

AWARENESS AND USE OF CLOUD COMPUTING IN FEDERAL UNIVERSITY LIBRARIES IN NORTH CENTRAL, NIGERIA

Bala Ali Maina (CLN)

Department of Library and Information Science
Federal Polytechnic Nasarawa, Nigeria.

Umar Danladi Abubakar (CLN)

Polytechnic Library
Federal Poltechnic Nasarawa, Nigeria.

Dr. Deborah Mazah (CLN)

Department of Library and Information Science
Federal Polytechnic Nasarawa, Nigeria.

Abstract

The main purpose of the study was to investigate the awareness and use of cloud computing in federal university libraries in North-Central Nigeria. Five (5) research questions were raised to address the aims of the study which include the awareness of cloud computing, uses of clouding, problem encountered and strategies for enhancing awareness, use and adoption of cloud computing in federal university libraries in North-Central, Nigeria. The methodology adopted for the study was descriptive survey design. The population for the study was one hundred and fifty six (156), comprising of professional librarians from the six (6) federal university libraries in North-Central Nigeria. The entire population was used. There was no sampling because the sample size was manageable. The instrument for data collection was questionnaire. The validity was established for standardization of the research instruction that were used in the study by three experts. The instrument was administered personally by the researcher. Data collected were analyzed using frequency distribution and mean scores to answer the five (5) research questions. The findings of the study revealed among are: librarians are aware of cloud computing especially in the areas of its characteristics, cloud computing is moderately uses in acquisition. The study also revealed that lack of proper awareness of working and benefit of cloud computing are the major challenges of cloud computing and suggested that there should be adequate workshops and seminars to keep the librarians abreast in the use and adoption of cloud computing systems in the university.

Key words: Awareness, Use, Cloud computing

Introduction

The university libraries are libraries established to cater for the academic and research needs of the university. They serve the reading and research interests of undergraduates, lecturers, researchers, and other users. University libraries are big repositories of information and knowledge from all fields of learning to the academic community of students and staff that they serve. University libraries, which are academic libraries, provide support to members of an academic community, including students, researchers and lecturing staff.

Academic libraries are libraries established in universities, colleges of education, polytechnics and monotechnics. Their collection is tailored towards achievement of the institution goals of teaching, learning and research. They serve the students, lecturers, administrative members of the academic community as well as others. They are central to learning, research, and have always depended on relevant new technologies, which on the other hand are driven by emerging trends in education and research. The major function of university libraries is to provide resources to meet the needs of users. Their materials are diversified to support teaching and programmes that take place within them. Therefore, the University library has to build a strong collection of information resources in physical and digital formats to cater for the knowledge requirements of students, faculty members and research scholars of the institution. To remain relevant, libraries must fulfill some set of roles for serving their parent institutions.

Librarianship continues to hold a central place in higher education worldwide. It has remained the strength of the best traditions in academics worldwide. Nonetheless, significant progress will have to be made for Nigerian higher education libraries to be in the main stream

of the digital revolution. Akintunde (2006). This is because library services today require more global networking in delivering services.

Cloud computing as: a pool of abstracted, highly scalable, and managed computer infrastructure capable of hosting end- customer applications and billed by consumption. Forrester (2009). Cloud computing is a way of providing various services on virtual machines allocated on top of a large physical machine pool which resides in the cloud. Cloud computing comes into focus only when we think about what IT has always wanted a way to increase capacity or add different capabilities to the current setting on the fly without investing in new infrastructure, training new personnel or licensing new software. Here 'on the fly' and 'without investing or training' becomes the keywords in the current situation. The following definition of cloud computing has been developed by the U.S. National Institute of Standards and Technology (NIST): Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

With cloud computing we have come a full circle. We come back to the centralized computing infrastructure. But this time it is something which can easily be accessed via the internet and something over which we have all the control. Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It

has become one of the buzz words of the industry. The core concept of cloud computing is, quite simply, that the vast computing resources that we need will reside somewhere out there in the cloud of computers and we'll connect to them and use them as and when needed.

With the advent of this technology, the cost of computation, application, hosting, content storage and delivery is reduced significantly. Cloud computing is a practical approach to experience direct cost benefits and it has the potential to transform a data center from a capital-intensive set up to a variable priced environment. The idea of cloud computing is based on a very fundamental principal of reusability of IT capabilities'. The difference that cloud computing brings compared to traditional concepts of "grid computing", "distributed computing", "utility computing", or "autonomic computing" is to broaden horizons across organizational boundaries.

