Information and Communication Technology (ICT) in 21st Century Nigerian Educational System: Prospects and Challenges

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Abstract
The effectiveness in the application of Information and Communication Technology (ICT) tools in teaching and learning is germane to the 21st century educational innovations in developing countries all over the world and Nigeria in specific. This is because the use of Information and Communication Technology (ICT) has changed the procedures and practices of almost all facets of human endeavour within business, public service and governance. Information and Communication Technology has become increasingly important in daily lives in general and the educational system in particular. Apart from its high educational outcomes, high productivity, creative and innovative thinking, the benefits of using ICT in education have led to the expansion of teaching and learning opportunities, thereby making education more relevant and accessible to more participants than the traditional methods. This paper x-rays the use of information and communication technology in a 21st century Nigerian educational system. The prospects, challenges and recommendations are also proffered to make the 21st century educational system in Nigeria ICT-driven in line with global best practices.
Keywords: Information, communication, technology, ICT, Nigerian, education, system

Introduction
Education is basic to nation building; that is why all over the world, nations strive to make education available not only to the few that can afford it but to all citizens. Nigeria has sought national development by using education to attain desired national objectives. One of the instruments for attaining these desired goals in the 21st century is the use of Information and Communication Technology (ICT) tools.

Globally, organizations understand that for effective running of their business and most especially in human resource management (HRM) processes and practices, they need to embrace the use of Information and Communication Technology (ICT). According to Doran (2003), work practices inclusive of HRM practice and policies have been changed by Information and Communication Technology (ICT). Information and Communication Technology (ICT) gives an organization a unique vantage point in its scale and scope of operation; as well as its target market for the effectiveness of its day to day operations.

Information and Communication Technology (ICT), is becoming increasingly important in daily lives and in educational systems. There is a growing demand on educational institutions to use ICT to teach skills in order to equip students with knowledge needed for the 21st century. Realizing the effect of ICT at the workplace and everyday life, today's institutions try to restructure their educational curricula and classroom facilities so that the existing gap between teaching and learning can be bridged (Pierson, 2011).

The application of ICT resources in school, according to Raji (2020) can motivate students, stimulate their interest, increase their self-confidence and self-esteem, increase their creativity, allow greater interactivity, enhance their critical thinking and increase their attainments among other benefits. Usage of ICT can also enhance teacher's efficiency and enthusiasm, encourage their planning and cooperation, help them adopt student-centered teaching strategies, reduce their workload, and improve the relationship between teachers and students.

In Nigeria, teacher education is gaining prominence because of the need for qualified teachers with the necessary skills and knowledge needed to adequately carry out teaching jobs as well as for professional growth (Osunde & Omoruyi, 2004). Teacher education refers to the process of training that deals with the art of acquiring professional competence and growth. It is an essential exercise that enhances the skills of teaching and learning. It is designed to produce highly motivated, sensitive, conscientious and successful classroom teachers who handle students professionally for better educational achievement (Ololube, 2005).

According to Oyediran and Dick (2017), effective teaching could be facilitated through advances in computer and telecommunication technology. The idea that teaching and learning can successfully take place through the application of electronic communication facilities between teachers and students is one which has generated, sometimes, hope and dismay and at other times, excitement and fear. Hope that many more learners can be reached at a more convenient pace that had erstwhile not been

the case, dismay that the infrastructure necessary for deploying an effective ICT platform is lacking in low-income countries like Nigeria (Olakulehin, 2007).

The use of Information and Communication Technologies in the educative process, according to Olakulehin (2007), has been divided into two broad categories: ICTs for Education and ICTs in Education. ICTs for education refers to the development of Information and Communication Technology specifically for teaching/learning purposes, while the ICTs in education involves the adoption of general components of Information and Communication Technologies in the teaching/learning purposes. Generally, the educational relevance of computers and other components of information technology cannot be overemphasized. From the period when Skinner applied programme instructions to teaching machines, through Brunner's experiment with computers in instruction, to the current wave of information transmission and exchange via the world-wide-web, different applications of ICTs in enhancing cognitive development have been seen.

