

The usage of ICT Education for Enhancing Sustainable Development in Nigerian Schools: Issues and Suggestions

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Abstract

Technology advancements and long-term sustainability can complement each other. Because technical innovation is usually regarded as the most important source of socio-economic progress, it can help the UN accomplish its Sustainable Development Goals (SDGs). Technology, when employed properly, can give effective solutions to development challenges at all levels, be it local, regional, and global scale. Information and Communication Technologies (ICTs) education have played an increasingly important role in influencing social and economic growth. The target year for the actualization of the global Sustainable Development Goals is 2030. Nigeria, by all indicators, is still a long way from meeting its stated objectives, despite the fact that 2030 is rapidly approaching. As a result, the purpose of this study is to examine the major difficulties surrounding the use of ICT education as a vehicle for achieving Nigeria's defined goals for sustainable *development*. It also intends to make appropriate suggestions that would assist the nation in achieving sustainable development goals through the use of ICT education, so that the country does not fall behind in the international community. In order to achieve these, the researcher reviewed some existing literature to determine the common challenges identified by these authors. The result shows that insufficient qualified ICT staff, poor budgetary allocation, poor internet service and unsteady power supply are among the problems confronting the use of ICT education for enhancing sustainable development in Nigeria. Consequently, the researcher suggested among others, that government at various levels should employ more qualified ICT staff in their educational institutions, allocate more funds to government schools, provide internet

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services to schools and improve upon the power generation, distribution and transmission in the country.

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Introduction

Technology advancements and long-term sustainability can complement each other. Because technical innovation is widely considered as the primary source of socio – economic growth, it can help in the achievement of the UN's Sustainable Development Goals (SDGs). Technology, when employed properly, can give effective solutions to development challenges at all levels, local, regional, and global scale. Information and communication technologies (ICTs) education have played an increasingly important role in influencing social and economic growth. We have seen the creation of programmes and organizations dedicated to promoting technology for the benefit of sustainable development in recent years.

Through various tools and more generic models, ICT provides a spectrum of fundamental and methodological contributions that empower sustainability. These technologies are critical enablers of economic prosperity, and they have subsequently been highlighted as key facilitators for the three pillars of sustainable development: social, economic, and environmental, as well as the primary enablers of the SDGs 2030 (Sachs 2015); (Tjoa & Tjoa 2016). ICT provides a wide range of basic and methodological contributions that, through advanced tools and more comprehensive models, enable sustainable development and implementation of the SDGs. ICT has enormous potential to accelerate the spread of a wide range of technologies. It can also assist low-income countries to accomplish development milestones faster by lowering service delivery costs. ICT education offers enormous potential to accelerate, scale-up, and accelerate the spread of a wide range of cutting-edge technologies, applications, and platforms across industries. It can also significantly reduce service delivery costs, assisting low-income countries in meeting key development milestones while contributing to economic growth and social well-being.

By combining vast data, analytics, and contextual management, ICT provides an efficient decision support system that scales and integrates sustainable ICT applications for varied markets successfully. This enabler facilitates computational modelling and strategic decision-making by merging systemic techniques and strategic projects. It also aids in the development of comprehensive models, integrated tools, strategies, and policies, as well as SDG implementation. ICT must be combined with creative policies, services, and solutions to fulfil the SDGs.

According to Darine (2018), Information and Communication Technology (ICT) is an effective tool for the implementation of sustainable development policies in a variety of ways. These include:

- Upscaling services in health, education, financial services, smart agriculture, and low-carbon energy systems are among them.
- Use online communities to help institutions learn faster.
- Conserving resources and lowering service delivery costs while improving quality.
- Lower deployment costs by taking into account urban and rural conditions.
- Use innovation, connectivity, productivity, and efficiency to propel advancement in a variety of industries and improve existing technologies. Energy, Manufacturing, Buildings, Agriculture, Mobility, and Health are the top six industries that will be heavily impacted by ICT.
- Increased public awareness and participation.

ICT can therefore be regarded as a veritable instrument by which the goals of sustainable development can be actualised. Since the target year for achieving the Sustainable Development Goals is 2030, which is only a few years away, it is critical to identify issues

surrounding their successful implementation in Nigeria, as well as propose possible solutions, so that Nigeria does not fall behind the rest of the world.

