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Information and Communication Technology in Education: Challenges and Solutions For Bangladesh

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Abstract

In today's internet-oriented modern era, we cannot imagine the fulfillment of learning process without the integration of information and communication technology in the education system. The "Vision 2021" aims at taking Bangladesh into developing, resourceful and modern economic country through the efficient and quality use of information and communication technology. Bangladesh has brought major changes in their socio-economic sectors during the last few years. The desire of making a digital country has leads Bangladesh to take a modern educational policy like the inclusion of ICT in all sectors of education. This research shows how we can change our traditional education systems by using the tools of ICT. Although the policymaker of education sector understands the importance of ICT inclusion, at the same time they are facing some challenges to cope up with this adaptation. With the expansion of ICT in education, the learning process can become easier than ever as the learner will have easy access to the IT facilities of their institutions and the world as well. This can help to reduce the gaps between the academics and practical field of work. At present most of the students are dependent on their lecture notes and reference books provided by the instructor for their learning purposes rather than ICT based education. There are lacks of awareness and utilization of ICT based services like cloud for data storage, Google classroom for an interactive session between teachers and students, Google hangout for live classes, taking online courses for obtaining the professional qualification, etc. Even though some of them have enough internet facilities in their home and universities, but they are not availing the full potential of ICT. Most of them are just used to with searching and browsing on the internet, social networking, gaming, and most often for recreational purposes. Proper usage of ICT services and multimedia contents in a classroom can substitute a traditional blackboard based system. In a word information technology can bring major changes to our traditional education system. This research comes up with a solution that

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how better education can be provided with proper utilization of the strength of ICT. Furthermore, what are the key challenges for the implementation of ICT in education?

Keywords: Information and Communication Technology, ICT in education, Scopes of ICT, ICT in Bangladesh, ICT based education.

Introduction

Using information and communication technology in education can significantly enhance the quality of education and its effectiveness. It is the use of technology that can be treat as a prime tool for the students, which will eventually support their learning process and promotes the achievement of their learning goal. These technologies are also being used to enable teachers to do the task more creatively and innovatively which will enhance their professional skills ("ICT in Education," n.d., para.1). Hernandez (2017) described ICTs as an unavoidable element for the educational environment. He concluded that the inclusion of ICTs in education will result in optimizing the teaching-learning process (Hernandez, 2017).

Besides this scope of ICT, the government of Bangladesh is facing some challenges for the establishment of ICT based educational process. Successful integration of information and communication technology in education largely dependent on the teacher abilities, views, and thoughts. Teachers are facing some problem for professional development opportunities in order to expand their ability to use of ICT informative learning assessment, individualized instruction, accessing online resources, and for interaction and collaboration purposes with the students ("ICT can impact student learning", 2018).When both teachers and students are willing in implementing the tools of ICTs in the classroom environment then it will need more spaces which can be considered as a challenge. Major challenges lie with the involvement of students in using ICT based tools like cloud services, google classroom for an interactive session between teachers and students, google hangout for live classes, taking online courses for obtaining professional qualification etc. and their motive to the adaptation information and communication technology. Some other challenges like government vision and plan, investment in ICT, teacher training, resource, and other constraints are also involved. Therefore proper inclusion and uses of information and communication technology in education can overcome these challenges and able to make an ICT based education system.

Literature Review

Lots of research has been done about the potential, scope, and challenges of ICTs in education. Researcher shows how we are transforming from a