Information and Communication Technology (ICT) can make the school more efficient and productive, by organizing a variety of tools to enhance and facilitate teachers' professional activities. Yusuf and Onasanya (2004) stated that ICT provides opportunities for schools to communicate with one another through e-mail, mailing list, chat room and other facilities. It provides quicker and easier access to more extensive and current information. ICT can also be used to do complex tasks as it provides researchers with a steady avenue for the dissemination of research reports and findings. Yusuf, Afolabi and Loto (2013) advanced three major reasons for information and communication in education. The authors suggested that it is a tool for addressing challenges in teaching and learning situation; a change agent; and central force in economic competitiveness. As a tool for addressing challenges in teaching and learning, technology has the capabilities for delivery, management and support of effective teaching and learning. As a change agent, it is capable of changing the content, methods and overall quality and quantity of teaching and learning, thereby reducing teachers' workload and ensuring constructivist inquiry-oriented classroom. Moreover, ICT is a central force in economic and social shifts as technology skill is critical to employment of today's students. Thierer (2000) stressed that the role of technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy. Experts in the field of education have agreed that if ICT is properly used, it holds great promise to improve teaching and learning in addition to shaping workforce opportunities.

Meaning of Information and Communication Technology

Information and Communication Technology, popularly known by the acronym 'ICT,' is a universal concept. It is defined as the application of electronic media (computers, telecommunication gadgets, digital media, mobile devices, Personal Digital Assistants (PDAs) etc.) in the acquisition, processing, storage, retrieving, and dissemination of information. It consists of those software and hardware technologies that support the purposeful communication of information (Abraham & Chuku, 2018). Vikoo (2015) defined it as the convergence of computer networking and telecommunications to process, store, retrieve and send information of all kinds. It is the intermingling of Information Technology (IT) and Communication Technology (CT). Nwanji, Nweke and Waribo (2007) regarded it as those instruments which permit purposeful acquisition and application of information. Therefore, Information Technology (IT) can be seen as the use of electronic devices in acquiring, processing, storing and dissemination of information. Communication Technology (CT) on the other hand, is the use of hardware and software to send (share and transfer) information from one place to another, recording, storing, or retrieving it, as well as ensuring its security (Achuonye, 2004).

Information Communication Technology (ICT) is a complex system involving gathering of information and transmitting same to the global community. It covers a wide range of complementary contemporary technology derived from the handling and processing of information by means of electronic gadgets and communication devices such as computers, camera, telephone, flat screen television, scanning machine etc. It emphasizes the integration of telecommunications, computers as well as necessary enterprising software, which allows users to access, store, transmit and manipulate all relevant information (Williams & Avwiri, 2016).

The term Information and Communication Technology (ICT), according to Abraham and Chuku (2018), represents the building block of modern society, as it cuts across every facet of human endeavour, which includes teaching and learning. It is an essential tool in transmitting a country into a knowledge-based society. As such, the emergence of Information and Communication Technology (ICT) in education reflects a paradigm shift in the teaching profession. The infusion in Information and Communication Technology (ICT) in education has redefined the society's expectations about what it means to be an educated person. Thus, one basic requirement of present day education is to prepare learners for participation in a networked information society in which knowledge will be the most critical resource for social and economic development. The application of Information and Communication Technology (ICT) in teaching and learning is a viable tool for uplifting the standard of education in any nation, including Nigeria. No wonder, many countries are already keying into it especially those of the developed world. It is

therefore defined as the use of Information and Communication Technology (ICT) tools in a brand new way to teach students digital literacy, and how to share content with the world. It emphasizes the whole range of facilities of technologies involved in information processing and dissemination, so as to achieve educational potentials (Oledibe, 2016).

The Use of Information and Communication Technology in Teaching and Learning

The Federal Government of Nigeria, as captured in the National Policy on Education (FRN, 2014), recognizes the role of Information and Communication Technology (ICT) in the modern world and has integrated ICT into education in Nigeria (Adomi & Kpangban, 2010). In order to actualize the objective, the policy states that government will provide basic infrastructure and training in the primary school. At the junior secondary school, computer education is made a pre-vocational elective and is a vocational elective at the senior secondary school (FRN, 2014).

The effectiveness of the use of ICTs in teaching and learning is germane to the recent educational development and innovation in Africa. Anderson (2005) regarded information and communication technology as a tool for changing students' learning behaviour. Both the teachers and administrative staff have an imperative passion for the integration of the use of ICTs into teaching and learning during classroom interaction. This idea is promoted where access to information, students' online registration, proper and soft record keeping of documents, and electronic learning opportunities are unhindered.

