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Adoption of Cloud Computing and OPAC Visibility in Nigerian University Library System

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Abstract

OPAC visibility, implementation of the cloud system and challenges of its adoption are the variables that define the crust of the research. The study, compartmentalizing the Nigerian University libraries, adopted the quantitative methods employing the use of observation and survey. A two-month long observation of the websites and OPAC of the studied universities was undertaken. The non-probability sampling - precisely purposive sampling - was deployed while the entire one hundred and sixty (160) Nigerian universities – as at 2018 – served as the sample size for the study. A questionnaire was designed to collect primary data on the availability of OPACs and adoption of cloud hosting in Nigerian university libraries. This was administered electronically via the email-boxes of virtual/systems librarians. Significant trends noticeable in the research findings include low visibility, in-house hosting of OPAC and indifference to the adoption of cloud computing with hosting (subscription) fee, downtime in internet connectivity and fear of vulnerability to hackers' attack being the significant challenges. It is recommended that stakeholders should leverage on the existing consortium (platform) facilitated by Nigerian Research and Education Network (NgREN) to benefit from the economy of scale in addition to collaboration with relevant global agencies. Furthermore, a synergy between the librarians and the ICT units should be strengthened for a better understanding of the technical challenges in order to provide appropriate solutions to them.

Keywords: OPAC Visibility, Cloud Computing, Nigerian University Library System, Nigerian University OPAC.

Introduction

Information Technology precisely cloud computing has become a formidable player in production of technology solution which is common place amongst contemporary information science experts in the field of librarianship due to its amenability for resource sharing (Tritt & Kendrick, 2014). It is consistently correlated with the computerization processing capability, apps and storage, thought of as a design to deploy prepayment network services or perceived to be akin to grid computing and shares typical feature with all of these technology prototypes and more (Sahu, 2015). Cloud based computing, the new technology template is the use of information assets (computer hardware and software) which can be delivered as a service across a mesh. It takes its name after the use of cloud - shaped token it contains in flow diagrams as an abstract for the compound understructure. Cloud computing has been coined as a generic term to define a class of complicated pay-as-you-go computing services originally provided by commercial operators such as Amazon, Google, and Microsoft. It signifies a template on which a computer-based infrastructure is regarded as "cloud" from which enterprises and private individuals obtain applications on demand around the globe. The primary rule under this model is provision of computing, storage, and software "as a service" (Gosavi, Shinde & Dhakulkar, 2012; Swain, 2014; Kaushik & Kumar, 2013). In the last decade, the extraordinary utilization of the Internet among library patrons has actually made it crucial that libraries offer her businesses electronically considering that patrons have workable alternates of accessing information than employing the use of the traditional library outlets. This is possible with the aid of Cloud technology. The impact of cloud computing on library services ranging from saving cost, innovation and flexibility, as well as general and broad skills imbedded in information technology in relation to access to variants of clouds ranging from private to hybrid, from community to other forms on one hand and huge, special expertise, cloud OPAC and Cloud Integrated Library Systems.

Statement of Problem

In recent times, cloud computing has enjoyed a high level of patronage among institutions and libraries worldwide even when its adoption in Nigerian university libraries is at the stage of infancy (Aliyu, Abdulrahaman & Yusuf, 2019). This is attributable to unarguably the accumulated benefits that have come to define this new approach to the promotion of library products and services at varying levels. It represents a transfer of responsibility which hitherto had the propensity to buoy down the few staff so engaged. Findings (Oyintola, AbdSalam & Ajani, 2014; Issa, Idowu, Amusan, Ojokuku, Adedeji, & Oguntayo 2016) had reported challenges of work overload as a result of a shortage of personnel and poor staffing in many Nigerian university libraries. This is in addition to the economy of scales positively tilted towards an advantageous side of libraries. Iroaganachi (2015) discovered that 75% of 39 university libraries in the South Western part of Nigeria were engaged in library automation of different extent at the time of the research. However, it is disheartening that OPACs of these institutions have remained largely inaccessible to the global world. Anasi and Ali (2012) revealed that the absence of web-accessible OPACs has impeded service delivery in the field of librarianship in Nigeria. 'Non availability of library automation alongside the provision of Web OPAC resources in the libraries' were identified as part of the difficulty of providing library services to lecturers and students of Open University education in remote areas of Nigeria (Ofodu & Agim, 2017). Aside from the responsibility of displaying bibliographic

details of library materials to library patrons, Nigerian OPACs have the onerous task of advertising locally published books and journals to the outside world. Therefore, the absence of a platform of this nature is a minus to the intellectual display of the Nigerian academic heritage. As librarians who regularly partake in cataloging and classification works, the authors have experienced regularly the popping up of several OPACs of universities from other climes when recourse is made to copy-cataloging, whereas it is a rare occurrence for OPACs emanating from most Nigerian Institutions.

