Requirements for the Development of an Effective Information and Communication Technology (ICT) Centre in Secondary School in Nigeria

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ABSTRACT
Information and Communication Technology (ICT) centres are a vital resource required to ensure the integration of digital technologies in education. Recently adoption of ICT in teaching and learning is rapidly gaining access in secondary schools. However and unfortunately, many schools in Nigeria are yet to adopt these tools for many reasons. This paper focuses on the basic requirement for the development of ICT centres in schools. To achieve this, the paper covers the need and place for digital technologies, networking, infrastructure, human resource training, community and local support. The paper recommends that government and the school community should support the school in the development, maintenance of ICT centres in schools. It's further recommended that adequate and stable power supply should be supplied in the schools for optimal utilization ICT to facilitate the adoption of advanced technologies in rural schools.

Keywords: information and communications technologies, adoption, teaching

INTRODUCTION
Evolution of the information society has ushered in dramatic changes in production and business activities, as well as in a larger social context (UNESCO, 2004). Rapid development of the information sphere of society is drastically altering the structure of work and employment, and creating new occupations and jobs. Information age has presented a greater opportunity for advancement in teaching and learning strategy. Computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, impacting the construction and distribution of knowledge and power around the world (Deuze, 2006). Information communication technology is a device of the 21st century that enhances the rate of connectivity and social relationship among people. Information and communication technologies (ICTs) are becoming more powerful, more accessible, more widespread and equally playing a key role in enhancing competitiveness, enabling development, and bringing progress to all levels of society (World Economic Forum, 2015). Ample evidences have shown that the applications of information and communication technologies (ICT) are making dramatic changes in economic and social development. These changes go beyond a mere increase in the number of computers appearing in work places, homes, and schools to more fundamental changes in the foundations of economic growth and its relationship to human capital (Anyaegbunam, 2013). ICTs have an impact that extends well beyond productivity gains. ICTs act as a vector of social development and transformation by improving access to basic services, enhancing connectivity, and creating employment opportunities. In these ways ICTs affect how people live, communicate, interact, and engage among themselves and with their governments (World Economic Forum, 2015). Moreover, ICT has
become a critical tool to facilitate large-scale learning needs for social and economic development (UNESCO, 2006). This equals the reason the integration of ICTs in teaching and learning is becoming a welcomed innovation in modern schools.

**ICT and Modern Education**

Obviously the impact of emerging technologies (ICTs) cannot be disproved in ensuring optimum distribution of knowledge to all who may have access to it. The integration of ICTs in education now helps to facilitate universal access to learning, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improves education administration and governance (UNESCO, 2019). Recently, the use of ICTs has ushered in new waves of delivering classroom instruction. The development of ICT is gradually replacing the traditional teaching pedagogy in such that online communication replacing face-to-face teaching, interactive whiteboard replacing blackboard and e-books replacing printed books among others (Suryani, 2010). Modern schools use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information. Similarly, Anyaegbunam, (2013) assert that ICT has also become integral to the teaching-learning interaction, through such approaches as replacing chalkboards with interactive digital whiteboards, using students’ own smartphones or other devices for learning during class time, and the “flipped classroom” model where students watch lectures at home on the computer and use classroom time for more interactive exercises. Over a decade ago till present, teachers and students in the developed world are more interested to use computers and other information technologies to engage in a number of classroom activities associated with the information society, such as gathering data for a research project, collecting information about another country, exchanging information with students elsewhere, and collaborating with students in other schools on learning projects. This revolution in education has dramatically changed the curriculum and scope of many subjects.

**The Potential Benefits of ICT implementation in Teaching and Learning**

It is widely believed that technology can bring our education sector from the Dark Age to the light age (Suryani, 2010). Generally, information and communication technologies are currently being used in education to assist students to learn more effectively by providing teachers with access to a wide range of new pedagogy. The principal aim of implementing advanced technology in education is to facilitate teaching, learning and other school administrative works. Similarly, Albirini (2006) clearly stated that the main role of ICT integration in education is to improve and increase the quality, accessibility and cost-efficiency of the delivery of instruction to students, benefits from networking the learning communities to face the challenges of current globalization. The utilization of global information network in teaching and learning is becoming pervasive due to the fact it helps to deliver quality lesson with full attraction among learners (Mostafa, Hashemi, Sosahabi & Berahman, 2017). For instance, teachers could easily have access to animations online that can portray exact picture of the concept of instruction. Thus, increases the rate of students’ retention and boosts teachers’ quality of service.