Literature Review

Concept of Sustainable Development

The term "sustainable development" has been defined in a variety of ways, but the most commonly quoted definition that may be useful in this study is that suggested by the Brundtland Commission Report. Sustainable development, according to the Brundtland Commission Report of 1987, is the "development that meets current demands without endangering future generations' ability to meet their own needs." To put it another way, sustainable development is a means for enhancing long-term economic well-being and quality of life while avoiding jeopardizing future generations' ability to satisfy their own needs. This definition contains two fundamental concepts: the concept of needs and the concept of restrictions imposed on the environment's ability to meet present and future requirements by the state of technology and social structure. The concept of resource protection for future generations, according to Oyeoku et al. (2017), is one of the major factors that distinguishes sustainable development policy from traditional environmental policy, which also tries to internalize the externalities of environmental deterioration. The overall goal of sustainable development is long-term economic and environmental stability; however, this can only be achieved by including and acknowledging economic, environmental, and social issues throughout the decision-making process (Rachel, 2015).

Sustainable development, according to Pearce, Makandia and Barbier (1989), entails developing a social and economic structure that assures that these goals are met, i.e., that real incomes rise, educational standards rise, the nation's health improves, and the general quality of life improves. This definition is concerned with the predicament of the peoples of third-world countries as a whole. Their main goal is to alleviate poverty, which is pervasive and deepening, and to improve people's quality of life. According to them, in the developing world, the notion of sustainable development is directly concerned with raising the material standards of living of the impoverished at the grassroots level, which can be quantified in terms of increased food, real income, education services, health-care, sanitation, and water supply, emergency stocks and cash, and so on, and is only indirectly concerned with economic growth at the aggregate national level.

HMSO (1994) defined sustainable development as societies' pursuit of economic progress in order to provide greater living standards for current and future generations. They also want to preserve and improve their environment for themselves and their offspring. Sustainable development aims at bringing these two goals together. This definition agrees with the Brundtland Commission Report of 1987. Goodland and Ledec (1987), viewed sustainable development as a pattern of social and structural economic change (i.e. development) that optimizes current economic and social benefits while decreasing the chance of future equivalent benefits (Nwankwo, Nweke, Okechi & Onyishi, 2015). Sustainable development, according to Vinceta (2014), entails striking a balance between environmental conservation and human economic development, as well as current and future demands. It means equity in development and sectoral actions across geography and time, according to her. It necessitates the combination of economic, social, and environmental development techniques. According to the various definitions listed above by various authors, the basic

goal of sustainable development is to reach a reasonable and equitably distributed level of economic welfare that can be sustained for many generations. As a result, sustainable development is a developmental process that attempts to improve individual and collective well-being. It is the development that allows us to have a better understanding of ourselves and the world around us.

Sustainable development is therefore the long-term process of wisely using and conserving natural resources in order to improve the quality of life for current and future generations. The notion of sustainable development was developed as a tool as well as a framework for achieving economic growth while remaining environmentally conscious. In the transition to a sustainable society, three interrelated and mutually reinforcing pillars of sustainable development are recognized globally. These are economic, environmental, and social sustainability, which services are the pivots upon which sustainability revolves. The environmental factor is important in this idea because it is the natural system that serves as the surrounding medium in which the social and economic systems are anchored. The environment is a prerequisite for long-term growth, whereas society is the goal for which progress is pursued, and the economy is the means to that end. As a result, maintaining the environment's structure is critical for long-term economic development. Because life on Earth depends on a healthy environment, the environmental pillar must be prioritized, as it provides the required foundation or stability for the economic and social pillars of sustainability.

ICT Education for sustainable development, on the other hand, is a social change process that aims at promoting the values, behaviours, and lifestyles essential for a sustainable future through education, training, and public awareness. It's about the education that will be required to help preserve and improve our quality of life for future generations. It is about teaching individuals, communities, groups, businesses, and governments how to live and act sustainably, as well as teaching them about the environmental aspect, good moral behaviour, and economic issues that are present or required in society (Ayodele, 2007). Hence, education is the barometer with which to measure the growth and development of any nation. This means that the attitude of any government to her education will determine whether or not she will achieve sustainable growth.

