

Evaluating the Integration and use of Cloud Computing Technology for University Library Services in Kwara State, Nigeria

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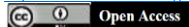
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ABSTRACT

Cloud computing is one of the vitamin to technology which makes easier the access of resources in higher education institutions to manage. This study investigated the adoption of cloud computing technology and its application for services provided by university library in Kwara State, Nigeria. The specific aims of the study were to ascertain available cloud computing technologies, investigate their use in university libraries and determine the challenges confronting adoption. The study used a descriptive survey research design and the population comprised of 108 librarians and library officers in eight university libraries in Kwara State. Collection of data was carried out through a previously designed and pretested structured questionnaire which was analyzed using descriptive statistics. These studies show that cloud based technologies including OCLC, WorldCat, Google Docs, Scribd and Duraspace are already at least tentatively available in university libraries across the country as well. The research also demonstrated that cloud computing improves information storage, productivity, operational efficiency and the optimal delivery of library services. On the one hand, restrictions such as weak Internet connectivity and power supply are considerably limiting factors for the successful deployment of cloud computing technologies. The findings of the study leads to a conclusion that cloud computing has become an important driver for modernizing university library services and, more so, if it adds efficiency to best practices in libraries due to increased access opportunities and recommends improved ICT infrastructure electricity supply/increased funding could maximize benefits of cloud computing for libraries.

Introduction

The integration of ICT in library services and operations has revolutionized traditional practices, enabling libraries to adapt to the evolving needs of users in the digital age. ICT has facilitated access to information, enhanced the efficiency of library processes, and expanded the range of resources available to library patrons (Inyang, 2016). More also, libraries worldwide have embraced ICT solutions to modernize their services and improve user experiences. These include the adoption of automated systems for cataloging, circulation, and resource management, the establishment of digital repositories and online databases, the implementation of virtual reference services, and the provision of remote access to library resources (Verma, 2015). However, despite the global advancements in ICT adoption in libraries, challenges and disparities exist across different regions and institutions. Factors such as inadequate infrastructure, limited funding, lack of digital skills, and resistance to change pose obstacles to the full realization of the potential benefits of ICT revolution in libraries (Chutia, 2015).

Cloud computing has emerged as a disruptive technology that has revolutionized the way organizations store, process, and access data and applications. It involves the delivery of computing resources, including storage, servers, databases, software, and analytics, over the internet, providing on-demand access and scalability (Gupta, Seetharaman & Raj, 2013). The adoption of cloud computing has gained significant momentum across various sectors, including libraries, business, education, healthcare, government, and research. Organizations are increasingly recognizing the potential benefits of cloud computing, such as cost savings, flexibility, scalability, enhanced collaboration, and improved efficiency (Sharma, Gupta & Acharya, 2021).

Cloud computing offers a wide range of services that have transformed the way organizations manage and utilize computing resources. These services provide on-demand access to scalable computing power, storage, applications, and other resources over the internet. Understanding the various services of cloud computing is essential for organizations seeking to harness the benefits and capabilities offered by this technology (Srivastava & Verma, 2015). The diverse services provided by cloud computing can be broadly categorized into three main types: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Infrastructure as a Service (IaaS) provides virtualized computing infrastructure resources, including servers, storage, networks, and operating systems. Organizations can utilize and manage these resources remotely, enabling them to scale up or down based on their requirements. IaaS allows greater flexibility and cost-efficiency by eliminating the need for maintaining and managing physical infrastructure on-premises.

Platform as a Service (PaaS) offers a complete platform environment for developing, testing, and deploying applications. It provides a set of tools, frameworks, and services that enable developers to build and deploy applications without the need to manage the underlying infrastructure. PaaS simplifies the application development process, allowing organizations to focus on their core tasks rather than infrastructure management. Software as a Service (SaaS) provides ready-to-use software applications that are accessed over the internet. Users can utilize these applications without the need for installation or maintenance. SaaS eliminates the requirement for organizations to purchase and manage software licenses, as well as perform updates and backups (Das, 2013).

Cloud computing provides libraries the opportunity to leverage scalable and cost-effective computing resources over the internet, enabling them to store, process, and deliver information efficiently, the various services of cloud computing is crucial for organizations aiming to leverage the benefits of this technology. By exploring and comprehending these services, organizations can make informed decisions regarding the selection, adoption, and utilization of cloud computing services that align with their specific requirements and objectives (Ogbu & Lawal, 2013). It offers numerous benefits and advantages to libraries, revolutionizing the way they deliver services, manage resources, and meet the evolving needs of their patrons. Understanding the advantages of cloud computing is crucial for libraries seeking to leverage this technology to enhance their operations and improve user experiences (Padhy & Mahapatra, 2012).

