Evaluation of electronic service infrastructures and quality of e-services in Nigerian academic libraries

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Abstract

Purpose – The purpose of this paper is to evaluate the quality of online services in academic libraries in Nigeria. It seeks to assess the functionality of electronic infrastructures, to expose areas where the service needs of users are not adequately provided and to recommend solutions.

Design/methodology/approach – The sample population was 210 staff and students who used electronic resources in Nigerian university libraries during the 2012-2013 academic session. A questionnaire was the main instrument for data collection. Modified WebQual four performance indicators were designed and used to measure: library equipment, library website, online public access catalogue (OPAC) and e-user education in the university libraries. The five-point service performance scale that ranged from very poor performance to excellent was used in measuring the views of the respondents.

Findings – None of the indicators was rated excellent; six were rated good; nine were average; two and five indicators scored poor and very poor, respectively. Poor funding, intermittent power supply and weak telecommunication infrastructures were among the major impediments to online services in Nigerian universities. Through adequate funding and prudent management of library funds, online services in Nigerian university libraries could meet global standards.

Practical implications – Results from this paper could guide library management on several concrete remedial actions to sustain e-service performance that could meet the missions and visions of contemporary academic libraries.

Originality/value – This paper was the first to apply WebQual model in the evaluation of electronic performance quality of academic libraries in Nigeria.

Keywords Academic libraries, E-resources, E-services, Nigerian university libraries

Paper type Research paper

Introduction

One of the primary objectives of academic libraries is to ensure that services rendered to clients contribute significantly to the visions and missions of the institution. Electronic service (e-service) in academic libraries is becoming indispensable because to scholars, it is the gateway to all electronic resources. User satisfaction is anchored to the extent that the information and communication systems available in a library meet the user's basic information needs. This is the reason performance measurement forms an integral part of evaluating whether the aims and objectives of an institution are met and, at the same time, sets priorities for continuous improvement. To measure these attributes,

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university libraries utilize benchmarking processes to evaluate performance. Performance evaluation, if well handled, minimizes errors, points out weaknesses and enhances efficiency (Henczel, 2002).

In this study, the quality of e-services is viewed as the effectiveness and efficiencies of libraries in providing needed e-resources and e-services to all users. The volume of a library's physical collections has, for many decades, been a benchmark for evaluating the quality of its performance. In developing countries, librarians had been relying upon counting their statistics and analyzing them as the means of measuring their contributions to the institution's mission. Weiner (2005) noted that for this method, successfully fulfilling its mission in a former era evaluated the quality of library services by measuring the size of collections and the budget, the number of visitors, issuing and returning statistics or inter-library loans, staff strengths and other processes. They were relying on what Blixrud (2001) characterized as an outmoded opinion that:

> […] the way to determine if a library was actually fulfilling its mission was to measure how many books were held in the collection, how many users were served, and how much money was spent while providing those services.

Before the arrival of information technology, librarians in Africa had focused their attention on measuring the level of their competencies by providing needed facilities and ignoring the measurement of the quality of services and the extent to which users' needs were met. African libraries and librarians then seemed not to be disturbed with Zeithaml *et al.*'s (1990) dictum: "within a service quality orientation, only the customers judge quality, and all other judgments outside customers' views were essentially irrelevant". Oluseye *et al.* in Rehman and Sabir (2012) also noted that a better understanding of the perceptions and expectations of users is a prerequisite for delivering high-quality services according to their expectations. Miller (2008) revealed that these outcomes began first in 1908 with the aim of demonstrating how "library services make a difference to its constituents; how it compares to similar institutions; and its contribution to recreation, teaching, learning, and research". Providing data allowed librarians and libraries to benchmark practices with other institutions. Benchmarking compares and measures their practices, policies, philosophies and performances against high-performing libraries anywhere in the world.

At the time, benchmarking provided an excellent way of measuring the performance quality of libraries until information and communication technology (ICT) revolutionized library operations. ICT has been accompanied by enormous changes and challenges to the way that academic libraries and librarians manage their resources and deliver efficient services. In line with the development of ICT, Nitecki (1996) remarked that in a virtual library environment, a measure of library performance based solely on a library's collection has become obsolete. In the twenty-first century, there has been a paradigm shift that has impacted the tools, services quality, approaches and skills for providing services in academic libraries. For instance, Internet databases and other electronic productivity software are now used in the management of library data (Chen, 1998). Online public access catalogues (OPACs) are rapidly eliminating the need for users to be physically present in library buildings, archives, museums and records offices for them to access materials. Virtual libraries and archives have enabled users in remote locations to simultaneously access archival collections without disturbing the physical contents.