With the emergence and expansion of ICT in education, the most basic changes in terms of quality have been achieved with regards to classroom interactions. Simply put, utilization of ICT in teaching and learning helps to enhance students’ activeness in the classroom. Teaching and learning process is said to be effective when the learners are explicitly engaged while teachers take cognizance of individual differences. Bonwell & Eisonin in Leonard and Smock (n.d) stated that active learning activities require students do more than just listen to the instructor: They must read, write, discuss, or be engaged in solving problems. Most important, to be actively engaged, students must engage in higher order thinking tasks such as analysis, synthesis, and evaluation”. The availability and accessibility of ICT such as cellphones, internet, and computers among others would enable students to independently engage in study with little or no supervision from the teachers. Teachers can adopt problem solving method to teach concepts, therefore requiring students to delve into internet for research purpose.

More so, ICT paves way for dynamism and collaboration in teaching and learning (Suryani, 2010). One of the greatest advances ICT can make in the world of teaching and learning is the ability to carry out teaching and learning process within the midst of individuals who are not physically present in the walls of the classroom.
It is now commonplace to use technology socially to communicate, collaborate, elicit and offer opinion, share ideas and to use Web 2.0 and Web 3.0 technologies to build knowledge. In this age, learners who are less familiar with digital culture are increasingly at a disadvantage both in the developing and developed countries (Deuze, 2006). Teachers nowadays, utilize the power of technology to deliver instructions to their students and obtain feedbacks from them at instant. Moreover, ICT can provide easy access to information materials for both teachers and the students. The mobile phones at present are equipped with internet access facility, which enable users to have unhindered access to wide range of up to date of learning materials. Recently, certain software or digital tools have been developed specifically for teaching and learning, available for primary, secondary and tertiary students. Chauchan (2018) asserts that hundreds of digital education tools have been created with the purpose of giving autonomy to the student, improving the administration of academic processes, encouraging collaboration, and facilitating communication between teachers and learners. These tools enables the teachers sometimes to create amazing images, multimedia presentations with dynamic slides which enables the importation of maps, link, quizzes, videos among others.

Hermans et al., in Ghavifekr, & Rosdy (2015) identified three main stages of teachers’ utilization of ICT in teaching and learning process namely; integration, enhancement and complementary. Integration approach is about applying appropriate ICT in a subject area that is involving complex concepts and skills to improve student’s achievement. Enhancement approach entails using ICT to create more emphasis on the subject matter. As earlier mentioned educational software packages can be used to generate more learning emphasis on students as they behold animations, computer simulation, pictures and other display formats on the topic introduced. Finally, complementary approach is when the ICT is used to aid and support the student’s learning. “This approach allows students to be more organized and efficient in which they can obtain the notes from computer, submit their works by email from home as long as they meet the deadline and looking for information from various sources provided online to fulfil the task given to them (Hermans et al., 2008)”. In the study of Ghavifekr, & Rosdy (2015) found that:

- The use of ICT promotes active and engaging lesson for students’ best learning experience
- ICT helps students to learn more effectively as well as it helps students to find related knowledge and information for learning,
- Provide the chances for students to be active and take more parts or roles for their best learning experience
- ICT helps to provide latest and current issues where students can obtain their information very easily and integrate it into their learning process.

Integration of ICT in Schools
The integration of ICT in schools is becoming a crucial standard for all schools in the new era of digital learning in the developing nation. The FGN (2013) stated among its requirements for effective and efficient teaching and learning process, the integration of computers and other advance technologies if available, for delivery of the educational curriculum. However, as a matter of policy, the Ministry of Education has recommended that schools should integrate technology through the use of computer laboratories for teaching and learning. This integration will not only shift teaching from teacher-centred to student-centred but also help student in enhancing their collaborative learning skills as well as developing transversal skills that stimulates social skills, problem solving, self-reliance, responsibility and the capacity for reflection and initiative. According to Kainth and Kaur in Essays (2018) “ICT integration is understood as the usage of technology seamlessly for educational processes like transacting curricular content and students working on technology to do authentic tasks”. It further noted that, nowadays ICT facilitate not only the delivery of lessons but also the learning process itself. This includes computer based technologies, digital imaging, the internet, file servers, data storage devices, network infrastructure, desktops, laptops and broadcasting technologies namely radio and television, and telephone which are used as instructional tools at schools.

