Internet-Based Learning System as a Gateway for Educational Development in Nigeria Opportunities and Challenges

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ABSTRACT

Internet technology is rapidly transforming socio-economic activities for sustainable development and fostering educational opportunities in developing countries. This article discusses the concept of Internet-Based Learning System (IBLS) as an online teaching and learning that provides a cost-effective interactive platform for establishments, students, teachers and administrative personnel to have opportunities to quickly and economically access various standard instructional resources through the Internet on-demand. This reduces expenditures on acquisition and deployment of Information and Communications Technology (ICT) infrastructure and human resources while the telecommunication service providers receive commensurate profits on their investments. The article focuses on the M-Learning, E-Learning and identifies some critical barriers for Internet-based learning in Nigerian education system which include weak Information Technology (IT) policies, inadequate funding, lack of political will, high tax duties, and poor infrastructure which culminated in poverty, unemployment, spread of diseases, cybercrimes, prostitution, industrial strikes, insecurity, "Boko Haram", brain drain, and corruption. It also identifies the opportunities of its adoption for educational value in Nigerian institution of learning. It concludes by offering recommendations that can help ameliorate the challenges raised, especially the need for joint effort, adequate funding, political will, partnerships through public private partnership initiative, adequate sponsorship like scholarship, research, provisioning for loan facilities with minimum interest rates, tax and custom duties reduction on importation of ICT equipment.

Key Words*:* Internet Technology, Infrastructure, Development, M-Learning, E-Learning

INTRODUCTION

Most developing nations have embarked on different forms of transformations that foster the use of Information and Communications Technologies (ICTs) in their economies especially in the education sector. The digital revolution today has paved a way for education in the new era where teaching and learning take place not only at schools, but at homes and in workplace irrespective of geographical region. The deployment and expansion of modern telecommunication infrastructure in Nigeria will have a positive impact not only on the media industry, but also on society and the economy as a whole. Owoseni & Dahunsi (2015) state that ICTs have the potential to open up opportunities in education, transaction, collaboration, information dissemination and in other areas of the life of a modern man. Osofisan & Idowu (2012) affirm that developmental transformation process in higher education supported with necessary Information Technology (IT) infrastructure would create improvements that give students the best opportunity in the global economy. Efficiency and collaboration evident in teachers' use of Information and Communications Technology (ICT) to plan and prepare lessons more efficiently and effectively and it increases collaborative approach among teachers to cooperate more and share curriculum plans with colleagues and school manager (Lubaale, 2015).

ICTs and Internet are innovative tools in the academia and their resources could be accessed by schools, governments, administrators, students and teachers across the globe. Internet is a repository of information resources that provides interaction for business, learning and leisure. It provides millions of people around the world have access to an extraordinary amount of information; they can search it, exchange email, make phone calls, buy and sell goods and services.

The growth and penetration of ICT on Nigerians among some African countries is illustrated in figure 1 where Nigeria is leading significantly in terms of Internet usage compared to the rest of the countries in Africa. Adoption of Internet and broadband networks are the main catalysts for qualitative and quantitative education, wealth and job creation, poverty alleviation, healthcare service delivery, governance, politics, economy and agriculture among others.

"Nigeria is the most populated country in Africa with over 180 million people has been described as the largest growing market in Africa's ICTs market in terms of Internet access, mobile and fixed line subscriptions" (The Guardian Newspaper, 2015). "Nigerian Communications Commission (NCC) statistics report the Nigeria teledensity stood at 91.40% as of January 2014 and increased by 9.19%t to reach 100.59% by January 2015" (The Guardian Newspaper, 2015). The Internet technology and mobile phones have become the commonplace electronic communication tools in developed countries but according to the Nigerian Minister of Communication Technology, Omobola Johnson on The Guardian Newspaper (2015), she disclosed that about 40 million Nigerians still lack access to basic ICT. Research by Owoseni & Dahunsi (2015) reveal that ICT is a key factor for the much needed poverty reduction in African countries in route to the achievement of the country's Millennium Development Goals (MDG). It implies that ICTs can help low-income countries in Africa, like Nigerian achieved faster growth and development in education and other sectors of the economy.