Cloud Computing is a completely new IT technology and it is known as the third revolution after PC and Internet in IT. To be more specific, cloud computing is the improvement of distributed computing, parallel computing, and grid computing, and distributed databases. The basic principle of cloud computing is making tasks distributed in large numbers of distributed computers but not in local computers or remote servers. In other words, by collecting large quantities of information and resources stored in personal computers, mobile phones and other equipment, Cloud computing is capable of integrating them and putting them on the public cloud for serving users.

Statement of the problem

Libraries need to use and adopt cloud computing. It makes them not to be behind as technologies advance. The use of cloud computing is beneficial because it reduces cost, saves

time, enhances the learning environment, leads to collaborations and facilitates retrieval of information. This situation raises questions concerning the awareness, use and adoption of cloud computing. Such questions include: Are the library professionals aware of the concept of cloud computing? Are they capable of using different applications in cloud computing in libraries? Are any particular clouds computing applications are adopted used by particular university libraries or all the university libraries in North Central Nigeria?

Studies and observation have shown that many university libraries in Nigeria are finding it difficult to meet the information needs of their users; a number of challenges have contributed to this ugly trend (Aguolu and Aguolu 2002). These include traditional and analogical way of their operation and services, the way they acquire process, organize, disseminate, retrieve and store information.

From the review of available literature studies have been carrying out in such countries India and South Africa on adoption and use of cloud computing in provision of library services. It will appear that Nigeria academic libraries are yet to explore the potentials offered by the cloud computing environment. It also appears that empirical studies in this area are negligible. It seems also that the awareness, use and adoption of cloud computing in federal university libraries in North-central will be novel area of investigation. This is the motivation for the study.

Research Questions

The following research questions were formulated to guide the study.

1. What is the level in awareness of cloud computing among libraries in federal university Libraries in North Central, Nigeria?
2. What uses are made of cloud computing in university libraries?
3. What is the extent of use of cloud computing by federal university libraries in North Central, Nigeria?
4. What constitute challenges to awareness, use and adoption cloud computing in federal university libraries in North Central, Nigeria?
5. What are the strategies for enhancing the awareness, use and adoption of cloud computing in federal university libraries in North Central, Nigeria?

Literature Review

The concept of 'awareness' has been used in numerous ways in the human computer interaction (HCI) and computer supported cooperative work (CSCW) literature. Schmidt (2002) argues that 'awareness' is being used in increasingly contradictory ways. In fact, it is hardly a concept any longer. Reflection on the meaning of 'awareness' explains this; awareness is almost a simile for consciousness – its meaning is derived from the object of the awareness.

Different awareness phrases; they classify these into four types of awareness: workplace awareness, which is knowledge of tasks within the virtual environment, availability awareness, which relates to the availability of people and objects, group awareness, which promotes the feeling of belonging to a group, and contextual awareness, which includes physical, social and mental context Christiansen and Maglaughlin (2003). In these definitions, awareness is both a perception of the users of a system, and an aspect of a system that

facilitates that perception. Awareness here is not used in the sense of having heard of, as in, 'I am aware of President Bush', nor, in the sense of thinking about someone, but in the sense of experiencing what is believed to be an external perception, whether synchronous or asynchronous.

Library and information centres are constantly in search of low-cost and best solutions that may enable them to serve the user needs efficiently and effectively. Ironically, with the involvement with IT the commitments as well as services have been miserably infested. Under such conditions, cloud computing is the saviour of all the ebbs of the information technology. Cloud computing is a mega change that has robbed IT of its traditional obligations and empowered the end users with on demand utility computing. Cloud-based services are set to transform the way libraries work, unleashing librarians from the admin burden to focus on services for students & researchers JISC (2011). Cloud computing has become an attractive option for organizations, like libraries, that would prefer to concentrate more of their focus and funds on their core mission instead of on IT issues(Wale, 2011).

However, implication of cloud computing in libraries has been an unresolved area of debate and concern in library profession. Moving from ground to the cloud is surrounded with ambivalence that whether cloud computing offers the best solution to serve the user needs or not. There has been abrupt change in the approaches of library patrons to information accessibility and delivery that have actively moved into the virtual environment. Smart phones, Mobile phones, Tablets and laptops are everywhere now. Libraries as such need to deliver resources and services in the virtual environment preferred by students, researchers, staff and faculty members or they risk alienating users. To keep pace with time libraries need to switch

over to cloud and deliver content, tools and services accessible to mobile users via mobile devices. Further, there is a need to “understand better why users prefer internet tools and services such as web search engine, e-mail, blogs, and RSS feeds despite their respect for and trust in the library’s resources” Sadeh (2007) in redesigning the services.

