# INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND VISION 20:2020

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## Abstract

The application of information and communication technology (ICT) in educational services has become a topical issue in most public fora on education. The ICT adoption in science education has been widespread and often premised on the potential of the new technology tools to revolutionize on outmoded educational system, better prepare students for the information age, and/or accelerate national development efforts. It is predicted that the effectiveness in the use of the ICT in education may be an important factor in determining which countries will succeed in the future. This paper therefore focuses on the concept of ICT, the basic structure of ICT, need of strategic planning of education, the imperatives of ICT in education services, necessity of ICT in Nigerian secondary schools, and Utilization of ICT in the teaching and learning process. The paper however, regrets that irregular power supply, limited access to ICT infrastructure among others poses threat to the use of ICT in education. The paper therefore recommends among others improvement in public power supply

The 21$^{st}$ century appears to hold promise for accelerated global development. This position becomes apparent when one examines the various millennium agenda and development goals of the major international organizations and the commitments of nations to work towards the realization of these goals within the specified time frame. The 21$^{st}$ century is indeed, witnessing great changes in science and technology-changes geared towards capacity building in all spheres of human endeavour for empowerment of the citizenry. Nations of the world with high illiteracy rates are responding quite fast to the clarion call to eradicate illiteracy among the diverse people of the world. In Nigeria, the government has introduced the UBE and nomadic education programme as some of the measures for the realization of this goal.

Presently, the world is reducing to a global village. This is made possible by the advances in information and communication technologies world wide. These advances call for initiatives in the education sector that will meet with the growing demands to move with the rest of the world. Education is the key to the development of any nation. Ali (2004) posited that ICT is meant to change the nature of education and training. He described ICT as the use of scientific tools and techniques for developing, documenting and communicating information when needed, especially as they concern solving problems or providing needed services in the various areas of human edeavour.

The developments in information and communication technology have affected every major spheres of human endeavour including governance, security health, banking, transportation, entertainment, manufacturing, commerce, aviation and economics (Barret, 2003), However, the greatest potential for development lies in education, which spawns human resources social and economic development.

Information and communication technology, is no doubt the most effective means of rapidly distributing knowledge and information (the core of education), to educational poor, starved communities and countries. That the world community is today said to be a global village is because of the application of ICT in closing the communication gap between persons, nations and continents in different parts of the globe.

## The Concept of ICT

Information and communication technology has been defined as "a broad based technology (including its methods, management and application) that supports the creation, storage, manipulation and communication of information" (French, 1996). The term "information" according to Ajayi (1999), can be viewed as crude data that are processed into meaningful form; information is a general term for news, reports, intelligence or anything which can be communicated from one individual to another. Information is never valuable unless it is communicated in the right way to the user (Oyeyinka, 2001).

Communication on the other hand, is a process of passing information. Communication covers a wider spectrum than information. To Laudon (1997), communication is the process of transmitting information and understanding from one individual to another. Communication is a mutual exchange of ideas, thoughts opinions, facts and emotions. Ike (1989) posited that communication is a transaction symbolic process, which gives people the opportunity to relate and manage the environment in establishing human contact, exchanging information, reinforcing the attitude and behaviours' of others.

Technology is simply seen as the systematic application of scientific or other organized knowledge to practical tasks in schools and industries (Okeke, 2006). It is a complete integrated process for analyzing problems, controlling and evaluating solution to those problems. Technology is also seen as a complex integrated organization of men and machines, ideas, procedure and management. It also include process system management and control mechanism in both human and non-human (Imogie, 1998).

Technology implies the application of knowledge to meet the goals, goods and services desired by people. Infact, it is the innovative change or modification of the natural environment to satisfy perceived human needs and wants. Schick (1999) posited that technology is the process of applying established knowledge to meet identified market and social needs.

ICT therefore, is a technology that supports activities involving information. Such activities include gathering, processing, storing and presenting data. Okoye (2001) citing Kirkpatrick (1983), noted that ICT is the study of processing and communication of data by means of computerized system. It is a system in which the presence of hard wares usually mandates the use of soft ware materials. In the field of educational technology, ICT can be seen as a sound multi-dimensional aid.