The Sustainable Development Goals (SDGs) are a set of seventeen global goals that are intended to serve as a "blueprint for a better and more sustainable future for all." Every single one of the 17 goals is intended to be met by 2030 in every country across the globe. Nigeria volunteered to be one of the nations to review the 2030 Agenda's progress in 2017 (VNR Compilation Highlights, 2020). Annual reports to the UN High-Level Political Forum on Sustainable Development are known as Voluntary National Reviews (VNRs) (HLPF). Nigeria was one of 44 UN member countries to present its Voluntary National Review on the 2030 Agenda and the Sustainable Development Goals at the HLPF. Later in 2020, Nigeria also volunteered with other 46 countries for VNR. The review focuses on:

- Poverty (SDG 1)
- Health and wellbeing (SDG 3),
- Education (SDG 4),
- Gender equality (SDG 5),
- Inclusive economy (SDG 8),
- Enabling environment of peace and security (SDG 16)
- Partnerships (SDG 17)

The focus areas are determined by current development priorities and goals. Despite the covid-19 Pandemic, which is expected to stymie work on the 2030 Agenda, the report was released (UNDP, 2020). All efforts must therefore be geared towards harnessing nations' resources together for the realization of the focal goals listed above. Despite the fact that 2030 is close by, the level of attainment of the goals is still very much in doubt. Hence, it is necessary to investigate the bottlenecks to the actualization of the set goals so that necessary suggestions could be proffered

Objectives of ICT Education for Sustainable Development in Nigeria

Some of the objectives of ICT Education that are relevant for enhancing sustainable development in Nigeria as outlined by Vasslios (2012) are:

- i. to actively facilitate e-learning and teaching in a way that promotes the goals of sustainable development;
- ii. to promote creative and integrative teaching and learning, ensuring that learning is student-centered and that ideas and individual initiatives are guided toward multiple learning routes to meet national development goals; and
- iii. to make instructional resources, high-quality data, information, and expertise, as well as research findings relevant to sustainable development issues, easily accessible.

ICT Resources for Sustainable Development

ICT stands for Information and Communication Technology. It is the convergence of two important technologies which are Information and Communication. We now live in the Information Age, which is characterized by fast technological adoption (Holland, 2015). The predecessor of all new technologies, Information and Communication Technology (ICT), has affected the way we live, communicate, socialize, learn, and educate. ICT in education has evolved into a critical instrument for academics and students, with ICTs and academic processes in Nigerian education becoming inextricably linked. For example, Patrick and Ugochukwu (2014) outlined some of the existing roles of ICT tools in Nigerian schools, revealing the following:

- i. **Computers:** Computers are no longer merely instruments for mathematicians; they are also important managerial resources. Computers can now conduct a variety of processes more efficiently. Information generation, processing, analyzing, storing, and communication for sustainable growth could all be done easily with a computer. The computer's most valuable assets are its speed, cost-effectiveness, and efficient use of available resources. The adoption of various types of computers in Nigerian educational institutions has made computers a useful ICT tool in teaching and learning between teachers and students, allowing them to process and save soft copies for future reference. At this time, the usage of computers have improved teaching and learning, particularly as instructors now offer their lectures using iPads, iPods, Tablets, Notepads, and Mobile phones to share communications and save relevant information.
- ii. **Electronic Mail:** Many academics, staff, and students now use electronic mail (e-mail) to initiate and maintain interaction, as well as to improve communication between and among them. Assignments, lecture notes, assessments, results, and academic updates are now given to students and also submitted to teachers via email, research such as e-interview and e-questionnaire can be conducted, academic questions can be asked, and teachers can communicate with their students, among other things. In addition, the usage of email services has become so prevalent in educational institutions.
- iii. **The Internet:** This is the most extensively used Internet resource. It allows users to send and receive emails (messages) using electronic devices. Faster and less expensive intra- and inter-organizational communication have been achieved. For many corporate and organizational



communications, e-mail has become the lifeline. In the educational context, the internet has presented itself to be the most valuable vehicle for rapid information transfer and sustainable development. It's a collection of computers that connect with one another via the phone. The internet's potential resides in its ability to provide a global platform for information sharing between businesses and individuals. Information sharing raises awareness, ensures that products and services are used consistently, and provides feedback and support to the organization. The argument here is that any business or government that has access to current and meaningful data is better able to improve efficiency and governance.

