THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EDUCATIONAL SYSTEMS: ISSUES AND CHALLENGES

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Abstract
The impact of technology is one of the most critical issues in education (Webber, 2003). New technologies are changing teacher’s role from information giver to facilitator, counsellor, advisor, guide, coach, co-learner, mentor, resource and technology managers, and mediator to the students (Jonassen, Peck and Wilson, 1999). The main purpose of this paper was to examine the possibility of using Information and Communication Technology (ICT) to promote and enhance teaching and learning in Nigeria. Much effort has been made towards the advancement of education via ICT applications in and outside the classroom. It enumerates ways of using ICT in education which include e-learning and blended learning. Limitations to the use of ICT in education were highlighted and it was recommended, among other things, that efforts should be geared towards steady supply of electricity to power the use of ICT in education.

In recent decade, the application of Information and Communication Technology (ICT) has brought a great impact and created a new paradigm in education. Technology has now changed or altered how people access, gather, analyze, present, transmit, and simulate information. Today’s technologies provide the tools, applications, and processes that empower individuals of our information society. Similarly, the International Technology Education Association (ITEA) (2000) emphasized that technology is human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities and the innovation, change, or modification of the natural environment to satisfy perceived human needs and wants.

ICT has largely contributed to an increase in developing knowledge, providing an enabling environment for innovation, and in building human capital required for the potentials for future development of an economy. Global reforms in education and challenging ICT demands have made a remarkable shift in the structure
of ICT environment and the utilization of ICT in education. Such technologies have become the key driver of the digital network in an era of technology-driven education. More schools and communities now have access to ICT resources to join the race for global economic growth with knowledgeable workers who have 21st century skills and are inspired by life-long learning. ICTs have great potential for knowledge dissemination, effective learning and the development of more efficient education services.

Information and communication technology is the processing and maintenance of information, and use of all forms of computer, communication, network and mobile technologies to mediate information. Communication technologies include all media employed in transmitting audio-visual devices, data or multimedia such as cable, satellite, fibre optics, wireless (radio, infra-red, Bluetooth, wifi). Network technologies include personal area network (PAN), campus area network (CAN), intranets, extranets, local area network (LAN), wide area networks (WANs), metropolitan area networks (MANs) and internet. Computer technologies include all removable media such as optical discs, flash memories, video books, multimedia projectors, interactive electronic boards, and continuously emerging state-of-the-art personal computers (PCs).

Mobile technologies comprise of mobile phones, palmtops etc. these technologies have information as their material object. Information is not reserved for use in isolation, but, rather communicated among users. ICT applied to education enhances the delivery and access to knowledge, and improves the curriculum. It produces richer learning outcomes more than education without ICT. It encourages thinking and offers unlimited means of achieving educational goals.

The key thing is not in ICT itself, but in understanding ICT and effectively employing it in the delivery of knowledge and reaching goals in less time. ICT is used as a means to an end, but not as an end itself. According to UNESCO (2002), four major approaches have been identified for effectively employing ICT in education. They are the emerging, applying, infusing and transforming approaches that constitute ICT optimizing stages in education. Sometimes, ICT employed in education does not reach expected goals, or at times it introduces some type of complicated educational reform.

According to Albirini (2006), successful implementation of educational technologies depends on educators, who eventually determine how they are used in the classroom. Unfortunately, teachers in developing-countries may not well receive technology due to its novel presence in society at large and in schools in particular. Thus, in order to use the technology for teaching, learning and administrative
purposes, the educational institutions should develop an innovative approach shaped by a proper planning process (Gulbahar, 2006).

Students and teachers in educational institutions can lose focus of the essentials and get distracted by rapidly changing technologies. This usually results when students and teachers have not yet understood the technologies; the role ICT plays; where, how and what technology to use. When the meaning of ICT and its unlimited offer to education are understood, then, rapidly changing technologies are not seen as overwhelming issues, but as enablers to more critical thinking and problem solving in education. Optimizing the use of ICT in education would depend on understanding ICT; when, how and where to use and what technology to use.

Applications of ICT in Education

ICT applied to education could be deployed in modes of e-learning, blended learning, mobile learning, distance education and online learning.