Recent works have been concentrated on awareness and use of the OPAC as a gateway to library resources. Kumar, Singh, Singh and Rana (2018) did a review of literature on the adoption of OPAC by university libraries. The review covered several countries including Bangladesh, India, Malaysia and Nigeria. Ironically, the works approached the issue from a perspective of users' use, awareness and satisfaction rather than from the angle of its global visibility as obtainable with OPACs of universities in Europe and the United States. Mohammed and Temboge (2019) continued in this line only to do a comparative study of usage between OPAC and Card Catalogue. Even though Hussaini, Vashistha, Garba and Jimah (2017) and Wada (2018), and similar authors identified the various opportunities that cloud computing possess for Nigerian university libraries, these and several articles have failed to address specifically the challenges that hinder OPACs from Nigeria from gaining global visibility via the advantages provided by cloud computing technology. This study seeks to evaluate and assess the extent of visibility of Nigerian university OPACs (which has the potential to expose Nigerian indigenous titles) to the world and equally identify the barriers slowing down the application of the new technology to OPAC services for the benefit of not only clientele but fellow librarians who may wish to access bibliographic details of newly published Nigerian titles.

Objectives

This study has as its primary objective to find out the adoption of cloud computing to host OPACs by university libraries in Nigeria thereby enhancing their visibility to the larger world. The following are the specific objectives of the study:

1. To ascertain the visibility of OPACs of university libraries in Nigeria to users outside the universities
2. To examine the usability of the cloud system for hosting OPAC by Nigerian university libraries
3. To identify challenges of adopting cloud computing for hosting OPAC in Nigerian university libraries

Research Questions

Three basic guiding questions are driving this research, namely:

1. To what extent are the OPACs of university libraries in Nigerian visible to users outside the university?
2. What is the rate of subscription to the cloud system to host OPAC in Nigerian university libraries?
3. What are the obstacles confronting the deployment of cloud computing for the hosting of OPACs of Nigerian university libraries?

Accessibility to Library Information Materials and Challenges of Opac Visibility

Zico (2009) defines Online Public Access Catalog (OPAC) as the electronic card cataloging system used to look up library resources, such as books, CDs or others. Kulkarni (2004) however in his definition, sees a Web OPAC as a library catalog on the Web or Intranet via which users are opportune to search the required information through connection to Uniform Resource Locator (URL) of Web OPAC from any location in the globe at any time of the day; a feature which highlights its global accessibility that transcends time-bound. Gbadamosi (2012) affirms that the Online Public Access Catalogue (OPAC) replaces catalog cards in automated environment thereby serving as gateway to access bibliographic data of the library. Adigun, Salvador-Olayokun and Abdulazeez (2011) identify increase of access points, varying search features and an increase in complexity of the process as differential characteristics separating the traditional card catalog from OPAC. Thanuskodi (2012) opines that the essence of the search facility is primarily to apprise the user on the availability of various library items for circulation, as well as current status of individual copies of a title and their reserve status. In most cases, OPAC systems could proffer access to the Web via OPAC interfaces. In addition he affirms that OPAC now provides access not just to the bibliographical details of book and serials collection held by a particular library but in addition enables access to numerous library systems. Yi (2016) observes that several effective promotion techniques are deplored by librarians to promote library resources and services to potential clients. These techniques include advertisements, library websites, social media, published guides etc. Going by this, it will just be appropriate to ensure effective promotion through visible OPAC via the website. Ruzegea (2012) posits that the task of searching and retrieving information resources from the library has become relatively easy due to OPAC. Zico (2009) further states that the web-based method has proved generally acceptable for circulation activities. Medeiros, Beattie & Wu (1999) says "WEBPAC has implications for marketing, bibliographic instruction, and overall display and design issues". All these might have largely accounted for the preference shown by libraries and library users globally for OPAC and Web-based OPAC in place of traditional catalog (Kumar, Singh, Singh & Rana, 2018).

The visibility of OPACs in African nations has encountered perennial challenges due to the low level of infrastructural development in the continent. In Uganda Parliamentary Library, the OPAC is made accessible to the law makers via assistance of the library staff and in the alternative through the intranet (Rugambuwa and Kintu, 2013). Contribution of clients to better performance and delivery of services by their libraries is further restricted when there is limited opportunity for comparison. Clark (1991) observes that library users have the potential to participate in the process of enhancing the potentiality of their libraries' OPACs. He cited the case of University of Edinburgh library OPAC, where having been introduced to the process involved in searching OPACs of other institutions, library users made suggestions on ways to improve Edinburgh's OPAC with integration of some features they saw in other systems.