- iv. **World Wide Web (WWW):** Another Internet-based resource is the World Wide Web. It's a hypertext-based utility (Hypertexts simply documents through keywords in document or page). Academics today use the internet to access current and up-to-date materials from all over the world, effectively turning the world into a global village. A website visit assists individuals or organizations in locating products, information, pursuing political or social agendas, and conducting business. We can deduce from the foregoing that being online would place any nation or organization on the correct track for rapid and sustainable development in light of emerging technological, economic, and political paradigm shifts. As a result, many academic institutions, organizations, ministries, and parastatals in Nigeria have their own websites where they provide pertinent information to the general public.
- v. **E-conference:** An e-conference is a structured discourse that takes place via the internet using a computer-mediated mode of communication. E-conferences are less expensive to host and attend than traditional face-to-face meetings. E-conferencing systems are specifically built for online presentations with the audio or even video, as well as other features like synchronized Web browsing, PowerPoint presentations, Whiteboards, document sharing, and user controls. The majority of Nigeria's higher institutions are currently focusing on reaping the benefits of e-conferences. E-learning and distant learning options are currently being created as a result of this process in order to promote rapid and sustainable growth.
- vi. **E-learning Tools:** Any software, app, or technology that can be accessed via an internet connection and improves a teacher's capacity to communicate knowledge and a student's ability to access that information is referred to as an online learning tool. Several e-learning tools are rapidly becoming the norm in Nigerian higher education institutions. These include online resources, tools, software, and platforms that allow teachers and students to educate and learn both within and outside of the classroom. Blended classrooms, flipped classrooms, distant education programs, social media platforms, and others are examples of these platforms. The internet, blogs, e-groups, SMS, socializing portals, e-dictionaries, e-encyclopedias, PowerPoint presentations with audio and video clips, webcam, and audio-video materials are among the tools proposed by Okafor, Imhonopi and Urin (2011) and Adul, Emunemu, and Oshati (2014). Teleconferencing (text, video, and audio conferencing), interactive board, digital satellite television, audio graphics, online chats, bulletin boards, podcasting, electronic portfolios, and conference notifications are just a few examples.
- vii. **Mobile Phones:** Mobile phones are, without a doubt, evolving into instructional tools. Many educational institutions in Nigeria are now employing mobile technology such as cell phones, tablets, iPods, iPads, and other similar devices to further their learning, teaching, and research endeavors. These tools make data generation, processing, storage, and transfer more easily. They also offer multimedia benefits, such as various learning benefits and real-time connections between academics and their pupils.
- viii. **Online publishing:** Prior to the invention of information and communication technologies (ICTs), research and academic papers were only published on hard copies in various formats. One of the biggest drawbacks of this method of publication was that journal materials were difficult to obtain because only print copies could read them. Because just a few people had access to research works that may have improved their epistemic bases, this scenario



hindered knowledge expansion. However, the importance of ICT in education in Nigeria has now introduced online publishing with the benefit of open access journals, making it easier for both academics and researchers to access information on the internet (Patrick and Ugochukwu, 2014).

- ix. **Virtual Learning Environment (VLE):** A Virtual Learning Environment (VLE) is an online platform that is used to teach students. It includes all online environments that serve as course supplements, including as online courses, reading resources, and informational sites with stand-alone skill evaluations, as well as other forms of virtual learning. Virtual learning environments can be used by teachers to plan lessons, manage administrative activities, measure students' performance, activity, and degree of involvement, and provide supplementary materials and support to those who need it. Distance Learning Degree Programs, Professional Certification Courses, Instructional Videos, Video or Audio Lectures, Podcasts, Webinars, and all types of writing skills (Books, Articles, and Others) platforms; are some examples of Virtual Learning Environments. In Nigeria, increasing numbers of institutions are now installing Virtual Learning Environments to provide the framework for curriculum resource materials.

