

Impact of ICT on Tertiary Education Quality in Nigeria

Jibrilla Hamza Modibbo and Mary Opeyemi Fashola

General Studies Department, Federal Polytechnics Mubi. Adamawa State, Nigeria.

ABSTRACT

The world is now a global village with aid of Information and Communication Technology. ICT has become an inseparable entity in all aspects of human life, including education. In the Nigerian tertiary institutions, ICT has begun to have a presence but the impact has not been extensive. The transition of the world to digital media and information has increased the importance of ICT in education, and this importance will continue to grow and develop in the twenty-first century. ICT an essential component of today's world; it has transformed the educational system by replacing traditional ways of teaching and learning with modern, computer-based processes. This paper highlights the impact of ICT for quality education in Nigeria tertiary institutions. ICT has undoubtedly impacted the quality and quantity of teaching, learning, and research in Nigeria tertiary institutions. The paper further discussed the benefits of having ICT infrastructure such as e-learning/virtual library, access to quality education for learners with special needs in Nigeria tertiary institutions. The various constraints to ICT utilisation should receive prominent attention. The study concludes that government funding of ICT infrastructure, effective policy legislation, and execution and acquisition of appropriate skills are most important for ICT to continue playing its lofty role as a change agent to bring about quality education in Nigerian tertiary institute

Keywords: Education, Electronic learning, ICT, Tertiary institutions, Quality control

INTRODUCTION

Quality education refers to education that serves each individual pedagogically and developmentally; an education that is inclusive and is structured to realize the potential of each individual regardless of location or economic status [1,2,3]. Quality education is a unique goal (Number 4 of the SDGs, labelled as SDG4) of the United Nations Development Programme, focused purely on education, to ensure inclusive and equitable quality education and promote lifelong learning [4, 5, 6]. Education is defined as the process of acquiring knowledge, skills, values, morals, beliefs, habits, and personal development or facilitating learning [7, 8, 9,10]. It is a potent tool for social, economic, and political progress, without which neither an individual nor a society can achieve professional development [11,12, 13, 14]. It is generally the basis for human development and civilization. Tertiary education is the third tier of the educational system and includes post-secondary education [15, 16, 17].

Tertiary education is defined by the Federal Republic of Nigeria (2014) as education provided after secondary school in universities, colleges of education, polytechnics, mono technics, and institutions offering correspondence courses [18,19,20]. Tertiary education is instrumental in fostering growth, reducing poverty, and boosting shared prosperity. It benefits not just the individual, but the society as a whole and so it is very important. The adoption of ICT into higher education provides opportunities for learners to access more advanced and wider areas of learning to develop analytical skills [21, 22, 23, 24]. ICT is an indispensable part of the contemporary world. It is a force that has changed many aspects of people's ways of life.

The impact of ICT in the past two or three decades in all fields has been enormous. The use of ICT in education as a means of enhancing skills and building capacity for the promotion of economic development is critical to bringing about viable changes within the education

system [25, 26]. Professionals in the fields of education have submitted that ICT holds great promise to improve teaching and learning when properly used, thus bringing about desired quality education. As Nigeria is striving hard to keep playing its leadership role in Africa and the world as a whole. Through leadership and ownership of the implementation process, Nigeria has continued to demonstrate its

Conceptual Literature Review Education

Education is a strategic investment in national development. It is the acquisition of knowledge, the aggregate of all the processes by which an individual develops the abilities, attitudes, and other forms of behaviour that are of positive value to the society in which he/she lives [25, 26, 27]. It is transmitting culture in terms of continuity and growth or disseminating knowledge either to guarantee the rational direction of the society or

Tertiary Education in Nigeria

In Nigeria, education is administered by the federal, state, and local governments. The Federal Ministry of Education is in charge of overall policy formation and quality control in Nigeria's education system, which is divided into three tiers. That is, basic education, post-basic/senior secondary education, and post-secondary/tertiary education. The National University Commission (NUC), is the government umbrella organisation that oversees the administration of tertiary education in Nigeria [30]. Therefore, tertiary education encompasses all forms of formal postsecondary education, including public and private universities, colleges, technical training institutes, and vocational schools. Tertiary education's goals include the development of relevant high-level manpower, the development of individuals' intellectual prowess, and the acquisition of technical and interpersonal skills. Tertiary educational institutions pursue these goals through a variety of programmes such as certificate, diploma, undergraduate, and postgraduate courses, as well as teaching, research, knowledge generation, and dissemination [31].