Perennial Issues in Cloud System Usage

Pandey, and Kushwaha (2015) opine that in addition to the library possessing the attribute of a 'knowledge ocean' it has been designated for the sole responsibility of offering acceptable services to all range of people. They therefore advocate for constant advancement of the library in the modern age through the adoption of new IT technologies. Sahu (2015) says that great investment is made by libraries to acquire software and hardware needed in the installation and

management of the electronic library, institutional repository, library website and portal, and Integrated Library Management Software (ILMS) among others. This is in tandem with the findings of Ogbu and Lawal (2013) which indicates a huge financial burden is borne by Nigerian universities during the process of procurement of huge servers and licensed software to run their heavy data. Additionally, the employment of staff who maintain these services as well as upgrading of the software whenever new versions are released constitutes a huge financial burden on libraries. In some instances, these activities are not achievable without the assistance of supportive IT staff. The advent of cloud computing makes the provision of these services attainable through third parties contrary to hosting such servers in-house. Library catalogs are thus made available through the cloud; this will be more beneficial to the users who can then find out the availability of materials. Raghavendra, Indrani and Poornima (2013) define cloud computing as a technology that employs the use of the Internet and centralized distant servers to maintain data, systems software and accompanying application. Cloud computing grants users the adoption of applications without previously installing such in their appliance to connect private and authorized records on any computer connected to the internet. He considers cloud computing as a newly emerging technology. It is a facilitating device for storing and accessing information, and guaranteeing a unified web presence in addition to addressing local storage capacity challenges (Mavodza, 2013). Zhang (2015) in his study on the application and discussion of cloud computing in academic libraries believes that the various features of the cloud system technology portend an extensive application prospect and commercial benefit.

Kumar & Mandal (2013) posits that cloud computing presents opportunity for institutions to enhance their operational efficiency while they simultaneously direct scarce resources towards services that stand them out of the crowd. He lists inter-institutional collaboration as a major benefit facilitated through cloud computing given the ease of accessibility by faculty and students at disparate institutions. Additionally, some scholars would argue that cloud services offer more security than on-campus solutions, despite potential security risks posed by cloud services. The complexity of installing effective IT security devices at the institutional level is better shared when the responsibility is evenly distributed. Bala (2012) considers accessibility to data from any location as a point that makes computer clouding a useful option in the library and information sciences; it can be ordered on the internet. He, therefore, likens cloud computing to revolution in the field of librarianship due to its assistance in modernizing data centre; specifically, the need for high speed of internet which is better guaranteed in cloud computing makes it attractive to the library and information science managers. He, however, expresses the fear of inherent danger to privacy. Enefu, Gbaje and Aduku (2015) say that the cloud system has enabled the National Open University of Nigeria (NOUN) to make library information and services available to its students dispersed across the country due to non-location specificity of the technology and unfettered accessibility.

While highlighting the advantages paraded by this technology, Nooshinfard & Ghorbani (2014) say "Cloud computing or cloud library as it is currently conceptualized increases efficiency indices and reduces ownership cost; it allows usage of software and hardware without purchasing them. Cloud computing offers many advantages such as cost savings, flexibility, user-centric, pervasive and openness, transparency, mutual interoperability, availability at any time and place, and resources sharing for libraries". Cloud computing has certainly benefited library in many ways by allowing the library staff to concentrate on their area of competency

instead of IT and infrastructural concerns. To properly put it in the right perspectives, Upadhyaya and Ahuja (2017) contend that cloud computing has risen as an active system to uphold the implementation and development of e-learning in the higher institutions of learning, as well as in institutional libraries leading to increased demand for cloud computing services in support of expansion and improvement of library services, as well as to meet the requirement of constant access to latest scientific research output and electronic resources in the library. These they argue further have the potential to increase accessibility to library resources when searches are conducted via OPACs supported by cloud-hosted systems.

Challenges to Adoption of Cloud Computing in Hostage of Opac

Despite all the broadly extensive publicity, there are still unmistakable demerits associated with Cloud Computing – especially relating to minor procedures. These negatives which are documented in research carried out by Adegbilero-iwari & Hamzat (2017) include: downtown in internet services provision, fear of security and privacy of documents being compromised as no system can guarantee absolute perfection, the vulnerability of the system to attack by marauding hackers, cloud technology customers have restricted control over the operation and administration of their hosting infrastructure, absolute reliance commonly referred to as "vendor lock-in" and Cloud computing expenses – particularly on a scaled-down and for short term schemes – could be exorbitant. Even though Hussaini, Vashistha, Garba and Jimah (2017) identified several managerial and management advantages inherent in the platform, they nonetheless accepted the existence of several issues preventing its elaborate use in Nigerian university libraries. This is in line with the position of Yuvaraj (2015) who warned of prevalent security threats in the cloud environment.