## The Basic Structure of ICT

The configuration of a basic ICT system comprise eight (8) essential elements which Haag and Keen (1996) in Nworgu (2006) described as the building blocks of an IT system. These include:

1. **Input devices:** These enable the user to enter information and commands into the system. Examples include mouse, key board, microphone, scanner etc.

2. **The processing Unit**: This is made up of the Central Processing Unit (CPU) and the internal memory or Random Access Memory (RAM). The central processing unit executes the instructions provided by or in a particular soft ware or command in order to perform a task. The internal memory (or the RAM) is where the instructions or software are stored temporarily.

3. **Software:** this is the set of instructions given to the computer to enable it perform particular tasks or operations. Examples include Ms-Word, SPSS, Excel.

4. **Communication devices**: These are devices used to connect ICT systems and people in different parts of the globe. Some examples include modems, satellites, coaxial cables etc.

5. **Information**: This is what is processed. It may be textual, audio, pictorial/visual or motion.

6. **Output devices**: These are devices that enable us to receive information from the system some examples include monitor/screen, printer, loudspeaker etc.

7. **Storage devices**: These are used to store information on permanent basis. They include, CD-ROM, tapes (Audio and Video) floppy disks, flash discs etc.

8. **People**: This is the most important component of an ICT system. Without people the ICT system will be non-functional. According to Haag and Keen (1996) "Without you, an IT system really is nothing more than an expensive piece of electronic requirement that takes up space and gather dust".

**Need for Strategic Planning of Education**

The nations educational system, from nursery to university level are faced with the challenge of urgently training future and current citizens on how to meet up with the challenges of ICT (Agaja, 2005) in a related development, Adeape (2005) posited that the twenty first century leaders will be paid more for seeing into the future and preparing to harness the opportunities it offers or escaping the threats it poses, than for effective grasp of today's status quo. All these point to the changing demands from the educational system and the need to plan ahead of time.

Other reasons in support of strategic planning for education include:

1. Strategic planning is necessary to reposition the nation's educational system to cope with the challenge posed by rapid technological change.

2. Education is a major agent of empowerment. The need to catch-up with the advanced economies of the world necessitates, strategic planning in education to empower the human resources of the nation.

3. In the face of rising cost of education and dwindling resource allocation (in real terms) to education, planning is necessary to ensure judicious use of available resource.

4. Planning is also justified on the grounds that as situations change, educational goals and policies need to be attuned to meet changing future demands on education.

5. Education system in Nigeria is a complex system. The complexities within the system can only be taken care of through the systematic process of planning.

6.  Planning is also necessary to facilitate quality control in education as one cannot talk of control where there is no plan.  There factors necessitates planning of education in Nigeria towards achieving the goals of vision 20:2020 as it affects ICT.

**The Imperatives of ICT in Education Services**

Access to information is a vital factor in the field of education.  The rising cost of traveling has made dependant on information and communication technique for access to relevant information in the field of education a necessity.  Ngurukwem (2006) citing Akinde (2004) posited that the stiff cost of travelling abroad is hampering the natural exchange of skills, knowledge and research results.  He observed a vital role for ICT in integrating and creating a pool of educational media.  ICT according to him, combines and integrates a variety of educational media-sound, vision, textual and numeric data for effective teaching and learning.  With appropriate investment in ICT, teaching and learning which before now have been hampered by gross inadequacy of educational technology on-site, will be made more efficient and effective.

Networking of ICT paraphernalia has created opportunities for access to and sharing of computer resources – personnel, hardware, software, data and information.  He highlighted the possibilities of ICT as follow:

1.  Networking of educational institutions.
2.  Access to educational database libraries and other scholarly works.
3.  Speedy dissemination of and retrieval of data and information from remote locations.
4.  E-learning
5.  Contact with news groups and a whole lot of other educational services.

