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Characteristics of Cloud Computing as Determinants of Service Quality among Library Personnel in Federal Universities in South-west Nigeria

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Abstract

Library service quality has long been a topic of interest to library personnel but it has become more significant with technological advancement which has opened up various sources of information to rival, or at times, even surpass what the library is capable of offering. As information becomes more accessible through the internet and various online platforms, libraries face heightened competition from alternate information sources. In response, academic libraries must enhance their service quality to meet and surpass these emerging expectations. This study investigated the correlation between characteristics of cloud computing, and quality of services among library personnel in federal universities in southwest Nigeria. The descriptive survey research design and a mixed method approach was adopted for this study. The population was 243 library personnel (237 library personnel & 6 university librarians) from Federal Universities in Southwest Nigeria. Total enumeration sampling was used, ensuring the inclusion of every member of the population in the study. A validated questionnaire was used to elicit response from 237 respondents of the sampled universities, while 6 Librarians were interviewed accordingly. A reliability coefficient value for each variable in this study was recorded as follows; Cloud Computing (CC) = 0.85; Service Quality (SQ) = 0.82. This suggests that specific aspects of cloud computing, such as accessibility, scalability, and efficiency, have a notable impact on the quality of services provided in these academic libraries. Cloud computing offers enhanced flexibility for managing information resources and allows library personnel to provide more seamless access to digital content. Therefore, its effective use is positively associated with improved service delivery. The study found that Characteristics of Cloud Computing significantly influence service quality (Adj. $R^2 = 0.284$, $F(1, 200) = 80.631$, $p < 0.05$). This study concluded that characteristics of cloud computing have positive correlation with service quality of library personnel in academic libraries in federal universities in Southwest, Nigeria. The study recommended that Library personnel in the federal universities in Southwest, Nigeria should embrace continuous professional development stay abreast of the new development in the field of librarianship.

Keywords: Cloud computing, Service quality, Academic library, Electronic Library

Introduction

Academic library services revolve around the gathering, organization, preservation, interpretation, and dissemination of information to support their clients in their quest to create more knowledge. To achieve this, libraries offer services such as reference services (both online and offline), circulation services, research advisory services, bibliographic completion, indexing and abstracting services, information retrieval services, and a host of other services

targeted at ensuring that the information needs of their clients are met adequately (Khaola, 2015 and Ramezani, 2018). These services are usually provided in full consideration of and cooperation with their users' needs and expectations. However, while the library has always been mindful of the need to satisfy its users, it is even more important now that users have access to a variety of alternative channels of information delivery, many of which are more convenient and can compete on cost with the library.

Judged on the dimensions of LibQual (Affect of service, library as a place and information control), Nigerian federal universities libraries are often found wanting with library patrons complaining of noisy, crowded, and cramped library halls. Library patrons have also complained that many digital-based services provided by the library are not user-friendly. This has led to several strategies being proposed to improve the service quality in university libraries in Nigeria. Among the strategy proposed are upskilling library personnel, remodeling user education, collaboration with faculties among others. However, among the factors that have not been explored in detail include the characteristics of cloud computing and the digital literacy competency of library personnel.

Cloud computing, in its most basic definition, refers to online data processing. Here, "cloud" refers to the enormous networks of hardware and software used to provide a variety of services to the client via the internet[10]. The term "cloud computing" refers to a model of service delivery in which numerous resources, including software, a platform, and data, are made available to users over the internet. The adoption of cloud computing provides three main categories of services, or "layers," as they are sometimes called. These are Infrastructure-as-a-Service (IaaS), Platforms-as-a-Service (PaaS), and Software-as-a-Service (SaaS) (Sharma et. al., 2021).

Accessing these services requires an active internet connection because they are distributed via the web (Srivastava & Verma, 2015). In practice, cloud computing refers to the practice of leasing out various types of virtualized computer resources, such as servers, networks, storage spaces, and application programming interfaces, on a utility or as-needed basis to users via the internet. This has the advantage of taking the responsibility of investing in hardware, computing expertise, and security away from an organization such as libraries. It is a cost-effective way of applying technology to library operations.

Many organizations, including libraries, have therefore shifted their focus to the adoption of cloud services. Technological advancements have provided opportunities to transform library services and operations from a lethargic and indifferent state to a more proactive and result-oriented state (Tella et. al., 2020) Cloud computing is one of the leading information and communication technologies that is currently bolstering and enhancing library services and activities. Since the advent of cloud computing, many types of library services have been made available for remote online distribution. Data storage, servers, databases, networking, and software are all examples of such resources. The characteristics of cloud computing may drastically re-engineer and regenerate library operations to better facilitate the delivery of effective information services, which can significantly increase the efficiency of library personnel (Tella et. al., 2020).

