapping, guided discovery, brainstorming, music, World Wide Web (www) that will make the learning process more fulfilling and meaningful.[18] ICT can be integrated with in teaching and learning activities in various forms. These include CDs, DVDs, power point presentations, captions, simulations, you tube, animations, hyperlinks, social media, internet, use of smart boards and pens etc.[19] Process of adoption of ICT is not a single step, but it is ongoing and continuous steps that fully support teaching and learning and information resources.[20]

ICT is also very important for research in educational institutions. The application of ICTs in academic research has grown steadily in the past 10 to 15 years in both developing and developed countries, although there are wide variations in usage both within and between countries and regions. Communication links make it possible for researchers to be spread across the world instead of concentrated in a single institution. Another important dimension of ICTs in research is the use of online full text databases and online research libraries/virtual libraries which are the direct outcome of the growth in telecommunications networks and technology. These databases and libraries provide researchers with online access to the contents of hundreds of thousands of books from major publishing houses, research reports, and peer- reviewed articles in electric journals.[21]

While, the aim of ICT integration is to improve and increase the quality, accessibility and cost-efficiency of the delivery of instruction to students, it also refers to benefits from networking the learning communities to face the challenges of current globalization.[22] It is obvious that almost all ranges of academic disciplines and fields can be learned more effectively through technology-based tools and equipment. The need for ICT integration in education is crucial, because with the help of technology, teaching and learning is not only happening in the school environment, but also can happen even if teachers and students are physically in distance. However, ICT integration is not a one-step learning process, but it is a continual process of learning that provides proactive teaching-learning environment.[20]

There are basic necessary conditions which should be in place for teachers to introduce ICT into their classrooms.[23] These include teachers should believe in the effectiveness of technology, teachers should believe that

the use of technology will not cause any disturbances and teachers should believe that they have control over technology.

However, various studies depicted that most teachers do not make use of the potential of ICT to contribute to the quality of learning environments.[24] It is clear that the benefits of ICT will be gained when teachers are committed and willing to explore new opportunities for changing their daily practices by using ICT.[25] By changing the pool of teachers, it is possible to change their responsibilities and skill sets for future teaching involving high levels of ICT and the need for more facilitative than didactic teaching roles.[26]

Utilizing of ICTs in educational settings does not guarantee alone to assure quality education but instead they are considered as an add-on supplements needed for the better teaching and learning.[20] It is commonly used as tools and catalysts which encourage and support independent learning.[27] Traditionally, the conventional process of teaching was more teachers centered and has revolved around teachers planning and leading students through a series of instructional sequences to achieve a desired learning outcome. Learning methods using contemporary ICTs deliver many opportunities for constructivist learning through their provision and support for resource-based, student centered settings and by enabling learning to be related to context and to practice. ICT provides the help and complementary supports for both teachers and students where it involves effective learning with the help of the computers to serve the purpose of learning aids.[28]

## PERCEPTIONS OF TEACHERS ON ICT APPLICATIONS IN EDUCATION

The perception of teachers on ICT use in educational systems is important as it forms a tendency that helps them to be favorable or unfavorable towards the usage of the most modern technology in the field of education. This in turn affects the usage of specific technology and technological willingness to embrace and use new technologies to accomplish goals in home, life, and at work.

Various studies have stated that the importance of teacher perceptions as a critical factor among teacher ICT readiness to integrate ICT into classroom teaching. One study discovers whether a significant correlation exists between perception of self-efficacy and technology adoption among teachers. The findings point out a positive correlation between teacher self-efficacy and the integration of technology. There is a need to address teacher concerns and fears as they integrate technology into their classroom instruction.[29]

Teacher's perception towards ICT integration in teaching and learning process is a key factor in accepting their pedagogical practices or their actual use. A number of studies have been carried out to determine teachers' perspective about use of ICT in teaching and learning process. A study carried on ICT integration in teaching and learning process among the teachers teaching in universities in the Southern United States found out that many of were less skilled in computer use and therefore had a negative attitude about it.[19]

