

THE INFLUENCE OF CLOUD COMPUTING SERVICE MODELS: INFRASTRUCTURE, PLATFORM AND SOFTWARE ON INFORMATION SHARING IN FEDERAL UNIVERSITY LIBRARIES IN SOUTH-EAST, NIGERIA

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Abstract

The study investigated the influence of cloud computing service models: infrastructure, platform and software on information sharing in federal university libraries in South-East, Nigeria. Physical survey design was adopted for the study and a structured questionnaire was used to elicit information from the respondents. A census sampling method was used to draw a sample size of one hundred and four (104) comprising sixty (60) professional librarians and forty-four (44) ICT staff for the study. The researchers adopted two methods of analysis namely; the descriptive and

inferential analysis. The results from the study showed that: there is influence of infrastructure as a Service, there is influence of Platform as a Service in information sharing outside the confines of the library and, there is influence of Software as a Service in information storage and access/retrieval among the staff and students in the Federal university libraries in South-East, Nigeria. The test of hypothesis was conducted using Z-test at 5% level of significance under a given P-value support the acceptance of the null hypothesis which conforms to the results from the descriptive analysis. Based on the findings of the study, the researchers recommend among others that government should encourage cloud computing services because of its cost effectiveness and also that university management should on their own part ensure that adequate funds are deployed to university libraries for effective running of cloud computing technologies.

Keywords: *Cloud Computing, Infrastructure as a service, Platform as a service, Software as a service, Information, Information Sharing*

Introduction

Cloud computing is gaining attraction in university libraries worldwide as a tool for enhancing information sharing. Nigerian federal university libraries, particularly those in the South-East, are encouraged to adopt cloud computing, although belatedly. It is therefore expedient to look out how well university libraries are using cloud computing and its sub-structures such as Infrastructure, Platform and Software as a Service for enhancing information sharing to library clientele. This study explores how libraries are using cloud-based services; Infrastructure, Platform, and Software as a Service (IaaS, PaaS, SaaS) to improve information sharing. According to Azam (2015), the cloud itself is a set of hardware, networks, storage, services and interfaces that enable the delivery of computing as a service. These services include the delivery of software, infrastructure, file sharing, information sharing and storage over the internet (either as separate components or a computer platform) based on user demand. Hasan and Ruhela (2018) also state that cloud computing provides users with a safe, reliable and economic data storage centre as users no longer need to worry about data loss, virus intrusion, and other problems. Similarly, Suman and Singh (2016)

opine that cloud computing is the use of the internet for computing needs especially the use of software applications, platform to build applications, storing data as well as sharing any kind of information which can be accessed from any type of internet connection without the burden of upgrading, backup and maintenance of servers.

Cloud computing, uses the internet to deliver software, infrastructure, and storage, and this offers cost-effective, reliable solutions, thus freeing libraries from IT maintenance and allowing them to focus on information management. Cloud computing service models provide customized, on-demand resources for university libraries, helping them choose services that fit their needs and budgets. As a corollary, Information sharing via the cloud emphasizes collaboration, security, accessibility, and cost efficiency, making it easier for libraries to meet users' information needs without concerns over time or location constraints.

Mell and Grance (2011) laid credence to three categorization of Cloud computing service models, each representing different layers of abstraction and control for users. They include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). These service models according to them offer university libraries flexible solutions for information sharing, storage, and software development. IaaS provides libraries with virtual computing resources, such as servers, storage, and networks, allowing them to rent resources as needed without investing in physical infrastructure. This helps libraries scale their needs dynamically and avoid the cost of maintaining their own data centers. PaaS offers a platform for developers to build, test, and deploy applications without managing the underlying hardware or software. It simplifies the process for libraries to create digital services without maintaining their own infrastructure. SaaS enables libraries to access fully developed software through the internet,

eliminating the need to install and manage applications locally. This model allows university libraries to use cloud-based services like Integrated Library Management Systems and other software platforms, reducing the burden of software maintenance and providing greater flexibility in accessing and sharing information. These cloud models are believed to be widely used for efficient library management, enhancing information services, and facilitating collaboration.