With digitization, advances in technology have enabled seamless access to abundant information located in geographically remote areas. Consequently, national barriers have been reduced as the Internet has effectively allowed libraries and archives in cyberspace to come into existence, has revolutionized the way scholars access information and has opened new and unprecedented opportunities in other areas, such as digital libraries and electronic information dissemination and retrieval (Rao and Babu, 2001).

New ways to conceive and measure quality in contemporary libraries have emerged and have changed the primary focus of libraries from material collections to one of service orientation instead (Simmonds and Andaleeb, 2001; Somaratna *et al.*, 2010). Also, "the goal of bringing together a perfectly customized collection of books for the purposes of fulfilling user's needs" has driven "collection sizes higher and led to assessing a library's performance by the magnitude of its e-resources and the quality of its e-services to the users" (Kyrillidou, 2002).

Related literature

In Nigeria, ICT development started with the telecommunications infrastructure initiative that came into existence in 1886 and led to the installation of 18,724 telephone lines (Omotayo and Fadehan, 2007). In 1992, the Nigerian Telecommunications Commission (NCC) enacted Decree 75 to regulate the telecommunications industry and ensure the provision of adequate, efficient and effective telecommunications services nationwide. Since then, the Nigerian government has privatized the telecommunications sector and attracted private sector investment that led to a rapid expansion of the communications network (Adeyeye and Iweha, 2005).

There were also a number of networking initiatives in the country to mainstream research in the academic, public and private sectors. For example, the National Universities Commission (NUC) – a body that supervises and coordinates the activities of all universities in Nigeria – launched the National Universities Network (NUNnet) programme with the aim to connect all universities into a national academic network. Another huge attempt occurred in 2003 when the federal government of Nigeria through the National Information and Communication Technology Policy launched the e-government initiative for the purpose of networking all government ministries. Since that time, hopes were raised that the Nigerian e-government would provide opportunities to deliver online efficiencies to the public.

Surveys on the use of ICT to access information have been undertaken by scholars with the majority of those studies having found that the use of the Internet via the World Wide Web to search for e-resources is becoming prevalent among the youths and the elites in Nigerian society (Omotayo and Fadehan, 2007). For example, Baro and Asaba (2010) investigated the state of Internet connectivity in Nigerian university libraries and found that despite the laudable efforts by the NUC to network Nigerian university libraries, many are still operating without Internet connectivity. Ojedokun's (2002) study on the use of the Internet by students of the University of Botswana revealed that only 23 per cent of the respondents were not using the Internet. Odusanya and Bamgbala (2002) found that 58 per cent of the medical and dental students in their final year at the University of Lagos in Nigeria used the Internet in their studies. Jagboro (2003) found that a majority of postgraduate students of Obafemi Awolowo University ranked the Internet fourth among the sources they use to search for materials. Ajuwon

(2003) studied Internet use by first-year clinical and nursing students of the University College Hospital in Ibadan, Nigeria, and revealed that 60 per cent of the respondents were using the Internet in their research. It was based on the results of these studies that Kanamadi and Krumbai (2007) concluded that the Internet has had significant impacts on library operations and has successfully changed the nature of infrastructures and information services being provided in libraries.

In other parts of the world, reports of studies on the use of the Internet by undergraduates have been published. For example, Bennett (2001) found that 75 per cent of Americans aged 18 to 29 years and 65 per cent of those aged 30 to 49 years regularly went online to find information. Haoffman *et al.* (as cited in Omotayo and Fadehan, 2007) indicated that there was a gap in access to and use of the Internet among black and white students, and that the gap does not decrease as education increases, but continues to widen among those with at least a college degree. For example, Woo (as cited in Babalhavaeji *et al.*, 2009) assessed the performance of library services at the University of Hong Kong libraries, using service quality facilities, equipment, physical environment and electronic resources and found that 68.8 per cent of the subjects preferred the use of online approach to source their materials. Ossai-Ugbah (2010) investigated the extent that the use of electronic information services by students has influenced their academic performance and found that students who made use of automated library services performed academically better than those who did not use electronic equipment. Bao (1998) surveyed Internet use at Seton Hall University and found that 40.2 per cent of respondents used the web on a daily basis, 38.3 per cent weekly and 10.7 per cent on a monthly basis, while only about 10 per cent of the respondents said that they seldom or never used the Internet. It was also discovered that students and faculty used the Internet to search for information related to both their academic (83.2 per cent) and non-academic (73.8 per cent) studies. Odell *et al.* (2000) studied Internet use among female and male college students at institutions of higher learning in Georgia, Hawaii, New Jersey, Massachusetts and Rhode Island. They found that while the gap in the use of the Internet by female and male students had nearly closed, there remained some differences in how they used the Internet. The main difference was that the males spent more time than the females using the Internet; however, while the females used the Internet more for social networking, the males spent more time using it for academic purposes. This finding has given some insight into a further study for this researcher. The study could be carried out on the level of differences between male and female users of e-resources among students in Nigerian university libraries and what might be the causes of such differences.