It has been argued that implementing cloud computing at institutions like libraries is the most appropriate step towards improving the quality of library services. Indeed, it offers numerous

advantages to academic libraries. First, it frees them from maintaining local servers with its attendance cost of alternative power supply, space provision, and recruitment of staff to manage it. It also ensures that more people will have access to the library resources than is possible with a local server. In addition, the adoption of cloud computing also allows for the creation of a unified data set that draws upon resources from numerous libraries. As a technology, the adoption of cloud computing however depends on perceived system characteristics such as relative advantage, complexity, and compatibility.

Like any other technology, potential users make the decision to adopt cloud computing based on the perception of relative advantage. This is the extent to which cloud computing is viewed as superior to the existing system being used by the library or to other alternatives that can be adopted. Libraries typically accept new technology if it can help them achieve strategic and operational success. When compared to other IT models, cloud computing is preferable since it cuts expenses, saves time, boosts library productivity and profile, and promotes the creation of library consortia (Salam & Ali, 2020). The flexibility and scalability of the cloud gave them better oversight of library operations and IT costs. To put it another way, if cloud services are deployed correctly, they will make it easier and cheaper for libraries to carry out their operations more effectively. The pay-as-you-go model, increased scalability and flexibility, and simplified installation and upgrade process are just a few of the previously unavailable advantages cloud computing offers libraries. Libraries and other organizations are more inclined to utilize cloud computing when they see a clear benefit to doing so. They are also more likely to consider the compatibility of cloud services with their current and planned mode of operation.

The compatibility of innovations such as cloud computing has to do with the perception of potential users, in this case, libraries, that their setup and functioning align with their usual manner of operation (Salam & Ali, 2020). For instance, cloud computing is applied to digital library services such as the provision of scholarly databases, institutional repositories, digital reference services, and user education among others. Libraries that do not offer any of these services and have no plan of offering them in the near future may not see the need to adopt cloud computing. On the other hand, libraries that have subscribed to databases, invested in internet infrastructure, and acquire a significant volume of digital resources which it wishes to disseminate to a wider audience in a cost-effective manner may be eager to adopt cloud computing. Another dimension to compatibility is the nature and level of skills of available library personnel. Skilled personnel are an integral part of any system set-up. As a result, libraries without personnel skilled in the use of digital systems may not see the need of adopting cloud computing. It can therefore be asked whether the reported low level of cloud adoption in Nigerian libraries is due to a lack of skilled personnel, little or no digital services, and a lack of the necessary infrastructure. It is therefore against this backdrop the study aims to find out the influence of characteristics of cloud computing on service quality among library personnel in Federal Universities in South-west Nigeria.

Statement of the Problem

The integration of cloud computing into library services has the potential to revolutionize information access, storage, and management in academic institutions. Federal universities in South-west Nigeria, like their counterparts globally, are increasingly adopting cloud-based technologies to improve the efficiency and effectiveness of their library services. Cloud

computing offers libraries enhanced scalability, data storage capabilities, and seamless access to information, thereby improving service delivery. However, despite these potential advantages, the actual impact of cloud computing on the quality of services provided by library personnel in these institutions remains unclear. Several factors, including the specific characteristics of cloud computing, such as scalability, flexibility, accessibility, security, and cost-effectiveness, are believed to influence the quality of services offered by library personnel. However, little empirical evidence exists on how these characteristics directly contribute to improving service quality in federal university libraries in South-west Nigeria. Additionally, while many libraries have adopted some form of cloud computing, there is variability in the extent of usage, which raises questions about its role in enhancing user satisfaction, operational efficiency, and the overall quality of library services. This gap in knowledge creates uncertainty regarding how well-equipped library personnel are to fully utilize the potential of cloud computing to deliver high-quality services. Therefore, it is necessary to investigate the relationship between the characteristics of cloud computing and service quality among library personnel in federal universities libraries, South-west Nigeria.

Research Questions:

1. What is the level of service quality provided by library personnel in academic libraries in federal universities in southwest Nigeria?
2. What are the characteristics of cloud computing by library personnel in academic libraries in federal universities and libraries in southwest Nigeria?

Hypothesis

The hypothesis was tested at a 0.05 level of significance

H_0There will be no significant influence of characteristics of cloud computing on service quality of library personnel in academic libraries in federal universities in southwest Nigeria

Literature Review

Service quality is important because it can affect a customer's satisfaction with a product or service, and ultimately, the customer's loyalty to the brand. Companies that provide high-quality service are more likely to retain customers and attract new ones through positive word-of-mouth. The concept of service quality evaluation has its roots in the field of quality management, which focuses on ensuring that products and services meet or exceed customer expectations. Library patrons are now considered the most reliable arbiters of whether or not library services are up to grade. This is based on the belief that library collections and services were intended for a certain audience and that only those services that cater to that audience can be judged to be of sufficient quality. After all, a large library building housing a million books has no relevance if the users cannot find what they need in it (Hart, & Amos 2018). Therefore, it is essential for academic libraries to know their core goals so that they can provide services that students and faculty want and need. This includes serving as a place for learning, research, and study. This reality has led to the development of various models and frameworks that can allow library users of all categories to evaluate the standard of library services and collections (Mckay et. al., 2019; Bhanu & Kumar, 2017).