Statement of the Problem

Cloud computing is increasingly being adopted by university libraries globally as a cost-effective tool for information sharing, enhanced by advancements in Information Communication Technology (ICT). It provides limitless, accessible services to users, helping libraries fulfill their primary objective of disseminating information. However, in spite of the numerous advantages of cloud computing, it appears most university libraries in the study area seem not to be benefitting or are yet to benefit enormously from the potentials available in cloud computing. It is therefore expedient to look out how these university libraries are using cloud computing and its sub-structures such as Infrastructure, Platform and Software as a Service for enhancing information sharing to library clientele. The study attempts at investigating how the federal universities in the South-East keyed into this evolving trend and how cloud computing service models are leveraging on effective information sharing. It is against this background that this study is carried out to ascertain the use of cloud computing service models for information sharing in federal university libraries in South-East, Nigeria.

Research Questions

The following research questions were raised to guide the study:

1. What is the level of awareness/knowledge of cloud computing model amongst the professional librarians in federal university libraries in the South-East?
2. What is the level of awareness/knowledge of cloud computing model amongst the ICT staff in the Federal University Libraries in the South-East?
3. Is Information digitally shared across different sectors / units (e. g. acquisition, processing, serial, circulation, e-library) in the form of Infrastructure as a Service in the federal university libraries in South-East, Nigeria?
4. Is information shared outside the confines of the library via internet connectivity in the form of Platform as a Service in the federal university libraries in South-East, Nigeria?
5. Do staff/ students access/retrieve information stored in the data base (such as Agora, Hinari, Science direct, e-library, Oare, etc.) in the form of Software as a Service in the federal university libraries in South-East, Nigeria?

Hypotheses

The following hypotheses were formulated to guide the study:

1. Information is significantly digitally shared across different sectors / units (e. g. acquisition, processing, serial, circulation, e-library) in the form of Infrastructure as a Service in the federal university libraries in South-East, Nigeria.
2. Information is significantly shared outside the confines of the library via internet connectivity in the form of Platform as a Service in the federal university libraries in South-East, Nigeria.
3. Staff/ students significantly access/retrieve information stored in the data base (such as Agora, Hinari, Science direct, e-library, Oare, etc.) in the form of Software as a Service in the federal university libraries in South-East, Nigeria.

Theoretical Framework

The study employs the Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. in 2003. This framework emphasizes users' attitudes towards technology adoption, shifting focus from infrastructure and institutional support to user intention and behavior. UTAUT identifies four key components influencing technology acceptance:

- i. Performance Expectancy: The belief that using the technology will enhance task performance.

- ii. Effort Expectancy: The perceived ease of using the technology, highlighting its user-friendly nature.
- iii. Social Influence: The extent to which individuals feel pressured to adopt the technology based on others' usage.
- iv. Facilitating Conditions: The perceived availability of organizational and technical support for technology use. Overall, UTAUT serves as a valuable lens for understanding user behavior in adopting new technologies such as the one deployed in this study.

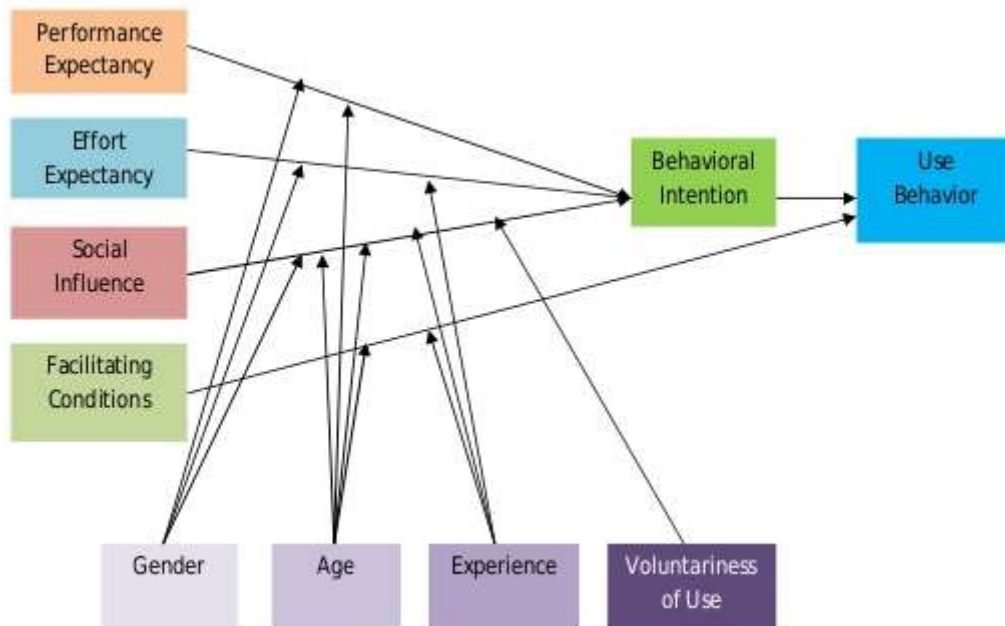


Figure 1.1: Unified Theory of Acceptance and Use of Technology (UTAUT)

