Availability, Accessibility and Utilization of E-Learning Technologies for Sustainable Secondary Education in Federal Capital Territory, Abuja-Nigeria

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Abstract-This study examined the adequacy of the available e-learning technological tools, their accessibility and utilisation at the Nigerian public senior secondary schools. The study adopted a descriptive survey method to collect data on available, accessible and utilised e-learning technology tools for secondary schools, using a questionnaire entitled "E-Learning Technologies Questionnaire" ELTQ. The findings of the study revealed that e-learning technologies were relatively available to the teachers and students, reasonably accessible and adequately accessible to students and teachers, respectively, and fairly utilized by both. There was no significant difference in the accessibility and utilization of the e-learning technologies between the teachers and the students. It was recommended that various stakeholders should formulate, legalise and implement specific ICT policies on e-learning technologies for the Nigerian secondary educational system to fast-track socio-economic transformation as encapsulated in the Vision 20:2020 Document.

Key words: E-learning, E-learning Technologies, Secondary Education Transformation, Nigeria.

INTRODUCTION

In this technology-driven information age, every aspect of a country's economy is supposed to be properly networked with the global environment. This networking is particularly crucial in education that dictates the pace of development in other areas. E-learning, otherwise referred to as Computer-Based Training (CBT), Internet-Based Training (IBT) or Web-Based Training (WBT), includes all forms of electronically supported teaching and learning activities.

The Senior Secondary School curriculum in Nigeria has been expanded with the inclusion of many science and vocational subjects. Use of appropriate modes of interactive technologies would ensure more effective and innovative lesson delivery towards internationalisation and application of knowledge for technological developments. Considering the continuous and increasingly complex trend of this information age, the question is not whether education in Nigeria will move towards e-learning, but how? With computer education introduced at the pre- primary through a primary level of education, the appropriate level to introduce e-learning would be the secondary level of education, to be perfected at the tertiary level.

STATEMENT OF THE PROBLEM

The Millennium Development Goals (MDGs) and the transformation agenda of the Nigerian government placed a premium on education as a vital tool towards the realisation of the objectives of these two developmental programmes. The position of secondary education within the three levels of Nigerian educational system as the bridge between basic and tertiary education, and the paradigm shift in the conduct of Unified Tertiary Matriculation Examination (UTME) from the manual-based to computer-based makes it highly imperative that teaching methodologies at this level are supported by appropriate e-learning technologies for effective teaching and learning in Senior Secondary Schools in Nigeria for global competitiveness in education and other sectors of the economy. The current trend in the conduct of university examinations (Post Unified Tertiary Matriculation Examination and internal examinations) is computer-based (Alabi, Issa

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& Oyekunle, 2012). This trend calls for proficiency in Information and Communication Technology (ICT) tools for students seeking admission to tertiary institutions. It appears the curricular orientation of secondary school graduates does not adequately cater for this ICT proficiency, thereby affecting their performance in such examinations. This inadequacy might have stemmed from inadequacy in available and accessible ICT equipment that would lead to their utilization. This study, therefore, examined the availability, accessibility and utilization of e-learning technologies for sustainable secondary education in Nigeria.

OBJECTIVES OF THE RESEARCH

The specific objectives this study to investigate the availability of e-learning technologies in senior secondary schools in Nigeria; to determine the level of the accessibility of e-learning technologies to teachers and students in senior secondary schools in Nigeria and to determine the level of utilization of e-learning technologies by the teachers and students in senior secondary schools in Nigeria.

HYPOTHESES

The study was guided by the following research hypotheses:
Ho1: There is no significant difference in the accessibility of e-learning technologies between the teachers and students in Nigerian senior secondary schools.

Ho2: There is no significant difference in the utilization of e-learning technologies between the teachers and students in Nigerian senior secondary schools.

REVIEW OF RELATED LITERATURE

The term 'e-learning' broadly refers to the use of computer technologies in education, whether in face-to-face classrooms, in blended and hybrid courses, in mediated distance education contexts or in online learning environments (Abrami, Bernard, Wade, Schmid, Borokhovski, Tamim, Surkes, Lowerison, Zhang, Nicolaidou, Newman, Wozney, & Peretiatkowicz, 2006; Canadian Council on Learning, 2009). In other words, e-learning can be seen as the use of electronic information communication technologies (ICTs) in formal learning contexts (Canadian Council on Learning, 2009; Greenall & Loizedes, 2001).