These perennial barriers continue to serve as impediments to the adoption of cloud computing systems in various institutions. These are basic security and privacy issues. Therefore there is demand for confidentiality that requires maintaining covert guard of costumers' data in the cloud systems via physical isolation and cryptography; a concept which is currently endorsed by the cloud computing merchants (Kumar and Goudar, 2012). In this vein, Tirodkar, Baldawala, Ulane and Jori (2014) advocate that customer's data must always be kept encrypted by cloud vendors who will ensure that such encryption keys are in themselves further encrypted, even at the time of usage. They suggest technologies like Key splitting and homo-morphing as a probable solution to security challenges. This requires that clients should be verified and authenticated – to avoid compromise - before they gain access to their data.

Erturk and Iles (2015) opines that a service in cloud systems known as Software-as-a-Service (SaaS) which seems to be vendor driven has been widely accepted by academic libraries. The challenge therein however is the risk of the institutions having their database access terminated since OCLC does not have to deal directly with the database provider if a breach occurs due to the fact the agreement was entered into between individual institutions and library database providers. Occurrence of authentication between the institution's AD/LDAP server and OCLC's server further creates the probability of a 'man-in-the-middle' hacking attack. In providing alternative routes to these challenges, Molnar and Schechter (2010) itemize the benefits of cloud hosting to include low up-front costs, elasticity of resources, and cost savings. Even though self-hosting gives an institution direct control over infrastructure, transfer of infrastructure control to a third party may not necessarily lead to loss of security since this can be catered for in the economy of scales; cloud providers can finance the up-front

costs security measures require- a provision which is not affordable in self-hosting environments.

Methodology

This study adopted the quantitative methods employing observation and survey. To examine the visibility of the OPACs of the studied universities, a two-month-long observation of the websites and OPAC of all Nigerian university libraries was undertaken between August and September 2018. The observation aimed to determine their status vis-à-vis visibility to the outer world beyond the university community and even Nigeria as a country. This observation covered areas of online visibility, hosting servers and platforms. This method directly helped to provide an answer to research question one. While the total sampling technique was used to select all universities in Nigeria for the study, the non-probability sampling precisely purposive sampling was employed to select all Virtual/Systems Librarians of Nigerian universities since they are the only category of people who could better provide the required data for the study. This gives a total population of the entire one hundred and sixty (160) Nigerian universities and their virtual/systems librarians– as of 2018 –as the sample size for the study. An uncontrolled observation guide with it naturalness and completeness was used to conduct the online observation of the OPACs of the universities through a direct search via the university/library websites, while a 21-item questionnaire divided into three sections was designed to collect primary data from the virtual librarians on the availability of OPACs and adoption of cloud hosting in Nigerian university libraries. The questionnaire was designed and pre-tested in two (2) universities in Osun State (Redeemers' University and Osun State University), it was thereafter modified and validated, before being administered to the respondents. The questionnaire was then administered electronically via the email boxes of virtual/systems librarians of the three categories of universities in the country, namely: federal, state and private universities totaling one hundred and sixty (160) via Google form to conduct the survey. In a few particular instances, print copies of the questionnaire were traditionally administered to boost the response rate of the respondents, specifically for those universities that did not respond to the online form. A total of Ninety-five (95) respondents completed and returned the questionnaires resulting in a response rate of 59.38%.

Data Presentation and Analysis

Below is the presentation of the raw data and its simultaneous analysis with a view to arriving at conclusions

a. Assessment of Nigerian University Online Public Access Catalogs' Visibility

A two-month-long assessment was conducted by the researchers on the Internet between August and September 2018 to access OPAC of all Nigerian university libraries using search terms such as Nigerian OPAC, Nigerian university OPAC, Nigerian university catalog and Nigerian Web-PAC. Ten OPAC were discovered. After that, a direct search via the university/library websites was undertaken which yielded the data in tables below:

Table 1
Web/OPAC Visibility

Types of University	University Website				Library Website/Page				OPAC		
	AV	NAc	NA	S	AV	NAc	MR	NA	AV	NF	NA
Federal	38	2	-	1	23	1	1	16	7	3	31
State	40	1	4	-	17	2	-	26	-	5	40
Private	73	-	1	-	35	1	-	38	5	4	65
Total	151	3	5	1	75	4	1	80	12	12	136

Note: AV=Available, NAc=Not Accessible, NA=Not Available, S=Suspended, MR= Mis-Represented, NF=Not Functional

The table indicates that out of one hundred and sixty universities on the list of the National Universities Commission - an organ responsible for registration, licensing and regulation of university education system in Nigeria - one hundred and fifty-one (thirty-eight federal, forty states and seventy-three private) universities have accessible university websites. Three (two federal and one state) Universities have URL but which are inaccessible, while five (four for state and one for private) universities do not possess websites and one (federal) was on suspension at the time the observation was carried out.