Source: Venkatesh et al. (2003). *User acceptance of information technology: Toward a unified View.*

The diagram illustrates that performance expectancy, effort expectancy, and social influence directly influence usage intention and behavioral intention, while facilitating conditions directly affect user behavior. Additionally, usage intention and behavior are moderated by factors

such as gender, age, experience, and voluntariness of use. This framework is relevant to the study of cloud computing and information sharing in university libraries. Libraries are more likely to adopt cloud computing if it enhances their ability to provide information resources efficiently and if the technology is user-friendly. Furthermore, awareness of peer institutions successfully using cloud technology will encourage adoption. Essential facilitating conditions include institutional support, such as funding for subscriptions and training for staff in cloud computing technology. When these support are in place, the likelihood of adopting cloud computing for information sharing significantly increases, highlighting the importance of both user perceptions and organizational infrastructure.

Literature Review

Cloud computing is the delivery of computing services, including software, hardware, and infrastructure, over the internet rather than local servers or desktops. It enables users to share resources and access services remotely, with third parties managing the resources. Cloud computing operates on the principle of shared infrastructure, providing services like data storage, processing power, and networking over an interconnected, virtualized system. This technology has transformed IT services, offering more efficient, scalable, and cost-effective solutions. Users can access the services on-demand, paying only for the resources they use without needing to invest in the full computing infrastructure. According to the National Institute of Standards and Technology (NIST), cloud computing allows easy, on-demand access to a shared pool of configurable computing resources, such as networks, servers, and applications.

Cloud services are categorized into three main models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), (Mell and Grance, 2011). These

models offer businesses flexibility in choosing services that meet their specific needs. Cloud computing deployment models define how these services are hosted and accessed, with variations in storage capacities and billing systems. The choice of deployment model depends on organizational needs. Overall, cloud computing allows for more flexible, efficient IT service management, transforming how businesses and individuals access and use computing resources. In university libraries, cloud computing is used to create digital libraries and automate processes through third-party services. Cloud technology enables libraries to share distributed resources, providing access to data storage, processing power, and applications from anywhere with a network connection. According to Suman and Singh (2016), cloud computing enhances information sharing, reduces IT costs, and facilitates online services such as catalogues, e-lending, and digital repositories.

Cloud computing applications in libraries include building digital libraries, facilitating scholarly content searches, file storage (e.g., Dropbox, Google Drive), automating library functions, and hosting library websites on third-party servers (Savatagi, 2017). Platforms like Duraspace and Knimbus support digital repositories and knowledge sharing, while tools like Twitter and Facebook help build professional communities (Pandey & Kushwaha, 2015). Additionally, cloud-based services like OCLC streamline data searching and sharing within libraries, promoting efficiency and innovation. Adopting cloud computing in university libraries addresses the need for efficient information management, quick access, and resource sharing. Cloud computing extends patron reach, enabling users to access library resources without time or space constraints. It also facilitates real-time interactions, such as digital reference services, and enhances collaboration by allowing libraries to pool resources on shared platforms. Cloud technology also improves service

delivery, enabling libraries to offer web-based applications to users outside business hours. Its advantages include cost savings, easy installation, increased storage, automation, flexibility, mobility, and resource sharing, all of which are capable of transforming library operations, allowing librarians to focus on improving user services rather than managing IT infrastructure (IBM, 2023; Information Hub, 2023). Additionally, cloud computing enhances library collaboration and resource availability, making it a valuable tool for modern libraries. Despite its challenges, cloud computing offers libraries the potential to store extensive digital content, enhance information sharing, and reduce the burden of maintenance while providing users with increased capacity.