knowledge-based society to information-based society. As Hernandez (2017) outlines, "the importance of educational agent (teacher-student) and their role in transforming the teaching-learning process".Hebegins with a description of the so-called knowledge-based society and how its evolution, an offspring of technology, has encompassed different areas, paving the way for innovation in education and promoting the generation of new knowledge. Desai (2010) argues that "the role ofICT in transforming teacher-centered learning to competency-based learning". It also explores some challenges in higher education like cognitive tutors, the need for developing a model, collaborative authoring etc. Sarkar (2012) highlighted the role of ICT in higher education for the 21st century. Sarkar (2012) also argued that "ICTs have impacted on educational practice in education to date in quite small ways but that the impact will grow considerably in years to come and that ICT will become a strong agent for change among much educational practice". Attaran et al. (2017) study presents "the main principles and potentials of the cloud, as applied to the world of education". Furthermore, this study highlights key adoption factors and illustrates some of the routes that might be taken to implement cloud technology in education. Saini, Jyoti, and Kaur (2017) research focuses on the need for e-learning to keep the pace with the technology and cloud computing as a tools of ICT which is "highly scalable and creates virtualized resources that can be made available to users will have a significant impact on the educational environment in the future". Salehi and Salehi (2012) study aimed to investigate "the teachers' perceptions of the barriers and challenges preventing teachers to integrate ICT in the classroom". For this research, they have selected 30 high school teachers from the five main educational districts in the city of Isfahan, Iran. Driscoll (n.d.) described the importance of blended learning and how it is useful for education. Kumar (n.d.) addresses the convergence of ICT and education. He also points out "When two technologies are converging to each other, together they will generate some great opportunities and challenges" (Kumar, n.d.).

The Role of ICT in Education

Sarkar (2012) claimed, our present world is transforming into information oriented society and ICT plays a huge impact for making information oriented world. Furthermore he predicts "as the world is rapidly going towards digital information, the role ICT in education getting more important than ever and this will continue to grow and develop in the 21st century" (Sarkar, 2012). Desai (2010) described the importance of technology as"The quality education helps to empower the nation in all aspects by providing new thoughts, the ways of implementation of new technology and so on and therefore, technology is the most effective way

to increase students' knowledge". She also stated that "Education determines the standard of society" (Desai, 2010). It provides a new opening for the learners. Hence the role of ICT in education comes. Being an academician I cannot think our education system without the integration of ICT in education.

Sarkar (2012) define ICT as "Information and communication technology consists of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services" (p.32). He also mentioned that "the rapid development of information and communication technology, special the internet (intranet and extranet), is one of the most blessing phenomena that reorganize the information age" (Sarkar, 2012). We see a transition from a knowledge-based system to information base system. ICT can bring changes the power of accessing information, can provide a new form of communication, and can serve many online services in the sphere of education (Sarkar, 2012). Sarkar (2012) explained how the world is evolving towards ICT based classroom as follows:

The concept of moving the traditional classroom of desks, notebooks, pencils, and blackboard to a digital or online based classroom is getting its popularity through the tremendous use of information and communication technology. Online instruction has become extremely popular as is evident in the rise of online universities, such as University of Phoenix Online and Athabasca University (Canada), and on-campus universities offering online courses and degrees, such as Harvard University and University of Toronto. For many students, it is always not possible to study in abroad due to their employment, health issues, family responsibilities, and some other constraint, online education is the only option for them. (p.31)

The Online classroom has just changed the way of learning or acquiring knowledge. Students having internet connection can easily access uncountable information on the web and can expand their knowledge about the world. Some institution like 10-minute school are most popular in our country, more than thousands of students from various location are interacting with their live session on a regular basis. Thus ICT can bring a huge a change to our traditional education systems.

According to Sarkar (2012) "Advancements, standards, specifications, and subsequent adoptions have led to major growth in the extensibility, interoperability, and scalability of e-learning technologies. E-learning is fast becoming a major form of learning".(p.31)

We can enriched our classroom environment by creating and presenting visualize contents to the learners. Hence, the ICT tools like

Computer multimedia come that offers to show content graphically. Interactive whiteboards or smart boards allow projected computer image to display and manipulate and so on. Handwritten notes can be taken on the board and saved for later use (Unesco, 2018). More visualization can be obtained by using these ICT tools. Through the use of these tools, an instructor can easily manipulate things and student can engage themselves in the class more closely than before. Thus teaching and learning material can be delivered in an effective and efficient way by using computer based system.