Report by NCC on the online Leadership Newspaper of 3rd, August 2015, showed that according to statistics released by the NCC, out of the over 180 million Nigerians in the country, active subscribers in the nation's telecommunication industry stood at 146,561,744 by May 2015 and the subsisting Average Revenue Per User (ARPU) in Nigeria's telecoms market is estimated at around $6 (N1, 452), given the foreign exchange rate at N242. An investigation revealed that with an ARPU of N1,452 and a subscriber base of 146 million, Nigeria's telephone users now pay an estimated N212 billion monthly in accessing telecom service, especially calls making.

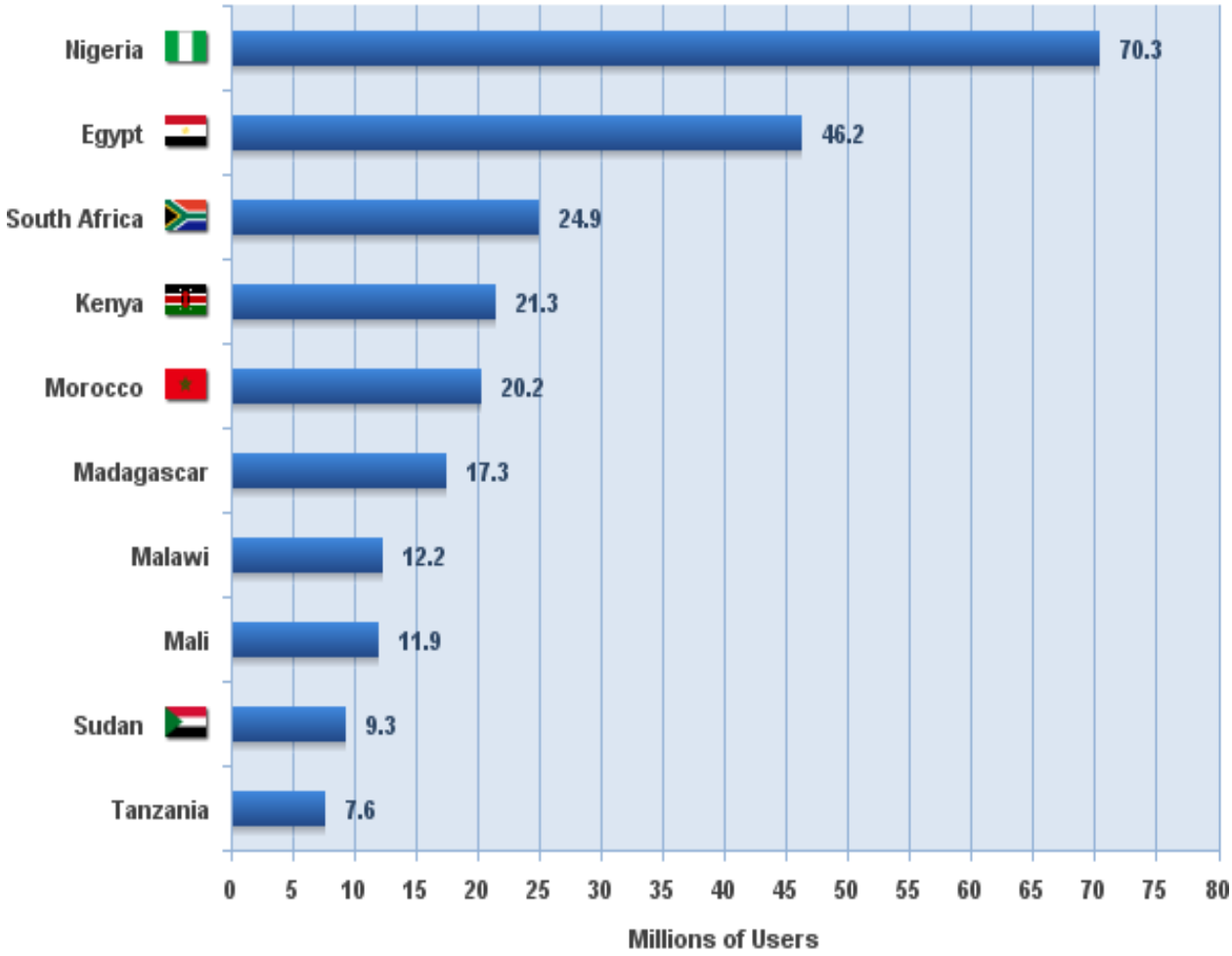

Figure 1: African Top 10 Internet Countries in Year 2014
Source: http://www.internetworldstats.com/stats1.html

Akin *et al*. (2014) say ICTs are powerful enabling tools for educational change and introducing new methods of teaching and conducting research as well as provisioning of educational facilities for online learning, teaching and research collaboration. Tedla (2012) views ICTs as powerful instruments that enable practical environment and assist new ways of teaching and learning, and help students to develop knowledge and skills for cooperation, communication and problem solving.