Similarly, Information sharing involves exchanging information between individuals, ensuring the receiver understands it. According to Eti (2014), it is a natural human behavior, occurring both spontaneously and deliberately. The primary goal is to enhance the receiver's knowledge, making it a key component of information behavior, which encompasses seeking, organizing, and using information. Aliakbar et al. (2012) identify three types of information sharing behaviors: collaborative, mutual-benefit, and relationship-based. Collaborative sharing involves individuals with common interests working together, while mutual-benefit sharing is driven by the gains of both parties. Relationship-based sharing strengthens connections between individuals through information exchange. The necessity of information sharing is to foster collaboration and enhance knowledge acquisition for individual development, which aligns with the adoption of cloud computing in university libraries.

Muhammad and Abdullahi (2021) explored cloud computing adoption in federal university libraries in North-West Nigeria. Their study revealed that Infrastructure as a Service (IaaS)

significantly improves information service delivery in these libraries. They recommended workshops to enhance staff knowledge on cloud computing for effective information dissemination. The study focused on service delivery, while the current study emphasizes cloud computing for information sharing. Similarly, Zubairu et al. (2021) examined cloud computing awareness in private university libraries in Osun State, Nigeria. Their findings showed high awareness, particularly regarding library management software, and concluded that cloud adoption benefits libraries facing financial challenges. Both studies align with the current research in discussing cloud models (IaaS, PaaS, SaaS), but differ in their focus on awareness and adoption among library personnel versus information sharing in university libraries.

Okusaga et al. (2021) studied cloud-based information resources and services among academic librarians in South-West Nigeria, focusing on the types of resources available and how effectively they are used. The study recommended increased use of these services to keep librarians relevant in a technology-driven world. Okwoli (2015) also investigated cloud computing adoption at the National Open University Library (NOUN), revealing that NOUN uses cloud computing to provide services to its students nationwide. Despite benefits, the library faces budget constraints, inadequate staff training, and recruitment issues. The study recommended seeking external funding and adjusting cloud service usage to reduce costs. Similarly, Idhalama and Fidelis (2020) explored librarians' attitudes toward cloud computing at the University of Dar es Salaam, finding that librarians had a positive attitude and were receptive to cloud adoption. Also, Awa et al. (2022) examined Platform as a Service (PaaS) in South-South and South-East Nigerian university libraries, highlighting its use for real-time information services and its potentials as a reference source for future research.

The foregoing explored cloud computing usage in university libraries, and its potential to improve library services. Though they focus on different regions and aspects such as service models, awareness, and adoption challenges, they share similar features and purposes, with the present study emphasizing information sharing.

Research Method

The research design used for this study is the physical survey research design. The instrument used for the data collection is a structured questionnaire. A total of one hundred and twenty (120) questionnaires were distributed to the respondents to fill and return. Out of this total number, one hundred and four (104) were correctly filled and returned, given a return rate of 87%. The population of this study stood at 104, comprising professional librarians with cloud computing knowledge/ ICT skills and other staff deployed in the ICT unit of the libraries in the federal universities in the South-East Geopolitical Zone of Nigeria. The researchers adopted the census technique in selecting only the target population; hence the population size is manageable. Out of the 104 sample, sixty (60) respondents were professional librarians and forty-four (44) were ICT staff, see Table 1.1. Both descriptive and Inferential Analysis Was Used To Analyze The Data.

Presentation of Results and Discussion

Table 1.1 Distribution of Respondents

Respondent Category	Frequency Percentage (%)	
Professional Librarians	60	58
ICT Staff	44	42
Total	104	100

From the data in Table 1.1 on the status of the respondents, we observed that sixty (60) respondents contributing (58%) were professional librarians with ICT skills while forty- four (44) respondents contributing (42%) were ICT staff. The response rate was high, it accounted for 87% of the total questionnaires distributed. So, the sample is a good representation of the population.

Table 1.2. Distribution of Respondents according to Institution

S/N	Institution	Librarians	ICT Staff	Total
1	University of Nigeria, Nsukka	12	9	21
2	Federal University of Technology, Owerri	15	11	26
3	Nnamdi Azikiwe University, Awka	12	9	21
4	Michael Okpara University of Agriculture	11	8	19
5	Alex Ekwueme Federal University, Ndufu-Alike	10	7	17
	Total	60	44	104

Table 1.2. Distribution of the respondents according to institution

Research question 1: 1. What are the levels of awareness/knowledge of cloud computing model amongst the professional librarians in federal university libraries in the South-East?