E-learning can transcend the limits of geography to provide access to quality education, regardless of a place of residence (Galway, 2004; Smith & Magee, 2005). Moreover, the use of e-learning is seen to over-come the challenges of traditional teleconferencing and print-based distance education, including (to name just a few) high costs, inflexibility, scheduling problems, and the inability to accommodate large numbers of students (Galway, 2004).

E-learning often involves both out-of-classroom and in-classroom educational experiences via technology applications and processes such as Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

Thus, e-learning is broader than just online learning because it covers classroom activities that use digital technology, as well as online learning.

An e-Learning system is a structured learning environment where timetable and enrolment data is used to enrol teachers as instructors in the subjects they teach, and students as learners in the subjects they take. The system can solve problems of access as work can be accessed from school or home (Keane, 2010). This access means that the dependency of booking a computer room at a particular time is lessened, and students are both encouraged and challenged to use information technology within an educational context. A successful e-learning experience will use a combination of the technologies most appropriate for the practitioner, the learner group, the course content and course assessment.

Central to e-learning success is communication technologies that are generally categorized as synchronous or asynchronous.

Synchronous technologies - allow activities to happen at the same time and involve the exchange of ideas and information with one or more participants. Students can interact in real time with their own computer using text chat, live voice, and interactive whiteboards. Such technologies include:
- Skype - Used for Web conference technology in two ways; small group communications and on-line office hours to communicate with individual students
- The telephone - a synchronous technology to use for audio communication
- YouTube - A video hosting technology.
- BlogSpot - An online blog or journal.
- Microsoft Office Suite - Proficient in Word (word processing), PowerPoint (presentation), Excel (statistical analysis), and Access (database), and

Outlook (e-mail, calendar and task management).
• Web browsers - Firefox, Safari, Netscape, Google Chrome and Internet Explorer.
• SPSS - statistical software.
• Digital imaging hardware - still and video cameras, scanners, etc.

Asynchronous activities - are conducted with participants providing input at different times and use technologies such as blogs, wikis, discussion forum, and email.

• Discussion Forums - Used for general class discussions and for small group discussions.
• E-mail - This is the workhorse for communication in online courses
• Wiki - The wiki has a number of asynchronous functions for eLearning purposes. These include being a collaboration tool for student workgroups ,a communications device similar to a threaded and an automatic e-mail reporting system to monitor student activity Finally, the wiki has a variety of analytics tools that objectively measure and document student activities such as revision

The ultimate aim of these e-learning delivery tools or technologies is to make learning a robust, viable, user-friendly training platform. Its appropriateness thus informs the choice of a particular tool to the intended content and learners involved.

The type of e-learning appropriate for secondary school education is blended learning. Otherwise referred to as hybrid learning, flexible learning, or mixed mode learning, blended learning refers to learning that involves a combination of face-to-face classroom time interspersed with computer access, use of school networked computers, and use of students own mobile phones and personal computers (Boyde, 2012).

As emphasised in the ICT Policy of the Nigerian government, the time has come to develop digital literate citizens. Powell (2011) noted that: Just like the ability to read and write, ICT (information and communication technology) literacy will be an essential life skill – an economic and social necessity. And that without ICT literacy, there is a risk that people will be cut off from job opportunities and is unable to take part in the full life of the community. Given this risk disposition, there is the dire need to prepare the schools and the teachers to move from a traditional classroom with books, paper, and pencils to a mixed media one that maximises the ubiquitous nature of the internet and digital tools (Alberts, Murray & Stephenson, 2010). This paradigm shift requires provision and utilization of appropriate technologies.

MATERIALS AND METHODS

The study adopted a descriptive survey method to collect data on available, accessible and utilised e-learning technology tools for secondary schools, using a questionnaire entitled "E-Learning Technologies Questionnaire" ELTQ. The study population comprised the 57 public secondary schools in the Federal Capital Territory (FCT), Abuja. Due to the heterogeneity of the FCT, stratified sampling technique was used to select 30 schools while purposive sampling method was used to select five teachers and 10 students per sampled school. The ELTQ was validated by two experts in Educational Management while its reliability was ascertained through a test-retest method within a three-week interval, yielding a coefficient of 0.78. Descriptive statistics of frequency count and mean were used to answer research questions while the t-test statistic was used to test the research hypotheses at .05 level of significance.