Although, the development of cloud based libraries is going to take a long time it is inevitable to look at various opportunities on offer from cloud computing that necessitates its adoption. Luo (2013) argues that “shifting library core applications to cloud-based services will reduce or eliminate most or the entire local technical needs in managing server hardware and operating systems that underlie the applications”. Moreover, according to Wale (2011) “cloud computing brings along economy of scale and will help to make overall prices far more affordable for computing, storage, networking, preservation, and overall administration” Also implementation of “Cloud computing can enable more energy-efficient use of computing power, especially when the users’ predominant computing tasks are of low intensity or arise infrequently” Baliga et al.(2010).

Recent searching on Google trends has showed maximum interest of cloud computing in India. Madhusudhan and Nagabhushanam(2012) also feel that “Indian university libraries have realized the paradigm shift in library services and they are providing better web-based library services to their current techno savvy users”. Most importantly “cloud computing enables new streamlined workflows for cooperation and community building among libraries” Goldner, (2011). According to Sultan (2010) Cloud computing can provide colleges and universities with a means to upgrade software and IT hardware attracting students and keeping pace with digital technological developments. On the other hand, Scale (2010) puts

forth his view that “Cloud computing is currently enabling librarians to shift from the paradigm of ownership and maintenance of resources towards the provision of access to information maintained and controlled by others”. There is a general misconception that moving the library into cloud will eradicate the need of library IT staff as all works will be done by cloud service provider. Although cloud computing involves more responsibilities and obligations of the service provider yet, “cloud based service is not entirely plug and play and the client library need worry only about such things as local bandwidth, hardware client (PCs) and software configuration” Prince, (2012). According to Sorensen and Glassman (2011) “Cloud-based applications offer libraries new ways to present information or offer services that were previously unaffordable or unavailable”. Patel et al.(2012) have enlisted four core areas of cloud computing solutions in the libraries: technology, data hosting archives, information and community.

Simultaneously, various scholars have argued that cloud computing was already in practice before the concept gained momentum and there are ample possibilities in the future. For instance, Hoy (2012) asserts that many library patrons are already using cloud products such as Gmail, Google Docs and bibliographic management tools for their daily needs. He further says that number of applications available in the cloud has increased substantially in recent years. On the other hand, Cohn et al. (2002) opines that libraries use database vendors or integrated library system providers who provide external servers to host library software and data in the cloud. Romero (2012) argues that “in the field of library automation there are several commercial suppliers already offering various adaptations of their products which make the use of the cloud possible to a lesser or greater extent”. According to Prince(2011) some of the “cloud-based options for libraries include IaaS or PaaS-hosted ILS systems in

which libraries buy their ILS software from one vendor and host it on another vendor's servers". Major ILS vendors exclusively having SaaS deployment options for libraries are: ExLibris, VTLIS and CyberTools.

Commenting on the future prospects of cloud based library services; Wale (2011) argues that "Discovery tools can be embedded in commonly used applications such as course management systems and institutional portals, enabling libraries to meet the needs of users wherever they are". According to Luo (2013) virtual reference services and research guides can be provided in libraries through software such as LibChat, QuestionPoint and LibGuides which are all hosted on the cloud. Further, there are various cloud based tools for reference service needs of the libraries such as "cloud- based video services" (e.g. YouTube, TeacherTube), "information collection services" (e.g. Google forms) and "file sharing services" (e.g. Dropbox). The revolutionary development to cloud based library services is WorldCat Local where "OCLC along with Google are exchanging data in the cloud to facilitate the discovery of library collections through Google search services in a single interface" Jordan (2010). However, the biggest impediment of adoption of cloud computing "lack of functionality of traditional counterparts" Marston et al. (2011) in cloud computing. Also, "Librarians in many developing world libraries are disadvantaged encountering connectivity challenges because funding cloud computing platforms or enhancing bandwidth are not always priorities in these regions as there are more immediately urgent problems for funders to deal with such as hunger" (Mavodza 2012). In order to develop a cloud based library there is a need of librarians` training and practice in order to address the issues of cloud in reality.

Research Method

Descriptive survey design is adopted for this study. The area of the study is North-Central Nigeria. North-Central, Nigeria is located in the middle belt of Nigeria. The population of the study is 156 professional librarians in the seven universities in North-Central Nigeria. The entire population of 156 would be used for the study. For the fact that this number is manageable, there would be no need for sampling. The instrument for this study will be a researcher-developed questionnaire. To ensure that the questionnaire to be used for this study was valid, the researcher gave copies of the draft questionnaire to three other experts in the researcher's field of study (Library and Information Science) for validation.