Professional librarians level of awareness/knowledge of cloud computing service

Institution	Very High	High	Moderate	Low	Total
University of Nigeria, Nsukka	3	4	3	2	12
Federal University of Technology, Owerri	6	5	3	1	15
Nnamdi Azikiwe University, Awka	3	4	3	2	12
Michael Okpara University of Agriculture	3	3	3	2	11
Alex Ekwueme Federal University	3	3	2	2	10

Table 1.3. : Professional librarians level of awareness/knowledge of cloud computing service

Research Question 2: What are the levels of awareness/knowledge of cloud computing model amongst the ICT staff in the federal university libraries in the South-East?

The level of awareness/knowledge of cloud computing model amongst the ICT staff

Institution	Level of awareness of cloud computing service				Total
	Very high	High	Moderate	Low	
University of Nigeria, Nsukka	3	3	2	1	9
Federal University of Technology, Owerri	5	3	2	1	11
Nnamdi Azikiwe University, Awka	3	2	2	2	9
Michael Okpara University of Agriculture, Umudike	3	2	2	1	8
Alex Ekwueme Federal University, Ndifu Alike	2	2	2	1	7

Table 1.4: ICT Staff's level of awareness/ knowledge of cloud computing service

Tables 1.3 and 1.4. show that respondents with very high and high knowledge of ICT account for 71(68.2%) while those with moderate and low knowledge are 39(37.5%). This result, implies that respondents have adequate knowledge of ICT related operations in the library including cloud computing services.

Research Question 3: Is Information digitally shared across different sectors / units (e. g. acquisition, processing, serial, circulation, e-library) in the form of Infrastructure as a Service in the federal university libraries in South-East, Nigeria?

Infrastructure as a Service

S/N	Infrastructure as a Service	Strongly Agree	Agree	Strongly Disagree	Disagree
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	Infrastructure as a Service helps university libraries to:				
1	be relieved of the burden of financial constraints (e.g. acquisition of cloud computing infrastructure, establishing and maintaining data centers)	50	40	9	5
2	bother less on space consideration for housing cloud computing infrastructure	45	35	18	6
3	be relieved of the constraints of data spaces on library computer	43	33	16	12
4	create an enabling network environment either through internet or intranet	40	30	20	14
5	bother less about the cost of maintaining cloud computing infrastructure	45	35	16	8
6	be relieved of the burden of technical know how (e.g. as service maintenance as well as upgrade as done by the service provider)	20	10	10	64
7	have access to servers which can serve a large number of uses at the same time without bothering about low bandwidth	40	30	22	12
8	create a platform that are developed on demand	35	35	25	9
9	provides staff/students with computing resources (such as computations, storage, networks)	36	34	24	10
10	allows staff/students to deploy /run arbitrary software (like operating system and application)	10	10	10	74

Table 2.1: Infrastructure as a Service

Research Question 4: 4. Is information shared outside the confines of the library via internet connectivity in the form of Platform as a Service in the federal university libraries in South-East, Nigeria?

Platform as a Service

S/N	Platform as a Service	Strongly Agree	Agree	Strongly Disagree	Disagree
	Platform as a Service helps university libraries to:				
11	build their own software application	45	35	20	14

12	test their own software (homegrown software)	35	34	21	14
13	deploy their own software application	35	35	20	14
14	manage their own software application	40	35	16	13
15	frequently upgrade their software application whenever necessary	35	34	21	14
16	engage in the development of home grown database management system	45	35	15	9
17	developed software application that are strictly tailored to suit their service delivery	40	35	17	12
18	develop their information technology skills (especially programming skills)	36	35	20	13
19	be free of the financial constraints of acquiring cloud computing infrastructure	45	35	15	9
20	be free from the constraints of space for managing data centres	36	34	21	13

Table2.2: Platform as a Service

Research Question 5: Do staff/ students access/retrieve information stored in the data base (such as Agora, Hinari, Science direct, e-library, Oare, etc.) in the form of Software as a Service in the federal university libraries in South-East, Nigeria?