Literatures showed that many schools especially in the developed countries integrates various kinds of digital technologies directly into the classroom for teacher’s and students’ ease of accessibility whenever the need arises. Although, the utilization of information and communication technology for teaching in the developing
countries is gradually gaining more stands daily, it is sometimes not directly built in the classroom. They require external centres for the use of these digital tools for teaching and learning. The teachers and students are required to move to these centres before there could be access to use the facilities for teaching and learning process. However, Andeya (2002) noted that the most common ICT initiative is the so called telecentre which has been tried in almost every country around the world. This centres are set aside for ICT technologies and they are used sometimes for external examinations and other related educational purposes. In line with this, the paper focuses the requirement for the development of such effective ICT centres.

**Requirement for Development of Effective ICT Centre**
OLE Nepal developed a model for necessary needs for the development of effective ICT centre for educational purposes.

![Diagram](Image)

**Fig. Source: OLE Nepal (2019)**:
The model simply implies that for development of effective ICT centre there should be availability of digital tools, technology and network infrastructure, local capacity and community support and teachers’ training. These elements of the design are explicate as follows:

**Digital Concept**
The digital concepts involve digital communication technologies that enable people and organization to
communicate effectively. These are technologies that enable information to be displayed in electronic image, stores and retrieve information when necessary. Wikramanayake (2005) posits that acquisition of digital technologies such as computers, camera, local area networks (LAN) and other education applications such as electronic document management system (EDMS), relational database management system (RDBMS) among others. Digital technologies are electronic tools, systems, devices and resources that generate store or process data. For instance, social media, online games, multimedia, mobile phones, computer are trending technologies used in the school for teaching and learning in schools. The availability of these technologies in the ICT centres can enhance learning, teaching, assessment process and record keeping. In addition, digital technologies also include educational software that ease teaching process and facilitate learning. Wikipedia (2019) described educational softwares as any computer software developed for the purpose of facilitating teaching and learning process. These softwares are specially designed for specific purposes ranging from assessment, reference, corporate training, analysis, language training, recording and grading. Such educational software includes socrative, thinklink, TED-ed, and Animoto. In addition to this, Resier (2001) posits that Encyclopedias on CD-ROMs provide information, digital images, video, and audio, and also provide links to websites where students access tools such as live web cameras and global positioning satellites. Based on the foregoing, ICT centre should possess digital technologies such as educational softwares, application, multimedia, web cameras, computers among others that are significant to teaching and learning.

**Technology and Network Infrastructure:**

According to NITDA (National Information Technology Development Agency, 2019) integration of ICT in education will require the acquisition of various infrastructures that will enhance the utilization of these technologies. Vanderlinde and Van Braak (2010) described ICT infrastructure measures the perceived availability and sustainability of ICT tools such as hardware, software, internet access and peripheral equipment provided in schools. In broad terms, infrastructure in ICT refers to all hardware and networking gears needed to keep information technology operation running. However, network infrastructures are peripheral used to create computer network. This may allow computers to share resources and information at the same time. The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams (Kaur, 2010). REMOGDF (2018) includes Computers on Wired Network Installation (i.e. Physical Cabling of Computers, excluding laptops) as one of the vital component that ensures the effective functionality of ICT centre. Over the years, due to persistent increase in computer for business organization and schools various wired and wireless network infrastructures such Hubs, Switches, Bridge, Routers, Gateways, CSU/DSU, Wireless access points (WAPs), Modems , Network interface cards (NICs), ISDN adapters, Transceivers, Firewalls.

LAN (Local area Network): This is a type of computer network that provides connectivity or digital telecommunication among computers in a relatively small area usually within an office, building or home. In ICT centres, it is necessary that connectivity exist among computers so as to carry out a programme or exchange electronic resources from the central server. Depending on the largeness of the ICT centre LAN can be used to provide computer network.

MAN (Metropolital Area Network). A metropolitan area network (MAN) is a large computer network that usually spans a city or a large campus. This may be useful if various ICT centres are within a campus. It helps to create linkage/telecommunication between computers that are a distance away from the central server.

WAN (Wide Area Network): WAN covers a large geographic area such as country, continent or even whole of the world.

