

## Technology-Driven Education a Framework For 21<sup>st</sup> Century Development Needs: Ict In Focus

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### Abstract

The remarkable technological transformation in the workforce has caused a fierce competition that has triggered development needs as work is no longer the way it used to be. The educational sector must embrace technology-driven education to help learners meet 21<sup>st</sup> century development needs. Teaching and learning must be done with futuristic mind-set, right education and skill set to embrace the powerful technology-based future. To contribute to national development, teachers at various levels must be empowered to provide ICT based training for learners. Thus, the learners' education must include opportunities to acquire skills in the selection, application and use of ICT tools and materials for instructional exercise. Yet in most public schools, ICT gadgets are in a very sorry state. ICT tools should be monitored, supervised, maintained, sustained and put in efficient and effective functional state. Relevant suggestions such as ICT tools should be monitored, supervised, maintained, sustained and put in functional state.

**Keywords:** Information and Communication Technology, Innovation, Technology-Driven Education, Development Needs.

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### Introduction

We live in a technology-driven world that has witnessed a phenomenal change in the workforce. Globally, the pace of change in the workplace is accelerating with a fierce competition for human capital. Few years back, what was viewed as talent and skills

are no longer what they mean today. Various job titles, roles and skills needed to fit in the workplace are yet not very clear today and as such are presented with lots of unpredictability. The 21st century education is more practical axioms than theoretical exegesis (Begum & Liton 2018), that has placed lots of demands on the workforce.

In this era, one cannot thrive without embracing critical thinking, creativity, constructive collaboration and communication skills. To fit into the labour market, one has to be technological savvy unlike some years back. There is need to equip the future generation with the right education, skill set and mind-set to embrace the powerful technology-based future. Tomorrow's future does not replace humans but demands that humans should have the right technological insight. The foundation of a truly successful nation in the 21st century is characterised by the emergence of a knowledge-based economy which is undoubtedly its human capital, which in turn, is greatly shaped by its education system and the skills of its workforce. The society cannot prepare a robust workforce without innovative education.

Education is the process of imparting and acquiring knowledge through teaching and learning especially at school or learning institutions. This, points to the fact that the aim of education is the development of the human mind, the personality, the potentials and impartation of useful and relevant skills to individuals thereby enhancing the growth of the society. Aminigo and Nwaokugha (2007) are of the opinion that education prepares the human mind to enable it cope with future challenges. Industry, science and technology and their advance are intimately bound up with the progress of education. In order to achieve the aims of education, the school especially public schools, which serves the purpose of transmitting desirable social norms from one generation to another and in fact, the educational system in general must be robust, functional and up-to-date with the relevant societal trends as the need of the individuals are subsumed within those of the society. ICT can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration (UNESCO, 2019) when they are functional, up-to-date, maintained and sustained.

According to Nigerian Funder (2017), the latest reform on the National Policy on Education in Nigeria included changes and innovations like: Information and Communication Technology (ICT) was instructed to be included into the school curriculum as a second official language; simultaneous teaching of science, technical and vocational education in the scheme of national education for complete student capacity and optimum performance and general contextual change to reflect the state of professional practice in education, and so on. Information and communication technology as a vast field, encompasses virtually all technologies that can receive, store, retrieve or transmit signals electronically. ICT play an essential role in how individuals work, live, teach and learn. ICT is found around us. In fact, the modern world will be incomplete without ICTs and their applications. It is almost impossible to even imagine modern facilities without ICT.

Therefore, teachers need to remain at a pace to incorporate technological developments happening around the educational world across the globe. This will also, differentiate and highlight areas of improvement between the digitally literate and digitally illiterate (Bijaya 2020). In order to contribute to national development in this technology-driven world, teachers at various levels must be empowered to provide ICT based training for the learners. Thus, the learners' education must include

opportunities to acquire skills in the selection, application and use of ICT tools, also the ICT tools must be maintained, monitored, protected, supervised and sustained if the educational sector is to meet the 21st century development needs.

### **Justification for the Paper**

Today's learning environment, in the view of Explorance (2022) is more dynamic than before. These learners are leaving in ways that are different from how the educational system was originally designed, classrooms should be remodelled and redefined in a number of ways to fit the evolving needs of modern digital learners. The biggest challenge any teacher faces is capturing the learners' attention and putting across ideas in such a way it stays with them long after they have left the classroom. Although, ICT was instructed by the Federal Government of Nigeria to be included into the school curriculum, yet students especially those in the public secondary schools cannot effectively and efficiently use ICT/ computers to perform word processing, spreadsheet, graphics, and database.