This paper discussed the concept of Internet-Based Learning System (IBLS) for providing a low-cost solution for boosting education in Nigeria. It outlined the opportunities and challenges for its adoption as applied to institutions of learning in Nigeria. The paper further identified features of e-Learning and mobile learning environment on the Internet and put forward some recommendations that can ameliorate the challenges raised in this paper.

Internet-Based Learning System and Educational Development

Internet-Based Learning System is an online multimedia teaching and learning tool designed with computers and telecommunication devices using the Internet technology as a gateway for accessing curricula, classroom contents, grades, assessments and other instructional resources. IBLS encompasses the capability to access, control, personalized physical resources of ICTs, multimedia, and the available digital content resources on the network and pay a token in the form of pay-as-you-use. IBLS is a multimedia platform that provides multidimensional system of teaching and learning including online learning, virtual learning, distributed learning, network and web-based learning that allow access of electronic curriculum or resources. IBLS provides accessibility to educational resources which include textual, audio, images, animation, and streamed video and applications on intranet/extranet for teaching and learning. Mobile learning (m-Learning) being supplemented with the existing system will promote student literacy skills, especially in a scenario whereby the learning materials to be taught in the next class is sent to the student before the class with questions attached, during the classroom learning the lecturer will just discuss briefly on the learning materials and ask student to login into their mobile devices and answer a particular question based on the material and the class discussion (Olutayo & Dupe, 2015).

IBLS enables users to use a wide variety of hardware devices (such as desktops computers, laptops, multimedia phones, Personal Digital Assistant (PDAs) or any other similar equipment) and software applications (like web browsers, for example Google Chrome) to access different kinds of utility programs, educational resources, storage, and application development platforms over the Internet, via services offered by Internet Service Provider.

The research by Oye *et al.* (2011) acknowledge that globalization is focused on e-Learning because e-Learning technology has the potential to bring improved learning opportunities to a larger audience than has ever previously been possible and e-Learning can play a critical role in preparing a new generation of teachers as well as upgrading the skills of the existing teaching force to use 21st century tools and pedagogies for learning, e-learning has played an increasing important role in supporting the economic and educational growth of industrial nations.

IBLS has the capability for teachers and students to interact through video conferencing as well as PowerPoint slide show and chatting. The students will be able to communicate with one another and likewise the teachers too can collaborate with one another, answer questions, or pose question