Cloud computing adoption in academic libraries offers numerous benefits and advantages. Atilgan, Ozel, and Cakmak (2015) highlighted some of these advantages, such as the flexibility to select auto-identification technology and the smooth transition from barcode systems to Radio-Frequency Identification (RFID) technologies. Additionally, cloud computing enables the replacement of outdated cataloging standards like Anglo American Cataloguing Rules (AACR2) with modern ones like Resource Description and Access (RDA). These benefits enhance the efficiency and effectiveness of library operations and services. Cloud computing technology offers libraries the potential to streamline various aspects of their operations, such as cataloging, resource management, digital preservation, data storage, and user services.

Statement of Problem

The use of cloud computing services in university libraries will boost and enhance their services delivery, pivoted on the fact that with cloud computing services, there won't be duplication of efforts, libraries will have a global outlook on the web and by extension optimization of library services will be ensured. Looking at the concept of cloud computing which is a service-oriented technology, internet supported and remote based is relatively current in some academic libraries in developed and developing countries. Limited studies seem to have examined the integration and use of cloud computing services in university libraries in Kwara State. However, this study is therefore, tends to be carried out in order to examine integration and use of cloud computing technology for university library services in Kwara State.

Research Objectives

The main objective of the study is to examine the integration and use of cloud computing technology for university library services in Kwara State, Nigeria. The specific objectives are to;

- i. Highlight the types of cloud computing technology available for university library services in Kwara State;

- ii. Determine the use of cloud computing technology for university library services in Kwara State; and
- iii. Identify the challenges affecting the use of cloud computing technology for university library services in Kwara State.

Research Questions

The following research questions will guide the conduct of the study.

- i. What are the types of cloud computing technology available for university library services in Kwara State?
- ii. What is the use of cloud computing technology for university library services in Kwara State? and
- iii. What are the challenges affecting the use of cloud computing technology for university library services in Kwara State?

Methodology

The study adopted a descriptive survey research design to examine the integration and use of cloud computing technology for university library services in Kwara State, Nigeria. The design was considered appropriate because it enabled the systematic collection of data on the opinions, attitudes, and practices of librarians regarding cloud computing technology (Creswell, 2015). The population comprised all librarians and library officers in the eight university libraries in Kwara State, totaling 108 respondents, and a total enumeration sampling technique was adopted since the population was relatively small (Kumar, 2018). Consequently, all 108 respondents participated in the study. Data were collected using a structured, closed-ended questionnaire titled *Integration and Use of Cloud Computing Technology for University Library Services in Kwara State Questionnaire*, which was specifically designed to elicit information relevant to the study objectives.

To ensure the quality of the instrument, face validation was carried out by the researcher and the supervisor, while reliability was established using the test–retest method with a two-week interval. The responses were analysed using Cronbach's Alpha, which yielded reliability coefficients ranging from 0.60 to 0.80, confirming the instrument's reliability (Winter, 2015). The questionnaires were personally administered by the researcher with the assistance of two research assistants across the eight university libraries after obtaining an introductory letter from the supervisor. Data collected were analysed using IBM SPSS Version 26.0. Descriptive statistics, including frequency counts, percentages, mean, and standard deviation, were used to answer the research questions, while Pearson's Product Moment Correlation (PPMC) was employed to test the hypotheses. The findings were presented in tables. Ethical considerations were strictly observed by ensuring respondents' anonymity, maintaining confidentiality, and adhering to accepted standards of scholarly research to protect participants from harm and encourage honest responses (Mugenda & Mugenda, 2003).

Table 1

Demographic Characteristics of the Respondents (N = 108)

Variable	Category	Frequency (f)	Percentage (%)
Institution	University of Ilorin (UNILORIN)	60	55.5
	Kwara State University (KWASU)	13	12.0
	Al-Hikmah University	13	12.0
	Landmark University	9	8.3
	Summit University	3	2.8
	Ojaja University	4	3.7
	Thomas Adewumi University	2	1.9
	Ahman Pategi University	2	1.9
	Muhammed Kamaldeen University	2	1.9
	Total	108	100.0
Highest Qualification	ND	6	5.6



Variable	Category	Frequency (f)	Percentage (%)
	HND	13	12.0
	B.Sc.	56	51.9
	M.Sc.	24	22.2
	Ph.D.	9	8.3
	Others	0	0.0
	Total	108	100.0
Age (Years)	30 and below	25	23.1
	31–40	56	51.9
	41–50	20	18.5
	51–60	7	6.5
	61 and above	0	0.0
	Total	108	100.0
Gender	Male	70	64.8
	Female	38	35.2
	Total	108	100.0
Years of Work Experience	1–5 years	29	26.9
	6–10 years	44	40.7
	11–15 years	25	23.1
	16–20 years	10	9.3
	Total	108	100.0
Professional Status	Library Officer	37	34.3
	Librarian	71	65.7
	Total	108	100.0

Source: Field Survey, 2026.