Some challenges

Though the information revolution has drastically changed the way scholars communicate, teach, study and live, the continent of Africa has not benefited much from this revolution, probably because modern facilities have not been adequately provided. For example, Abubakar (2011), Okiy (2010), and Omekwu and Echezona (2008) have all, in their various studies, identified major challenges to the acquisition and application of information technology in African academic libraries, including inadequate funding, a poor and inadequate telecommunication infrastructure, poor levels of ICT literacy, limited computer facilities and terminals and a minimum involvement of academic institutions in network building and diffusion. Though the use of e-resources in libraries

was gradually increasing, no serious efforts in these studies were made to evaluate the quality of online services for users. Rather, the studies concentrated instead on the use of the Internet to access information and largely ignored the evaluation of electronic services to users or the extent that users were satisfied with the e-services provided by libraries. Because users in the Internet environment have very minimal contact with librarians, the pattern of measuring e-service quality of library users has fundamentally changed. This change has affected traditional methods of evaluating service quality and demands the application of a different service quality approach.

Statement of the problem

The transition of the traditional library to digital collections has presented new opportunities to academic librarians in developing countries. Because the NUC networked all federal universities in Nigeria in 2003, their institutions' faculties and libraries and their pattern of information provision, dissemination and retrieval has fundamentally changed. The transition has also affected ICT infrastructures, collection development methods, tools, service styles, the perceptions and expectations of university accreditation teams and even service evaluation patterns.

This paradigm shift has prompted a series of studies on the impact of the Internet on library resources and services, as can be observed in the research studies by Ojedokun (2002), Odusanya and Bamgbala (2002), Jagboro (2003), Ajuwon (2003), Salaam (2003) and Omotayo and Fadehan (2007), among others. Interestingly, these studies have revealed that library users in Nigeria preferred online searches to manual. However, these studies have neither measured the adequacy nor functionality of electronic infrastructures nor evaluated the quality of electronic services or the satisfaction of library users. Therefore, the purpose of this study on Nigerian university libraries is to:

- evaluate the adequacy of electronic infrastructures;
- determine the extent these infrastructures meet the needs of users;
- find out the steps academic librarians have taken to provide e-education to users;
- expose the constraints and challenges to the use of these resources by users; and
- recommend strategies for improvement.

Significance

The use of the Internet to deliver efficiencies is now an emerging issue in Nigerian academic libraries because they seem to provide faster and more convenient services. It has fundamentally changed the needs of library users. Therefore, the outcome of this study would be to expose to Nigerian university administrators and library management and other Africa countries, the required ICT infrastructures, the information resources needed and the strategies for optimizing electronic services.

Methodology/approach

The aim of this study was to assess the extent to which 10 Nigerian universities are providing electronic facilities and services to library users. The area of study – purposively sampled – was drawn from three federal universities, four private universities and three state universities.

The population of the study was 210. This number was drawn from all the registered library users in 10 Nigerian university libraries during the 2013 academic session, as

follows: 36 staff, 115 undergraduates and 59 postgraduate students (Table I). They represent the class of users who used electronic resources in their libraries during the months of October and November. The justification for choosing the universities and the class of users was for geographical spread, Internet service provision and suitability in providing relevant information for this study.

Analytical model

Many models or instruments, such as ServQual, LibQual, WebQual, ServPerf, SiteQual and others, have been developed to serve as a standard or benchmark for measuring the quality of performances or services in organizations. WebQual was adopted in this study because as Tarigan (2008) noted:

> […] a measure of user satisfaction should contain [a] complete and valid set of factors and instruments which could measure not only user's reaction but also why he/she acted the way he did.