Similarly, seventy-five universities (twenty-three for federal, seventeen for state and thirty-five for private) have websites/pages dedicated to their libraries. Four library websites/pages (one federal, two for state and one private) even though have icons represented on their main university sites, but they are not accessible. One (federal) has its library webpage captured under a wrong heading, therefore being misrepresented. However, eighty universities (sixteen federal, twenty-six for state and thirty-eight private) do not have a dedicated website/webpage for their various libraries.

Regarding visibility of the library OPAC, twelve libraries (seven for federal, none for the state and five for private) were visible and, functional and accessible. In a similar vein, twelve (3,5 and4) provided Uniform Resource Locator (URL) to their OPAC, but which are neither visible nor functional

Table 2
Functional OPACs

Functional		
	University	**OPAC Domain**
1	Ahmadu Bello University	http://catalog.abu.edu.ng/
2	Anchor University	http://library.aul.edu.ng/
3	Bowen University	http://www.libonline.bowenuniversity-edu.org:8000/index.html
4	Covenant University	http://clr.covenantuniversity.edu.ng/
5	Fed. University of Tech. Minna	http://library.futminna.edu.ng:8054/
6	Federal University, Dutsin-Ma	http://elibrary.fudutsinma.edu.ng/
7	Nile University	http://yordam.nileuniversity.edu.ng/
8	Redeemer's University	http://154.68.199.18/
9	University of Ilorin	http://opac.unilorin.edu.ng/
10	University of Jos	http://library.unijos.edu.ng/
11	University of Nigeria	http://nal.unn.edu.ng/
12	University of Port-Harcourt	http://41.220.65.107/

Table 3
Non-Functional OPAC Domain

	University	**OPAC Domain**
1	African University of Science & Technology	https://opac.aust.edu.ng/cgi-bin/koha/maintenance.pl
2	Bayero University	http://197.210.252.41:8000/
3	Benue State University	http://154.68.225.19:8000/
4	Fountain University	http://192.168.9.253:81/
5	Imo State University	http://172.16.1.30:83/
6	Kano University of Science & Technology	http://kustwudil.edu.ng/elibrary/opac.php
7	Ondo State University of Science & Technology	http://catalogue.osustech.internal/
8	Osun State University	http://opac.uniosun.edu.ng/
9	Rhema University	http://192.168.0.10:8001/cgi-bin/koha/opac-main.pl
10	Samuel Adegboyega University	https://koha.sau.edu.ng/
11	University of Lagos	http://librarydb.unilag.edu.ng/
12	Usmanu Danfodiyo University	http://opac.udusok.edu.ng/

Tables 2 and 3 above show the names and URL of the twelve OPACs that are functional and accessible at the time of the research. Also displayed are the names of twelve Universities that have OPAC hyperlinked from their websites or that of their library websites, but the OPAC is neither functional nor accessible. Each of these two variables represents 7.5% of the entire Nigerian universities