E-Learning

E-learning seems to be a bigger umbrella over distance learning, online and mobile learning. E-learning is the type of learning mediated by an open set of all kinds of technology. The set is open because new technologies are yet to come. It is the use of ICT which includes computer, networks, communication and mobile technologies to enhance and extend learning. These technologies help deliver and make education and information accessible to whoever needs it.

In the traditional education setting, the students’ assimilation of knowledge, excluding other factors, always depends on how well the teacher or lecturer passed the knowledge. With e-learning, the focus is no longer on the teacher, but both teacher and student especially who take advantage of technology to varied resources of knowledge made available by existing technology.

E-learning has many benefits which include the enhanced and consistent mode of delivery of knowledge, easy and regular administration of individual and group assessments; awareness of the institution; unhindered interaction among teachers and students; collaboration with other institutions like universities. The collaboration decreases the digital divide between institutions in developing countries and developed countries (World Wide Learning, 2009).

E-learning, needless to say, makes learning self-paced for the student, and puts the student on the driving seat on the “highway” of learning. The student, in other words, has a better control over the learning method. Learning is personalized. Learning when it is online or distance learning removes the geographical barriers of
learning between the students and teachers. There might be no need for study leave for workers running a programme in schools. E-learning makes knowledge available on demand anytime, anywhere and anyhow (Brown, Anderson and Murray, 2009).

Though, implementation of e-learning in any institution is costly. However, it is cost-effective to the students and staff when implemented. It is evident that e-learning has a lot of advantages, but, there could be a few drawbacks such as the time consuming preparation of lecture materials for lecturers; lack of motivation in learning especially in asynchronous modes; cultural rejection and isolation. These drawbacks are highly minimized when e-learning is made a flexible and blended learning.

**Blended Learning**

According to http…..(2008), blended learning is a flexible form of learning that constitutes a proper blend of all the components of technological-enabled learning and face-to-face teaching and interaction. Blended learning incorporates models that enhance the delivery of e-learning for the students and teachers involved in learning. The proper variation and blending off resources made available by technology, including face-to-face interaction makes e-learning a blended learning. E-learning that is well blended easily adapts to the students needs and obviates student adaptation to e-learning against their convenience. Hence, it can be said that the delivery of e-learning is flexible and well blended with face-to-face learning.

**Online Payment and Registrations**

There has been a lot of development in using ICT in tackling the administrative problems of secondary and higher educational institutions in Nigeria. In the past six years, payment of tuition, hostel and other sundry fees which were normally paid in cash or bank draft are largely carried out online. Online payment and registrations have now eliminated the nightmare of long queues for payments, loss of uncontrolled revenues by students and accounts departments of the institutions. Researches, reflections and innovations in integrating ICT in education have proved to be a means and a better fit between published and achieved timetable of academic events. Although there is great scope for improvement, the modest efficiencies recorded represent great achievements.

**Application of ICT Tools in Schools**

The penetration of ICT in Nigerian tertiary institutions is broad and shallow. There are island of deeper ICT penetration particularly in libraries that in addition to online libraries provide cyber café services in an atmosphere consistent with library environment.
The delivering of lecture through ICT could be internal or external. It is internal when modern information and communication technology equipment are used in the process of teaching and learning within the tertiary schools for internal and regular students. It is external when the similar facilities are used for non regular or part-time students who may not be living within the institution.

According to Mohammed and Ekpunobi (2003) ICT can be used in school as assisting tools; as medium of teaching and learning and as a tool for organization and management in schools.

ICT tools can be used to support teaching and learning both in content and methodology. It can be used as a tool while marking assignment, collecting data and documentation, conducting research and communicating. For example, students use internet to browse and search for the information.

**ICT as a Medium for Teaching and Learning**: ICT serves as a medium through which teachers can teach and learners can learn. It can be in form of drills, simulations, practice exercises and educational networks. For example in using computer assisted instruction packages where students are taught by the computer and not the teacher.

**ICT as Tool for Organization and Management**: this refers to use of ICT in handling schools records, like time tabling, attendance, fees collection, examination results and general communication.