Findings and Discussion

Level of Achievement of Nigerian Development Goals

Nigeria focuses on the following goals:

- Poverty (SDG 1)
- Health and wellbeing (SDG 3),
- Education (SDG 4),
- Gender equality (SDG 5),
- Inclusive economy (SDG 8),
- Enabling environment of peace and security (SDG 16)
- Partnerships (SDG 17)

1. **Poverty (SDG 1):** This goal strives to put an end to poverty, which has long been a problem for humanity. Many people in many countries live just over the poverty line. As a result, by 2030, eradicating poverty will be the first of the 17 SDGs. According to all indications, poverty is spreading throughout Nigeria, with the average monthly wage of a Nigerian worker falling below \$55.00. Many Nigerians, it goes without saying, cannot afford three square meals per day. The rate of inflation is rising, while unemployment is at an all-time high. Information from the National Bureau of Statistics (NBS), Nigeria indicates that Nigeria's inflation rate as at July, 2021 stood at 17.38% while the unemployment rate by the fourth quarter of 2020 was 33.38%. Many young Nigerians have become professional beggars as a result of this circumstance, while others have taken up odd jobs. Nigeria's economy is on the edge of collapse since the country's budget has become increasingly reliant on external borrowing in recent years. As a result, the country's debt profile has gotten out of hand. People have begun to ask if governments' efforts to develop the country will not harm the future generations, which is counter to the Brundtland Commission's notion of sustainable development (1987). The Corona Virus outbreak has exacerbated the problem. To say the least, Nigeria's poverty is far from being relieved, let alone eradicated.
2. **Health and wellbeing (SDG 3):** According to the United Nations, at least 400 million people lack access to basic healthcare, with 40% of the population living in poverty. Tropical diseases, AIDS, hepatitis, water-borne infections, and other communicable diseases are also targets for this Sustainable Development Goal. While the country has made progress in lowering some of

the ailments listed above, providing inexpensive health care to Nigerians has remained a significant concern. The country's health situation is abysmal, with proper health facilities out of reach for the average Nigerians. Many health institutions lack doctors and other necessary health personnel, reducing many of these care facilities to mere consultative centers. Many don't have the essential amenities that a typical health center would have. Many hospitals are in poor condition due to a lack of essential infrastructure. Many communities lack access to basic primary health care. Many hospitals lack basic health equipment, and those that are available are either antiquated or inoperable. The majority of health care personnel have fled the country in quest of better opportunities. This is why those who can afford it migrate outside the nation to seek medical help. If the current state of our healthcare institutions is any indication, the country will not be on track to meet its sustainable development goals anytime soon.

3. **Education (SDG 4):** Education is the yardstick by which each country's progress may be gauged. Regrettably, education has not received the serious consideration it deserves. It's no surprise that Nigeria's Universal Basic Education Commission (UBEC) stated that the country had the world's greatest number of out-of-school children, with an estimated 10.5 million in 2016. As a result, the State Universal Basic Education Board's provision of free Universal Basic Education to all Nigerian children of school age has been implemented. The program's success is still in doubt, as the number of out-of-school youngsters continues to rise on a daily basis. The country's educational institutions are severely underfunded. Budgetary allocations to education are significantly lower than the UNESCO-recommended rate. As a result, many public schools (primary, secondary, and tertiary) lack current teaching and learning materials and equipment. This explains why, during the Covid – 19 Pandemic, many Nigerian educational institutions (with the exception of a few privately held ones) suspended all academic operations. Teachers' and university lecturers' salaries are either not paid or simply paid in part. This unpleasant circumstance frequently lowers academic staff morale, leaving them with the choice of either quitting or putting in little or no effort. It is not an exaggeration to claim that teaching professionals leave the country's shores on a daily basis in search of greener pastures. Strikes are the order of the day these days. Many people have lost faith in our public institutions as a result of this, and those who can afford it are sending their children to private schools or sending them abroad for superior education.
4. **Gender equality (SDG 5):** Efforts are being made to establish gender parity between female and male professionals. In order to achieve this, Nigeria enacted the National Policy on Women in 2000, which was directed by the Global Instrument on the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). According to a 2015 National Bureau of Statistics report, girls' access to education has improved, with female enrolment in primary and secondary schools increasing from 46.7 % and 47.1% in 2010 to 48.3% and 47.9 % in 2015. Despite this, the goal cannot be considered to have been accomplished or to be on the verge of being accomplished in the near future. There have undoubtedly been a number of campaigns and advocacy efforts aimed at offering females the same opportunities as their male counterparts, notably in terms of appointments, but these efforts have not yielded the desired results.
5. **Inclusive economy (SDG 8):** The term "inclusive economy" refers to the goal of fostering more sustainable and inclusive societies by involving all members of society in the growing process rather than distributing wealth after periods of rapid growth. People's engagement in economic, political, and social institutions is emphasized by inclusiveness. In addition, the goal is to promote long-term economic growth, increased productivity, and technological innovation. Encouragement of entrepreneurship and job development, as well as effective efforts to end forced labour, slavery, and human trafficking, are essential. With these goals in mind, the goal is for all women and men to have full and productive employment, as well as