Results and Findings

Research Question 1: What is the level of awareness of cloud computing among libraries in federal university library in North Central, Nigeria?

Table 1: Mean ratings of respondents on extent of awareness of cloud computing in Federal university Libraries

	Mean							Overall		D
	UA	FUAM	FUTM	FUL	UJ	UIL	FULL	Mean	SD	
Cloud computing Applications	2.70	2.79	2.66	2.76	2.67	2.82	2.85	2.75	.65	HA
Simplify way to create, share and collaborate	2.77	3.00	2.72	2.92	2.55	2.83	3.20	2.83	.89	HA
An online news and social networking service where users post and interact with messages	3.54	3.09	2.94	2.67	3.09	2.94	3.20	3.07	.95	HA
Instant messaging application that provide online text messages and video chat services	2.69	2.73	3.22	2.67	2.58	2.94	2.90	2.79	.90	HA
Simple way to capture and share the world's moment	2.38	2.78	2.78	2.00	2.33	2.94	2.70	2.60	.92	HA
Application that makes it easier to comment to the people and things that matter your professional world	3.23	2.58	3.00	2.33	2.70	3.11	2.10	2.72	.97	HA
Online Computer Library Catalogue (OCLC)	2.62	2.67	3.11	2.17	2.85	2.56	3.30	2.75	.97	HA
Library of Congress (LC)	2.12	2.71	2.00	2.67	2.88	2.00	2.20	2.30	.99	LA
Provision of library automation technology to academic and research libraries	2.31	2.80	2.37	2.20	3.15	2.43	2.40	2.48	.87	LA
Reading subscription that is available anytime and on any device	3.23	2.98	1.94	2.08	2.27	1.94	2.30	2.48	.45	LA
Freely accessible web search engine that indexes the full text meta data of scholarly literature	2.38	2.73	2.17	3.75	2.82	2.78	2.90	2.75	.96	HA
World's most comprehensive data of information about library collection	2.85	2.38	2.78	2.75	2.88	3.06	2.70	2.71	.44	HA
Social networking site for scientist and researchers to share papers	1.92	2.71	2.50	3.08	2.30	2.72	3.10	2.58	.97	HA
Free reference manager and academic social network	2.77	2.89	2.06	3.17	2.61	2.83	2.80	2.72	.98	HA
Free software library automation package.	2.23	2.96	2.33	3.42	2.36	3.06	3.10	2.75	.93	HA

Characteristics of cloud computing	2.62	2.73	2.85	2.69	2.75	2.82	2.38	2.72	.76	HA
On demand capabilities	2.62	2.84	2.22	2.67	2.67	2.39	2.20	2.60	.99	HA
Broad network access	2.46	2.60	3.06	3.00	2.73	2.78	2.30	2.70	.55	HA
Resources pooling	2.92	2.89	3.17	2.67	3.06	3.22	2.80	2.98	.98	HA
Measured services	2.46	2.60	2.94	2.42	2.52	2.89	2.20	2.60	.90	HA
Potentials of cloud computing	2.85	3.10	3.27	2.95	3.03	3.02	3.32	3.08	.74	HA
Organization of knowledge	2.77	3.18	3.11	2.67	3.06	3.06	3.50	3.09	.86	HA
Storage and preservation	2.77	2.93	3.39	3.00	2.94	2.94	3.00	2.99	.80	HA
Acquisition of library materials	2.92	3.07	3.33	2.92	3.03	3.06	3.51	3.11	.74	HA
Dissemination of knowledge	3.00	3.18	3.28	2.92	3.06	3.00	2.90	3.09	.71	HA
Library administration and maintenance	2.77	3.13	3.22	3.25	3.06	3.06	3.30	3.11	.72	HA
Limitation of Cloud Computing	2.14	2.08	2.25	1.96	2.17	2.29	2.20	2.14	.66	LA
Lack of confidentiality/privacy putting the users at the legal risk	2.27	2.20	2.28	2.17	2.25	2.19	2.10	2.20	.81	HA
Unauthorized access to a computer or online account belonging to a person or organization.	2.00	1.96	2.22	1.75	2.09	2.39	2.30	2.08	.53	LA
Cluster Mean	2.58	2.68	2.76	2.59	2.66	2.74	2.69	2.67	.93	HA

Table 1 above shows the mean rating of the respondents on extent of awareness of cloud computing. Using the principal of real limit of numbers, the results of the data analysis divulge that the respondents are highly aware of cloud computing applications (mean=2.75); characteristics of cloud computing (mean=2.72) otentials of cloud computing (mean=3.08), while less awareness of limitation of cloud computing (mean 2.14).