The followings are the aim and objectives of ICT implementation in education according to (kaka &S.Pd. 2008):

1. To implement the principle of life-long learning/education.
2. To increase a variety of educational services and medium/method.
3. To promote equal opportunities to obtain education and information.
4. To develop a system of collecting and disseminating educational information.
5. To promote technology literacy of all citizens, especially for students.
6. To develop distance education with national contents.
7. To promote the culture of learning at school (development of learning skills, expansion of optional education, open source of education, etc.)
8. To support the institution in sharing experience and information with others.

The Uses of ICT Tools in Higher Education

Chelladurai and Pitchammal (2016) described education as follows:

Education inits general sense is a form of learning in which the knowledge, skills, values, beliefs, and habits of a group of people are transferred from one generation to the next through storytelling, discussion, teaching, training, and or research.(p.80)

Education is basically a general way of transforming knowledge from persons to persons or learners to learners. In teaching, it is said that ‘Voice is mine, but the story is theirs'. Education has several levels of stages that can be classified as primary level, secondary and higher secondary level and finally university level. All of this sectors deal with providing a different level of education. Among these sectors, higher education is the one that can broadly expand our knowledge, our thoughts, and our beliefs towards the world. The inclusion of ICT in higher education will make it more meaningful than ever. According to

Chelladurai and Pitchammal (2016) "Education should be a three-fold process of imparting knowledge, developing skills inculcation proper attitudes and values towards life and society in general. It must enable the individual to develop the activity skill" (p.80). Student mostly dependent on their respective teacher for guidance and learning but they can easily educate themselves through internet oriented self-learning. As the world is now treated as a global village. It is only possible when they are self-motivated and have knowledge of digital ICT based tools. For example, when some topic seems too confusing to them, they can take help from online resources. Even they are capable of taking online courses as well, can take an interactive session with their corresponding teacher through the virtual classroom of Google hangouts. Thus ICT can make our education system more meaningful, efficient and convenient to use.

Using technology in learning can empower out education system. It can change teacher-students interaction policy that takes place during class. Chelladurai and Pitchammal (2016) stated that "Educational technology includes numerous types of media that deliver text, audio, images, animation, and streaming video, and includes technology applications and processes such as audio or video tape, satellite TV, CD-ROM, and computer-based learning, as well as local intranet/extranet and web-based learning" (p.80). They also suggested some advantages of ICT in education like –

1. Through ICT, images can easily be used in teaching and improving the retentive memory of students.
2. Through ICT, teachers can easily explain complex instructions and ensure students' comprehension.
3. Through ICT, teachers are able to create interactive classes and make the lessons more Enjoyable, which could improve student attendance and concentration (Chelladurai & Pitchammal, 2016).

Case Study: Cloud Server can Reduce Result Day Server Overload

Cloud computing is the general term for the delivery of the hosted services over the internet. "Cloud computing enables companies to consume computing resource, such as virtual machine (VM), storage or an application, databases, networking, software, intelligence and more" (Rouse, 2017). Cloud computing is an emerging technology. Cloud technologies can bring tremendous changes to our IT systems. However, people are using it in different ways as cloud provides different types of services, mainly like – Software as a service, Platform as a service, and Infrastructure as a service. The addition of cloud services to our education can give us many outstanding advantages as many of our

educational institutes are not financially strong enough. Therefore, the cloud can be a helpful choice for them for assuming cloud services and as well as to reduce their IT infrastructure cost. Because the cloud provides a great advantage that user does not need any specific knowledge about its installation process or even the hardware systems as cloud uses pay per use methodology. They just need to be connected with the cloud and the cloud service provider will manage the rest of things that the user actually demands. So the institutes do not need any human resources for maintaining the cloud services.