Table 4 showed that out of the 108 respondents, 62 of them representing 55.5% are working in Unilorin library, 13(12.0%) are working in KWASU and Al-Hikmah library respectively, 9(8.3%) are working in Landmark library, 3(2.8%) are working in Summit, 4(3.7%) are working in Ojaja library and 2(1.9%) are working in Thomas Adewunmi and Ahman Pategi library respectively. This shows that majority of the respondents were from Unilorin library while Thomas Adewunmi, Ahman Pategi and Mahammed Kamaldeen were the lowest.

The table also showed that out of the 108 respondents, 6 out of them representing 5.6% were ND holders, 13(12%) were HND holders, 56(51.9%) were BSc holders, 24(22.2%) were MSc holders, while 9(8.3%) were PhD holders. This shows that most of the respondents were BSc holders while MSc holders followed and ND holders were the lowest. In the age range, 25 of them representing 23.5% were 30 years and below, 56(51.9%) were within the age range of 31-40, 20(18.5%) were within the age range of 41-50, 7(6.5%) were within the age range of 51-60. This shows that majority of the respondents were within the age range of 31 to 40 while the lowest were within the age range of 51 to 60.

The table showed that from the 108 respondents, 70(64.8%) were males, while the remaining 38(35.2%) were females. This indicates that more male respondents participated in the study than their female counterpart. The table also showed the years of work experience of the respondents, 29(26.9%) has worked for 1-5 years, 44(40.7%) has worked for 6-10 years, 25(23.1%) has worked for 11-15 years while the remaining 10(9.3%) has worked for 16-20 years. This indicates that majority of the respondents has worked for 6-10 years while the lowest years of work experience were 16-20 years. Lastly, the table showed that from the 108 respondents, 71 representing 67.7% were librarians (professional librarians) while the remaining 37(34.3%) were library officers (para-professional librarians).

Table 2

Types of cloud computing technology for university library services in Kwara State, Nigeria

Statements	Yes	No	Not sure
OCLC	81(75.0%)	19(17.6%)	8(7.4%)
World cat	80(74.1%)	22(20.4%)	6(5.6%)
Google docs	59(54.6%)	39(36.1%)	10(9.3%)
OSS Lib	49(45.4%)	42(38.9%)	17(15.7%)
Scribd	50(46.3%)	44(40.7%)	14(13.0%)
Encore	54(50.0%)	34(31.5%)	20(18.5%)
Exlibris	54(50.0%)	29(26.9%)	25(23.1%)
Polaris library system	49(45.4%)	31(28.7%)	28(25.9%)
Duraspace	52(48.1%)	30(27.8%)	26(24.1%)

From the table above, it shown response on the types of cloud computing for university library services which 81(75.0%) of the respondents picked yes to OCLC;80 respondents representing 74.1% also picked yes to Wordcat; 59(54.6%) picked yes to Google docs; 49(45.4%) also picked yes to Discovery services; OSS Lib and Polaris library system respectively;50(46.3%) picked yes to Scribd;54(50.0%) picked yes to Encore; 52(48.1%) picked yes Duraspace and 51(47.2%) picked no to Ex-Libris cloud. It indicates that Alexandria and Ex-Libris cloud were not really being used in some university libraries.

Table 3

The use of cloud computing technology for university library services in Kwara State, Nigeria

Statements	Strongly Agreed	Agreed	Disagreed	Strongly Disagreed
Using cloud computing may make things more efficient	78(72.2%)	29(26.9%)	1(0.9%)	0(0.0%)
Using cloud computing makes storing information easier	57(52.8%)	50(46.3%)	1(0.9%)	0(0.0%)
Using cloud computing offers an advantage over other data information storage services	59(54.6%)	48(44.4%)	1(0.9%)	0(0.0%)
Using cloud computing make it easier to do my job	53(49.1%)	53(49.1%)	2(1.9%)	0(0.0%)
Using cloud computing increase my productivity	67(62.0%)	40(37.0%)	1(0.9%)	0(0.0%)
Using cloud computing enhance my effectiveness on the job	60(55.6%)	46(42.6%)	2(1.9%)	0(0.0%)

Table 4 above revealed the librarians' perceived usefulness of cloud computing for university libraries services in Kwara State, 78 of the respondents representing (72.2%) were strongly agreed that using cloud computing make things more efficient; 57(52.8%) were strongly agreed that using cloud computing makes storing of information easier. More also, 59(54.6%) were strongly agreed that using cloud computing offers an advantage over other data information storage services; However, 53(49.1%) were strongly agreed and agreed that using cloud computing make it easier to do their job; while 67(62.0%) were strongly agreed that using cloud computing increase their productivity and 60(55.6%) were also strongly agreed that using cloud computing enhance their effectiveness on the job. This indicates that majority of the respondents found cloud computing useful and enhance their workforce.