Network could be intra, i.e. within or inter-without. Also it may be local area network, or world –wide network.  ICT makes it possible to harness lots of information on educational research available on the internet.

Other potential uses of ICT especially in administration of education are students documentation, registration of courses and examinations, processing of results of examinations, preparation of electronic transcript, payroll and accounting, financial planning and forecasting, office automation.

Office automation system usable in planning and administration includes: Word processing systems, desktop publishing, copy systems, electronic mailing (E- mail) voice mail, facsimile (faces) desktop video conferencing, electronic meeting systems, collaborative work systems, teleconferencing, telecommuting, multimedia systems, and presentation graphics.

The use of ICT to support operations and increase efficiency and effectiveness could spin-off effects that may bring about strategic initiatives.  Such support according to Ngwurukwem (2006) may lead to:

1.  Improved teacher efficiency and effectiveness
2.  Timely processing and release of results
3.  Cost savings resulting from telecommunications networks that electronically connects educational institutions, major libraries and scholarly work world wide.

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In the private sector, enterprises leverage IT to gain competitive edge. Given the restructuring agenda of the present administration which has encouraged private sector participation in ownership and running of educational institutions, commercial principles and competition may soon become critical factors in administration of schools. Already, some educational institutions, especially those in private hands, are investing in ICT to gain competitive edge. ICT allows an establishment or system to develop strategic information database that can provide information to support strategic planning. Information about operations, customers/clients, competitors, and economic and demographic data is strategic and can be used to support strategic planning and other strategic initiatives.

## Necessity of ICT in Nigerian Secondary Schools

The use of technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in the contemporary education policy (Rosen, Well, Thierer (2001) in Uzodinmma 2006). Most experts in the field of education agreed that, when properly used, information and communication technology hold great learning in addition to shaping workforce opportunities.

Graham (1986) recognized 'the computer and information and communication technologies (ICT) as the latest products of technology to make their way into the classroom'. The use of computer and ICT in the teaching and learning is generally referred to as e-learning (Electronic learning). Chime (2004) saw e-learning as "the application of electronic device such as computer, radio, television etc in the learning process". E-learning therefore encompass learning delivered through a range of technologies such as the internet, television, video tape, intelligent tutoring systems and computer based training. Uzodinmma (2006) highlighted the need to use ICT in Nigeria secondary school because of the following:

1. ICT is a powerful instrument which enables global flow of information, product within and out side the school so it offers people or students great potential for radical improvement in human development.

2. ICT changes the traditional process of teaching and learning and the way education is managed. It has impact across all curriculum areas.

3. In the home, at work and in educational establishment, it makes learning to become a truly life long activity.

4. In addition of being a subject on its own right, it has an impact on most other curriculum areas in secondary school since the national curriculum require all students to study it compulsorily.

5. The use of ICT such as e-mail, fax etc over come barriers of space, time, and open new possibilities for learning in schools.

From the above-mentioned, one can see that information and communication technologies (ICT) are very big assets in the educational sector.

## Utilization of ICT in the Teaching and Learning Process

Educators and policy makers alike agree that ICTs are of paramount importance to the future of education. According to Col (2000) in Madiehie (2006) ICT in education initiatives

that focus on the following areas are most likely to successfully contribute to meeting the millenniums development goals.

1. Increasing access through distance learning:
   ICT can provide new and innovative means to bring educational opportunities to greater number of people of all ages, especially those who have been excluded such as populations in rural areas, women facing social barriers and students with disabilities. Online learning continues to show tremendous growth potentials. Learning effectiveness from the standpoint of instructors and students lends support to continued online course development. Most researchers indicate that there is typically no significant difference in terms of online and traditional learning environment. However, some evidence suggests that students learn better online (California Distance Leaning Project (2000). The reasons for these findings according to Long (2002), are varied e.g. function of age, employment status or motivation.

2. Enabling a knowledge network for students: With knowledge as the crucial input for productive processes within today's economy, the efficiency by which knowledge is acquired determines economic success. Effective use of ICTS can contribute to the timely transmission of information and knowledge, thereby helping education systems meets the needs of the learners.