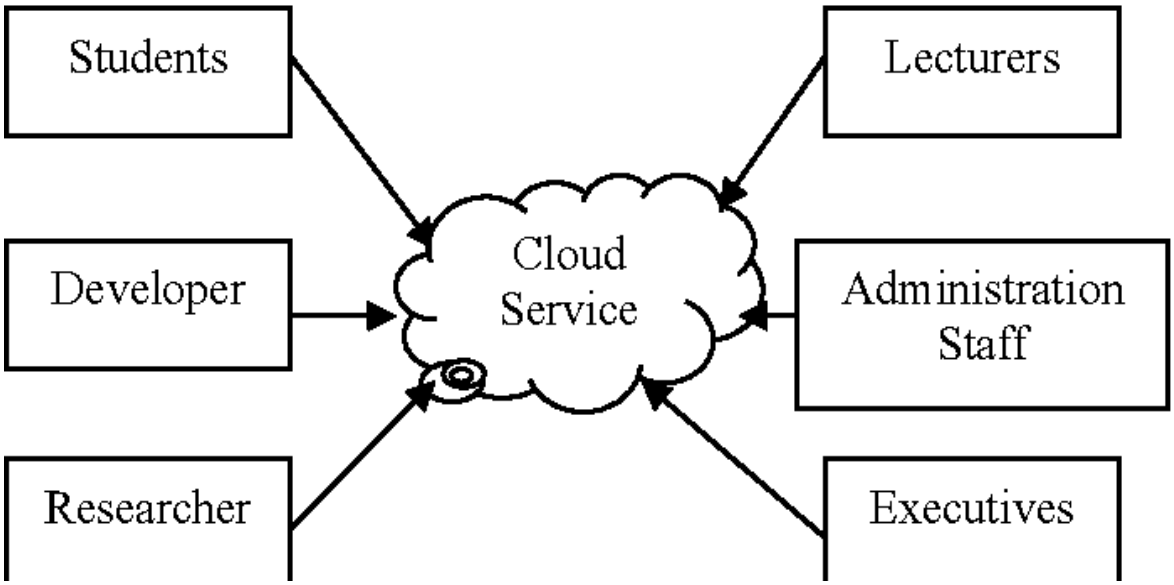
We are facing some problem during publishing the result of some board examination in the different level like- primary, secondary and higher secondary education. Student and their parents are still suffering a lot for getting the result on its publication day as our result server is not that much strong enough to meet hundreds of thousands requests at the same time from numerous number of places. This is frustrating of not getting result on due time as it causes immense overloading problem. This causes a serious problem as an existing server are not capable of balancing the load. Thus the term cloud computing comes to this problem as a solution. We can easily update our result publication system to the cloud server so that there will be no delays for getting a result as the cloud server are capable of smart load balancing.

Cloud Promises in Higher Education

The world of education and training has always embraced new teaching methods and tools. In order to modernize our education system in terms of technology that basically deals with content delivery, communication and collaboration. Cloud computing services enabled an educational institution to offer many services cheaply or freely. One of the main features of a cloud is its availability that is provided by distributed information technology infrastructure. Attaran, Attaran, and Celik (2017) states that"Free or low-cost cloud-based services are used daily by learners and educators to support learning, social interaction, content creation, publishing, and collaboration. Examples of cloud-based services include Google Apps, YouTube, Twitter, and Dropbox". Attaran et al. (2017) explained cloud services as following:

Software as a service (SaaS), which enables institutions to access fully functional applications such as Microsoft Office, Adobe, and Auto Cad Suites are growing at an unprecedented rate. Many higher educational institutions, for example, use Google Apps for email and to create documents and spreadsheets, bypassing capital investments in servers and software licenses. (p.24)

Figure 1: Cloud service model (Rudy & Cassandra, 2016)



Saini, Jyoti, and Kaur (2017) described that if we are capable of implementing cloud then "Teacher will prepare the class and upload the power points and videos for the next class in the home using the account created by the administration. They can maintain the records of the students for the subject. The teacher can upload the study materials which can be accessed by the students in the home as well as in the classroom." The teacher can assign them a presentation and they can also change it dynamically during teaching. The student will submit their assignment also able to enjoy video lecture of their respective teacher. At the same time parents can also know about their child performance as everything is online or the cloud system can send the feedback of students to their parents. It is tedious but possible to build such a system for the betterment and to digitize our education system.