DATA ANALYSIS

The researchers, using two trained research assistants distributed 450 copies of ELTQ in public senior secondary schools in the Federal Capital Territory, Abuja-Nigeria to 150 and 300 teachers and students respectively and 394 copies were retrieved representing 87.5% rate of returns.

RESULTS AND DISCUSSION

Research Question One: What is the level of availability of e-learning technologies in Nigerian senior secondary schools?

As shown in Table 1, the level of availability of e-learning technologies in Nigerian senior secondary schools was fair with mean of 1.97. This implies that desktop computers, printers, phones, photocopy machines among others are fairly available in Nigerian senior secondary schools. Education is an essential element for e-learning technologies dissemination. Therefore, improving the e-learning technologies in senior secondary schools has been a high priority in Nigeria, as in other countries of the world. Both developed and developing countries adopted e-learning technologies investments in accordance with their policies in order to increase quality of education, to provide work power, and to educate individuals who have proficiency in Information and Communication Technology (ICT). When making such investments, the general assumption is that once hardware and software are available in schools, ICT integration will automatically follow (Niederhauser & Stoddart, 2001).

Table 1: Availability of e-learning technologies in Nigerian senior secondary schools
N-394

S/N	E-learning Technologies	Adequately Available	Fairly Available	Not Available	Mean
i.	Desktop computers	74	226	94	1.95
ii.	Laptop Computers	64	146	184	1.70
iii.	Scanners	119	187	88	2.08
iv.	Electronic Overhead Projectors	19	146	149	1.26
v.	Printers	72	170	152	1.80
vi.	Photocopying Machines	208	138	48	2.41
vii.	Internet	99	155	140	1.90
viii.	Phones	174	183	37	2.35
ix.	Microsoft Word	138	165	91	2.12
x.	Microsoft Excel	119	178	97	2.06
xi.	Microsoft PowerPoint	164	217	13	2.38
xii.	Electricity Supply	85	138	171	1.78
xiii	Alternative Energy Source	75	181	138	1.84
	Overall Mean				**1.97**

Mean: > 2.00 = Adequately Available, Mean: 1.50 - 1.99 = Fairly Available, Mean: 0.00 – 1.49 = Not Available

Research Question Two: What is the degree of accessibility of e-learning technologies to the teachers in Nigerian senior secondary schools?

From the results in Table 2, e-learning technologies in Nigerian senior secondary schools were adequately accessible by the teachers with a mean of 2.01. Computer, which is a major component of e-learning technologies, is a machine specially designed for the manipulation of coded information, an automatic electronic device for performing simple and complex operations. It is one of the wonders of the last century that has helped humanity to solve its various problems. While it is helping manufacturing industries to plan, organize and control its production and sales, it is equally assisting the teachers in secondary schools to be more efficient and effective in their functions. When teachers are adequately exposed to computer and other electronic gadgets, the students will benefit maximally thereby leading to high academic achievement (Abdulrahaman and Akinnubi, 2012). The educational institutions must have to provide microcomputers that will be able to serve the needs of their teachers. The computers and other information equipment have been found to be inadequate in secondary schools (Alabi, 2001).

Table 2: Accessibility of e-learning technologies to the teachers in Nigerian senior secondary schools
N-144

S/N	E-learning Technologies	Adequately Accessible	Fairly Accessible	Not Accessible	Mean
i.	Desktop computers	28	101	15	2.09
ii.	Laptop Computers	22	108	14	2.06
iii.	Scanners	38	36	70	1.78
iv.	Electronic Overhead Projectors	35	56	53	1.89
v.	Printers	48	84	12	2.25
vi.	Photocopying Machines	59	37	48	2.08
vii.	Internet	35	73	36	1.99
viii.	Phones	59	26	59	2.00
ix.	Microsoft Word	46	73	25	2.15
x.	Microsoft Excel	34	105	5	2.20
xi.	Microsoft PowerPoint	22	109	13	2.06
xii.	Electricity Supply	46	38	60	1.90
xiii.	Alternative Energy Source	12	84	48	1.75
	Overall Mean				**2.01**