respectable jobs, by 2030. The extent to which this objective has been met leaves a lot to be desired. This is due to the fact that the societal vices stated above are still very much alive and well. Furthermore, it is fairly uncommon to hear of a region being marginalized by another or a region being controlled by another being acquired and counter-acquired. There is a widespread assumption that one section of the country benefits more than others in terms of the economy, politics, and social institutions. As a result, today's popular slogans include restructuring, self-determination, and absolute separation. So yet, not much has been accomplished in this regard.

6. **Enabling environment of peace and security (SDG 16):** The risks to Nigeria's peace and security are among the scarier stories that frequently appear in the country's newspapers. It's difficult to go a day without hearing or reading about some sort of terrifying news. It is not an exaggeration to suggest that the country's security architecture has collapsed to the point where the country's security services appear to have been overwhelmed by the operations of terrorists, kidnappers, armed robbers, cultists, bandits, and their accomplices in crime. There are many different sources of security issues in the country, and they cannot all be assigned to one part of the system. Citizens' lives and property are no longer safe. Because of the security agencies' utter failure, the country's geographical regions have formed their own security guards. The Amotekun in the south-west, the Civilian JTF in the north, and Ebubeagu in the south-east are only a few instances. The nation's peace and security have been jeopardized to the point where individuals can no longer sleep with their eyes closed. From the preceding, it is clear that the long-term goal of creating a conducive atmosphere for peace and security in the country is still a long way off.
7. **Partnerships (SDG 17):** The purpose of this goal is to establish global alliances and collaboration so that governments can share ideas and foster innovation while also coordinating policies to help poor countries manage their debts and promote investments for the least developed. This is critical for long-term growth and development, international trade promotion, and assisting poor nations in increasing their exports in order to achieve a global, rules-based, and equitable trading system that benefits all. Furthermore, this has not been accomplished in any way because Nigeria has simply been viewed as a dumping ground where developed countries may sell their products in exchange for loans. Such loans are always subject to harsh terms, dragging the country into a scenario where over half of our national income is required to service debts.

Challenges Associated with Use of ICT in Education

The use of Information and Communication Technology (ICT) facilities, according to Abduraman, Yahya, and Suleiman (2014); Olojo, Popoola & Boris (2021), is the best facility or instrument that may be utilized to promote teaching and learning in today's educational system in Nigeria for sustainable growth. Nonetheless, a number of factors impede the complete integration of ICT facilities into the Nigerian educational system as found out in this research. These are as follows.