Case Study: Google Cloud Services for Education

Google has introduced different kinds of cloud apps like- Google drive, Google sheets, docs, task list and so on which are very effective for our education. Google drive is one of the most useful features for all in general and especially it is more effective for professionals and students as well. We can easily store our important, secure and confidential data on Google drive what is totally free of cost. Students can easily store their important lecture notes and other necessary staffs without prior concern of having any physical storage infrastructure. Teachers can use Google docs and sheets by which they can bring any kinds of dynamic changes to it and it will automatically update and the people who are using it also get the updated information. These are really important for the digital classroom.

Case Study: Google Classroom for Education

Hephzibah (2017) described Google classroom that it is "Released in 2014, this application is for schools that seek to simplify creating, distributing and grading assignments in a paperless way. It integrates many of Google's services (Gmail, Google Drive, and Google Calendar) in order to help educational establishments switch to a system that would be completely paperless". Google classroom is basically a way of sharing files between students and teachers through which we can make our education system more interactive and digital than ever. “Teachers can simply add students directly from the Google Apps directory or generate a code, which the student can enter to gain access to the class” (Hephzibah, 2017). Teacher is capable of taking online classes by using Google classroom and Google hangout. Learning continues after the class also. Students can also collaborate with each other, can share their knowledge in a Google classroom environment.

Google classroom support many grading schemas. The teacher can create an assignment file which student can view, edit or can get the original copy. “Students can create files and then attach them to the assignment if a copy of a file wasn't created by the teacher. Teachers have the option to monitor the progress of each student on the assignment where they can make comments and edit. Turned in assignments can be graded by the teacher and returned with comments to allow the student to revise the assignment and turn back in. Once graded, assignments can only be edited by the teacher unless the teacher turns the assignment back in”(“Google Classroom”, 2018).

Case Study: E-learning in Education

According to the website allencomm“e-learning is training provided via a computer or other digital device, allowing technology to facilitate learning anytime, anywhere”("What is eLearning? – Allen Comm", 2018). E-learning changes the way of teaching with the help of electronic resources which can make our classroom more meaningful and efficient ever than before. Through the proper use of electronic resources student can gain knowledge more practically, more visualization is possible which can make long-term benefits for the learners. The computer and internet are the major components of e-learning. “In the early days of e-learning, some people were concerned that bringing computers into the classroom would remove the human element that many learners benefit from” ("Virtual College | What is e-learning?", n.d.). But the growing enhancement of technology especially electronic resources and the inclusion of these resources like- computer, tablet, internet connection, and some other smart technology to our classroom will give us a

numerous number of advantage. “Books are gradually getting replaced by electronic educational materials like optical discs or pen drives. Knowledge can also be shared via the Internet, which is accessible 24/7, anywhere, anytime” (E-learning - What is E-learning? E-learning meaning, E-learning definition, n.d.).The website Allencomm (2018) described some examples of e-learning for successful classroom uses include:

a. Flipped classroom model
b. Rich media for classroom materials
c. Modular curriculum
d. Social element during a classroom session
e. Real-time polling and interaction
f. Gasification and simulations
g. The toolkit of web-based assets to use after the classroom session is complete

Case Study: Blended Learning

According to blog website panopto “Blended learning (also known as hybrid learning) is a method of teaching that integrates technology and digital media with traditional instructor-led classroom activities, giving students more flexibility to customize their learning experiences” (“What is Blended Learning”, 2017). It is a combination of offline learning (traditional method) and online learning in a way so that they are the complement of each other. We can successfully include this types of mixing learning formula in our education system for gaining better use of our classroom which will eventually more beneficial for our learners. “For example, a student might attend classes in a real-world classroom setting and then supplement the lesson plan by completing online multimedia coursework. As such, the student would only have to physically attend class once a week and would be free to go at their own pace” ("What is Blended learning and how can it be used?", n.d.). Driscoll found the term blended learning referred to four different concepts:

1. To combine or mix modes of web-based technology (e.g., live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio, and text) to accomplish an educational goal.
2. To combine various pedagogical approaches (e.g., constructivism, behaviorism, cognitivism) to produce an optimal learning outcome with or without instructional technology.