Hence the gap poised on accessibility, availability and functionality of ICT in the educational system is worrisome. Due to the embarrassing situation in the just concluded UTME examination, reports has it that over 100 centres out of 708 centers experienced inability of some students to operate the systems, and technical challenges that prevented candidates from successfully participating, according to Onyeniran (2023) and Tyohemba (2023). This would have been prevented if appropriate measures were taken in monitoring, maintenance of ICTs. This paper tends to buttress the need of a technological educational environment, the developmental needs of the 21st century educator, learner, and also the challenges.

The paper is concerned with exploring technology driven education as a framework for 21st century development needs through the instrumentality of ICT. Specifically, the objectives are as follows:

1. Explain Information and Communication Technology.
2. Identify the ICT 21st Century Development Needs.
3. Outline the challenges of ICT in the 21st Century.

### **Literature Review**

#### **Information and Communication Technology (ICT)**

Information and Communication Technology (ICT) can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration (UNESCO, 2019). ICT integration is the usage of technology seamlessly for educational processes like transacting curricular content and learners working on technology to do authentic tasks. Globally, educational systems are adopting new technologies to integrate ICT in the teaching and learning process to prepare learners with the knowledge and skills they need and prepare them for the realities which they will face in the future. This can be achieved through effective communication using ICT: when communication is properly handled, it is easy for people to connect on a global scale.

Therefore, this paper is based on the theory of connectivism by Siemens and Downs (2005). Connectivism is a learning theory that explains how ICT have created new opportunities for people to learn and share information across the World Wide Web and among themselves (Downes, 2019). These technologies include web browsers,

email, wikis, online discussion forums, social networks, Youtube and any other tool which enables learners to learn and share information with others. The theory holds that knowledge exist in the worlds and not in the head of an individual, knowledge exist within systems which are accessed through people participating in activities. Here, people learn through contacts and learning is viewed as the process of creating connections and developing networks.

Connectivism is said to be a theoretical framework for understanding learning in this digital age. As technologies such as web browsers, search engines, wikis, online discussion forums and social networks contribute to new avenues of learning. Since learning does not only happen within an individual, technologies have enabled people to learn and share information across the globe among themselves in the 21st century in ways that were not otherwise possible before now. One of the innovative technologies that can enable the educational sector to meet the 21st century development needs is ICT. ICT stands for Information Communication Technology. The three important words behind ICT according to Adedapo, et. al., (2012) are:

1. **Information** Information refers to the knowledge obtained from reading, investigation, study or research.
2. **Communication** Communication is an act of transmitting messages. It is a process whereby information is exchanged between individuals using symbols, signs or verbal interaction.
3. **Technology** Technology which was derived from two Greek words “techne” (art, skill, cunning of hand) and “logia” is the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings.

There is not a universally accepted definition of ICT because the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. ICT includes all information and communication devices or applications like radio, television, computer, internet, network, hardware and software, satellite systems and cellular phones as well as the various services and applications associated with them. Information and communication technology, is a vast field encompassing virtually all technologies that can store, receive or transit signals electronically (Walton 2009).

Rashmi (2011) defines ICT as diverse set of technological tools and resources used to communicate and to create, disseminate, store, and manage information. Also, Ale, et. al., (2008) sees ICT as the technology that uses electronic computers and computer software to convert, store, protect, process, transmit and retrieve information from anywhere, anytime. Agumagu, et. al. (2014) pointed out that the introduction of various ICT trends has led to reorganization, change of work patterns and demand for new skills, job retraining and reclassification positions. Suresh (2016) stated that ICT offer the opportunity for more student centred teaching, provide greater opportunity for teacher-to-teacher and student-to-student communication and collaboration, give greater exposure to vocational and workforce skills for students and provide opportunities for multiple technologies delivered by teachers.