Furthermore, the table revealed that cloud computing is applied most on an online news and social networking services where users post and interact with messages (mean=3.07); the most characteristics of cloud computing is seems as resources pooling as resources pooling (mean= 2.80); had the most potential as acquisition of library materials (mean=3.51) and had the greatest limitation of lack of confidentiality/privacy putting the users at the legal risk (Mean=2.20).

Research Question 2: What uses are made of cloud computing in university libraries?

Table 2: Mean ratings of respondents on the uses made of cloud computing in your library

	Mean							Overall		D
	UA	FUAM	FUTM	FUL	UJ	UIL	FULL	Mean	SD	MU
Acquisition	2.46	2.73	2.78	2.32	2.55	2.80	2.38	2.63	.65	MU
Acquisition of library resources	2.92	2.91	2.83	2.67	2.88	3.17	2.60	2.89	.85	MU
Checking of publishers list	2.38	2.96	3.33	2.67	2.70	3.06	2.60	2.86	.82	MU
Selection of library resources	2.08	2.71	2.50	2.00	2.15	2.78	2.70	2.46	1.13	LU
Ordering of library resources	2.46	2.33	2.44	1.92	2.48	2.17	1.60	2.29	1.12	LU
Organization of knowledge	2.38	2.65	2.84	2.64	2.57	2.52	2.57	2.61	.56	MU
Indexing and abstracting of materials	2.15	2.40	2.89	2.17	2.33	2.06	1.60	2.31	1.15	LU
Bibliographic Compilation	2.69	2.96	3.06	3.08	3.12	3.11	3.00	3.01	1.09	MU
Cataloguing and classification of materials	2.31	2.60	2.56	2.67	2.27	2.39	3.10	2.51	1.09	MU
Storage and reservation	2.64	2.50	2.83	2.81	2.56	2.63	2.27	2.59	.54	MU
Storage of information	2.38	2.31	2.83	3.00	2.21	2.11	2.20	2.38	.78	LU
Archiving of institutional repository	2.77	2.33	2.72	2.92	2.39	2.94	2.10	2.54	.91	MU
Back up of information and resources	2.77	2.87	2.94	2.50	3.09	2.83	2.50	2.86	.94	MU
Dissemination of Knowledge	2.30	2.46	2.68	2.51	2.53	2.43	2.17	2.47	.54	LU
Giving current awareness services	2.92	2.51	2.83	3.25	2.91	3.00	2.20	2.77	.94	MU
File sharing services	2.15	2.49	3.11	3.17	2.88	2.39	2.20	2.64	.94	MU
Provision of reference services to library users	2.31	2.24	3.28	3.08	3.42	3.11	2.80	2.85	.48	MU
Selective dissemination of information	2.38	2.24	1.33	1.83	1.88	2.11	2.30	2.02	.51	LU
Giving orientation service to new users	2.23	2.44	2.22	1.83	2.15	1.50	1.40	2.10	.65	LU
Communicating to library user/ correspondence with library user	1.54	2.24	2.78	2.50	2.09	2.22	1.20	2.16	.99	LU
Retrieval of Information from resources	1.92	2.22	2.50	1.92	2.12	2.06	2.10	2.15	.99	LU
Marketing of library resources and services	2.62	2.89	2.94	3.00	2.61	3.06	3.10	2.85	.84	MU
Chatting with colleagues and users	2.62	2.87	3.17	2.00	2.67	2.39	2.20	2.66	.50	MU
Library Administration and Maintenance	2.46	2.44	2.63	2.61	2.56	2.67	2.17	2.55	.54	MU
Collaborating with	2.46	2.60	3.00	2.58	2.58	2.78	2.30	2.63	.62	MU

colleagues											
Emailing and messaging of information	2.46	2.11	2.67	2.42	2.55	2.33	2.00	2.35	.76	MU	
Subscription of bandwidth	2.46	2.60	2.22	2.83	2.55	2.89	2.20	2.68	.90	MU	
Cluster Mean	2.41	2.54	2.78	2.55	2.55	2.57	2.27	2.54	.99	MU	

Table 2 above shows the mean rating of the respondents on extent of use of cloud computing.

Using the principal of real limit of numbers, the results of the data analysis divulge that the respondents moderately uses of acquisition (mean=2.63); organization of knowledge (mean=2.61) storage and reservation (mean=2.59.); dissemination of knowledge (mean=2.47), library administration and maintenance (mean=2.55).

Furthermore, the table revealed that cloud computing is are mostly utilized in acquisition of library resources (mean=2.89); mostly utilized in storage and reservation through back up of information and resources (mean= 2.86); mostly uses in dissemination of knowledge through provision of reference services to library users (mean=2.85) and mostly used in library administration and maintenance, through subscription of bandwidth (Mean=2.68).