Mean: > 2.00 = Adequately Accessible, Mean: 1.50-1.99 = Fairly Accessible, Mean: 0.00–1.49 = Not Accessible

Table 3: Accessibility of e-learning technologies to the students in Nigerian senior secondary schools
N-250

S/N	E-learning Technologies	Adequately Accessible	Fairly Accessible	Not Accessible	Mean
i.	Desktop computers	173	55	22	2.60
ii.	Laptop Computers	33	111	106	1.71
iii.	Scanners	18	120	112	1.62
iv.	Electronic Overhead Projectors	24	130	96	1.71
v.	Printers	54	52	144	1.64
vi.	Photocopying Machines	11	45	194	1.23
vii.	Internet	77	48	125	1.81
viii.	Phones	137	100	13	2.50
ix.	Microsoft Word	132	99	19	2.45
x.	Microsoft Excel	86	143	21	2.26
xi.	Microsoft PowerPoint	38	162	50	1.95
xii.	Electricity Supply	41	176	33	2.03
xiii.	Alternative Energy Source	13	147	90	1.69
	Overall Mean				**1.94**

Mean:> 2.00 =Adequately Accessible, Mean: 1.50-1.99 =Fairly Accessible, Mean: 0.00 – 1.49 = Not Accessible

Based on the results in Table 3, the degree of accessibility of e-learning technologies to the students in Nigerian senior secondary schools was fair with mean value 1.97. The provision of e-learning technologies to the students has been a major concern to all stakeholders in the education sector. Internet facilities in secondary schools will go a long way in helping the students to complete their assignment which will invariably improve their performance in examinations.

Research Question Four: What is the level of utilization of e-learning technologies by the teach-ers in Nigerian senior secondary schools?

Table 4 shows that the level of utilization of e-learning technologies by the teachers in Nigerian senior secondary schools was fair with mean value 1.76 in spite of adequate accessibility of the technologies to them (mean of 2.01). In order to maintain quality in the delivery of instruction in secondary schools, the teachers must be exposed to the use of computer, printer, photocopy machine, scanner and internet facilities as these will make the teachers more effective on their job.

Table 4: Utilization of e-learning technologies by the teachers in Nigerian senior secondary schools.
N-144

S/N	E-learning Technologies	Adequately Utilized	Fairly Utilized	Not Utilized	Mean
i.	Desktop computers	23	85	36	1.91
ii.	Laptop Computers	10	59	75	1.55
iii.	Scanners	1	72	71	1.51
iv.	Electronic Overhead Projectors	12	37	95	1.42
v.	Printers	25	72	47	1.85
vi.	Photocopying Machines	39	62	43	1.97
vii.	Internet	24	97	23	2.01
viii.	Phones	47	39	58	1.92
ix.	Microsoft Word	10	76	58	1.67
x.	Microsoft Excel	13	84	47	1.76
xi.	Microsoft PowerPoint	1	96	47	1.68
xii.	Electricity Supply	13	62	69	1.61
xiii.	Alternative Energy Source	13	99	31	2.01
	Overall Mean				**1.76**

Mean:> 2.00 = Adequately Utilized, Mean:1.50 - 1.99 =Fairly Utilized, Mean: 0.00 – 1.49 =Not Utilized

**Table 5: Utilization of e-learning technologies by the students in Nigerian senior secondary schools.
N-250**

S/N	E-learning Technologies	Adequately Utilized	Fairly Utilized	Not Utilized	Mean
i.	Desktop computers	45	192	13	2.13
ii.	Laptop Computers	16	195	39	1.91
iii.	Scanners	50	90	110	2.16
iv.	Electronic Overhead Projectors	15	192	43	1.89
v.	Printers	14	165	71	1.77
vi.	Photocopying Machines	15	92	143	1.45
vii.	Internet	47	198	5	2.17
viii.	Phones	45	195	10	2.14
ix.	Microsoft Word	95	140	15	2.32
x.	Microsoft Excel	91	133	26	2.26
xi.	Microsoft PowerPoint	88	128	34	2.22
xii.	Electricity Supply	10	161	69	1.68
xiii.	Alternative Energy Source	12	134	104	1.63
	Overall Mean				**1.98**