The first version of WebQual (WebQual 1.0) was developed from the results of quality workshop held with students in an organization, using the students to test the qualities of an excellent business school website. The fourth or latest versions, WebQual 4.0, was tested in the domain of online services, and the results led to the identification of 22 items and 3 dimensions of website quality – usability, information quality and service interaction quality – whose indicators were considered appropriate for this study (Barnes and Vidgen, 1993).

This model differs from those of ServQual and LibQual because item statements were not repeated to capture the expectations of users. Instead, it focused on user's perceptions of actual service delivery. Also, instead of a seven-point Likert scale used by Nitecki and Hernon (2000) in their research, this study uses a five-point scale.

Instrument

A questionnaire was structured on the modified version of WebQual using 22 performance indicators suitable for academic libraries. It was hoped that the views of library users on these indicators would help to measure the accurate quality of electronic provision and services in Nigerian university libraries. The questionnaire has four sections and each section covered a given dimension of the WebQual 4.0, as follows:

- Library equipment (measures availability and functionality of electronic equipment).
- Library website (measures usability and quality associated with site design).
- Library OPAC/Internet services (evaluates the quality of the content or suitability of the information for the user's purpose).

Table I. Sampled population by institution

Class of users	Universities Federal	Private	State	Response rate (%)
Staff	15	10	11	36 (17.14)
Graduates	31	14	14	59 (28.09)
Undergraduates	50	38	27	115 (54.76)
Total (%)	96 (45.71)	62 (29.52)	52 (24.76)	210 (99.99)

- E-user education (evaluates the level of users' skills, competencies and information literacy).

Responses were grouped as either negative or positive. Negative and minimum ratings were very poor (1 mark), poor (2 marks) and average (3 marks); while positive or higher ratings were good (4 marks) and excellent (5 marks). In the questionnaire, respondents were asked to use 1, 2, 3, 4 or 5 marks, respectively, to rate the level of their views about the online/e-services they obtained in the library.

Data collection

Data were collected with the help of research assistants. Five postgraduate students of the University of Nigeria Nsukka who reside from or close to the sampled universities were engaged in data collection for a fee. In all, 350 copies of the questionnaire were randomly administered to both staff, undergraduate and postgraduate students in the 10 institutions during the first semester of the academic year 2013. The period was purposely chosen because it was a time when students use the library more for their term paper writing and other assignments. The questionnaires that were correctly completed and returned were as follows: 96 users (45.71 per cent) from federal universities, 62 users (29.52 per cent) from private universities and 52 (24.76 per cent) from state universities. This gave a total of 210 respondents who became the population of this study. Table I shows the class of users that constitute the population to be: staff 36 (17.14 per cent), graduates 59 (28.10 per cent) and undergraduates 115 (54.76 per cent).

Benchmark for measurement

Generally, a service/indicator may be rated positive or negative depending on their scores. Any service indicator rated as positive (P) might be interpreted as average, good or excellent. If it is negative (N), then the interpretation may either be poor or very poor (Table II). The above approach was applied in data presentation and analysis to guide the discussion of the results.

Criterion of judgment

The criterion of assessment was to match the five-point scale with performance ratings that range between 0 and 100 per cent, as shown in Table II.

To analyze the data, an item/indicator that scores 0-20 per cent was negatively rated and, therefore, regarded as a facility or service with very poor performance and in need of urgent attention; an indicator that scores 21-40 per cent was also rated negative or of poor performance and requires greater improvement; and an indicator that scores 41-60 per cent was rated fairly positive or of average performance and an improvement is needed here. On the other hand, scores between 61-80 per cent are a positive mark and

S/N	Performance scale (%)	Judgement	Action required
1	0-20	Very poor	Urgent attention
2	21-40	Poor	Serious attention
3	41-60	Average	More improvement
4	61-80	Good	Steady maintenance
5	81-100	Excellent	Continuous sustenance

Table II.
Performance rating/ assessment benchmark

rated as good performance to the users and in need of steady improvement to move to the next level; and an indicator that scores 81-100 per cent is considered to have attained its full capacity or highest level of performance and, therefore, needs continuous sustenance to maintain its standard.

Findings

To measure the quality and functionality of electronic equipment and services that Nigerian university libraries provide to users, respondents were asked to use very poor, poor, average, good and excellent to indicate whether the available electronic equipment satisfy their information needs. Table III presents their responses.