Research Question 3: What is the extent of uses of cloud computing by federal university libraries in North Central, Nigeria?

Table 3: Mean ratings of respondents on Extent of use of cloud computing

	UA	FUAM	FUTM	FUL	UJ	UIL	FULL	Mean	Overall		R	D
								Mean	SD			
Application that makes it easier to comment to the people and things that matter your professional world	2.77	3.16	3.44	3.17	3.12	3.06	3.30	3.15	.71	1 st	HE	
Simplify way to create, share and collaborate	2.77	3.18	3.17	3.00	3.12	3.06	3.70	3.13	.76	2 nd	HE	
Instant messaging application that provide online text messages and video chat services	2.92	3.07	3.28	2.83	3.12	3.06	3.70	3.11	.71	3 rd	HE	
Simple way to capture and share the world's moment	3.00	3.18	3.17	2.83	3.09	3.00	2.90	3.07	.68	4 th	HE	
An online news and social networking service where users post and interact with messages	2.77	2.96	3.17	2.75	3.00	2.94	3.00	2.96	.79	5 th	HE	
Provision of library automation	2.92	2.93	3.17	2.75	2.97	3.17	2.60	2.96	.82	6 th	HE	

technology to academic and research libraries												
Reading subscription that is available anytime and on any device	2.38	2.98	2.50	2.92	2.70	3.06	2.60	2.79	.85	7 th	HE	
Freely accessible web search engine that indexes the full text meta data of scholarly literature	2.08	2.80	3.22	2.92	2.39	2.94	2.70	2.72	1.06	8 th	HE	
World's most comprehensive data of information about library collection	2.31	2.40	3.78	3.08	2.36	2.56	2.70	2.64	1.16	9 th	HE	
Social networking site for scientist and researchers to share papers	2.15	2.31	3.00	3.58	2.45	2.89	3.10	2.64	1.18	10 th	HE	
Free reference manager and academic social network	2.69	2.38	2.44	3.42	2.85	2.44	2.70	2.63	1.23	11 th	HE	
Free software library automation package.	2.31	2.62	3.00	2.17	2.33	2.39	3.10	2.54	1.09	12 th	HE	
Library of Congress (LC)	2.33	2.11	2.31	2.50	2.10	2.33	2.40	2.41	.87	13 th	LE	
Online Computer Library Catalogue (OCLC)	2.77	2.20	2.44	2.83	2.35	2.89	2.00	2.34	.83	14 th	LE	
Cluster mean	2.62	2.86	3.03	2.91	2.81	2.91	3.00	2.87	.91		HE	

Table 3 above shows the mean rating of the respondents on extent of use of cloud computing in federal university libraries. Using the principal of real limit of numbers,, the results of the data analysis reveal that federal university libraries to a high uses application that makes it easier to comment to the people and things that matter your professional world (Mean=3.15); simplify way to create, share and collaborate (Mean=3.13); instant messaging application that provide online text messages and video chat services (Mean=3.11); simple way to capture and share the world's moment (Mean=3.07); an online news and social networking service where users post and interact with messages (Mean=2.96); provision of library automation technology to academic and research libraries (Mean=2.96); reading subscription that is available anytime and on any device (Mean=2.79); freely accessible web search engine that indexes the full text meta data of scholarly literature (Mean=2.72); world's most comprehensive data of information about library collection (Mean=2.64); social networking site for scientist and researchers to share papers (Mean=2.64); free reference manager and academic social network (Mean=2.63); free software library automation package

(Mean=2.54).

Furthermore the overall mean indication from the table showed that application that makes it easier to comment to the people and things that matter your professional world (mean = 3.13) is ranked highest, while Online Computer Library Catalogue (OCLC) (Mean = 2.34) is ranked lowest as extent of use of cloud computing in federal university libraries.

Research Question 5: What constitute challenges to awareness, use and adoption cloud computing in federal university libraries in North Central, Nigeria?