Mean: >2.00=Adequately Utilized, Mean:1.50-1.99=Fairly Utilized, Mean: 0.00–1.49 =Not Utilized

As shown in Table 5, level of utilization of e-learning technologies by the students in Nigerian senior secondary schools was fair with mean value 1.98. In recent years, schools have become captivated with e-learning technologies as a means to improve students' satisfaction, performance and learning. To corroborate this, George & Sleeth's (1996) survey results from 500 liberal arts majors indicated positive student response to computer aided presentation and reported that multimedia presentation has large improvement over blackboard and overhead presentations. There is no gain saying the fact that students using forms of technologies as tools for learning have experienced an increased sense of control and increased levels of intrinsic motivation. In fact, such students will perform better than their colleagues in both internal and external examinations.

Hypothesis One: There is no significant difference in the accessibility of e-learning technologies between the teachers and students in Nigerian senior secondary schools.

As shown in Table 6, the calculated t-value (1.04) is less than the critical t-value (1.96) at 0.05 and for 393 degrees of freedom. Hence, the null hypothesis is accepted. It can be inferred that there is no significant difference between teachers' and students' accessibility to e-learning technologies in Nigerian senior secondary schools. Information and Communication Technologies are modern instrumental tools that the educators use to modify the teaching methods they use in order to increase students interest. It covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. It consists of hardware, software networks and media for collection, storage, processing, transmission and presentation of information in a form of voice, data, texts and images (Abdulrahaman and Akinnubi, 2012).

Table 6: Analysis of accessibility to e-learning technologies between the teachers and students in Nigerian senior secondary schools

Respondents	N	Mean	SD	df	Calculated t-value	Critical t-value	Decision
Teachers	144	2.62	1.99				
				393	1.04	1.96	Ho: Accepted
Students	250	1.98	1.01				

Table 7: Utilization of e-learning technologies between the teachers and students in Nigerian senior secondary schools

Respondents	N	Mean	SD	df	Calculated t-value	Critical t-value	Decision
Teachers	144	1.81	.97	393	.986	1.96	Ho: Accepted
Students	250	1.99	1.02				

Hypothesis Two: There is no significant difference in the utilization of e-learning technologies between the teachers and students in Nigerian senior secondary schools.

From the results in Table 7, the calculated t-value (.986) is less than the critical t-value (1.96) at 0.05 and for 393 degrees of freedom. Hence, the null hypothesis is accepted. This shows that there was no significant difference between teachers' and students' utilization of e-learning technologies in the sampled senior secondary schools in Nigeria. The use of computers can assist to accomplish the objectives of any school programme apart from the attainment of the needs of the curriculum. Thus, a computer should not be seen as sophisticated equipment but as a teaching-learning tool that characterise the modern age. Fabunmi (2004) recognised the impact of computer communications since the world has become a global village. Computer network and internet interaction network could be applied to learning for the development of education generally.

CONCLUSION AND RECOMMENDATIONS

It is a truism to assert that availability, accessibility and utilization of e-learning technologies in senior secondary schools will enhance sustainable secondary education in Nigeria. There was no significant difference between teachers' and students' availability and utilization of e-learning technologies in senior secondary schools in Nigeria. One of the factors that determine educational development and innovation, in general, is teachers as they are the ones to use the ICT investments for educational development. Technology does not have an educational value in itself. It becomes necessary when teachers use it in the learning-teaching process. Although there are some, who claim that the presence of technology in the classroom creates a pressure and requires an effective use (Kozma, 2003). It is recommended that:

• Efforts should be made by the governments at all levels and other stakeholders in education (parents, non-governmental agencies, etc) to make adequate provision for computers and other necessary accessories required for e-learning at secondary schools. This would form the basis for upgraded e-learning at the tertiary level of education.

• Teachers and students should be sensitized through seminars and workshops on the need to maximally utilize available e-learning technologies in secondary schools.

• Stakeholders in education, such as Ministry of Education and non-governmental agencies should formulate, legalise and implement specific ICT policies on e-learning technologies for the Nigerian secondary educational system to fast-track socio-economic transformation of Nigeria as encapsulated in the Vision 20:2020 Document.

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