b. Hosting OPAC on Cloud

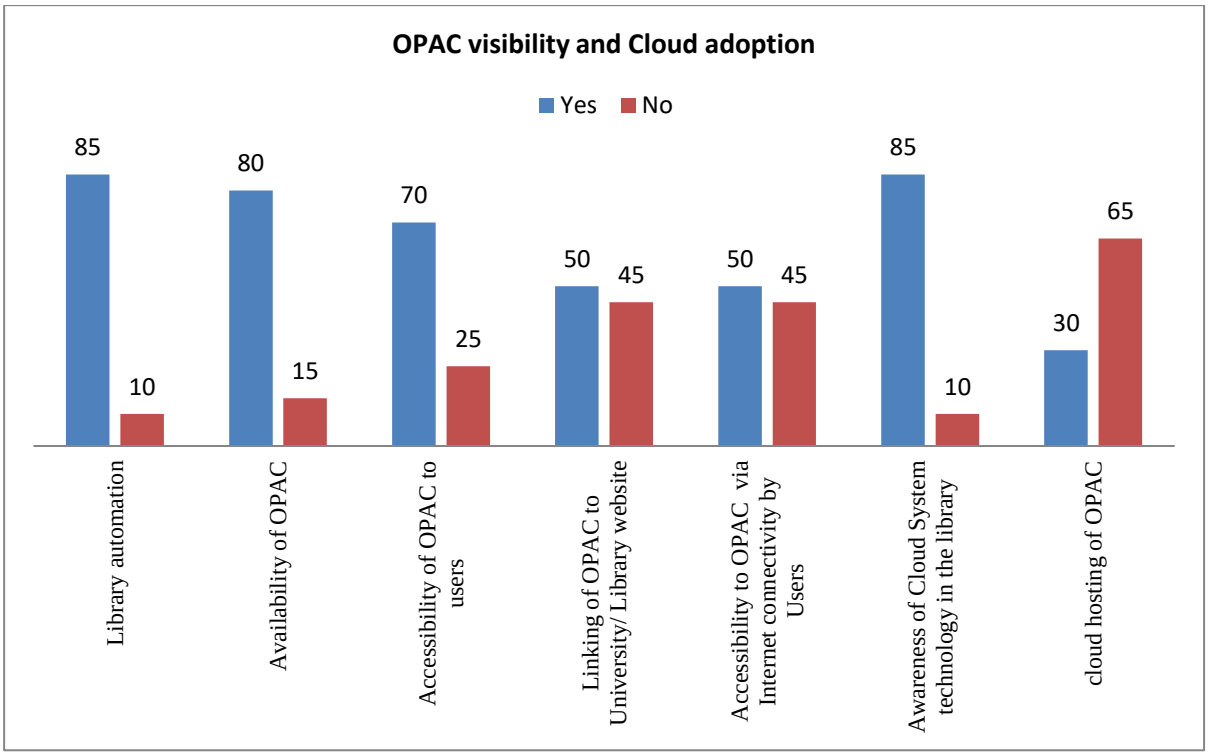

Figure 1: OPAC Visibility and Cloud adoption

The column above illustrates various issues around OPAC in the University System. Among the ninety-five respondents, eighty-five (89.47%) of them say their libraries are automated while ten (10.52%) said their libraries remain in the traditional manual mode. On library possession of OPAC, eighty (84.21%) of the respondents agreed that their libraries have OPAC. But a minority of fifteen (15.78%) said that they do not possess it. Regarding the accessibility of OPAC to library users, seventy respondents confirmed that their OPAC is accessible to patrons in their different libraries. Fifty (52.63%) respondents said that their OPAC is linked with the university/library website when forty-five (47.36%) disagreed.
Similarly, a total of fifty (52.63%) respondents affirmed that users of their libraries do not need internet facilities to access their OPAC, while on the other hand, forty-five (47.36%) claimed that Internet connectivity is a condition to gain access to their library OPAC. Affirmation of awareness of the Cloud System technology was endorsed by eighty-five (89.47%), and the remaining ten (10.52%) respondents lack knowledge of the evolving technology. Thirty (31.57%) respondents said that their libraries do employ cloud computing for hosting library OPAC. However, the majority numbering sixty-five (68.42%) responded that they do not deploy the technology for hosting of OPAC.

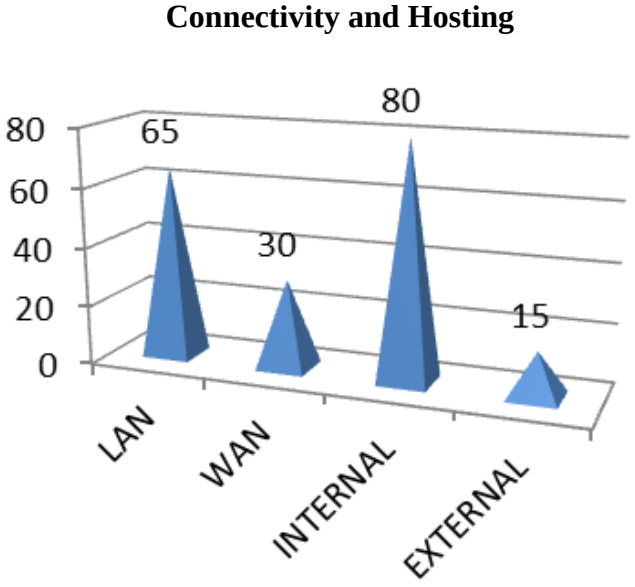

Figure 2: OPAC Connectivity and Hosting

This chart above represents the respondents' answers to queries on connectivity and hosting of OPAC in Nigerian university libraries. Out of the ninety-five respondents, sixty-five (68.42%) agreed that their library OPAC is connected via Local Area Network (LAN), but the remaining thirty (31.57%) respondents said that theirs were connected to Wide Area Network (WAN). In the same vein, eighty (84.21%) respondents claimed that their OPAC is hosted by operatives in-house, while the other fifteen (15.78%) respondents affirmed that the hosting of their OPAC was done by an external body outside the library.