Software as a Service

S/N	Software as a Service	Strongly Agree	Agree	Strongly Disagree	Disagree
21	Software as a Service helps university libraries to: bother less on the cost of software applications because it is provided by a vendor through subscription	45	35	16	8
22	make use of any device with internet connection	45	35	15	9
23	be relieved of the burden of constraints of time as well as space	45	34	16	9
24	be relieved of the burden of acquiring cloud computing infrastructure (computers, servers, data accessing, collaborating, editing, storing as well as document sharing)	36	35	20	13

25	be relieved of the technicalities of upgrading of software	46	34	16	8
26	be relieved of the burden of installing software on the university libraries' computers	35	34	21	14
27	reduce the work load on library computers as the software are not installed on the library's computers	36	34	20	14
28	be relieved of the constraints of maintenance as well as upgrade of the software	40	35	16	13
29	be relieved of the burden of acquisition of many computers for the library since information resources can be shared with the use of any device with internet connection just with the payment of subscription to a vendor	42	36	16	10
30	only pay for the use of software application for information sharing rather than out rightly buying them which are rather expensive	45	35	16	8

Table 2.3: Software as a Service

The data gathered in Tables 2.1-2.3, show that the influence of cloud computing (Infrastructure, Platform and Software as a Service) is most on financial relieve for the institutions, as indicated in nos 19 & 21. This influence is most needed in lieu of the dwindling financial fortune being experienced by universities in Nigeria. The findings from table 2.1 revealed that Infrastructure as a Service (IaaS) significantly influences information sharing in federal university libraries. This led to the rejection of the first hypothesis, which originally suggested no significant influence of IaaS on information sharing. The study aligns with previous research by Muhammad and Abdulahi (2021), who found that cloud computing, particularly IaaS, improves service delivery in university libraries by reducing hardware costs. It also supports the findings of Okusaga et al. (2021), who

reported that IaaS enhances information service delivery in academic libraries in Southwest Nigeria.

The findings from table 2.2 show that Platform as a Service (PaaS) significantly influences information sharing in federal university libraries in South-East Nigeria. This led to the rejection of the hypothesis that PaaS had no significant effect on information sharing. The results align with previous studies, such as Awa, Aloysius, and Okereke (2022), who found that various PaaS tools are widely used in university libraries for information service delivery in South-South and South-East Nigeria. Similar studies by Zubairu et al. (2021) also confirmed that PaaS plays a critical role in enhancing information services in academic libraries.

The findings from table 2.3 indicate that Software as a Service (SaaS) has a significant influence on information sharing in federal university libraries in South-East Nigeria, leading to the rejection of the hypothesis that SaaS has no significant effect. This result aligns with the findings of Zubairu et al. (2021) who reported that library management software, a part of SaaS, significantly impacts information sharing and service delivery in university libraries in Osun State, Nigeria.

Table 3: Information sharing

S/N	Research Questions	SA	A	SDA	DA
1	Information is digitally shared across library units (IaaS)	45	28	24	7
2	Information is shared outside the library via internet (PaaS)	45	28	24	7
3	Users access databases (e.g., HINARI, ScienceDirect) (SaaS)	48	32	10	14
4	Information is shared without data/space/time constraints	55	35	6	8
5	Users access OPAC resources	60	40	2	2
6	Homegrown software is frequently updated	35	30	25	24
7	Users access institutional repository (IR)	55	35	7	7
8	Collaboration with other universities is possible	45	34	14	11

S/N Research Questions		SA	A	SDA	DA
9	Cooperative acquisition of resources is enabled	43	37	13	11
10	Cooperative management of resources is possible	45	27	22	10

Summary of Hypothesis Testing on Information Sharing

S/N	Hypothesis	SA (4)	A (3)	SDA (2)	DA (1)	Mean	Benchmark	Decision
1	Digital sharing across units (IaaS)	180	84	48	7	80.0	75.5	Significant
2	Sharing outside library (PaaS)	180	84	48	7	80.0	75.5	Significant
3	Database access (SaaS)	192	96	20	14	80.5	75.5	Significant
4	Sharing without constraints	220	105	12	8	86.3	75.5	Significant
5	Access to OPAC	240	120	4	2	91.5	75.5	Significant
6	Homegrown software updates	80	30	20	64	48.5	75.5	Not Significant
7	Access to institutional repository	220	105	14	7	86.5	75.5	Significant
8	Inter-university collaboration	180	102	28	11	80.3	75.5	Significant
9	Cooperative acquisition	172	111	26	11	80.0	75.5	Significant
10	Cooperative management	40	30	20	74	41.0	75.5	Not Significant