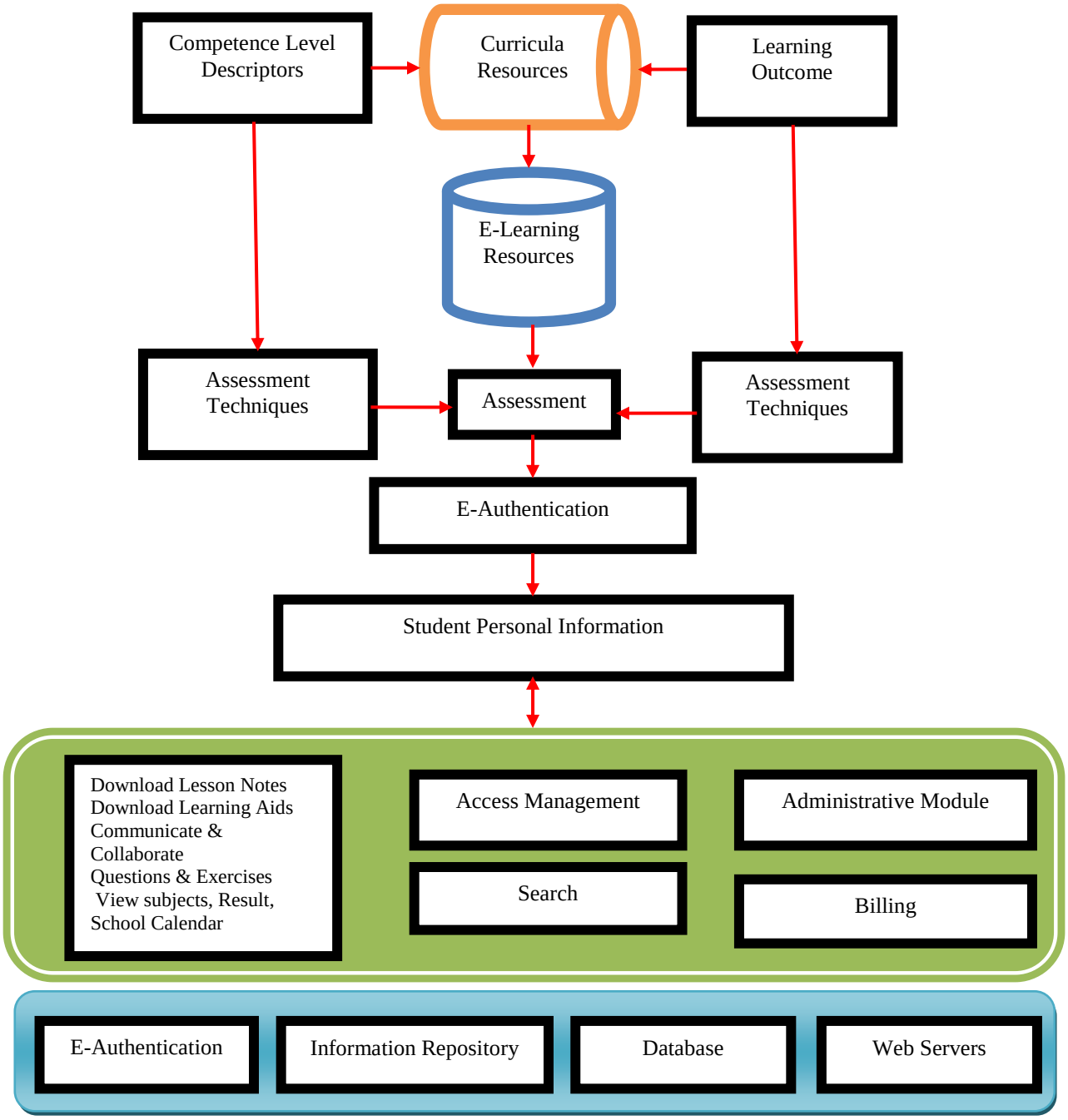

Figure 2: Basic Support Component of the Internet-Based Learning System

The first part addresses the network infrastructure for the web-based course management module which is managed by the web server to register learner to access course materials that are provided and maintained by teachers. The network layer is responsible for daily operation of the platform and monitoring. It integrates communications amongst end-user devices and the Internet-based data center. The terminals can be connected to the school network infrastructure in the form of Local Area Network (LAN), or they can be connected on external networks, the Internet with high-speed servers hosting educational resources. A user may access the platform directly from the school LAN or through the Internet in order to collect the learning materials. The user can access the data center either from school LAN, or directly from the Internet. This must be authenticated by a server purposely for validation or

authorization of access to the data center, and it will be directly connected on a server. The advantage of this model is that it offers an interactive mode on digital communication devices, as a special benefit from using the data center within the Internet environment.

The second part is the user interface layer, network layer and web-based multimedia delivery system. Mobile clients (smart phones, tablets and laptops) are members of the user interface layer that provide various access points for accessing the online-based system. Kardo (2015) reveal that the growth of television, telecommunication, videotape, audio teleconferencing, audio graphics conferencing and video conferencing allowed linking the learners and instructors who are geographically isolated. He added that the use of innovative teaching and learning methods helps to sustain learner's interest and make the learning process more effective and interesting. The impact is already significant in all developed countries, and the great majority of developing countries are, despite difficulties and fears seeking to take part in the emerging global educational community.