**Teacher Training**

Studies have found that teacher factor is really the determinants of ICT utilization in teaching and learning. Moses, Mamud, Bakar and Wong (2012) assert that teacher lack competencies in technical usage and low administrative support amounts to the reason for low intensification of digital technologies in teaching and learning process. Kamarulzaman, Abdullahi,Idris and Nasrun (2017) reported that the level of ICT application among secondary school teachers is still at low level. This deficiency stems from the fact that the teachers possess poor ICT skills (Ogechukwu & Osuagwu, 2009). It is in this regard that Agbetuji & Oluwatayo (2012) recommended capacity development for teachers at all levels of Nigerian educational system, at primary,
secondary and tertiary levels, there must be ICT training and re-training, education and usage for teachers. This will enhance the maximization of ICT use nationwide. ICT centres can only be effective when there is proper utilization of the centres by the teachers for teaching and learning process. Therefore, it is pertinent that teachers’ training should be given priority alongside with establishment of ICT centres in schools. It is not enough to establish ICT centres without equipping the human resources that would know how to utilize the centre effectively.

Moses, Mamud, Bakar and Wong (2012) in their study found that there was need for technical and administrative support for proper integration of ICT in teaching and learning. They went further to state that technical support is characterized as the access, operation and troubleshoot of computer hardware, software, and network resources, while administrative support refers to the encouragement from the role models to enhance the application of ICT tools in teaching and learning.

Local Capacity and Community Support

The school serves the community by helping to eliminate illiteracy among the people. The contribution of the community is also needed to ensure adequate facilities are in place for proper delivery of educational objectives. In the establishment of school ICT centres community may help in the following:

- Provision of stable school electricity: ICT centre cannot function to its full capacity without power supply. Digital technologies require power supply to function, if not it may malfunction when not used for long. One of the major challenges of ICT in Nigeria is the situation of erratic power supply. Fatunde (2008) also claimed that poor electricity supply in Nigeria is proving a major impediment to the operation and growth of information and communication technologies in the nation's universities. This unwholesome situation is capable of rendering ICT systems dysfunctional. This amounts to the reason why provision should be made for stable power generation for the development of effective ICT centres in secondary schools.

- Funding: Schools requires consistent funding to keep the administrative, teaching and learning system functional at all times. The major kind of support the community can render to school for sustained productivity and efficiency is the provision of funds to support the schools developments. The acquisition of ict equipment, infrastructure, services, payment of ICT instructors for installation and maintenance require fund. In the case of unstable power supply, there is need for power generators which may demands consistent burning of fuels. All these needs will centred on the school. Funding is therefore highly required from the government and the community for effective delivery of instructional objectives in the digital age. To this reason, ICT Development Fund (ICT-DF) contributes to sustainable development through the co-financing of ICT national, regional and global development projects.

In general overview, National Information Technology Development Agency (NITDA) (2019) proposed specify framework and guidelines for the development and management of ICT centres in schools. These include

a) Software acquisition, development and usage, and maintenance;
b) Acquisition of ICT equipment, infrastructure and services;
c) Repairs, disposal and disaster recovery;
d) ICT networking infrastructure development;
e) Universal access management and control;
f) Funding of ICT equipment and infrastructure;
g) Data and information management;
h) Network services - Internet, email services and tertiary institution website;
i) E-learning and digital resources;
j) Cyber security issues- prohibited use of tertiary institution's ICT resources;
k) Enforcements
CONCLUSION
Information and Communication Technology centre are vital to ensure the integration of digital technologies in education. Recently adoption of ICT in teaching and learning is rapidly gaining access in secondary schools. Unfortunately, many schools are yet to adopt this technology especially because of unavailability of ICT centres and lack of ICT skills and competence among teachers. The paper focuses on the requirement for the development of ICT centres in schools. It was therefore concluded that digital technologies, network infrastructure, teacher training and community and local support are essential requirement for the development of ICT centre in school.

RECOMMENDATIONS
The study recommends as thus;
- Government should prioritize the development of ICT centres in secondary schools so as to encourage the incorporation of ICT in teaching and learning.
- The schools administrators should impress the need for the utilization of ICT technologies in secondary schools this will enable to teachers to make effective use of available ICT facility for teaching.
- The government and the school community should support the school in the development, maintenance of ICT centres and provision of stable power supply in the schools, this will also facilitate the use of advanced technologies in rural schools.

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