Library equipment was evaluated to ascertain their availability and functionality. Data in Table III reveal that respondents were of the view that the quality and functionality of existing equipment was average. Generally, out of the four equipment types tested, two – adequate and functional computers and spiral binding machines – were rated good; that of "computer workstations were available" was of average performance. Due to low bandwidth in most libraries, either the computers take a longer time to boot or the number of functional ones was not enough for the users' needs. One indicator, "availability of functional photocopying machine", was also rated average. This may be as a result of the limited number of copying machines inside the library buildings which hardly satisfies the increasing population of users. That "availability of printers/scanners" was rated very poor may be because readers were not allowed to use scanners, CD-ROM or flash drives; instead they were advised to send the downloads to their e-mail box. These rules were intended to prevent importation of viruses into the computer system.

In Table IV, the library website was rated on six performance indicators to test the level of its services. This result shows that the overall performance of the website in libraries did not meet the desires of the user, as only one item, "availability of online request form", was rated good; two of the service indicators – ease of logging and availability at different locations – were rated average. Also, two items were rated very poor, namely, the "ability to access e-resources of other libraries" and "sending of overdue notice online to library defaulters". This finding has shown that the library is not meeting one of its visions: "To provide effective linkage mechanisms that enables the library's clientele to access information in other knowledge institutions both locally and internationally" (Nwoye, 1981; University of Nigeria Nsukka, 2012).

S/N	Service indicators	Responses		Rating	Interpretation
		Positive	Negative		
1	Photocopiers are functional and readily available	101 (47.9)	109 (52.1)	P	Average
2	Adequate and functional computer workstations	135 (64.3)	75 (35.7)	P	Good
3	Printers/scanners are always available and functional	10 (4.6)	200 (95.4)	N	Very poor
4	Photocopied materials can be spirally bound instantly, if requested	141 (67.4)	69 (32.6)	P	Good
Overall performance		97 (46.0)	113 (53.0)	P	Average

Table III.
Responses on library equipment

Note: N represents negative and P represents positive performance in all the tables

To access the e-resources of other libraries, there is a need for a link on the Internet, as well as inter-library networks. In Nigeria, there is a weak presence of Internet infrastructure in most university libraries. One of the greatest requirements of web-based tools or services is to have hassle-free access to the Internet, but in Nigerian university libraries, these basic requirements are lacking or inadequate due to poor funding, low bandwidth and obsolescence of hardware and software.

In Table V, the library's OPAC or Internet services were measured using ten service indicators. The results showed that the overall performance was poor. Only the clarity of the web page which scored 78.3 per cent was rated good. It was also found that three of the items were rated average:

(1) provision of information that links the user with his/her book on the shelf (58.1 per cent);

(2) the rapidity of the network (49.3 per cent); and

(3) the opening and closing hours (54.9 per cent).

S/N	Service indicators	Responses (%) Positive	Negative	Rating	Interpretation
5	Enables me to log in easily	111 (53.2)	99 (46.8)	P	Average
6	Is always accessible at many locations	125 (59.5)	85 (40.5)	P	Average
7	Allows access to e-resources in other institutions	19 (9.1)	191 (90.9)	N	Very poor
8	Contains or provides online request form	137 (65.0)	73 (35.0)	P	Good
9	Easily detects material theft in the library	78 (37.2)	132 (62.8)	P	Poor
10	Sends overdue notice online to users	20 (9.7)	190 (90.3)	N	Very poor
Overall performance		82 (39.0)	128 (61.0)	N	Poor

Table IV. Responses regarding the library's website

S/N	Service indicators	Responses Positive	Negative	Rating	Interpretation
11	Displays items very clearly	164 (78.3)	46 (21.7)	P	Good
12	Indicates the number of books available in the library	14 (6.7)	196 (93.3)	N	Very poor
13	Users renew borrowed materials from off-campus	9 (4.2)	201 (95.8)	N	Very poor
14	Allows users to locate books needed in the library	122 (58.1)	88 (41.9)	P	Average
15	Helps users know if a book is available on the shelves	10 (4.6)	200 (95.4)	N	Very poor
16	Provides information on all collections in the library	18 (8.5)	192 (91.5)	N	Very poor
17	Enable users to reserve materials online	29 (29.7)	31 (62.4)	N	Poor
18	Is very fast in searching for items online	104 (49.3)	106 (50.7)	P	Average
19	Internet network is always available from off campus 24/7	10 (4.8)	100 (95.2)	N	Very poor
20	Opening and closing hours are suitable to students	115 (54.9)	95 (45.1)	P	Average
Overall performance		65 (31.0)	145 (69)	N	Poor

Table V. Responses on library OPAC/Internet services

However, the rest or half of the indicators were rated with a very poor performance: the ability of users to know the number of books in the library, to renew their books online, to know the position of books on the shelf, to obtain information on all the collections in the library, to make online reservation for materials and to access Internet services outside the campus environment. The library OPAC was not providing those services in most of the libraries because it is still being developed and tested, and there were not enough funds to provide needed facilities that would deliver uninterrupted services. This finding reaffirms that of Baro and Asaba (2010), who also found that many universities in Nigeria are operating without Internet connectivity due to the lack of funding.