Modibbo and Fashola

commitment to the SDGs promise. There have been considerable efforts in Nigeria to pay more prominent devotion to the improvement of education, particularly tertiary institutions, in the pursuit of SDG4. One of the means of achieving this entails the adoption of ICT in Nigeria's tertiary education. The Internet of Things (IoT) is a priceless modern-day intervention.

both" [28]. The place of education in development cannot be overemphasised, because education gives development the impetus required to harness human capital and material resources [29]. In this regard, education is congruous to national development. The transformative potentials of sustainable education increase national development. This strengthens the position that education is instrumental to the national development process.

University education, in particular, contributes to the production of high-level manpower in a variety of professional occupations as dictated by national development requirements. The goals of university education also focus on the inculcation of community spirit in the students through projects and action research. There is a great demand for tertiary education due to, among other things, the awareness of its vital importance for the economic and socio-cultural development of a nation. Tertiary education benefits society as a whole, not just the individual. It plays an important role in promoting growth, alleviating poverty, and increasing shared prosperity [32, 33]. A highly-skilled workforce with long time access to a solid tertiary education is a necessary precondition for any society's innovation and growth [34, 35]. Graduates of tertiary education are more concerned about the environment, have healthier habits, and participate in civic activities at a higher level. Furthermore, increased tax revenues from higher earnings, healthier children, and smaller family sizes all contribute to stronger nations [36, 37]. In short, tertiary education institutions prepare

individuals not only for adequate and relevant job skills, but also for active

participation in their communities and societies [38, 39, 40].

Quality Education

Quality education refers to the type of education that is concerned with its goodness of it. Quality in education means “fitness for purpose”; that is, the quality of education to any society must take reference from what that society considers to be the purpose of education [41]. The clarified objectives of section 20 of the 1979 Nigeria constitution states that the educational system shall be the type that motivates and stimulates creativity and draws largely on our traditions of values such as respect for positive Nigerian moral and religious values, ensure steadiness of traditional values and their progressive updating to meet modern development, produce responsible citizenship and an ordered society among others [40]. This means that the educational system should assist students in developing the habits, skills, opinions, tastes, and virtues required for the preservation of our cultural values and the flourishing of moral principles lives [41]. Quality education refers to the ability of the school to provide the necessary facilities

required to aid teaching and learning that can lead to the achievement of educational goals in line with prescribed acceptable global standards [7]. It is an investment in people which has great benefit to the society. Quality education is one of the Sustainable Development Goals (SDG number 4) of the United Nations Development Programme (UNDP) ratified in 2015. It seeks to ensure inclusive and equitable quality education and promote lifelong learning across the world by the year 2030 [30]. The Association for Supervision and Curriculum Development (ASCD), and Education International (EI), in a statement in support of the SDGs and the pursuit of quality education for all, defined quality education *as education that focuses on the child as a whole, that is, the social, mental, physical, emotional, and cognitive development of each student irrespective of race, ethnicity, gender, socioeconomic status, or geographic location. It prepares the child for adulthood, not just for testing or examination.*

Information Communication Technologies (ICT)

Information and Communication Technologies (ICTs) are broadly defined as technologies used to convey, manipulate and store data by electronic means. These include e-mail, SMS, text messaging, video chat (e.g., laptop, desktops, and smartphones) that carry out a wide range of communication and information functions [31]. ICT is an acronym for computers, software, networks, satellite links, and related systems that enable people to access, analyse, create, exchange, and use data, information, and knowledge in previously unimaginable ways [20]. It refers to technologies that provide access to information through telecommunication. This includes the internet, wireless networks, cell phones, and other communication mediums. ICT

is modern and dynamic. It has, in the last few decades, provided society with a vast array of communication capabilities and converted society into a global village. It has effectively and efficiently managed information through a diverse set of technological tools and resources and is silently contributing to the overall growth and development of society. ICT has globally been recognised as a catalyst of change. It is an essential element in the development of every area of any nation, in this era of globalisation. It is serving as a change agent in the method and quality of teaching and learning in educational institutions all over the world in this 21st century. It has become, within a very short time, one of the basic building blocks of modern society.