In order to attain the 21st century development needs through ICT, Webanywhere (2016) highlighted some benefits of using technology in the classroom, which are as follows:

1. **Improved Engagement:** When technology is integrated into lessons, students are expected to be more interested in the subjects they are studying. Technology provides different opportunities to make learning more fun and enjoyable in terms of teaching same things in new ways.
2. **Improves Knowledge Retention:** Students who are engaged and interested in things they are studying, are expected to have better knowledge retention. Technology helps to encourage active participation in the classroom which is also a very important factor for increased knowledge retention. Different forms of technology can be used to experiment with and decide what works best for students in terms of retaining their knowledge.
3. **Encourages Individual Learning:** Technology provides great opportunities for making learning more effective for everyone with different needs. For example, students can learn at their own speed, review difficult concepts or skip ahead if they need to. It provides more opportunity for struggling or disabled students. Access to the internet gives students access to a broad range of resources to conduct research in different ways which in turn can increase the engagement. Research is an academic exercise that involves human element in the solution to a problem (Nworuh, 2004) and an intellectually demanding activity, technology can help make it easier.
4. **Encourages Collaboration:** Students can practice collaboration skills by getting involved in different online activities. For instance, working on different projects by collaborating with others on forums or by sharing documents on their virtual learning environments. When students get involved in different online activities, they x-ray the ideas and opinions of other people and become more tenacious and objective, that is, holding fast to truth essentially observed to be consistent over time (Asuka, 2003). It can also encourage collaboration with students in the same classroom, school and even with other classrooms around the world.
5. **Students can learn useful skills through technology:** By using technology in the classroom, both teachers and students can develop skills essential for the 21st century. Students can gain the skills they will need to be successful in the future. Modern learning is about collaborating with others, solving complex problems, critical and creative thinking, developing skills and improving motivation and productivity.

Webanywhere (2016) went further to also state the benefits to teachers to include: countless online resources, technology can help improve teaching. Teachers can use different apps or trusted online resources to enhance the traditional ways of teaching and to keep students more engaged. Virtual lesson plans, grading software and online assessment can help teachers a lot time. This valuable time can be used for working with students who are struggling. Having virtual learning environments in schools enhances collaboration and knowledge sharing between teachers. All of these stated above cannot be possible without ICT. Therefore, to meet the 21st century development needs, ICT has a huge role to play. When teachers are digitally literate and trained to use ICT, it leads to higher order thinking skills, provide creative and individualized options for students to express their understanding and leave students better prepared to deal with ongoing technological change in society and the workplace.

Jackson (2023) opines that the business world, especially in the advanced and developed world, have galloped precipitously with technology and is evident in many other fields such as health, sports, retail, mining and nearly every field there is.

However, the educational sphere has been a bit laggard at adopting technology though there are some inroads in the area of educational technology, the sector as a whole seems to be miles away from the revolution which was promised by the enthusiasts. This scenario made Attih (2021) to assess undergraduates, and question whether the present-day learners possess critical thinking, creativity, collaborative and communication skills necessary to tackle and fit into the 21st century shifts in the marketplace. Herold (2022) noted that ICTs and software programs can be used to address literacy gaps among students and prepare them to meet whatever challenge in the marketplace, but the challenge of ICT in education in that most public schools are: lack of maintenance, monitoring, and proper supervision.

The framework of this paper is anchored on the 21st century rainbow bar which cut across all sector of the economy. Such as in Accounting and Banking, ICT is used to automate the manual accounting systems. The automated teller machines are used in the banking sector which is known as ATM, and mobile phone money (Thisday, 2023). In the views of Nwokoma (2023), a cashless economy is great, but there must be improvement in the economic state of most Nigerians and the necessary infrastructures built. The researchers agree that improvements on the internet banking are a necessity due to the difficulty experienced during the Naira re-design.

Ariyo (2023) stated that the internet and social media, an aspect of ICT have drastically changed how elections are held. In the past, candidates relied heavily on television and print ads to reach voters. However, in recent times, candidates must also have a strong online presence to succeed. They put the social media into effective usage, also, voting machines are becoming more and more advanced, and incorporating features like biometric authentication and block-chain technology. This allows for more secure and efficient voting systems that can help prevent election fraud. This implies that the appropriate application of technology to elections can increase administrative efficiency, reduced long-term cost and enhanced political transparency (ACE Project, 2023). Therefore, in the business of education and academics, the 21st century development needs are met when ICTs are applied by teachers and learners in teaching and learning. It is also very important to monitor, maintain, and sustain ICT and its applications in education.