c. Challenges Militating against Adoption of Cloud Computing for OPAC Hosting

A set of seven challenges deducted from the literature were painstakingly identified and presented to the respondents, these include lack of awareness on the part of the Systems Librarian, downtime in internet services provision, the subscription fee for hosting, the security of information in the database, envisaged loss of data especially when access to the cloud is denied due to non-renewal of subscription, anticipated loss of control over information placed in the cloud and vulnerability to hackers' attack when they strike. The chart underneath represents the responses of the respondents;

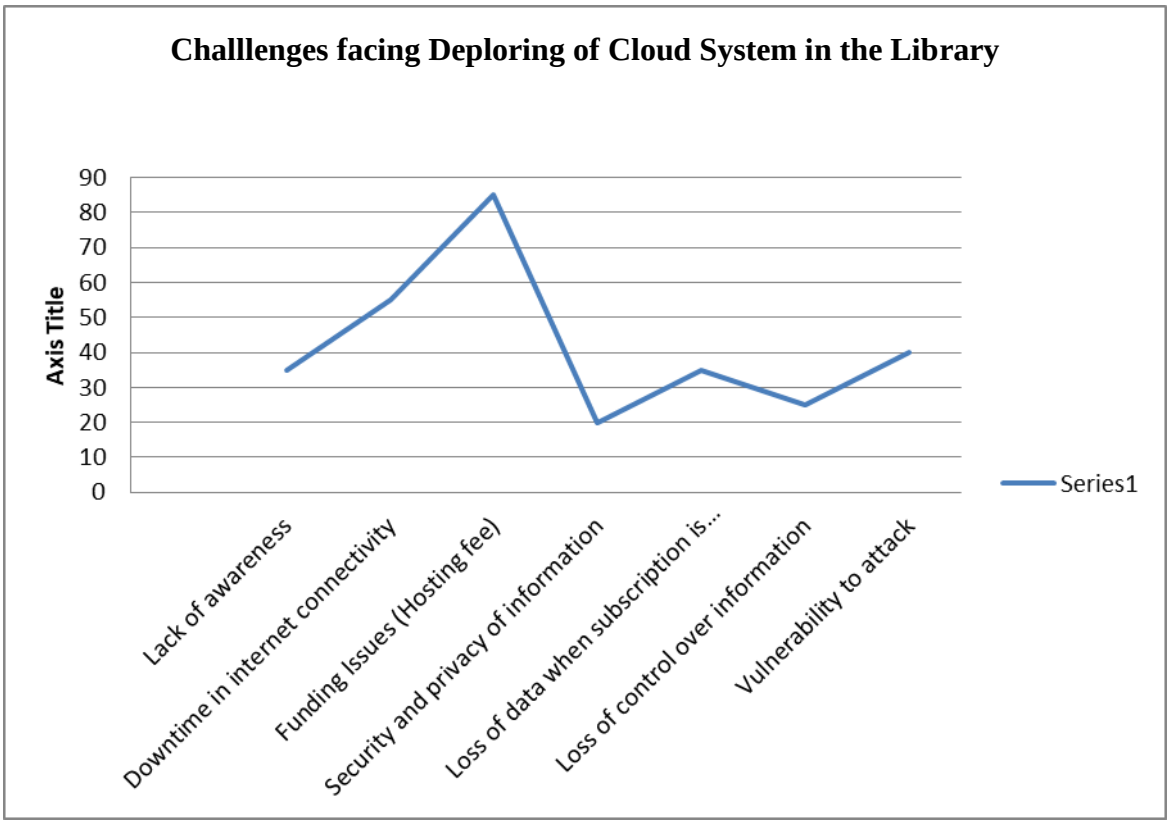

Figure 3: Challenges of Deploring Cloud System

In the chart above, respondents highlight the various obstacles impeding the smooth implementation of the deployment of Cloud Computing for hosting of OPAC in the Nigerian University Library System. Funding issues were primarily identified by respondents as a barrier with eighty-five (89.47%) tagging it. This was followed by a challenge of downtime in internet connectivity which was tagged by fifty-five (57.89%) of the respondents. A total of forty (42.10%) respondents highlighted vulnerability to attack as a reason for the low patronage of the cloud system in OPAC hosting. However, the dual issues of lack of awareness on the part of Nigerian academic librarians as well as the phobia for the expected loss of data especially when subscription (hosting fee) is not renewed were considered by thirty-five (36.84%) respondents each as challenges to the deployment of the cloud technology for OPAC hosting. Loss of control over information and security and privacy of information hosted on the cloud featured as the least concerns inhibiting the introduction of the technology into Nigerian university libraries with twenty-five (26.31%) and twenty (21.05%) respondents respectively.