ICT and Education

The use of ICT in education as a means of enhancing skills and building capacity for the promotion of economic development is critical to bringing about viable changes within the

education system [30]. ICT in education encompasses the use of computers and their peripherals like printers, software, scanners, projectors for teaching and learning. Indeed, ICT represents a

paradigm shift in the way mankind processes information using the computer and the internet. It has moved information exchange from a static to a dynamic model. The adoption of ICT into higher education provides opportunities for learners to access more advanced and wider areas of learning to develop analytical skills. ICT enhances teaching and learning through its dynamic interactive and engaging content. It has the potential to accelerate, enrich and deepen skills, motivate and engage students learning, help to relate school experience to work practice, help to create economic viability for tomorrow's workers; contributes to the total development of the tertiary institution; strengthens

Modibbo and Fashola teaching and learning; and provides opportunities for connection between the tertiary institution and the world [21]. ICT can make the tertiary institutions more efficient and productive, through its variety of tools to enhance and facilitate teachers' professional activities [29]. It allows students to communicate with one another through e-mail, mailing lists, chat rooms, and other means. It allows for faster and easier access to more comprehensive and up-to-date 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.

Theoretical Review

Theory of Technology Acceptance Model (TAM)

The technology acceptance model (TAM) is an information systems theory that explains the acceptance of information systems by individuals. It holds that the technology acceptance is predicted by the users' behaviour intent, which is determined by the perceived usefulness of technology in performing tasks and perceived ease of use. Developed by [15], it is one of the most commonly used models of technology adoption, with two primary factors influencing an individual's intention to adopt technology: perceived ease of use and perceived usefulness. An elderly person who views digital games as too difficult to play or a waste of time will be less

likely to adopt this technology, whereas an older adult who views digital games as providing needed mental stimulation and being simple to learn will be more likely to want to learn how to use digital games. While TAM has been criticised on several occasions, it remains a useful general framework that is consistent with a number of studies into the factors that influence older adults' willingness to use new technology [26]. This theory is well situated in this study as the present study sought to appraise the role of information technology in achieving quality education in Nigerian tertiary institutions.

Empirical Review

[21] studied the effect of using information and communications technology (ICT) in teaching and learning the English language in tertiary institutions in Nigeria during COVID -19 pandemic era. The study examined the effects of using ICT in teaching and learning the English language in tertiary institutions in Nigeria during the COVID -19 pandemic era. The study established that there is no proof that students assimilate better in classroom teaching than e-learning, students can do very well using either or both mediums of teaching and learning because academic performance is irrespective of the media, institutions that previously did not incorporate ICT

into teaching and learning are now embracing this technology, and ICT learning can completely replace classroom learning of the English language. The study suggested that more effort should be made to enhance the learning process generally and prepare for similar events like this pandemic in the future.

[8] studied the use of ICT for teaching Islamic Studies amidst of COVID-19 pandemic in Kwara State. The simple random sampling technique was used to sample schools from the state's three senatorial districts. The findings revealed that Smartphones, Radio, Television, and a variety of applications such as Whatsapp, Zoom,

www.idosr.org

Telegram, Facebook, Google, 2go, Twitter, Instagram, and a slew of others were heavily used for teaching and learning Islamic studies in Kwara State during the Coronavirus lock-down. It was suggested that in order to improve the effectiveness and efficiency of Islamic studies teaching and learning through virtual learning, teachers and students should receive rigorous training on how to make the best use of ICT tools. It was suggested that to enhance effective and efficient teaching and learning of Islamic studies through virtual learning, teachers and students need to undergo rigorous training on how to make maximum use of ICT tools. [13] studied the role of information and communication technology on knowledge sharing among the academic staff during the COVID-19 pandemic. The study examined the impact of ICT and ICT infrastructure on academic staff knowledge sharing. The stratified sample method was used in the study. According to the findings of the study, ICT and ICT infrastructure had a positive and significant impact on knowledge sharing among academic staff at Iraqi public universities. The study recommended that the government and universities enhance and improve the ICT infrastructure, which would greatly benefit the reputation and ranking of Iraqi universities.