1. Infrastructure related challenges

Policymakers and planners must carefully consider a number of factors before launching any ICT-based program in any country, including the availability of appropriate rooms or buildings to house the technology, the availability of electricity and telephony, and access to computers in schools, communities, and households, as well as affordable Internet service. Many of these facilities are lacking in Nigeria, while others are in poor condition. Many historic school buildings, for example, require considerable retrofitting and require correct electrical wiring, heating/cooling, and ventilation, as well as safety and security. Furthermore, many communities still lack a stable source of energy, and the nearest

telephones are hundreds of kilometers away. Wireless technologies (such as VSAT or Very Small Aperture Terminal) have shown to be effective levers for leapfrogging in most regions. Despite the fact that this is currently an incredibly expensive approach, other developing countries with inadequate telecommunications infrastructure should consider it. Policymakers should also consider the widespread availability of various types of ICT in the country as a whole, and in the educational system (at all levels) in particular. Unfortunately, most of the above-mentioned infrastructure facilities are skill-deficient in most educational institutions, resulting in the country's lack of long-term progress.

2. Capacity Building Challenges

For ICT integration to be successful, MacDougall and Squires (1997) emphasized that multiple abilities must be fostered throughout the educational system. These include:

- (a) **Teachers:** Teacher professional development should have five focuses.
- Skills with particular applications;
 - Integration into existing curricula;
 - Adjustments in the curriculum relating to the use of ICT (including instructional design changes);
 - Changes in teacher role; and
 - Underpinning educational theories.
- (b) **Education administrators:** Leadership is critical in integrating ICT into education for long-term growth. Lack of support from education administration has hampered several teachers- or student-led ICT projects. Administrators must be proficient in the use of technology and have a thorough awareness of the technical, curricular, administrative, financial, and social components of ICT use in education for ICT integration initiatives to be effective and sustainable. However, in Nigeria, we find that the majority of school administrators have managerial experience and that many are not ICT-compliant. As a result, their focus is always on projects that will not help the ICT industry achieve the vision of sustainable development.
- (c) **Technical support specialists:** Without a corresponding increase in employees, ICT facilities departments are undoubtedly facing rising expectations from their institutions. Many of the programming modifications required to adopt sustainable ICT necessitate a high level of technical expertise. Technical support specialists, whether offered by in-school employees or external service providers or both, are critical to the long-term success of ICT use in a given school. While an institution's technical support requirements are ultimately determined by the type of technology and how it is deployed and used, general capabilities in the installation, operation, and maintenance of technical equipment are essential (including software). In Nigeria, the technological know-how to resolve many of the technical challenges associated with ICT use in schools is insufficient, and in some cases, drastically inadequate. In the majority of cases, technical assistance is sought from outside the country, posing a substantial risk of system failure.

3. Financing the Cost of ICT Use

In Nigeria, one of the most difficult issues in using ICT in education is reconciling educational aims with economic realities. ICTs in education programs require huge capital investments, so education policymakers must be cautious in deciding which models of ICT use will be implemented and keep economies of scale in mind. The main question here is whether the value contributed of ICT use outweighs the expense; when compared to alternatives. To put it in another way, is ICT-based learning the most effective technique for accomplishing the required educational goals, and if so, what mode and scale of implementation can be supported given current financial, human, and other resources? Many



academic institutions are underfunded, and a lack of capital budget implies there isn't enough money to keep ICT infrastructure and activities running. Nigerian institutions have been further disadvantaged as a result of their mismanagement of priority in their interactions. Lower operational expenses will result from energy efficiency initiatives, but traditional budgeting procedures make it difficult to shift money saved from operational costs to the capital budget. Many constraints, according to Ilaonisi and Osuagwu (2010), hinder the use of ICT in Nigerian educational institutions. These include a lack of ICT infrastructure and access; high enrolments, insufficient funding, and no technology funding allocation; high cost of ownership and cost to the consumer; and policy implications of the mismatch between advertised ICT capabilities and the goals of individual educational institutions. All these put together act as a cog in the wheel of progress of using ICT to enhance sustainable development in Nigeria.