Discussion

The study discovers that one hundred and fifty-one (151) universities have developed their institutional websites accessible to the general public. Even though there are three others with inaccessible websites, this is an indication of fair representation with regards to website hostage. Coming to dedicated library websites/pages for information presentation to patrons, approximately half (seventy-five) of those who deployed institutional websites have provision for library representation. In all, an infinitesimal quota of twelve – being 7.5% of the sampled population - libraries possess visible, functional and accessible OPACs; this does not suggest a low deployment of OPAC, but since the focus of the research is on visibility, there was no

provision to measure the use of OPAC beyond those practically accessed via the internet, the respondents confirm that majority of the university library (84.21%) have OPAC hosted in-house. This was further corroborated by a total of fifty (52.63%) respondents who affirmed that users of their libraries do not need internet facilities to access their OPAC, while on the other hand, forty-five (47.36%) claimed that Internet connectivity is a condition to gain access to their library OPAC. Invariably, the study has confirmed the findings of Anasi and Ali (2012), and Ofodu and Agim (2017) that the OPACs of Nigerian universities are not Web-based. This undoubtedly accounted for their non-availability on the radar of the Internet. Achieving effective and wide promotion of library resources and services advocated by Yi (2016) can be as good as a mirage without a visible OPAC widely accessible to users and the interested general public. The assertion of Kumar, Singh, Singh and Rana (2018) that libraries all over the world have accepted OPAC and Web OPAC as a replacement for traditional card catalog has been partially validated by this research (the study contradicted the second leg of that assertion – Web OPAC)

Most of the libraries (89.47%) were fully automated indicating a better appreciation and acceptance of automation in Nigerian university libraries. Even though a majority of 89.47% indicated their awareness of the concept of cloud system technology, but a lesser percentage of the majority (68.42%) agreed that they do not deploy the technology for OPAC. This work further confirmed the position of Aliyu, Abdulrahaman and Yusuf (2019) who stated the adoption of a cloud system in Nigerian universities is a growing concern. Various obstacles impeding the smooth implementation of deployment of Cloud Computing for hosting of OPAC in Nigerian University Library System were identified including; funding issues, the challenge of downtime in internet connectivity, vulnerability to attack as a reason for the low patronage of cloud system in OPAC hosting in that order of severity. This has demonstrated that the challenges confronting the deployment of cloud computing technology for the hostage of OPAC are not particularly different as they remained similar barriers identified by Ogbu and Lawal (2013), Hussaini, Vashistha, Garba and Jimah (2017) and Yuvaraj M. (2015) in their different findings.

Conclusion

This work has presented an evaluation and visibility studies of the Nigerian university OPAC vis-à-vis the utilization of the cloud computing technology to drive this visibility project. The study further confirms the earlier discovery suggesting a low level of visibility for the University OPAC of Nigeria. This situation is instead portrayed in its tragic sense going by the few universities that are found to be discoverable leaving the overwhelming majority of one hundred and thirty-six (85%) out of the calculation. Presently, the downtown in the internet connectivity which is a product of infrastructure gaps with the huge shortage in terrestrial ICT and its twin sister of the epileptic power supply is overwhelming challenges that universities might find difficult to surmount. To overcome this, the government of the federation may have to do more by providing cable (fiber) connections in universities by the latter source for commensurable bandwidth from their Internet Service Provider (ISP). The appropriate advocacy by stakeholders in the University System should not find it a herculean task to lobby the federal government going by its current drive to provide independent electricity supply to all federal universities. Furthermore, the opportunity for access to multiple library systems which was considered as one of the endearing attributes OPAC is hampered due to obstructed

visibility encountered by Nigerian academic librarians and their patrons who patronize OPAC for enhanced accessibility to library materials; the advantage that OPAC offers in projecting Nigerian titles become lost in the process. This has created a link between the low patronage and the apparent lack of visibility for the Nigerian University OPAC. The challenges identified for this level of adoption bothers fundamentally on funding and the technicality of the technology and its workings. Asides the former, the latter does not fall within the proper appreciation of the academic librarians who are end-users of the product. Thus, this calls for a synergy between the librarians and the ICT units for a better understanding of the challenges and their solutions. On the funding modality which is the primary source of fear against the application of this technology, it is recommended that leveraging on the existing consortium among Nigerian university libraries facilitated by NUC through Nigerian Research and Education Network (NgREN) will provide a benefit from the economy of scale which shared responsibilities in Cloud computing offers, especially when facilitation of internet services falls within the mandate of the body. A dedicated joint-account (pool) is a suggestion that the consortium can toy with to make the task easily surmountable. Similarly, bodies like IFLA and UNESCO can be approached for collaboration especially when viewed from the perspective of the potentially shared knowledge which visibility of Nigerian resources portends for the attainment of the mission of these global bodies. Finally, future research can focus the often-repeated security threats that data hosted on the cloud face to allay the fears of some and encourage more patronage of the cloud system for library operations and services

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