[17] studied an international perspective on the right to education and ICT during COVID-19. The research examined how COVID-19 has aggravated inequalities

METHODOLOGY

This study is exploratory research, taking into cognizance the experiences, perceptions, and socially unspoken realities of the educational sector in Nigeria. The study adopts a secondary research approach in which the

DISCUSSION OF FINDINGS

Impact of ICT in Quality Education in Nigeria Tertiary Institutions The integration of ICT into tertiary education institutions in Nigeria is gradually taking shape with several institutions appreciating its potential to improve, enhance and assist teaching and learning processes for both teachers and students [21]. The

Modibbo and Fashola

and pre-existing issues in educational systems around the world. The study found that there is an uneven capacity in terms of response and preparation to deal with the learning losses caused by school closures, both in low-income regions and in middle- and high-income countries. The study concluded that it is essential to articulate inclusive educational policies that support strengthening the government response capacity, especially in low-income countries, to address the sustainability of education and recommended that policies aimed at fighting inequality, discrimination, and exclusion in education are implemented. [20] studied the roles of information and communication technology in tertiary education in Africa. The study assessed the role of ICT and its ability to increase the quality of education in higher institutions of learning in Africa. The study established the advantages of having ICT infrastructure such as e-learning/virtual library, access to quality education through special tools for physically challenged students in tertiary institutions across Africa. The study concluded that government funding of ICT infrastructure is important to improve the quality of education in tertiary institutions and suggested that government implements ICT policies as well as provide adequate funding for ICT infrastructure and also monitor ICT infrastructure in various tertiary institutions to be sure that ICT equipment is not abandoned but are in use.

researchers' decision is based entirely on the review of extant literature as it relates to the use of ICT to achieve quality education in Nigerian tertiary education.

National Policy on Education [21] recognizing the role of ICT in the development of skills, abilities, and competencies for effective development offer that it should be integrated into education in Nigeria at all levels. The integration is taking the form of the use of computers, the internet, TV, radio, video conferencing, and mobile learning

[27]. The deployment of ICT in Nigerian Tertiary Schools has been supported by government and non-governmental organisations, such as banks, and individuals. For example, Firms such as Nigeria Communications Commission (NCC), Education Trust Funds (ETF), MTN Nigeria, and Zinox Computers, have at intervals and at separate times, shared laptops and other ICT apparatuses to teachers and students in tertiary institutions. The role of Information Communication Technology (ICT) for quality education in Nigerian tertiary institutions is very extensive and widespread. In the management and administration of tertiary institutions, ICT has been found to have played a great role in improving and modernizing the processes and methods being used. Most administrative and clerical processes, for activities including admission processing, course registration, fee payment, and purchase of academic materials have been computerised and are being done remotely. Most tertiary institutions have websites from which students can perform several functions by themselves and submit them remotely to the institution. Most tertiary education institutions in Nigeria are now utilizing ICTs to address the majority of their administrative issues as well as provide qualitative and quantitative instructions. Tuition, hostel, and other costs that were formerly paid in cash or by bank draft are now mostly paid online. This implies that with the introduction of ICT in tertiary institutions, administrative services are faster and better implemented, thereby boosting efficiency and effectiveness in the institutions' service provision. In academic research and collaboration, researchers effectively use ICT in the tertiary institution as a source of information and a reliable means of gathering research materials which is beneficial to students in their study; by expanding the frontiers of learning from traditional classroom studies. ICT has opened up the opportunity to collaborate with other scholars in different tertiary institutions globally [23]. ICT has provided more opportunities for research collaboration

and networking among scholars all over the world, thus; national and international dimensions of research issues are being studied as researchers can easily connect for communication and comparison of their findings, with experts. Researchers are thus, no longer faced with a lack of information, but with a glut of information. Data sharing, peer review, and developing a network of contacts are no longer constrained by distance as access to e-mail services, web-based files, data sharing, weblogs, and collaborative workspaces have become a norm. As such, ICT has made academic research much easier and more interactive among scholars.