According to Achimugu, Oluwagbemi and Oluwaranti (2010), Information and Communication Technology has become a tool of reformation for education as well as an integrative part of national education policies in the Nigerian educational system and Africa as a whole. It is widely accepted that ICT can be seen as a catalyst in teaching and learning for enhancing the productivity of teachers and the performance of the students. Olelewa and Amaka (2011) stated that a teacher that is understood to be skilled uses various teaching and learning technologies (like video camera, fax machine, computer, internet and multimedia equipment) that are now widely being used by teachers to enhance teaching and learning process through presentation of new ideas and innovations that will assist both the teachers and students to interact with adequate knowledge that is required of a student to properly retrieve, retain and analyze for decision making in a conducive school environment.

Prospects of ICT in teaching and learning
The prospects of Information and Communication Technology (ICT) in teaching and learning include:
- ❖ Helping students to learn on their own pace.
- ❖ Promoting individualized instructions through personalized responses to learners' action to yield a high rate of reinforcement.
- ❖ Putting more information in the hands of teachers.
- ❖ Providing a more positive effective climate especially for slow learners.
- ❖ Allowing students' control over the rate and sequence of their learning.
- ❖ Giving appropriate feedback.
- ❖ Producing significant time saving over conventional classroom instruction (Bada, Adewole & Olalekan, 2009).

Benefits of ICT to the students
According to Patil (2012), the following are the benefits of Information and Communication Technology (ICT) to the students:
- ❖ Computers can improve independent access for students to education.
- ❖ Students with special educational needs are able to accomplish tasks working at their own.
- ❖ Create greater enthusiasm for learning amongst students.
- ❖ Visually impaired students using the internet can access information alongside their sighted peers.
- ❖ Gives greater exposure to vocational and workforce skills for students.
- ❖ Students with profound and multiple learning difficulties can communicate more easily.
- ❖ Students using voice communication aids gain confidence and social credibility at school and in their communities.
- ❖ Increased ICT confidence amongst students motivates them to use the internet at home for school work and leisure interests.
- ❖ Provide distance learners country-wide with online educational materials.
- ❖ Provide learners with additional resources to assist resource-based learning.

Benefits of ICT to the teaching and non-teaching staff
The benefits of Information and Communication Technology (ICT) to the teaching and non-teaching staff include:
- ❖ Reduces isolation for teachers working in special educational needs by enabling them to communicate electronically.
- ❖ Provide opportunities for multiple technologies delivered by teachers.
- ❖ Offer the opportunity for more student-centered teaching.
- ❖ Improved skills for staff and a greater understanding of access technology used by students.

❖ Enhances professional development and the effectiveness of the use of ICTs with students through collaboration with peers.

❖ Materials already in electronic form (for example, from internet) are more easily adapted into accessible resources such as large print (Ohiwerei, Azi & Okoli, 2013).

Other benefits of ICT to the teaching and learning process include that new instructional techniques that use ICTs provide a different modality of instruments for students. ICT creates room for individualized instruction. In schools where new technologies are used, students have access to tools that adjust to their attention span and provide valuable and immediate feedback for literacy enhancement, which is currently not fully implemented in the Nigerian school system (Enuku & Enuku, 2000). ICT application and use will prove beneficial in improving Nigeria's educational system and giving students a better education. Moreover, the use of ICT tools in Nigerian education at all levels in this present age has enhanced both the teaching and learning process and makes it easy for the achievement of the teachers' set objectives. Barker (2002) noted that ICT has proved to be a very powerful tool in educational reform. Based on this assertion, institutions in the past years have been reviewing their mission, goals, strategies and operations in order to position themselves more effectively to meet the challenges of the 21st century. It is generally observed that ICT has replaced Information Technology (IT) because of its appropriateness and utilization in lending itself to principles, policies, administration and practices of globalization. Optimizing the use of ICT at all levels of education in Nigeria depends on understanding of how, what and when to use ICT tools (Daramola & Omoyajowo, 2016).

Influence of ICT on teaching and learning
Information Communication Technology (ICT), according to Anikweze and Kanu (2018), affects teaching and learning in the following specific ways:

(i) It provides a more specific basis for designing instruction in a sequential manner and utilizing adequate instructional materials and other reinforcement strategies.

(ii) It makes instruction richer and more powerful in influencing learning through the application of new forms of communication and technology by which distant and remote events can be brought close into the learning situation, e.g. use of films (motion pictures), slides, photographs and film strips.

(iii)ICT supports the delivery of educational resources, particularly course materials ranging from printed books and charts through radio and television to multimedia computers and internet.

(iv)ICT makes education to become more productive by speeding up learning and enabling students to invest more time in the application of acquired knowledge and creativity which can lead to breakthroughs.

(v) It simplifies the task of the teacher in communicating abstract concepts to learners by helping to bridge the gap between theory and practice. Learners can study reality through computer simulation and the use of various media that are capable of bringing the world into the classroom.