Another significant approach to this model is that it can provide service continuity, or seamless mobility as the user handovers from the external network to the school LAN. According to this model, the school classrooms will be connected to the server platform and the internet. The school classroom usually should have the following equipment: A desktop computer, or laptop, microphone, speakers, tablet, webcam, projector, and a monitor, or screen. At the school classroom a lecturer will present and deliver the content via the Internet to the students in a classical manner, or via the Internet to the students that are at home, at work, or simply they are mobile (on the road). The students that are at home, or at work connect to the course by using their computers or laptops and smart phones using the high speed Internet from their homes or their offices. In the case of the mobile learners use their mobile devices to connect to the course via their mobile networks.

The server-end provides possibility to host the digital educational resources, which can be accessed by the lecturers, instructors, IT content managers, secretaries, school administrators and all students either locally or throughout the Internet connection. Additionally, all students, as well as the lecturer over the Internet can access the server platform to collect or download the data that needs to be computed in an Internet environment. The components of the proposed architecture are mainly to solve the sharing of computing resources, which can be used as the e-Learning resource library. The administration and authentication unit provides and implements the Internet's access facilities. This task falls into the security scope of identification, authentication and permission management.

Mobile-Learning and Electronic-Learning Using the Internet Gateway

Teaching and learning is no longer confined within the classroom in the era of mobile technology. M-Learning is a subset of e-Learning that uses mobile devices as the primary education tool. M-Learning) on the internet is a learning technology whereby most of the processing and data storage associated with the applications is moved off the mobile device to centralized computing platforms stationed in the internet.

M-Learning can be referred to the type of learning that occurs through the use of portable electronic devices or wireless devices like cell phones, iPads, tablets, and laptop computers. Students can access lessons, video clips and audio libraries from anywhere, including public places and moving buses and trains.

On the other hand, Mouyabi (2012) refers to e-Learning as applications and processes include web-based learning, computer-based learning, virtual classrooms and digital collaboration. Viktar (2012) views e-Learning as an Internet-based learning process, using internet technology to design, implement, select, manage, supports and extend learning, which will not replace traditional education methods, but will greatly improve the efficiency of education. This is concurred in Kardo (2015) that e-Learning is a technology that support virtualized distance learning through the means of electronic communication mechanisms using Internet platform. Olabode *et al.* (2015) say that e-Learning could be seen as a web-based learning tool that utilizes web-based communication, collaboration, knowledge transfer and training to benefit individuals and organizations and it involved the delivery of teaching materials via electronic media, such as Internet, intranets, extranets, satellite broadcasting, audio/video tape, interactive TV, and CD-ROM and it could use Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. This corresponds to the research by Olutayo & Dupe (2015) which states that the great development of mobile technologies has made instructional messages to be sent from the educators to the learners easily through their mobile devices such as Smartphones, Apple iPhones, Pocket Personal computers, Mobile Computers, Android phones, Tablets, iPads etc.

According to Anene *et al* (2014), e-Learning involves the use of electronic technology to deliver education and training, to monitor learner's performance and to report the learner's progress. E-learning refers to the use of ICTs to enhance and support teaching and learning process. E-learning ranges from the way student use e-mail and accessing course work online while following a course on campus to programs offered entirely online and it allows for efficient transfer of knowledge anywhere and anytime, regardless of subject matter (Oye *et al.* 2011).

Marc (2005) wonders why we are fighting the trend toward using cell phones in education. He acknowledged that students can learn anything from a cell phone, if educators design it right and m-Learning enables student-teacher interactions frequently, and improves listening, observing, imitating, questioning, reflecting, trying, estimating, predicting, speculating, and practicing.