In teaching and learning processes in universities and colleges, ICT has, to a large extent changed old, out-of-date, traditional teaching and learning methods that do not reflect contemporary realities. ICT in tertiary institutions has changed the way education is enacted [24]. It has paved the way for a new pedagogical approach, where students are expected to play more active roles than before, that is, students are more involved in the learning process; they have become more involved and active participants of knowledge creation and not just recipients. ICT has also increased opportunities for rapid information exchange that facilitates teaching, research, and lifelong learning, and led to the globalization of higher education. Furthermore, ICT lessens the stress and motivates students and teachers as it clarifies difficult concepts effortlessly for students [21].

The four ICT mediums through which the learning and teaching processes can take place are Audio Conferencing, Video Conferencing, Web-based Conferencing, and Open and Distance Learning [22]. Audio Conferencing involves the live or real-time exchange of audio or voice messages over a network. Examples of tools used are telephone and WhatsApp platforms. An advanced type of this medium allows for pictures or images to be sent and received over the network. This advanced medium is referred to as audio-graphic. Video Conferencing allows users to exchange videos or moving images, in addition to

www.idosr.org

voice messages, audio conferencing. Zoom app is a typical example of a video conferencing tool. Web-based Conferencing differs in that it allows audio messages, graphics, and videos to be exchanged between two or more persons, via the internet, with the use of a computer and browser [30]. Open and Distance Learning allows for greater interaction and participation among individuals during the learning and teaching process. Learning is also facilitated by performing tasks based on the tutor's instructions, solving problems, and learning at one's own pace.

This study revealed that with the advent of ICT, there is quick access to learning for tertiary school students. For example, opportunities for access to distance learning education programs for those who are unable to attend school or college for economic or cultural reasons abound now. Nigeria, like many other countries, now has Open Universities which provide education via the internet and other telecommunication devices for students. Open Universities offer students the opportunity to study with or without supervision from teachers. Due to its flexibility, ICT based learning process increased students' (young and old) participation unlike traditional teaching methods [34]. ICT brought about the concept of E-Learning and Virtual Learning. E-Learning is a method of learning that makes use of an information technology network such as the internet, that is the intranet (LAN) or extranet (WAN) whether wholly or in part, for delivery, interaction, and or facilitation of the study course. A virtual learning environment allows participants to acquire knowledge by cooperation. The environment includes a course syllabus, pre-requisites registration, instructor, and distant learning applications [36]. Students can gain knowledge and improve their quality of education at a reduced cost by being exposed to interdisciplinary studies [32]. E-Learning systems provide great opportunities for learning for individual students globally, by helping in educating and providing training opportunities on different topics [30].

Modibbo and Fashola

Application of e-learning includes computer-based learning, virtual classroom, video-conferencing, and digital collaboration where contents are delivered via the internet, intranet/extranet, audio/videotape, satellite TV, CD-ROM [31]. Thus, students have access to adequate learning aids which enhances access to information resources.

Furthermore, the utilisation of ICT in education has made online examinations possible. With the aid of computers, the internet, and other ICT resources, it is now possible for examinations to be administered to students online [23]. This method has been proven to save time and cost, improve security and promote impartiality and fairness. For example, during the Covid-19 pandemic and the ensuing lockdown, in Nigeria, most tertiary institutions had to resort to online examinations. ICT has also allowed teachers to deliver lectures in absentia, via audio or videotape. This also makes it easier for students to access these notes at their convenience, in the comfort of their homes. ICT has encouraged collaboration and partnership by teachers and students who are domiciled in different parts of the world with the use of its apparatuses such as webcam or videoconferencing. ICT has also functioned well as a library tool. Unlike the traditional library where physical books are kept and students go to seek information, ICT has offered students and even teachers, the opportunity to access libraries anywhere in the world at any time [20]. Considering the wealth of learning resources on the Internet, most of which are freely available, librarians are becoming information managers or librarians. These librarians will be computer experts and information brokers [11]. ICT has also played an essential role in supporting quality tertiary education for learners with disabilities [17]. Learners with special needs, with disabilities, who have been disenfranchised in the past due to lack of appropriate learning materials that could be used by them, are now well supported through ICT. Special application packages and customised tutorials have been created and made accessible. ICT

www.idosr.org

enabled an environment in which these set of people find it easier to overcome the challenges to their academic pursuits and achieve personal goals and dreams of being educated.