**Limitations to the Application of ICT in Nigerian Educational Institutions**

Many factors limit the infusion of ICT in educational institutions in Nigeria. These include paucity of ICT infrastructure and lack of access; high enrolments, inadequate funding and absence of funding allocation to technology; high cost of ownership; high cost of the consumer; policy implications of the mismatch between the advertised capabilities of ICT technology; and the aims of individual educational institutions.

**Paucity of ICT Infrastructure and Lack of Access**

The underlying assumption for ICT in education is universal access to the network. Although some progress has been made in this front, there is urgent need to break the crippling access barrier confronting institutions of higher learning in Nigeria.

The profile is vastly different from campus to campus. Some have Campus area Network (CAN) backed by wireless narrowband or fibre-optic backbone; some have only internet cafes with grossly insufficient computers for the user base with a 50:1 ratio being typical. Others have departmental LANs. The expected quality and performance will correspondingly be low.
Web-based education in the form of online, mobile and distance education requires reliable computer networks, broadband connectivity, fibre-optic backbones for all the bandwidth hungry applications and interconnect offices, departments and centres to the public internet via the campus area network.

High student enrolment, inadequate funding of universities and lack of technology budget exacerbate the problems of ICT infrastructure.

**High Cost to the Consumer**

The cost to the consumer of ICT services is quiet expensive. Staff, students and researchers visit on-campus business cyber cafes to use the internet. In these cafes, the average cost of browsing is N130 per hour. As a result of the high cost, students and staff browse only when absolutely necessary. One could get a home internet subscription of N13,000.00 of slow and on and off internet connectivity to N35,000.00 of stable and fast access. A fortune could therefore be spent on internet connectivity.

**High Cost of Ownership**

There is a realization in Nigeria that the government alone cannot adequately shoulder the high cost of quality education in the 21st century. Partnership between government, industry and stakeholders appears to be the preferred option. In Nigeria a number of organizations for example, Education Trust Fund (ETF), petroleum technology development fund (PTDF), etc donate ICT laboratories equipped with 20-50 computers to some tertiary institutions. In addition they pay for one year subscription and mandate the recipient institution to sustain the facility. Most of these laudable efforts have failed because the recipients were unable to pay for the high cost of equipment renewal, maintenance and bandwidth. This is because network costs in Nigeria consist of not only capital cost but also high operating cost. Thus the cost of ownership is very high.

**Unsteady and Inadequate Electric Power Supply**

The irregular supply of electric power has crippled the Nigerian economy and hindered the progress of research carried out by institutes, groups and individuals in the country. It is maddening for any establishment to start off new projects without addressing the almighty power supply problem. It is even worse to embark on extensive ICT project within an educational institution, without solving power problems first. The federal government is however, working towards improving the generation of enough megawatts of power in the country. Alternative sources of power are standby generators, batteries and solar panels.

When the power is rarely supplied, the admirable goals of transforming education with ICT and taking a paradigm shift in education is all a dream; having
access to educational resources on demand, anytime, anyhow and anywhere is a story; e-learning would not be sustained either.

**Conclusion**

In conclusion, ICTs are also transformational tools which, when used appropriately in education sector, can promote the shift to a learner-centered environment. The distance learning education offers this practical guide and paves the way for the transformations in teaching and learning which learning technologies have been promising for many years. This paper discussed the applications of ICT in education environment and also noted the limitations in this regard. Some recommendations were made for the effective use of ICT in education.

**Recommendation**

To tackle the problems and challenges of ICT in education, it is recommended as follows:

1. Steady electric power supply should be provided by making concerted effort to increase power generation through realistic integrated power project (IPP).
2. Seminar workshops should be organized for technical and academic staff; for easy understanding and application of ICT in the classroom.
3. The private sector should be motivated to provide ICT facilities via government-private sector partnership in education.
4. The cost of owning an ICT network should be made minimal so that many people can afford it.
5. Cost of ICT services should be reduced via government subsidy so as to enable the ICT consumers afford it at all times.
6. Educational resource centers in the various states should be equipped with modern ICT tools such as updated computers in terms of speed and memory capacity with ICT-compliant personnel to man them.

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