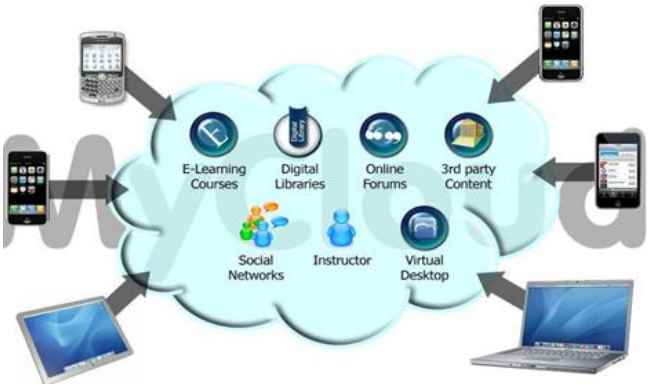

Figure 3: Internet-Based Resources and Teaching Learning Tools

Source: http://www.slideshare.net/Scientix/ml-nikou2

Obe (2013) says Africa still lags behind as a result of lack of knowledge and awareness on the subject matter, studies have shown that e-Learning delivers quality education to student who involved in it because of the ease of convenience it affords. Philip *et al.* (2004) state that e-Learning also has the potential to create continental and other international networks and links utilizing the connectivity of e-Learning. Adepetun (2013) says the benefits of e-Learning includes self-paced which gives individuals a chance to speed up or slow down as necessary, self-directed allowing individuals to choose contents and tools proper to their differing interests, needs and skill levels; accommodates multiple learning styles using a variety of delivery methods that are more effective to certain individuals.

Opportunities for Internet-Based Learning System

Mehmet and Serhat (2001) establish that some critical benefits offered by Internet-based education to include on-demand access to online database repositories, e-learning platforms, digital archive, portals, research applications and tools, file storages, e-mails and other educational resources anywhere for faculty, administrators, staff, students and other users in university.

The article outlines the following opportunities:

Cost Savings

Internet-based integrated learning offers the opportunity of 'pay-as-you-use' plan. There is virtual learning environment, shared lessons among schools, reduced material cost, reduced travel and accommodation difficulties. Internet also allows students to share not just ideas, but education infrastructure and tools. This can reduce schools' overhead expenditures on quality learning materials like books and software, and can equalize access to these scarce resources. Ofemile (2015) expects low-budget organizations and individuals to access sophisticated services on Internet platform e.g. Google docs 20 GB storage costs $5 per year.

Availability of Instructional Learning Techniques

Students can take web-based courses, attend the exams, get feedback about the courses from teachers, and send their projects and assignments through online to their teachers. Teachers can upload and download teaching resources,

prepare online tests for students and create better content resources for students through content management, assess the tests, homework, projects taken by students, send the feedback and communicate with students through online forums.

Advantage of Video Conference
According to Olutayo and Dupe (2015), communication between the instructors and the students can be done through text messages, voice as well as through images. CILS supports conduct of live lectures, communication with students and parents. It also supports audio and on-screen video teaching and learning, chatting and sharing of applications can be recorded and later be used for on demand lectures.

Back up Facilities
Web-based platform automatically saves content, making it impossible to lose or delete any valuable material. This means that even if a computer crashes, all documents and content will remain safe, saved, and accessible in the Internet.

Centralized Data Storage Facilities
Losing an Internet client is no longer a critical incident while the main part of the applications and data is stored into the internet so a new client can be connected very fast. The Internet allows its users to store almost all types of content and data including music, documents, eBooks, applications, photos, and much more. Schools can move their libraries online, allowing students to access hundreds of thousands of books, online video, periodicals and other resources at any time made web-based education more exciting, providing universal access to teaching videos and demonstrations on almost any topic.

Portability of Communication Devices
The increase in use is attributed to the affordability and portability that PDAs and other mobile telecommunication devices offer, making it possible for each student to have access to a computer or mobile phone at any time and any place. On the Internet students can also take PDAs on field trips to collect, store, and analyze data on site.

Improved Document Format Compatibility
There is more compatibility for opening the files, downloading, uploading, software installation and upgrade on web technology and telecommunication devices. Some file formats and fonts do not open properly in some digital devices and mobile phones, the Internet powered e-Learning applications do not have to worry about those kinds of problems as the Internet-based e-Learning applications users open the file from Internet.

Instantaneous Software Updates
When the app is web-based, updates happen automatically and constantly on users' behalf and are available the subsequent time you log on to the Internet. When you access a web-based application, you get the latest version without needing to pay for or download an upgrade with your mobile device. Internet service providers are responsible for ensuring that the platform works on the latest browsers thereby removing the need for expensive upgrades and testing every time a new version is released.

Anytime, Anywhere Access to Content
Internet provides round-the-clock service delivery and monitoring. Hours of learning are flexible and indeed a great boon as students can access online applications, database and network services 24 hours a day, 7 days a week and 365 days a year from any geographical location. Each student can learn at his or her own pace – some student may be slower learners.