(vi)Today, the emphasis on technology has led to broadening of the academic curricula to include courses in vocational areas such as home economics, journalism, accountancy, photography, environmental design, animal husbandry, television and broadcasting, engineering, electronics, puppetry.

(vii)   ICT has further led to individualized instruction thereby enabling learners to proceed at their own rates through the use of programmed instruction, learning packages and computer terminals.

(viii)   Besides improved access and equity in education by influencing open and distance learning, ICT has made it possible for instruction to be brought to individual homes through radio and TV broadcasts and through the internet. Even the handicapped and children with special learning problems could be provided with diversified learning environment employing appropriate technological devices that enable them to develop their potentials. For instance, Braille for the visually impaired learner is an outcome of innovation in technology (Anikweze & Kanu, 2018).

Infact, the computer is regarded as add-on rather than a replacing device. The pedagogic uses of the computer necessitate the development, among teachers as well as students, of skills and attitude related to effective use of Information and Communication Technologies. Besides literacy, ICTs also facilitates learning to programme, learning in subject areas and learning at home on one's own, and these necessitate the use of new methods like modelling, simulation, use of databases, guided discovery, closed word exploration etc. The implications in terms of changes in the teaching strategy, instructional content, role of the teachers and context of the curricula are obvious as well as inevitable (Olakulehin, 2007).

The Organization for Economic Co-operation and Development (OECD, 2005) enumerated the benefits of Information and Communication Technology (ICT) in education to include:

❖ It can be used to help in school administration.

❖ It can be used to train students in skills which they will need in further education and as an ongoing learning process throughout the rest of their lives and for their future jobs, e.g. word processing, e-mail communications etc.

❖ It can provide access to information and communication outside the classroom e.g. via the internet.

❖ It can be used to support teacher development via external networks.

❖ It can support and potentially transform the learning and teaching process.

❖ ICT has a number of features which is particularly suitable for tertiary education.

❖ It combines and integrates a full range of media essential for effective learning. The ICT uses sound, vision, text and numeric data.

❖ It provides lecturers with new opportunities and in particular, distance learning and involvement in the real-world.

❖ There is an opportunity to increase the interest and involvement of students by the one to one relationship provided by the student and computer.

❖ It provides students with an opportunity to work and learn on their own.

Moreover, Ohiwerei, Azih and Okoli (2013) advanced the following as the benefits derived from the use of Information Communication Technology in education.

❖ **Active learning:** ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information, thus, providing a platform for students' enquiry, analysis and construction of new information. Learners therefore learn as they do and, whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner's life situation. In this way, and in contrast to memorization-based learning, ICT enhanced learning promotes increased learner engagement; ICT-enhanced learning is also "just-in-time" learning in which learners can choose what to learn when they need to learn it.

❖ **Collaborative learning:** ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modelling real-world interactions, ICT-supported learning provides learners the opportunity to work with people from different cultures, thereby helping to enhance learners' learning and communicative skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning space to include not just peers but also mentors and experts from different fields.

❖ **Creative learning:** ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the regurgitation of received information.

❖ **Integrative learning:** ICT-enhanced learning promotes a thematic, integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines, and between theory and practice, that characterizes the traditional classroom approach.

❖ **Evaluative learning:** ICT-enhanced learning is student-directed and diagnostic. Unlike static, text or print-based educational technologies, ICT-enhanced learning recognizes that there are many different learning pathways and many different articulation of knowledge. ICTs allow learners to explore and discover rather than merely listen and remember.

The teacher must be acquainted with the affordances of the various Information and Communication Technology (ICT) tools for appropriate, suitable and effective utilization, hence, the dire need for inclusion of Information and Communication Technology in teachers' education, to equip prospective teachers with the relevant skills and knowledge needed to effectively apply Information and Communication Technology (ICT) in teaching (Abraham & Chuku, 2018). Teachers need a sound understanding of the tools available and their utilization for pedagogy. Without such an understanding, the learning and teaching tools such as computers may become part of the problem rather than part of the solution to improve learning. This however erases the fear of teachers that technology will someday replace their role in the classroom thereby displacing them from their most cherished job (Dambudzo, 2014).