Table 5: Mean ratings of respondents on Challenges to Awareness, Use and Adoption Cloud Computing

	UA	FUAM	FUTM	FUL	UJ	UIL	FULL	Overall	SD	R	D
Lack of proper awareness of working and benefits of cloud computing	3.46	3.24	3.44	3.17	3.27	3.33	3.40	3.31	.70	1 st	A
No manufacturing or assembly plants for cloud equipments	3.39	3.27	3.39	3.08	3.21	3.28	3.40	3.28	.74	2 nd	A
Lack of stability of power supply has been identified factor that can cause both loss of data inability of access cloud services.	3.36	3.22	3.22	2.67	3.21	3.22	3.60	3.22	.65	3 rd	A
Limited trained and qualified engineers that understand how to install, manage and support cloud infrastructures	3.15	3.11	3.44	2.75	3.03	3.28	3.60	3.16	.79	4 th	A
Unauthorized access to a computer or online account belonging to a person or organization.	2.62	3.09	3.06	2.58	2.79	3.22	2.40	2.91	.54	5 th	A
High cost of internet access, even if bandwidth is not currently at premium, that affects the provision of the services.	1.85	2.84	3.11	2.92	2.79	2.67	2.60	2.75	.90	6 th	A
Lack of confidentiality/privacy putting the users at the legal risk	3.00	2.71	2.61	3.00	2.67	2.39	3.10	2.72	.84	7 th	A
Lack of domestic network	2.23	2.64	3.00	2.92	2.52	2.94	2.50	2.67	.74	8 th	A

infrastructure is the major problem inhibiting the growth of broadband												
Multiple taxation on the part of federal, state, and local governments	2.23	2.56	2.61	3.00	2.27	2.50	2.10	2.47	.71	9 th	D	
Cluster Mean	2.83	2.97	3.10	2.90	2.86	2.98	2.97	2.94	.86	10 th	A	

Table 5 above shows the mean ratings of the respondents on the challenges to awareness, use and adoption cloud computing in institution in federal university. Using the criterion mean of 2.50, the results of the data analysis show that the respondents agreed that items 1-9, which includes lack of proper awareness of working and benefits of cloud computing (mean=3.31); no manufacturing or assembly plants for cloud equipments (mean=3.28); lack of stability of power supply has been identified factor that can cause both loss of data inability of access cloud services (mean=3.22); limited trained and qualified engineers that understand how to install, manage and support cloud infrastructures (mean=3.16); unauthorized access to a computer or online account belonging to a person or organization (mean=2.91); high cost of internet access, even if bandwidth is not currently at premium, that affects the provision of the services (mean=2.75); lack of confidentiality/privacy putting the users at the legal risk (mean=2.72); Lack of domestic network infrastructure is the major problem inhibiting the growth of broadband (mean=2.67) were challenges to awareness, use and adoption cloud computing in institution in federal institution, since their means score is above (2.50).

Also, the overall mean showed lack of proper awareness of working and benefits of cloud computing (mean = 3.31) is ranked highest, while multiple taxation on the part of federal, state, and local governments (Mean = 2.47) is ranked lowest as challenges to awareness, use and adoption cloud computing in federal libraries.

Research Question 6: What are the strategies for enhancing the awareness, use and adoption

of cloud computing in federal university libraries in North Central, Nigeria?

Table 6: Mean ratings of respondents on strategies for enhancing cloud computing awareness, use and adoption

	UA	FUAM	FUTM	FUL	UJ	UIL	Mean FULL	Overall		R	D
								Overall	SD		
Government should ensure the development of basic infrastructure such as stable electricity supply	3.31	3.20	3.28	3.33	3.03	3.33	3.50	3.23	.68	1 st	A
Promoting the establishment of more inclusive and robust network infrastructure will bring about increase in the use of broadband services	3.38	3.09	2.56	3.50	2.94	3.33	2.80	3.06	.61	2 nd	A
Regulations for enforcement of data protection laws and all other intellectual property right protection regime should be adequately enforced	3.00	2.73	2.89	3.33	2.97	3.33	3.00	2.97	.87	3 rd	A
The establishment of manufacturing plants for ICT equipment that used in cloud computing	3.15	3.02	2.78	2.58	2.73	2.89	2.60	2.86	.92	4 th	A
Universities can be encouraged to establish cloud network laboratory in their institutions	2.38	2.96	2.67	3.25	2.79	2.39	3.60	2.83	.60	5 th	A
Tax relief to private sector investors to encourage them	2.15	2.80	2.50	2.67	2.97	2.44	3.50	2.74	.96	6 th	A
More focus research should be geared towards improving cloud computing infrastructure and services	2.38	2.87	2.17	3.25	2.67	3.11	2.50	2.73	.92	7 th	A
There should be increased advocacy on the use and benefits of cloud computing in university libraries.	2.92	2.73	2.17	2.25	2.64	2.83	2.80	2.64	.93	8 th	A
Cluster Mean	2.84	2.93	2.63	3.02	2.84	2.96	3.04	2.88	.91		