Such ICT products for variety of disabilities include Qualikey, look keys, adaptive keyboard: virtual keyboard, Intel keys, head/ mouth stick keys, Quail world (software for accessing computer without conventional keyboard and mouse), Frog-pad (keyboard for persons with one hand, 15 keys, with three different level overlays), Foot pedal KB (Programmable 3 keyboard), Quail- click software (Programmable mouse click), Eye-tracking software (On screen cursor controlled by simple body movement. A standard USB Webcam captures user movement and software translate it into mouse movement), Speech recognition (allows operation of any application

Impediments to the Impacts of ICT for Quality Education in Nigeria Tertiary Institutions

However, despite the progress made on the impact of ICT on quality education in Nigeria, some factors identified as impediments (Rivers, et al, 2015) include lack of infrastructure to support ICT, which has made it impossible to implement these technologies and improve education systems; limited financial resources making

Nigeria has increasingly adopted and implemented national policies on ICT. The benefits of integrating ICT into Nigeria's educational system cannot be overemphasized. ICT has been noted to increase access to modern learning techniques which improves knowledge in this highly competitive era of globalization. ICT in its crucial role in Nigeria Tertiary Education brings learning closer to students by offering virtual services. ICT creates an abundance of opportunities for students who do not have access to the classroom to also learn. Nigeria is adapting ICT into its tertiary education system. Although this is at a slow rate due to some impediments. The possibility of ICT in

RECOMMENDATION

1. Staff and students in higher education institutions should be encouraged to learn how to operate and use ICT

Modibbo and Fashola

and full control over computer/device), Magnification S/W (1.1x to 36x, bulls' eye for aiming, screen spilt, large print keyboard, change in background colours, inversion of colour for persons with negative vision, network based), WYNN/Kurzweil 3000 (for persons with dyslexia, provide audio and visual support for learning), Braille Embossers (Hardware device used for printing computer generated text in raille format), and JAWS (The most popular screen reader worldwide, JAWS for Windows works with PC to provide access to today's software applications and the Internet and supports 17 languages) [8]. Using any of these will make it easy for every learner with special needs to study with the least amount of difficulty. The introduction of all of these will make teaching easier for the teachers thus, learning processes will also become easier and smoother.

establishment and even maintenance of ICT infrastructures difficult; lack of physical and human resources to support ICT; irregular power supply; high cost of ICT equipment's; unavailability of relevant and acceptable Software: digital divide , that is inequality of access to ICT; Literacy and Local Content Barrier.

CONCLUSION

tertiary education in Nigeria is achievable if the government implements ICT policies as well as provides adequate funding for ICT infrastructure. The government's funding will make it easier for students to not only learn but also contribute meaningfully to innovation and ground-breaking research. Lastly, national governments must monitor ICT infrastructure in various tertiary institutions to be sure that ICT equipment is not abandoned but are in use. With effective policy legislation and execution, ICT would be able to become a powerful stimulant of quality education in Nigerian tertiary institutions.

facilities and equipment in teaching and learning.

2. The inequality in the spread of ICT gadgets in the larger society should be addressed by the government and stakeholders in the ICT sector of the Nigerian economy.

3. The management of tertiary institutions in Nigeria should endeavour to grant access to available internet networks on campus to students. This will encourage students to complete their assignments utilizing online e-materials.

4. Outdated ICT facilities and equipment should be replaced with modern facilities and equipment.

5. The government should make an effort to grant funding to tertiary

Modibbo and Fashola institutions for the purchase of ICT equipment. Also, the administration of Nigerian tertiary institutions should strive to raise funds domestically and redirect a portion of that income to ICT learning.

6. The culture of maintenance should be established by the management of tertiary institutions to ensure that the available ICT facilities and equipment are always in good working conditions.

7. There should be regular sensitization of staff and students on the use of the digital library and other ICT resources for research and learning purposes.