A nationwide survey of teachers in the united states also revealed that, while ICT use enabled a minority of teachers to put into practice a pedagogy that is more constructivist and more in tune with their teaching philosophy, it has not transformed the teaching practices of a majority of teachers, particularly teachers of secondary academic subjects. However, the teachers did acknowledge that under the right condition's computers are becoming a valuable instructional tool and is having an impact not only on students' performance in the classroom but on their academic efforts outside the classroom as well. Another research pointed out that teachers' perceived usefulness of an innovation plays a pivotal role in determining the extent to which that innovation will be adopted for use in the classroom. Teachers often view the technology integration as an additional imposition on their already demanding time schedule when they simply want to get on with the business of teaching. In addition to the fact they do not believe that they have the technical competence to effectively use technology in the classroom, they fail to see its utility or relevance for their subject.[9]

Similarly, a survey conducted in 170 secondary school teachers in New Zealand found that most teachers considered ICT to be beneficial to their teaching but not in the area of methods of delivery and classroom practice. Similar findings of studies conducted in Europe reported that ICT use enabled teachers to save time and to increase productivity in such activities as preparing and updating daily lessons and maintaining records. In addition, ICT use has fostered greater collaboration between teachers with increased sharing of resources and ideas. The findings also underscored the teachers' strategic role in structuring tasks and activities as key to effectively harnessing ICT for successful and meaningful learning.[30]

## CHALLENGES OF USING ICT IN EDUCATION

While potentially of great importance, the integration of ICTs into teaching and learning practices is still in its infant stage. There are various impediments which tackle ICTs' integration in educational systems.

These include Lack of skill and understanding towards the technology among users, cost of acquiring, installing, operating, maintaining and replacing ICTs. Other constraints those challenge introducing ICTs into teaching and learning are installing learning technology without reviewing student needs and content availability, imposing technological systems from the top down without involving faculty and students, using

inappropriate content from other regions of the world without customizing it appropriately, and producing low quality content that has poor instructional design and is not adapted to the technology in use. Lack of electricity and well-functioning telephone networks are also obstacles faced in many developing nations. On the other hand, teachers need to develop their own capacity so as to efficiently make use of the different ICTs in different situations is also another challenge.[21]

Political and commercial interests are also other factors outside the education system which frequently influence decisions about introducing ICT into educational institutions providing ICT to schools, whether the project is well designed and appropriate to the system or not, can be presented to the public as a bold, innovative, and impressive measure by politicians. As important, electoral timelines can shorten technology-project timelines, without scaling back projected results. Decision-makers responding to election cycles can sometimes influence project designs to fast forward technology roll-out, the projected building of teachers' skills, and students' achievement, accelerating timelines beyond the system's capacity for new practices or change.[9]

According to the findings of several studies, teachers who hold constructivists pedagogical beliefs may not necessarily teach actively because of other contextual factors such as teacher technology competence, time constraints and demands of high stakes examinations. Moreover, teachers' insufficient understanding of pedagogy associated with technology use, lack of knowledge about how to use technology effectively, classroom relocation when the required technology is located in specialist rooms, access to equipment, system unreliability and a lack of technical support are also barriers to technology integration. A study of Nigerian secondary schools also found that teachers' lack of expertise in using ICT was a prominent factor hindering teachers' readiness and confidence in using ICTs.