Table 6 above shows the mean rating of the respondents on strategies for enhancing cloud computing awareness, use and adoption. Using the principal of real limit of numbers, the results of the data analysis disclose that the respondents deem it as appropriate strategies for enhancing cloud computing awareness, use and adoption for government to ensure the development of basic infrastructure such as stable electricity supply (mean=3.23); promoting the establishment of more inclusive and robust network infrastructure will bring about increase in the use of broadband services(mean=3.06); regulations for enforcement of data protection laws and all other intellectual property right protection regime should be adequately enforced (mean=2.97); the establishment of manufacturing plants for ICT equipment that used in cloud computing (mean=2.86); universities can be encouraged to

establish cloud network laboratory in their institutions (mean=2.83); tax relief to private sector investors to encourage them (mean=2.74); more focus research should be geared towards improving cloud computing infrastructure and services (mean=2.73) and there should be increased advocacy on the use and benefits of cloud computing in university libraries (mean=2.64)

Furthermore the overall mean indication from the table showed the following government should ensure the development of basic infrastructure such as stable electricity supply (mean = 3.23) is ranked highest, while there should be increased advocacy on the use and benefits of cloud computing in university libraries (Mean = 2.64) is ranked lowest as strategies for enhancing cloud computing awareness, use and adoption.

Recommendations

Based on the findings of this study, the following recommendations are made to the relevant authorities to improve the use of cloud computing systems in universities libraries in north central, Nigeria:

1. There should be adequate workshops and seminars to keep the librarians abreast in the use of cloud computing systems in the university.
2. The library administration should encourage librarians to always work with cloud computing systems by constantly giving them assignments that require use of the currently available electronic information resources in their libraries. The resultant effect of this is frequent use of library e-resources for learning and research; and also for easy management.
3. The academic librarians should be more involved in assisting users to acquire the skills for information retrieval from cloud computing by guiding them during the search

process. Also emphasis should be on different search strategies that can enhance appropriate retrieval of information for use of researchers.

4. University librarians should organise in-house training and short term courses, for library staff, on the use of effective use of cloud computing system so as to efficiently assist researchers or users generally to access and retrieve information.
5. The university authority should make adequate and updated provision for the full migration of library information resources from its old preserve forms to conform to trend of modern standard which is cloud computing oriented approach.
6. The university authority and library management should commit more funds for training staff either through consultation of experts from outside or within the organization, or staff being sent on conferences and foreign studies.
7. Organizations, corporate bodies, alumni, individuals and government should be encouraged to intervene and support university libraries with funds to provide and sustain the use, and management of cloud computing systems.
8. The university authority and library management should ensure that there is provision of regular supply of electricity in order to make the use of cloud computing efficient for uploading and downloading of information materials.

Conclusion

Based on the findings of this study, some conclusions were drawn as follows:

It is evident from the study that cloud computing system are important and vital research tools, for use of librarians, other staff of the library and patrons (users) in universities. Also it is noteworthy that librarians are aware of cloud computing system and its benefits to the library services. The use and adoption of cloud based system in the university

libraries is necessary for accurate and fast retrieval of information but due to lack of skills, technical know-how, poor power supply etc, the awareness and use of cloud based system in the university libraries is not fully explored. Therefore, for optimal awareness and use of cloud computing in university libraries, it is necessary for university management and university librarians to settle some of these issues hindering the effective usage of cloud computing as this will equip librarians and the users with skills and information needed in the society. In addition, the use and adoption of cloud computing will go a long way to enhance the effective delivery of library services. The survival of library services in university libraries is anchored on the proper creation, storage, and retrieval of information materials, and this can be achieved efficiently with the adoption of cloud computing.

It was further noted that cloud computing in university libraries in north-central Nigeria are not efficiently implemented; in essence, it signifies that the extent to which this system is operational or utilized is not at the highest level of efficiency and effectiveness. This may not be far from the fact that it is relatively new in these university libraries and also because of the technological disparities in less developed countries and advanced economies, While there are problems confronting these institutions in their efforts in usage, adoption and management of cloud based system; and these problems are : lack of confidentiality/privacy putting the users at the legal risk, unauthorized access to a computer or online account belonging to a person or organization, lack of domestic network infrastructure, high cost of internet access, even if bandwidth is not currently at premium, that affects the provision of the services. Multiple taxation on the part of federal, state, and local governments, no manufacturing or assembly plants for cloud equipments, limited trained and qualified engineers that understand how to install, manage and support cloud infrastructures, lack of proper awareness of working and

benefits of cloud computing, lack of stability of power supply has been identified factor that can cause both loss of data inability of access to cloud services. However, the solutions to these problems have been suggested, and if they are implemented, it will go a long way in improving service delivery in the universities in north central, Nigeria.

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