In Table VI, e-user education was measured using two performance indicators, namely, provision of an orientation programme that helps users to access e-resources effectively and provision of finding aids to users. These items were rated positive because Nigerian university libraries organize orientation programmes every academic session for freshmen and, at the same time, deliver lectures on the course *Use of Library and Study Skills* (GSP 111) for more than 12 weeks to all first-year undergraduates. These two approaches have immensely helped first-year library users in understanding how to operate computers and source their information online. Also, there are systems analysts and data entry operators deployed in the OPAC section to assist those who may not be conversant with use of the Internet.

Table VII is a summary of the tables showing all the responses by the subjects on the performance indicators. Generally, the summary revealed that e-service in Nigerian university libraries is of average performance. However, the table shows that performances in two areas – library web site and OPAC/Internet services – were abysmally poor. While provision of library equipment was average, e-users education was good. This result is pointing at some service areas where urgent attention is needed if librarians in Nigerian universities are not going to be redundant. The poor performance of electronic services in Nigerian university libraries may be attributed to certain constraints.

Table VI.
Responses regarding e-user education

S/N	Service indicators	Responses: Positive	Negative	Rating	Interpretation
21	Library provides orientation programme that helps users to access e-resources effectively	165 (78.7)	45 (21.3)	P	Good
22	Librarians help users to find information online	147 (69.6)	63 (30.4)	P	Good
Overall performance		156 (74.3)	54 (25.7)	P	Good

Table VII.
Summary of Tables III-VI and the results

Tables	Performance indicators	Responses: Positive	Negative	Rating	Interpretation
3	Library equipment	97 (46.0)	113 (53.0)	P	Average
4	Library website	82 (39.0)	128 (61.0)	N	Poor
5	Library OPAC/Internet	65 (31.0)	145 (69.0)	N	Poor
6	E-user education	156 (74.3)	54 (25.7)	P	Good
Overall performance		100 (47.6)	110 (52.4)	P	Average

Constraints to efficient access to e-resources in academic libraries in Nigeria

Users were asked to freely enumerate their views on the problems they encountered in their efforts to use electronic facilities in the library. Also, librarians in charge of the digital libraries in some of the libraries were interviewed on the challenges of providing effective online services to users. The views of the majority are summarized in Table VIII.

Table VIII presents, in order of severity, the major problems which users encountered in their attempt to use electronic resources in Nigerian university libraries. The result has shown that more than 80 per cent of users demonstrated that those factors constituted an impediment to their use of library e-resources. The only exception was when verification was needed to find out whether those challenges were as a result of a weak knowledge of ICT among librarians. The result has shown that 74.8 per cent of the subjects rejected the idea.

Persistent power outage

The table shows that the greatest and most critical challenge was the intermittent power supply in the library, as can be seen in their reaction to this question. It reveals that all the users regretted the inability of the Nigerian government and the university administration to provide a steady power supply in the library. This has been identified by previous writers as the major setback to ICT development not only in Nigeria, but also in other Africa countries. For example, at Colombo University in Sri Lanka, the great importance of power in libraries caused users to rate adequate lighting as the most desired improvement (Woo, 2005). Obviously, an inadequate supply of electricity in many libraries in Nigeria has adversely lowered productivity levels. For instance, sometimes, libraries remain without electric supply for many days. Worst still, the cost of using a generator is very prohibitive in the face of recurrent increases in prices of petroleum in Nigeria. Consequently, libraries are frequently closed earlier than the official time, and this had been negatively affecting all other services that depend on the power supply. However, with privatization of the Power Holding Company of Nigeria (PHCN) and the setting up of a power distribution monitoring body, it is hoped that very soon this hydra-headed challenge would be minimized.