The major results of research questions 3-5 were all significant. This implies that the descriptive analysis, conclude as follows: There is influence of infrastructure as a Service in Information sharing across different sectors / units in the federal university libraries in South-East, Nigeria. Similarly, there is influence of Platform as a Service in information sharing outside the confines of the library via internet connectivity in the federal university libraries in South-East, Nigeria. Finally, there is influence of Software as a Service in information storage and access/retrieval among the staff and students in the federal university libraries in South-East, Nigeria

Test of Hypothesis:

Descriptive Statistics

N	Mean	StDev	SE Mean	5% CI for μ
4	76	16.73	3.16	(63.51, 87.41)

μ : population mean of CI
Known standard deviation = 16.73

Test of hypothesis 1:

Null hypothesis $H_0: \mu = 76$
Alternative hypothesis $H_1: \mu \neq 76$

Z-Value	P-Value
0.00	0.998

Descriptive Statistics

N	Mean (μ)	Std. Deviation	Std. Error	95% CI for μ
4	76.00	16.73	3.16	63.51 – 87.41

Hypothesis Testing 1

- Null Hypothesis (H_0): $\mu = 76$
- Alternative Hypothesis (H_1): $\mu \neq 76$
- Z-value = 0.00
- P-value = 0.998

Decision:

Since $p > 0.05$, the null hypothesis is **not rejected**.

Interpretation:

There is **no statistically significant difference** between the sample mean and the hypothesized population mean. However, based on earlier descriptive results, LaaS still shows **practical influence** on information sharing.

Hypothesis 2

Descriptive Statistics

N	Mean (μ)	Std. Deviation	Std. Error	95% CI for μ
4	80.30	17.49	5.53	67.78 – 92.82

Hypothesis Testing

- Null Hypothesis (H_0): $\mu = 80.3$
- Alternative Hypothesis (H_1): $\mu \neq 80.3$
- Z-value = -0.00
- P-value = 0.998

Decision:

Since $p > 0.05$, the null hypothesis is **not rejected**.

Interpretation:

There is **no statistically significant difference**, but PaaS demonstrates **strong practical relevance** in enabling information sharing beyond the library.

Hypothesis 3

Descriptive Statistics

N	Mean (μ)	Std. Deviation	Std. Error	95% CI for μ
4	86.00	20.37	6.44	71.45 – 100.50

Hypothesis Testing

- Null Hypothesis (H_0): $\mu = 86$
- Alternative Hypothesis (H_1): $\mu \neq 86$
- Z-value = 0.00
- P-value = 1.000

Decision:

Since $p > 0.05$, the null hypothesis is **not rejected**.

Interpretation:

There is **no statistically significant difference**, but SaaS shows the **highest practical impact** on information access and retrieval.

From the three-hypothesis postulated in this study, it was observed that the P-values at 5% level of significant shows that the values were greater than 0.05; therefore, the null hypothesis was accepted . There is influence of Infrastructure as a Service in Information sharing across different sectors / units in the federal university libraries in South-East, Nigeria. There is influence of Platform as a Service in information sharing outside the confines of the library via internet connectivity in the federal university libraries in South-East, Nigeria. Finally, there is influence of Software as a Service in information storage and access/retrieval among the staff and students in the federal university libraries in South-East, Nigeria.

Recommendations

Based on the findings of this study, it is recommended that:

- i. Government should encourage cloud computing services because of its cost effectiveness and its ability to enhance the quality of information resources available for intellectual overall development of the students in university libraries.
- ii. University management should on their own part ensure that adequate funds are deployed to university libraries for effective running of cloud computing technologies because of its numerous benefits to both students and staff.
- iii. The library management should ensure that regular training and retraining is given to library personnel in the operation and use of cloud computing technology for effective information sharing activities in the library.

- iv. Students should be encouraged to access the varieties of information available as a result of cloud computing technology to enrich their academic achievements.

Conclusion

Based on the findings from the study, it is concluded that cloud computing technologies, such as Infrastructure, Platform and Software as a service have significant influence on information sharing in federal university libraries in South- East, Nigeria. This will in turn enhance scholarship and improve academic standard.

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