3. To combine any form of instructional technology (e.g., videotape, CD-ROM, web-based training, film) with face-to-face instructor-led training.
4. to mix or combine instructional technology with actual job tasks in order to create a harmonious effect of learning and working (Driscoll, 2018).

Challenges in Integrating ICTs in Education

The far-reaching changes that can bring to our education by the adaptation of technology were discussed above. While considering the opportunities associated with ICT enhanced education, we can easily end that ICT based education is better than the traditional educational system. But there are many challenges as well. One should bear in mind that the main challenge is how to apply this technological approach to the teaching and learning process. M. Hernandez (2017) explained that "Teachers, faced with the transformative vision of a society that needs to integrate ICT into the classroom, have seen their role change into that of agents with the ability to generate the necessary skills for a society 'yearning' for technological knowledge and the frequent use thereof in various educational matters". Ra (2016) mentioned some challenges in his blog can be summarized as"Infrastructure constraints, a lack of investments, and research into the uses of ICT in education, and a lack of capacity of teachers and school leaders to use ICT to enhance the quality of teaching and learning". He also referenced some other challenges like "equity, including financial, gender, and racial fairness in access to education" (Ra, 2016). Some challenges or barriers are mentioned below-

Barriers to Using ICT in Classroom

The process of using ICT in everyday education is really complicated and in some cases so costly that some educational institutes may not bear this cost at all. The opportunities provided by ICT to teaching and learning are not problem free. Yunus, Lubis, and Lin (2009) claimed that "Both students and teachers may lack the necessary skills to access, process and use information". They are afraid of about the facts "virtual limitless information can act as a danger if the teacher is unable of filtering relevant information in an educational context" (Yunus, Lubis, & Lin, 2009). A teacher has faced some barriers of integrating ICT in the classroom environment. As Schoepp (2005) defines "a barrier is considered as any condition that makes it difficult to make progress or to achieve an aim". Salehi and Salehi (2012) stated that "Some other researchers grouped the barriers into two categories of teacher-level barriers and school-level barriers". Becta (2004) classified "the barriers

based on whether they refer to the individual (teacher-level barriers), such as lack of confidence, shortage of time, and resistance to change, or to the institution (school-level barriers), such as lack of effective training in solving technical problems and lack of access to resources".

ICT infrastructure

Kumar (n.d.) points out that "the availability of ICT technologies infrastructure as the major challenges for education". He also described that "policymakers and planners must ensure the availability of the followings: appropriate rooms or buildings to house the technology, computers as well as affordable Internet service for online learning, and availability of electricity and telephony" (Kumar, n.d.).

Language and content

The primary language for internet (online) content is English. Due to these consequences, maximum e-learning contents are based on the English language. In some cases, it creates some problem for Asia region, especially for our country as English is the second language for us. It can cause tremendous problems for the learner who is located in rural areas. Some other challenges can be listed according to (Imon, 2017) as follows:

- Lack of Government vision and plan
- Lack of teacher skills
- Teacher and students beliefs towards ICT
- Lack of supervision and leadership
- Time constraint and lack of resources
- Lack of motivation and teachers experiences

Conclusion

The role of ICTs in education is revolving and unavoidable. Rapid changes in the technologies that take place due to social and business changes are indicating that the role of ICT in the future will be on the increase in education. As moving towards the 21st century, many factors that were described above will bring strong forces for the adoption of ICT in education. The inclusion of ICT in education can increase access to learning opportunities. It will help to enhance the quality of education with advanced teaching methods, improve learning outcomes and enable reform or better management of education systems.

However, ICT as a teaching aid is complicated as it demands more specific skills from teachers. Moreover, the teacher is facing some challenges and barriers that may prevent them from the successful deployment of ICTs in education. ICTs in education will not only change

our education sector but also can help to create a modern, established and developed country. The integration of ICT in education can be thought of as an asset for encouraging technological growth. However, the successful inclusion of ICT in educational institutes will largely depend on the attitude of the corresponding learners and the teachers (creative, welcoming changes) for using ICT in their daily learning processes.

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