Insufficient computer terminals/workstations

Added to the above challenge is an inadequate number of computer workstations that hinders the need of 94.3 per cent of users to access e-resources in the library. The library OPAC is the library's electronic catalogue that shows the library holdings. Users are not

Table VIII. Constraints to e-services in Nigerian academic libraries

S/N	Challenges	Responses		
		Positive (%)	Negative (%)	Interpretation
1	Recurrent power outage	–	210 (100)	Negative
2	Inadequate computer terminals/workstations	12 (5.7)	198 (94.3)	✓
3	Poor Internet services/network availability	19 (9.0)	191 (91.0)	✓
4	Low level of ICT skills among users	35 (16.7)	175 (83.3)	✓
5	Use of print/flash drive is prohibited	41 (19.5)	169 (80.5)	✓
6	Most librarians were not ICT compliant	157 (74.8)	53 (25.2)	Positive
Average of total percentage		(20.83)	(79.05)	

expected to use the OPAC for a long time. In Nnamdi Azikiwe library at Nsukka, for example, more than 500 computers were installed in the computer laboratory for staff and graduate students only. The MTN Library is where undergraduates could go for their online research, but this is only open to those who have registered to use the network. This and others might be the reasons users ranked inefficient computer workstations as the second major problem, as the undergraduates – who dominated the population of this study – were barred from using the library's computer laboratory. This might be the reason for a majority of students bringing their personal laptop computers into the library for browsing. Results of this study have reaffirmed that of Okorie (2010), who found in her study that insufficient numbers of computer terminals and power outages scored highest as their major impediments at the University of Agriculture, Abeokuta, Nigeria.

Poor Internet services/network availability

Poor availability of Internet networks that adversely affect 91.0 per cent of library users was another setback. This was ranked third as another critical challenge to the use of library e-resources because on several occasions, Internet service was either very slow or completely not available, often frustrating the plans of researchers. This problem may be attributed to low bandwidth, limited numbers of ICT engineers or a lack of skills in handling the technology. Consequently, multiple locations on campuses would remain without network service for many hours. Reporting on the state of Internet connectivity and access in African universities, Oluoch (2006) said that Internet services in Africa were poor, unreliable, scarce and very expensive; and, where available, it is almost never dedicated. As a result, users have to contend with very slow speed services and frequent outages most of the time. The results of this study show that this problem that was detected by Oluoch (2006) still persists in Nigeria in the twenty-first century.

Poor ICT skills among users

Other challenges include a low level of ICT skills among users and the prohibition to print documents downloaded or to insert data devices into computers by students, among others. In spite of the orientation programmes and lectures organized by university librarians for freshmen students in all the faculties, many are still not conversant with the use of electronic facilities. This finding has corroborated that of Okiy (2010), who found that a poor level of ICT literacy was a major challenge to student's application of computers in their studies. This class of users waste a lot of time in the library OPAC searching for information.

Also, Odusanya and Bamgbala (2002) revealed that a majority of final year students at the College of Medicine, University of Lagos, had limited computer skills with only 23 per cent of the students having used the Internet in the library for medical research. This observation was made when they discovered that greater percentages of students coming out from higher institutions in Nigeria were not ICT compliant, and therefore, this negatively affected their productivity or the quality of services.

Challenges of e-service provision in Nigerian university libraries

For further verification, the authors interviewed some of the librarians in charge of the digital libraries on what constitute the challenges to efficient e-service delivery. The majority of their answers reaffirmed those of the students and broached on the following points

Inadequate funding

The majority of the librarians pointed to underfunding and misappropriation of library funds as the greatest setback to effective e-services in Nigerian university libraries. For example, the five-month industrial action embarked upon by the Academic Staff Union of Nigerian Universities (ASUU) was as a result of poor infrastructures and the lack of funds to maintain the existing ones that are falling into dilapidation in federal universities. Hopes were raised when the federal government of Nigeria, FGN, and ASUU leadership signed a memorandum of understanding (MOU) in which the FGN accepted to release on installment a sum of 1.3 trillion naira to be spread over five years. The money is to be utilized for infrastructural development in Nigerian universities. It is hoped that if the money is released and judiciously utilized to acquire more modern infrastructure, then the problem of inadequate ICT facilities would be minimized.

Mismanagement of library funds

Though the policy for funding university libraries in Nigeria is for 10 per cent of the institution's budget to be allocated as library funds, many university administrators do not adhere to this directive. Instead, the money is diverted to other projects. In addition, library administrators were mandated to draw money from the Tertiary Education Trust Fund (TETFund) for various capital projects. This money is expected to be accounted for after executing the project so as to collect more.