REFERENCES

1. Adeoye, Y. M., Oluwole, A. F. & Loto, A. B. (2013). *Appraising the role of information communication technology (ICT) as a change agent for higher education in Nigeria*, *International Journal of Educational Administration and Policy Studies*, 5(8), 177-183,
2. Adu, E O, Emunemu, B. O., & Oshati, T. (2014). *The role of information and communication technology (ICT) and higher education in sustainable development*. *Journal of oluwaCommunication* no. 5 (2), 141-192.
3. Ajayi, G. O. (2003). NITDA and ICT in Nigeria. Retrieved from: <http://ejds.org/meeting/2003/ict/p/papers/ajayi.pdf>. Josiah Ddembe and Kalyankolo Umar
4. Anikweze, C. M. (2011). *Assessment of teachers' professional skills in Nigeria: Needed reforms*. *Nigerian Journal of Educational Research and Evaluation*, 10, 57-68.
5. Arnhold, N. (2021). *Higher education*. Retrieved from: <https://www.nk.org/en/topic/tertiaryeducation>
6. Bakare, J., Orji, C. T., Wogu, J. O. & Ogbonna, C. A. (2018). Effectiveness of teleconferencing in Nigerian universities: A Descriptive Approach. *International Journal of u- and e-Service, Science and Technology*, 11(3), 27-38.
7. Barakabitze, A., Lazaro, A., Ainea, N., Mkwizu, H., Maziku, H. Matofali, A., Iddi, A. & Sanga, C. (2019). *Transforming African education systems in science, technology, engineering, and mathematics (STEM) using ICTs: Challenges and opportunities*. *Education Research International*, <https://Dghoi.Org/10.1155/2019/6946809>
8. Bello, S. A. & Johnson, S. (2011). *Role of ICT in managing higher education for sustainable development*. *Makerere Journal of Higher Education*, 3(1), 10- 20.
9. Braun, M. T. (2013). *Obstacles to social networking website use among older adults*. *Computers in Human Behavior*, 29(3), 673-680.
10. Dabas, N. (2018). *Role of computer & information technology in education system*. *International Journal of Engineering and Techniques*, 4(1), 570-574.
11. Damkor, M., Irinyang, D. J. & Haruna, M. (2015). *The role of information communication technology in Nigeria educational system*. *International Journal of Research in Humanities and Social Studies*, 2(2), 64-68.
12. Dave, P.A., & Tearle, J. (2010). *Impact of ICT based distance learning: The African story*. *The Electronic Library* 21(5), 476-486.

13. Davis, F. D., Bagozzi, R. P & Warshaw, P. R. (1989). *User Acceptance of Computer Technology: A Comparison of Two Theoretical Models*. *Management Science*, 35(8), 982-1003
14. Fomunyam, K. G. (2019). The role of information and communication technology in tertiary education in Africa. *International Journal of Civil Engineering and Technology*, 10(12), 60-69.
15. Josiah Ddembe and Kalyankolo Umar (2022). Simulation and Conceptualization of Automatic Power Factor Compensation for Industries in Uganda. *IDOSR Journal of Computer and Applied Sciences* 7(1):45-60.
16. George Kasamba and Anthony Ekeh (2022). Enhanced Security Monitoring System for the Pay Card Energy Meter. *IDOSR Journal of Computer and Applied Sciences* 7(1):109-118.
17. Ghavifekr, S., Kunjappan, T., Ramasamy, L., & Anthony, A. (2016). *Teaching and learning with ICT tools: Issues and challenges from teachers' perceptions*. *Malaysian Online Journal of Educational Technology*, 4(2).
18. Masisani William Mufana and Adabara Ibrahim (2022). Monitoring with Communication Technologies of the Smart Grid. *IDOSR Journal of Applied Sciences* 7(1) 102-112. 19.
19. Hamilton-Ekeke, J.T & Mbachu, C.E. (2015) *The place of information, communication and technology (ICT) in teaching and learning in Nigerian tertiary institution*. *American Journal of Educational Research*. 3(3), 340-347.
20. Ifeakor, J. U. (2021). *Effect of using information and communications technology (ICT) in teaching and learning English language in tertiary institutions in Nigeria during COVID -19 pandemic Eras*. *Journal of Educational Research and Development*, 4 (2), 130-143.
21. Ijov, T. M. & Wombu, R. N. (2019). *Impact of information and communication technology on institutions*. *BSUJEM*, 1 (2), 28- 34.
22. Nabiryo Patience and Itodo Anthony Ekeh (2022). Design and Implementation of Base Station Temperature Monitoring System Using Raspberry Pi. *IDOSR Journal of Science and Technology* 7(1):53- 66. 20.
23. Jameel, A. S. & Ahmad, A. (2020). *The role of information and communication technology on knowledge sharing among the academic staff during COVID-19 Pandemic*. A paper presented at the 2020 2nd Annual International Conference on Information and Sciences (AiCIS), Fallujah, Iraq, 141-147
24. Lorente, L. M. Z., Arrabal, A. A. & Pulido-Montes, C. (2020). *The Right to Education and ICT during COVID-19: An International Perspective*. *Sustainability*, 12(21), 1-16.
25. Masisani William Mufana and Adabara Ibrahim (2022). Implementation of Smart Grid Decision Support Systems. *IDOSR Journal of Scientific Research* 7(1) 50-57, 2022. 21.
26. Natumanya Akimu (2022). Design and Construction of an Automatic Load Monitoring System on a Transformer in Power Distribution Networks. *IDOSR Journal of Scientific Research* 7(1) 58-76,
27. Lubega, J. T. (2017). *The role of ICT in Africa's evolving higher education sector*. Retrieved from: www.ruform.org
28. Martinez, R.S. (2011). *Disability and the use of ICT in education: Do students with special needs recognise the support given by teachers when using technology*. *Problems of education in the 21st Century*, 35(1), 139-158.
29. Mathevula, M.D & Uwizeyimana, D.E (2014). *The challenges facing the integration of ICT in teaching and learning activities in South African rural secondary schools*.