There is a growing body of evidence which seems to suggest that the ways in which students use ICTs at school are heavily influenced by out-of-school cultures of use. ICT tools are not static and continue to evolve with a rapidity that is nothing short of awe-inspiring. Students are generally more au courant than their teachers with the latest advances in technology. It is important, therefore, for learning environments involving the use of ICTs to be collaborative in nature in order to facilitate the co-construction of knowledge by students. Most teacher-training courses with respect to technology integration in education focus on teaching basic computer literacy skills. The underlying belief being that teachers simply have to be trained to use the basic application packages in order to successfully incorporate technology in their classrooms. Most scholars however, agree that these traditional methods of technology training for teachers are ill-suited for preparing teachers to be intelligent users

of technology for pedagogy. Merely knowing how to use technology is not the same as knowing how to teach with it.[30]

Many developing countries suffers from typical infrastructure problems including insufficient numbers of computers and other technologies owing to limited funds, absence of properly developed curricula for teaching ICT skills and lack of subject teachers trained to integrate ICT into learning areas. Unfortunately, in many African countries, the lack of trained teachers and the low levels of teachers' ICT knowledge and skills have been identified as major impediments to effectively introducing technology into schools.[31] Most teachers identified a lack of technical knowledge as a major deterrent to ICT use. Teachers reported that initial use of ICT was extremely traumatic with two teachers admitting to being resentful of having to use it initially.[30]

According to the technology acceptance model (TAM), the intention of someone to use technology is derived from four factors. These are perceived usefulness (U), perceived ease of use (EoU), attitude toward using (A), and behavioral intention to use (B).

Perceived usefulness (U) determines that the user's acceptance toward using one specific item is believed to enhance their performances. The users know the benefits or advantages of the item that they use, either for themselves or for other users.

When a user believes that using a kind of technological tool can enhance his performance, he tends to use it. In the teaching context, a teacher may feel that he can enhance his performance in teaching if he uses ICT. This arouses his motivation to accept using technology in teaching.

Perceived ease of use (EoU) determines the degree to which the users expect the target system to be free of effort. Literature notes that the difficulties to use a particular technology may derive from technical and non-technical things. Technical things that teachers probably find can be related to inadequate electrical support, low Internet access, unavailability of equipment or others. On the other hand, the fact that teachers may also feel reluctant to use ICT relates to their incapability to operate the system, manage the classroom, or feel that the pedagogical approach in teaching does not suit them. These conditions make teachers believe that using technology needs a lot of effort and thus decrease their motivation toward its implementation.

Moreover, attitude toward using (A) is explained as the user's evaluation of the desirability of employing a particular information systems application. This relates to users' feelings toward a particular technology use. When a teacher feels positive about ICT in teaching, he may use it. When a teacher feels negative toward ICT, he may avoid using it.

Finally, behavioral intention to use (B) emphasizes the likelihood of a person to employ a technology application. When a user feels positive about the implementation of ICT, it is likely to use it in the future and vice versa.[32]

To sum up, the implementation of ICT faces several infrastructural and personnel challenges. They include technical problems associated with ICT, teacher technical competence, access to equipment ,costly Internet access, limited information sharing, limited skills for ICT integration, shortage of labour force due the failure of training institutions to produce ICT technicians and professionals needed for the labour market, limited electricity supply, fixed telephone networks and number of computers, few people have heard of or used computers, lack of policy framework, inadequate infrastructure and cost of bandwidth, and inadequate in-service training on ICT integration in education.[16]

## CONCLUSION

The integration of ICT in educational systems continues to be viewed as having the potential to transform teaching and learning practices. It can help to enhance the quality of education with advanced teaching methods, improve learning outcomes and enable reform or better management of education systems. It can increase flexibility so that learners can access the education regardless of time and geographical barriers. ICT also offers a lot of materials and communication opportunities to improve teaching and learning activities. Perceptions of teachers, learners and administrators on the use of ICT tools in teaching and learning practices are generally positive, with the teachers hailing its use for speed and convenience. However, the effective integration of ICT in education practices poses different challenges. Lack of technical knowledge, training experience, and limited ICT tools are major obstacles of using ICT in educational systems. It is critical, therefore, that educators need to acquire the skills and competences necessary to fully exploit the potential that ICT has to offer for teaching and learning as they prepare their charges to meet the challenges of the 21st century.

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