Availability of Standard Resources and Experts in the Internet
There is increased availability of high-performance applications**.** Web-based education exposes users and clients to global audience like students, trainers, administrators and institutions and also the learners to a very high extent and mainly students from rural parts of the world will get an opportunity to get the knowledge shared by the experts on other part of the world as well as modern teaching materials and best educational practices

Motivation
Psychological factor in dealing portable e-Learning devices is a driving force which increases student motivation and deepens the commitment to using and learning with them. It provides opportunities to stimulate learning and

increase motivation that enables teachers and students to interact productively with neighbouring experts/professional globally.

Security and Privacy
In the Internet, the data of each client is completely partitioned and protected against intrusion so that none of the areas interferes with the others. The connection to the servers is secured according to the highest standards, making sure that you are the only one with access to your data.

Synchronous and Asynchronous Collaborative Learning
Internet-based teaching and learning facilitates collaboration through synchronous and asynchronous communication. From social learning perspectives, they can collaboratively build common knowledge through frequent and convenient interactions. There is asynchronous discussion forum, teacher can create discussion groups and can post a question and request students to comment, students can post their comments. Schools in Nigeria already use computers in the classroom, but Internet platforms can increase collaboration, enhance team-building initiatives and improve group- and team-centered project success rates.

Challenges of Internet-Based Learning System in Nigeria
There are some potential benefits to institutions deploying web-based education services but it penetration is low. However, the critical challenges and risks facing deployment of IBLS are explained in the following headings:

Inadequate Funding
Embarking on ICT project of is capital intensive and always cause some strain on the budget with huge consequential effects. "Though the Internet holds the future for sustainable socio-economic development, Nigeria, like other developing countries, is still facing challenges in full adoption of cloud computing paradigm due specifically to the inefficient infrastructure, cost of access to ICT products and services" (Angaye, 2013).

Inadequate Security
"In Nigeria, people are conscious of the security of information on the Internet so if there is bridge in the services, customer's data will be prone to hackers to tamper with and security is one of the major reasons why most Nigerians are scared of adopting the cloud" (Owoseni and Dahunsi, 2015). There is need to reconsider the issue how is the service provided to end users and with which protocols and methods? Are the services and its data encrypted in transmission? How is the service then received by end users? Precautions and measures are in for protecting the data in the long run with respect to fire or natural disaster.

Inadequate E-Infrastructure
Bandwidth networking is required to support scientific research institutions. Osuagwu *et al*. (2013) reiterate that absence of adequate bandwidth has terribly dwarfed application of IT in scientific research and development in Nigeria and Africa. Owoseni & Dahunsi (2015) identify lack of adequate infrastructure on which the Internet runs such as electricity, fast Internet connectivity, backbone networks as critical barrier to online education. The Internet infrastructure are not readily available while the several technical and managerial cultures problems. According to Osuagwu *et al.* (2013), most internet access facilities are very slow, downloads are very difficult and takes much time which implies additional cost of application. This performance de-motivates users who need information for research but are not able to have them when they need them.

Information Technology Policies
ICTs are rapidly changing with old IT polices. There is a large number of government laws and regulations that limit innovation and deployment of Internet connectivity in Nigeria. There is no adequate IT policy on quality control over importation of ICT tools into the country. Privacy and cross-border data flow regulations, Internet deployment internationally may be hindered by IT policies and cross-border data flow issues. Information leaving national borders are becoming subject to foreign laws that may not be compatible with domestic regulations.

Erratic Power Supply
Mobile phones, power bank need recharging to function. Most of digital systems need steady electricity to operate. Osuagwu *et al.* (2013) state that most of the time, generating sets is used to power IT systems. This increases the cost of application as much as twice the cost of public electricity supply. This is one of the factors responsible for the collapse of most ISPs and Internet Cafes. It is even worse to embark on extensive ICTs project within an

educational institution, without solving power problems. According to Owoseni & Dahunsi (2015), availability of electrical power in the country is also a major problem which is why minimal data centers are being planted in the country.

Portal Development and Linguistic Barrier
The rapidly changing nature of IT and software developers do not take consideration of some crucial element for service delivery. Portal developers do not take cognizance of language as a critical factor in developing portals. Web-based education delivery must be supported with learning and curriculum development suitable in native languages.