- Mediterranean Journal of Social Sciences*. 5(20), 1087-1097.
30. Hamisi Sekiti and Adabara Ibrahim (2022). Security Analysis for Virtual Private Network Based on Site to Site Circuit Switching (Vpns2scs) Case Study: Liquid Telecommunication Ggaba. *IDOSR Journal of Computer and Applied Sciences* 7(1):95-108
31. Mikre, F. (2011). *The roles of information communication technologies in education. Review Article with Emphasis to the computer and internet*. Retrieved from: <https://www.ajol.info/article/view>
32. Murgor, T.K. (2015). *Challenges facing adoption of information communication technology on african universities*. *Journal of Education and Practice*. 6(25). 62-68
33. Ogiegbaen, A. S. E., & Iyamu, E. O. (2005). *Using information and communicating technology in secondary schools in Nigeria. Problems and prospects*. *Educational Technology and Society*, 8 (1), 104 -112.
34. Olusanya, O. and Oluwasanya, A. T. (2014). *Information and communication technology (ICT): Catalyst for enhancing the intellectual capacities of educationists and closing observed skill gaps of graduates in higher education in institutions in Nigeria*. *American Journal of Engineering Research*. 3(2). 217-229.
35. Oyebade, S.A., & Dike, C. (2013). *Restructuring Nigerian tertiary (University) education for better performance in education in one world: Perspectives from different Nations, Part 4: Higher Education, Lifelong Learning and Social Inclusion* 11th Annual International Conference of the Bulgarian Comparative Education Society (BCES) ijob
36. Pius, M. I., & Aiii, M. (2019) *Nigeria's vision 20:2020 and quality education in Nigeria: Implications for sustainable development*. *BSUJEM* I(2),
- Retreved from: <https://www.bsum.edu.ng/journals/files/jem/vol1n2/article8.pdf>
37. Ratheeswari, K. (2018). *Information communication technology in education*. *Journal of Applied and Advanced Research*, 3(1), S45-S47.
38. Rivers, P. A., Rivers, J. K., & Hazell, V. (2015). *Africa and technology in higher education: Trends, challenges, and promise*. *International Journal of Innovation Education and Research*, 3(5), 14-31
39. Sean, S. (2016). *What do we mean by a quality education? Senior Director, Global Outreach, ASCD*, 02/22/2016 available at https://www.huffpost.com/entry/what-do-we-mean-by-a-quality_b_9284130
40. Terlumun Mark, J. T., & Nguzan, W. R. (2019). *Impact of information and communication technology on tertiary institutions*, *BSUJEM* Vol. I(2).
41. UNDP (2022). *Goal 4: Quality Education*. Retrieved from: <https://www.ng.undp.org/content/nigeria/en/home/sustainable-development-goals/goal-4-quality-education.html>. Accessed on Feb 3rd 2022.