### **ICT 21<sup>st</sup> Century Development Needs for Students**

To better understand the ICT 21<sup>st</sup> century development needs for students, there is need to critically explore the information, media and technology skills as contained in the Rainbow Bar: The 21<sup>st</sup> century learning framework otherwise known Rainbow Bar ( Partnership for 21<sup>st</sup> Century Skills 2009), the first curve of the bar has three sections, the first section talks about the life and career skills, the second section talks about learning and innovation skills, the third section talks about information, media and technology skills, and the pillars in which the bar is anchored on. This is the knowledge and expertise teachers must master to thrive.

1. **Information, Media and Technology Skills:** To be effective, efficient and thriving in the business of education in this 21<sup>st</sup> century, teachers must exhibit varieties of practical and critical thinking skills related to information, media and technology.
2. **Information Literacy:** teachers should be able to access and evaluate relevant information; use, manage information, accurately manage the flow of information and creatively move educations forward.

3. **Media Literary:** they should be able to analyze media, understand how and why media messages are constructed and examine students' different interpretation of messages and the influence of media on the students' behaviour and philosophies; and apply these understandings to effect a positive change in education. They should also be able to create media products by understanding and utilizing the most appropriate media tools to put in use in order to reach out to the students.
4. **Information Communication and Technology (ICT) Literacy:** Teachers should be able to use digital technologies such as internet, computers, personal digital assistants, etc., to research, organize, evaluate and communicate information. In this knowledge-based economy, the use of ICT in education will be better to handle new active learning and other skills that work well online. Ability to access and use teaching and grading apps such as Zoom, Google Suite, Dropbox, TED, Quick Grader, iGrade, Socrative Teacher, etc., is key if the 21<sup>st</sup> century development needs are to be met.

### **Challenges of ICT in the 21st Century.**

Challenge means a problem or task that stimulates effort and interest, while a problem is a situation, person or thing that needs attention and needs to be dealt with or solved. ICT devices are tools or digital infrastructures such as computers, laptops, desktops, data projector, software programs, printers, scanners and interactive teaching box etc. (IGI Global, 2018), which are used for teaching and learning. These devices in order to be effectively and efficiently utilized for teaching and learning should maintain some degree of excellence. That is to say, they are to be in a very good working condition, operational and functional.

There are no laudable ventures without the corresponding challenges. In fact, “uneasy lies the head that wears the crown” is a popular saying. Flexisaf (2018) and Mungai (2011) outlined challenges of ICT as follows:

1. **Power:** More than 95% of those living without electricity are in countries in rural sub-Saharan Africa and developing Asia. It is a fact that irregular power supply or constant power outage is a hindrance to effective delivery of education as well as the use of ICT tools, for the schools that have access to ICT. Until power is widely available, reliable and affordable for many Nigerians, educational progression will be a lot slower than anticipated. To handle the issue of epileptic power supply, alternative energy sources such as generators, solar system and uninterrupted power supply (UPS) should be put in place.
2. **Internet Connectivity:** Nigerians are still grappling with the high cost of accessing the internet and mobile services while internet speed is inordinately slow. For many schools, access to internet incurs high costs due to lack of cable infrastructure. For those that have had the opportunity to acquire IT resources and equipment, internet connectivity is frustratingly erratic.
3. **Training and Professional Development:** Even if power, internet bandwidth, electrical devices and educational tools are present, there is still the question of how can teachers be able to use technologies effectively? Schools that have had the opportunity to incorporate technology for engaging and supporting learning, still have the issue of their teachers not being tech savvy. The development of instructional awareness and understanding of the concepts behind teaching with technology is the first step to improving the academic outcomes of students.
4. **Sustainability:** It is one thing to have all the educational requirements set in place; it is another thing to continuously provide means to sustain those

requirements. Part of the challenges for schools is the possible cost of maintenance. Initial grants and funding can only go such a long way when it is used to cover scholarships, classroom equipment as well as the upkeep of physical infrastructure, which is why it is unlikely that maintaining technologies will move to the top of the list for these schools. Having sophisticated technological solutions that solves all the educational needs is a great move, but if they cannot be supported and maintained, then it slowly bites the dust.

5. **Lack of Computers:** Computers are still very expensive and despite spirited efforts by the government agencies, NGO, corporate organizations and individuals to donate computers to as many schools as possible, there still remain a big percentage of schools unable to purchase computers for use by their students. Computers and computer software's should be made available to schools. They should be safeguarded, maintained and kept in good working conditions.
6. **Broken down computers:** While a good number of schools have benefitted from donated computers, they have not been adequately equipped with the same on maintenance and repair, hence it is very common to see a school's computer lab full of broken-down computers, some repairable and some not. Measures should be put in place to repair and maintain the computers.
7. **Increased Moral Degradation:** Internet pornography, cyber bullying and other anti-social behaviour is a worrying emerging problem. Students should be taught responsible usage of ICT and its application and how to avoid bad sites and make the most of ICTs.