Table 4

Challenges that are affecting the use of cloud computing technology for university library services in Kwara State, Nigeria

Statements	Strongly Agreed	Agreed	Disagreed	Strongly Disagreed
Poor internet connections	65(60.2%)	40(37.0%)	3(2.8%)	0(0.0%)
Unreliable power supply	56(51.9%)	49(45.4%)	3(2.8%)	0(0.0%)
Poor technical knowledge among library personnel	10(9.3%)	16(14.8%)	70(64.8%)	12(11.1%)
Technical problems associated with the use of cloud computing	12(11.1%)	38(35%)	57(52.8%)	1(0.9%)
Poor funding of the library	43(39.8%)	60(55.6%)	3(2.8%)	2(1.9%)
Data security problem	10(9.3%)	10(9.3%)	60(55.6%)	28(25.9%)
Data privacy problem	9(8.3%)	10(9.3%)	62(57.4%)	27(25.0%)

The table above revealed the challenges that are militating against the use of cloud computing for university libraries services in Kwara State, 65 of the respondents representing (60.2%) were strongly agreed that poor internet connections is a challenge on then use of cloud computing for university library services; 56(51.9%) were also strongly agreed that unreliable power supply is another challenge that militates the use of cloud computing for university library services. However, 70(64.8%) were disagreed that poor technical knowledge among library personnel is a challenge to the use of cloud computing for university library services; 57(52.8%) were also disagreed that technical problems associated with the use of cloud computing as a challenge, while 60(55.6%) were agreed that poor funding of the library is a challenge to use of cloud computing for university library services; 60(55.6%) were disagreed that problem of data security as a challenge to the use cloud computing and 62(57.4%) were also disagreed that problem of data privacy as a challenge to the use of cloud computing. This indicates that the major challenge that militates against the use cloud computing for university library services is poor internet connections.

Discussion

This study has shown that respondents with BSc and MSc have the lager ratio from the frequency distribution; it also shows that male respondents as the larger ratio more than female. This is in accordance with the findings of Abosede and Ibikunle (2011) who reported that there are more male librarians in a study they carried out on Lagos Polytechnic library. Followed is the age between 31-40 years of respondents as the highest response rate. Also, by years of work experience 6-10 years have the lager ratio from the frequency distribution in this study.

The findings of the study showed the types of cloud computing technology for university library services in Kwara State which includes: OCLC, Word cat, Google docs, Discovery services, OSS Lib, Polaris library system, Scribd, Encore, Duraspace, and Ex-Libris cloud as the types of cloud computing used for university library services. The finding agrees with a study by Aiyebilehin et al., (2020), reported that the majority of the librarians in the selected universities in Edo State are aware and use of OCLC, Word cat, Exlibris etc. as types of cloud computing in the library except OSS Libs which they are not aware of and not making use of it. The findings revealed the use of cloud computing technology for university library services in Kwara State' stated that, using cloud computing make things more efficient; using cloud computing makes storing of information easier; using cloud computing offers an advantage over other data information storage services; using cloud computing make it easier to do their job; using cloud computing increase their productivity and using cloud computing enhance their effectiveness on the job, these indicates that they found cloud computing usefulness for university library in Kwara State. The finding agrees with a study by Mavodza (2013) reported that academic libraries are using cloud computing Software-as-a-Service (SaaS) in library catalogs such as WorldCat, GoogleDocs, and others for putting together user resources and library data.

The findings revealed the **challenges affecting the use of cloud computing technology for university** library services in Kwara State such as internet connections; unreliable power supply; and poor funding of the library. The finding agrees with a study by Masha (2017) reported that cloud computing has challenges such as insufficient budget, lack of resources, poor ICT infrastructure, inadequate Internet connectivity, lack of management support, constant breakdown of hardware among others.

Conclusion

The integration of cloud computing technology for university library services has been shown to be very crucial in this study. It is clearly observed from the study that the university libraries use cloud computing technology for their services. Furthermore, it is very convincing to ascertain that cloud computing plays significance roles in university library services. Also, the findings showed the OCLC, Word cat, Google docs, Discovery services, OSS Lib, Polaris library system, Scribd, Encore, Exlibris, Duraspace, Alexandria and Ex-Libris. The study identified the challenges affecting the use of cloud computing technology for university library services.

Recommendations

Based on the findings from this study, the following recommendations were given:

- i. University should provide uninterrupted power by making available alternative power generating source for the library every time in order to make use of cloud computing for purpose it was bought for.
- ii. Adequate budgeting should be allocated to the library in order to curb some of the perceived challenges affecting the use of cloud computing.

Good and reliable internet facilities with fast speed and high broadband should be made available to aid the use of cloud computing for university library services.

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