Exorbitant Taxes and Custom Duties
The tax system in Nigeria is discouraging telecommunication businesses, local ICT entrepreneurship. It is a known fact that importation of ICT infrastructure attacks high charges of taxes and custom duties in Nigeria.

Lack of Political Will
Leadership will be required before, during and after deployment of ICTs adoption. Governments should embrace ICT innovations to boost economic development especially in government, administration, commerce, health and tourism.

Change Management and Staff Development
Internet-based learning and e-Curriculum implementation offer new pedagogy. A vital point towards ensuring Internet learning sustainability is to invest in teacher's capacity building that will provide them with valuable technological skills, knowledge and understanding on how to integrate technology with the new pedagogical approach.

CONCLUSION

The paper proposed Internet-based learning system for educational institutions in Nigeria with the aim of enhancing quantitative and qualitative teaching and learning for urban and rural areas for national development. The IBLS is a robust, cost effective, easy-to-deploy Internet-based structures and applications for universities, polytechnics, colleges and research institution that can ameliorate some critical challenges of ICT-enabled education in Nigeria. Internet, e-Learning and mobile technologies are the strongest e-Gateways for sustainable educational growth and development in the world. Deployment of IBLS has multiplier effect and offers opportunity to raise educational standard in Nigerian schools but the main impediments to the growth of e-Learning are inadequate funding, lack of access to the necessary technology infrastructure, erratic electricity supply, 'Boko Haram' insurgency, IT policy, corruption, leadership, and language barrier. The web-based education is a major driver of educational development and bandwidth is a major issue in the deployment of e-learning. Therefore, government should make Internet connectivity a priority for Nigerian institutions to tap promises and opportunities of the information age full of ICT job creation.

RECOMMENDATIONS

Migrating to web-based education technology will transform education at lower cost of curriculum development, administrative and infrastructural deployment in Nigerian schools. The following recommendations should be embraced to boost web-based learning in Nigerian schools.

1. Increase funding of education is very important. Federal Government should allocate 26 percent of its budget to education as prescribed by UNESCO.
2. It is recommended that policy makers, Internet Service Providers and IT practitioners should review IT policy to tackle security, privacy and cybercrime issues in deployment of ICT solutions to allow unrestricted transfer of data across the borders in promoting interoperability and mutual recognition of data especially the ePayment systems.
3. All tiers of government, educational organizations, alumni, community and telecommunication companies should form synergy (Public Private Partnership-PPP) so that they can smoothly deploy infrastructure especially standard ICT-enhanced educational software.
4. There is need to improve electricity supply to accommodate ICT appliances.

5. Babatunde (2015) opines that teachers need retraining in terms of IT awareness because the students they want to teach are even more aware of the use of technology. Regular teachers training workshops, seminars and conferences on curriculum resources for academic and professional development are very necessary based on the emerging trend and the rapidly changing techniques of educational service delivery. Teachers need to have necessary knowledge, skills, and resources about ICTs upload, download of instructional materials can help students personalize their ICT gadgets and adjust accessibility settings.
6. There is need to upgrade existing datacenters to support Internet Protocol-based to 5G wireless broadband network technology. This will certainly ameliorate the problem of Internet network failure and improve high data transmission.
7. Government should support research activities in Internet-based technologies by adequate sponsorship like scholarship, research grants to motivate postgraduate students.
8. The government should encourage telecommunication companies and ICT investors by making loan facilities available with minimum interest rates and also reducing taxes and custom duties on importation of ICT equipment.
9. The NITDA initiative in mobile computer laboratory should be embraced and both ICT and non ICT teachers should be given iPads, laptops or mobile devices to be used at home, offices, classroom and workshops.
10. There is need for the Government to lower taxes and custom duties on importation and exportation of ICT equipment.
11. There is need for government agencies, ICT practitioners, non-governmental agencies and organisations, professional organisations, educational agencies; educational research institutes to conduct research on need assessment to tackle infrastructural, accessibility, religion, digital divide and linguistic barrier to ICT deployment.
12. Federal Government of Nigeria must make effort to tackle corruption in the IT industry through enlightenment campaign and rule of law.

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