Regrettably, some university administrators often divert this money to another area for which it was not intended. Consequently, the inability to render an accurate account on how and where the money was spent blocked further disbursement. And, in reaction, the government withheld the funds and ICT infrastructures and other facilities, as well as other developmental projects, are left unattended. That is the root of inadequate funding in most Nigerian university libraries. Therefore, if university management would be sincere about the funds released for capital projects, then e-resources and services of Nigerian academic libraries would have advanced beyond their present stage today.

Intermittent power supply

Librarians have reaffirmed the views of users on the negative effects of incessant power outages on library services. Their views are not new. For example, various studies by Zulu (1994, 2008), Zakari (1997) and Okiy (2010) have identified a general low supply of electricity in most parts of Nigeria and Africa as a major setback to globalization. Librarians and researchers who are confronted with intermittent power supply are not likely to plan for the use of Internet services for sourcing their information in the library (Asogwa, 2014).

Inadequate planning

This study has exposed inadequate planning for ICT development as one of the causes of poor performance in the library. Before embarking on electronic library services, there is a need for serious analysis of what is involved – the funding, the skills, human capital requirements and regulatory frameworks – that would guide the whole exercise. Very often, all these are not calculated by African leaders before undertaking the project, and along the line, serious setbacks are encountered. Availability and adequacy of these structures determines the functionality and competencies of academic libraries in providing excellent electronic services.

Conclusion and recommendations

This study assesses the quality of electronic infrastructure and service provision in Nigerian university libraries. In the course of this study, 22 e-service performance indicators were tested. The results show that electronic facilities for accessing information were available in Nigerian university libraries, but none of them was adequate and functional enough to be rated excellent; six indicators were rated good; nine received an average score. Two of the indicators got poor scores, while five were rated very poor. This suggests that neither the equipment/facilities nor the services delivered met the electronic information needs of users. Inadequate computer terminals, poor Internet/network services, low ICT skills and competencies among students and some staff were some of the constraints to the effective use of existing electronic facilities. Poor funding and misappropriation of the available little funding, insufficient power supply and technological obsolescence were some of the critical challenges to effective e-services in Nigerian university libraries.

Recommendations

In view of the above findings:

- The policy of allocating 10 per cent of the university budget as library funds should be strictly implemented in Nigerian universities by university administrators so as to improve funding of the library and allow library management the freedom of access to, and full control of, library funds and other resources.
- The idea of providing an e-learning opportunity to all freshmen in Nigerian universities is a welcome development, but knowledge of ICT by students should start right from the primary school level, so that by the time they are in higher institutions, the use of computers and other electronic facilities to access and source their needed information would not be so problematic.
- There is a need for a uniform ICT policy framework for Nigerian university libraries. These libraries should work out an enduring framework for ICT development. The policy would set a goal or target and time frame for all to know where they are headed. Implementation of the policy and a regulatory framework should be instituted simultaneously in all university libraries. This would enable university librarians to see what other libraries are doing and where they are headed and allow them to frequently undertake a self-assessment to determine where they are, or why they have been left behind, and to take immediate correction. Babalhavaeji *et al.* (2009) agreed with such a strategy when they noted that without timely feedback of quality, (academic) library systems could deteriorate so much that meeting user's satisfaction would be difficult.
- The NUC, that initiated the idea of networking Nigerian universities and their libraries and faculties, should set up a body that will frequently monitor development and use of electronic infrastructures and the extent those priorities are attained. A university library that fails to meet such an e-service standard should be sanctioned.

- There is a radical reformation going on today in the power sector in Nigeria. With the privatization of the sector and the setting up of monitoring bodies known as the Nigerian Electricity Distribution (NED) and the Nigerian Electricity Regulation Commission (NERC) whose task it is to distribute, supervise and monitor the various companies in charge of power distribution, it is hoped that the ailing power sector in Nigeria would be revitalized and bring to a halt the lingering power crises that have, for many decades, bedeviled industrial and economic development in the country.

Modern library development is driven by information technology. Therefore, an electronic service in contemporary libraries without a corresponding investment in ICT infrastructure and human capital is bound to render inefficient electronic services. There are positive correlations between investment in ICT infrastructures, staff skills and competencies and effective and efficient electronic services. A suggestion for further research would be an investigation conducted on the evaluation of availability, functionality and utilization of electronic infrastructures in public and academic libraries in Nigeria.

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