Having had the explanations and understanding of ICT and its 21st century development needs and the challenges of ICT in the 21st century, the big question is: how can teachers use ICT to meet these 21st century development needs and prepare learners for the workforce? Anderson (2023) answered the question thus:

1. **Make Learning Active:** Learning requires an active role. As the complexity and availability of information has increased, figuring out what to teach has become more difficult. Take for instance in the workplace, employees need to know what they need to know, when they need to know it. This requires an active role of finding, validating and interpreting a knowledge base. It then requires technology and an active search engine that gives employees what they need, when they need it. Teachers are therefore encouraged to teach learners to use digital tools to broaden their perspective and enrich their learning by effectively working together in teams with others locally and globally.
2. **Provide Credible and Accessible Resources:** Two ways educational institutions can reverberate technology-based learning is as follows:
  - a. Help learners understand the context within which they need knowledge (technological and non-technological).
  - b. Create an opportunity for practice, growth and reflection.

With so much information available, learners need help knowing where they can find credible resources online and offline. In teaching with ICTs and teaching in general, teachers should model a real-life workforce scenario whereby employees needs to know that there are laws and policies to guide their actions, and have a general understanding of what they are, what they cover and the consequences for a mistake. Then, they need to know where to go to find the answer to their questions. The resource should be easy to search and read, and relevant to the life and professional development of the employee and that of the organization. To be ultimately useful, the

resource should offer progressively more in-depth information, should the learner want to go deeper, as well as a place for real-time questions.

3. **Facilitate Two-Way Dialogue:** Real life work scenario is about communication. For communication to be effective, knowledge should be conveyed in such a way that it brings out interest and excitement in the listener. ICT help to bring out the interest and excitement in learners. The success and growth of any organization depends on effective communication. By means of communication, prospective customers can be convinced to choose a particular product over another. Through communication, customers can ask questions and get feedbacks. Communication help organization to share ideas and communicate the vision, mission and core values of any organization and work towards organizational growth. Therefore, teachers should treat learning as a process of growth and development of networks. They should facilitate learning by handing assignment online to learners, encourage students to ask questions, guide students to information and answer key questions as needed in order to support student learning and sharing on their own.
4. **Cultivate an Environment for Self-Directed Learners:** Finding learning content is not very tasking, what is tasking is creating an environment that generates curiosity for self-directed learning, establishing relevant context and then helping learners recognize the learning that has occurred. Learning in the 21st century has to find the right balance between all three elements of organizational learning: the context, the content and practice. ICTs can, and will, play a huge role in all areas, but it will be important to understand what the organization is trying to achieve. Good practice means observation, feedback and reflection. To construct their own learning, teachers can encourage learners to go on field trip using the appropriate software to gain the desired learning outcome, making the learners see the virtually real thing, complete assignments and develop projects more authentically because of the knowledge gained.

## **Conclusion**

In recent times, the society have witnessed a remarkable transformation in the workforce as a result of technology. The researchers agrees with Ariyo (2022) that technology has transformed the entire learning experience making technology driven education critical to national development (Jackson, 2023). There is a fast-tracked global change in the workplace with a fierce competition for human capital due to the influx of innovative technology. The 21st century has greeted the global society with lots of development needs. Work is no longer the way it used to be as innovation has become the order of the day. It therefore behoves the educational sector that are in the forefront of preparing learners for the future to embrace a technology-driven education to meet 21st century development needs.

## **Suggestions**

1. To handle the issue of epileptic power supply, alternative energy sources such as generators, solar system and uninterrupted power supply (UPS) should be put in public schools.
2. Access to internet and internet connectivity should be put in public institutions of learning.

3. There should be adequate professional development of instructional awareness and understanding of the concepts behind teaching with technology for teachers because being technologically savvy is beyond computer literacy in this era.
4. Computers and ICT gadgets should be made available to schools, they should be safeguarded, maintained and kept in good conditions.
5. Students should be taught responsible usage of ICT and its applications and how to avoid bad sites.
6. These ICT tools should be monitored, supervised, maintained, sustained and put in efficient and effective functional states.

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