4. Poor Access to ICT Infrastructure

Universal network access is the basic assumption for ICT in education. However, history has proven that this is not the case in Nigerian institutions, as many of the country's educational institutions either lack internet access or have epileptic internet access. Although considerable progress has been made in this area, there is an urgent need to remove the crippling access barrier that Nigerian educational institutions face. According to Esoswo (2011), the profile differs significantly from one Institution to another. He added that while some have Campus Area Networks (CANs) with wireless narrowband or fiber-optic backbones; others have merely internet cafes with a 20:1 users -to-computer ratio, and still others have departmental LANs. As a result, the expected quality and performance are low. For all bandwidth applications and to interconnect offices, departments, and centers to the public Internet via the campus area network, web-based education in the form of online, mobile, and remote education requires reliable computer networks, broadband connectivity, and fiber-optic backbones. The challenges of ICT infrastructure are worsened by high student enrolment, insufficient university finance, and a lack of technology budget.

5. Unsteady and Inadequate Electrical Power Supply

The Nigerian economy has been crippled by the intermittent availability of electrical power, which has hampered the development of research conducted by institutes, organizations, and individuals in the country. Without a reliable electrical source, ICT infrastructure will not be able to function. In most cities, the average daily power supply is around 6 hours. Despite the fact that most villages lack access to electricity, educational institutions are located in such areas. In such settings, ICT is almost impossible to integrate into teaching and learning. Alternative energy sources include standby generators, batteries, and solar panels, all of which are costly to purchase and operate. Even the most prestigious institutions, let alone smaller ones, cannot afford to maintain multiple standby generators because of high maintenance cost.

Due to the high cost of gas, not all local ISPs can keep their boosters running for 24 hours, and many subscribers are unable to use the Internet properly because there is little electrical power to do so. When electricity is scarce, the admirable goals of revolutionizing education with ICT and bringing about a paradigm shift in education become a pipe dream; having access to educational resources on-demand, anytime, anyhow, and anyplace becomes a story; and e-learning is doomed. Mr. Egwu (2011) also noted infrastructure availability as a

barrier to e-learning in Nigeria, particularly given the country's inconsistent power supply, which is compounded by a lack of technological access. He went on to remark that simply expressing a desire for bandwidth, internet, or connectivity is insufficient since power is required to build a strong foundation.

Another obstacle to realizing the full potential of ICT for education, research, and development in Nigeria is brain drain. Because of brain drain, there is a critical mass of ICT engineers and scientists who are qualified to work on ICT-related projects professionally. Another key stumbling block is the lack of an enabling environment, which is defined by a high level of insecurity and a solid ICT roadmap and strategy by policymakers, resulting in uncoordinated and unsustainable ICT development operations. Other issues identified by Oyeoku (2017) include:

- High operating and subscription costs;
- Lack of good publicity and incentives to attract potential users;
- Identification of information sources that meet users' needs;
- Poor Quality of Service of the internet and telecommunication services by the service providers; and
- Ineffective network traffic and infrastructure management.

Conclusion

Information and Communication Technology (ICT) is widely acknowledged and shown to be the driving force of the twenty-first century and beyond, since it will shape the economic, religious, cultural, legal, and social lives of nations, particularly developing countries like Nigeria. Developing countries have long acknowledged the importance of information and communication technology for long-term growth. ICT has the potential to impact various sectors of the Nigerian economy if properly implemented. Its appropriate use has the potential to bring significant 21st-century development to the country. It can facilitate rapid information transmission, high-level decision-making, lower resource/organizational management costs, and expand information sharing options among individuals, businesses, and government agencies. It goes without saying that Information and Communication Technology (ICT) is critical to Nigeria's long-term growth. But feelers and existing research indicate that achieving Nigeria's Sustainable Development Goals with ICT may become a mirage if certain difficulties are not addressed. In this study, these challenges were uncovered and suitable suggested were provided.

Suggestions

The following suggestions have been given based on the findings of this study:

1. Academic staff in the fields of ICT and related discipline should be employed, while existing staff in other field should be trained.
2. In the same vein, technical staff should be employed in all the government-owned schools, while owners of private schools should be advised to do the same
3. In-service training, seminars, and workshops should be organised on regular basis for staff.
4. Federal government should step up actions on the improvement in power generation and distribution in the country. Alternative sources of power supply should be provided for Nigerian schools.
5. Schools should be provided with functional internet facilities.
6. Educational software should be supplied to all the schools'

7. Budgetary allocation to educational institutions should be increased to the UNESCO recommended rate.
8. Necessary infrastructure should be provided for schools.

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