Challenges of ICT Utilization in 21st Century Nigerian Education
Information and Communication Technology (ICT) in Nigeria is faced with several challenges hindering its effective and successful implementation in Nigerian education system. Some of the notable challenges include;

❖ **Lack of ICT facilities in Nigerian schools:** Limited funds available at all levels of education in Nigeria have hindered the provision of needed facilities and infrastructure to promote ICT for training. Classrooms are equally not equipped for ICT usage. Thus, teachers and students do not have access to ICT tools within their schools due to the limited ICT facilities. The few available ICT facilities are mostly used for administrative purposes.

❖ **Lack of technically experienced tutors:** Most of the tutors/teachers in Nigerian schools do not have competence in the use or integration of ICT tools in their instruction. Majority of the teachers teach their students without ICT and they have not developed competence in the use of ICTs.

❖ **Problem of electricity:** ICT tools are electrical equipment that requires electricity for operation. Electricity failure has been a persistent problem militating against the use of ICT tools at all levels of education in Nigeria. This hinders the few schools with ICT tools to use them regularly.

❖ **Environmental factors:** Part of the problem militating against the use of ICT tools is the target population for whom the materials are to be used and the settings or vicinities where the learning should take place; the degree of satisfaction derived by learners with respect to comfortability of environment of that learning situation is of great importance.

❖ **High cost of ICT tools:** The price of computer hardware and software continues to drop in most developed countries, but in developing countries like Nigeria, the cost of computer is several times more expensive. While a personal computer may cost less than a month wages in the United States based on research, the average Nigeria worker may require more than two years income to buy one. For

this reason, the cost of computer is too high for many Nigerians to afford especially those in rural areas.

❖ **Lack of professional skills:** Nigeria does not only lack ICT infrastructure, it also lacks the human skills and knowledge to fully integrate ICT at all levels of education in Nigeria. To use Information and Communication Technology (ICT) in Nigerian schools, the need for locally training workers to install, maintain and support these systems cannot be overemphasized. There is acute shortage of trained personnel in application software, operating system, network administration and local technicians to service and repair computer facilities. Those who are designated to use computers in Nigeria do not receive adequate training; at worst, do not receive any training at all levels of education in Nigeria (Daramola & Omoyajowo, 2016).

In addition, lack of relevant software, limited access to the internet and weak infrastructure are also some of the challenges of ICT implementation in Nigeria. Moreover, shortage of qualified teachers that specialize in ICT, particularly at the primary and secondary school levels is also a challenge. For tertiary institutions, there are graduates that specialize in computer science and related ICT areas but the same cannot be said about staff in basic and post basic schools in Nigeria. There is also the problem of high cost of producing specialized instructional materials in response to the dynamism that is associated with ICT application (e.g. word processing, internet usage, networking, e-mail, and multimedia). Other major drawbacks in the implementation of ICTs in Nigerian schools include prohibitive cost of software, low computer literacy rate, communication and collaboration barriers, and criminal or fraudulent use of ICT facilities (e.g. internet, fraud and use of GSM to perpetuate examination malpractice) (Anikweze & Kanu, 2018).

Recommendations

In view of the daunting challenges posed to the effective and successful implementation of Information Communication Technology (ICT) in education in Nigeria, the advantages outweigh the challenges if truly the education system is poised to meet up with global best practices. Some of the suggestions for effective implementation of ICT in teaching and learning enumerated by Anikweze and Kanu (2018) include:

1. Teachers should use the computer to enhance educational efficiency, especially in handling large classes of students. This presupposes that teachers must possess the skills of using digital projectors and produce slides for teaching.

2. Teachers can also use the computer to enhance problem-solving skills in the learners by focusing on thinking skills especially in subjects such as mathematics.

3. School heads should insist on using computers for administrative functions such as replacing the laborious exercise of filing papers in filing cabinets and shelves, assisting in budget planning, accounting for expenditure, writing correspondences and

reports, assigning students to classes, reporting students' progress and testing students and scoring tests which help to reduce paper work.

4. Teacher education institutions should endeavour to introduce student-teacher to how computers could play the role of the tutor and present the learner with a variety of contents and symbolic modes. Thus, ICTs can be utilized for individualized learning in Nigeria.

In addition,

❖ Teachers should be adequately remunerated to motivate them.

❖ Students should be exposed to the various Information Communication Technology (ICT) tools.

❖ ICT tools and facilities should be adequately provided to schools, teachers and students, both in the urban and rural areas.

❖ Information Communication Technology (ICT) should be used by school administrators to prepare budgets, registration of students, keeping of attendance, taking stock of inventories and monitoring of students.

❖ ICT tools should be subsidized and made relatively cheap and affordable.

❖ There should be improved power supply in schools and educational institutions.

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