3. Training Teachers: Large numbers of school teachers will be needed to meet the vision 2020 goals for education. The use of ICTs can help in meting teacher training targets. Moreover, ICTS provide opportunities to complement on-the-job training and continuing education for teachers.

4. Broadening the availability of quality education materials: Network technologies have the potentials to increase the availability of quality educational materials. The interactivity and global-reach allow for customized sharing of knowledge, materials and database quickly and cheaply over long geographic distances. Furthermore, online resources offers teachers access to a vast and diverse collection of educational materials enabling them to design curricula that best meet the needs of the students.

5. Enhancing the efficiency and effectiveness of educational administration and policy: New technologies can help improve the quality of administrative activities and processes, including human resource management, student registration and monitoring of student enrollment and achievement.

ICT as applied in the teaching learning process has continued to improved the quality of teaching/learning that go on in classrooms. Some implications of these potentials is that teachers cannot control access to knowledge any more. This also forces a shift towards a facilitation role for teachers.

This role includes not only provision of the adequate virtual learning methods. According to Toth and Pentelenyi (2001), only teachers who are capable of using IT applications can efficiently develop the new communication skills. Therefore, there is need for retraining courses for teachers.

This is in line with the active learning strategies that can be used in science classrooms to actively engage students in the learning process. Udoinyang (2006) showed that active learning occurs when students consciously invest physical and mental energies in

activities that help them make what they are learning meaningful. It uses the active engagement of the students thinking processes in learning and applying knowledge to solve problems.

**Challenges Facing Use of ICT in Education**

There are many challenges facing the use of ICT in education. One of such challenges is the inability of government to turn around public power supply system in Nigeria. Regular supply of electricity and the scary cost of running stand by power generating sets are militating against efficient use of ICT in education. There is every need to improve public power supply in Nigeria so that the gain of ICT will not be overshadowed by the cost of alternative sources of energy.

Building an ICT platform that will serve the strategic needs of education requires the support of government and development partners. Sustainable use of ICT facilities in education require huge initial investment and continued funding and government being in the forefront of encouraging the use of ICT in education must lead the way for others to follow by ensuring adequate budgetary allocation to education sector for ICT related technologies.

A lot of work still needs to be done in the area of manpower development. General lack of confidence and competence in ICT related technologies still pervade the education sector, hence, the need to educate students, teachers and educational administrators on the desirability of being ICT literate and competent. A lot of capacity building by way of training and workshops still need to be done for teachers, administrators and non-teaching staff working in the education sector.

Access to computers, internet and other ICT technologies should not be the exclusive preserve of a privileged few. It should be in both private and public domain for easy access to all and sundry. This will help to inculcate a culture of ICT in majority of Nigerians. Enough computers should be provided in all schools for students and teachers to practice with.

Paucity of on-site technical support staff for regular repair and maintenance of ICT equipment is one of the greatest problems facing the use of ICT in educational institutions located outside major cities in Nigeria. Much is spent to secure the services of independent private operators to service equipment and render expert advice. A lot will be gained by engaging an on-side technical expert to contend with the many disruptions that may arise as a result of equipment failure.

**Conclusion**

Information and Communication Technologies (ICT) are indispensable tools for the growth and efficiency of education sector. It provides the platform for information system in any organization whether private or public. Bringing ICT connectivity to schools is a task that will occur alongside the provision of basic educational infrastructure which is the responsibility of the government. Extensive provision of ICT is however beyond the financial resources of the government alone. So, non-governmental organizations constitute critical success factors.

There is no doubt that teachers and students in secondary schools in Nigeria will have incredible resources available if they have access to the internet. Also by integrating information and communication technology into secondary school curriculum, the way teachers and students teach and learn will greatly improve.

In this era of the rapid changes and globalization, the benefits of ICT in education sector may be lost if bold and concerted effort is not made to address the many problems hindering the development of efficient ICT infrastructure in Nigeria. There is need for the country to re-strategize and expand its vision so as to cope with the challenges of technological society.

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