Since services are intangible, it is impossible to quantify or illustrate them in a specific way, which is why measuring library services is not a simple affair (Kumar & Mahajan, 2019). Likewise, it is not easy to settle on what constitutes "best practices" in library service. Since services cannot be stored indefinitely in advance of their actual usage, performance is affected to some degree by the level of demand. Last but not the least, as customers play an active role in the service's delivery, they have a say in shaping the service's overall quality. Therefore, service quality may differ based on individual preferences. Total quality management, accreditation, benchmarking, library standards, SERVQUAL, SERVPERF, and LibQUAL are just some of the tools and techniques that have been tried by libraries and other service providers and found as being helpful in evaluating and improving library service quality (Hart, & Amos, 2018).

Excellence, value, conformity to standards, and meeting or exceeding expectations are the four characteristics of service quality proposed by Hernon and Altman (Cristobal, 2018). This study after considering several theories has agreed to use the library-centered measure of service quality according to Libqual model which grouped all the measures into trio of affect of service, information control and library as a place.

Over the years, library being a service-rendering organization has found that there are several factors that influences service quality. Moreover, the technological innovations have brought several functionalities that can enhance library degree of quality of services rendered. Among these factors is cloud computing. Cloud computing is a type of computing that involves delivering computing services, such as storage, networking, and computing power, over the internet. This allows users to access and use these services on demand, without the need to manage and maintain the underlying infrastructure. One of the most rapidly expanding technologies of the 21st century, cloud computing offers numerous advantages but is not without its share of difficulties (Kumar, Raj & Jelciana, 2018). Theorist on the adoption of technology have suggested that the adoption of cloud computing can be measured with system characteristic such as relative advantage, compatibility, and complexity. The perceived relative advantage of an innovation is influenced by a variety of factors, including the characteristics of the innovation itself, the existing technology or practice it is replacing, the individual or organizational adopting the innovation, and the broader social, cultural, and economic context (Pathak, Brown & Best, 2019). Moreover, cloud computing in libraries is seen as having enormous benefits for library patrons because it allows access to services regardless of location (Guchacha, 2019). However, while the compatibility of cloud computing has been widely acknowledged, the issue of complexity has not been clearly resolved. Complex applications can be difficult and time-consuming to migrate to the cloud. This can lead to increased costs and delays in realizing the benefits of cloud computing. Applications with interdependencies, legacy code, or custom configurations may require additional effort to migrate (Yuvaraj, 2015).

Empirically, Scholars have mostly given a positive review to the adoption and use of cloud computing in academic libraries. This is probably because cloud computing plays a crucial role in enhancing the effectiveness with which information services are managed, processed, and supplied. New computing technology known as "the cloud" runs on a remote server hosted on the internet and is primarily concerned with providing a service. Flexible, dynamic,

and user-friendly infrastructure and software applications are guaranteed by this technology, which is primarily responsible for supplying IaaS, PaaS, and SaaS to others.

Researchers in India conducted a study which explored the advantages offered by cloud computing to academic libraries in the country. While all libraries face difficulties, some benefit more than others from overcoming them. 43% of the library studied agree that the investment needed on computer infrastructures can drastically reduce when a library can use cloud computing. In light of the enormous cost associated with the purchase of hardware, this sounds like a great idea for libraries. Fifty-seven (69%) of libraries report that software installation is not a problem. The platform and software are both provided and installed by the service provider. It was mentioned by 48% respondents, therefore it's clear that libraries can use cloud-based services without employing technical staff. Fifty-nine percent of library users think it's not difficult for libraries to keep their records updated. Eighty-three (54%) libraries have a favorable view of cloud-based services, with the main benefit being that users have instantaneous, always-on access to their library's collections. Forty-four (28%) of the collection's citations make reference to cloud service providers' assistance with optional augmentation. About a quarter, or 34 people out of 157, gave their thoughts on whether or not the fees would be manageable. Payments will be readily within the budget of libraries. Furthermore, (50% of respondents) remark that their cloud service provider guarantees data backup on a regular basis, so they never have to worry about losing any of their information (Gandotra et. al., 2019).

Another study examined whether libraries view cloud computing as a blessing or a curse for their operations. The researcher administered the questionnaire via email, forum, various WhatsApp groups, social media, and our own website. 157 people filled the online google form and share their answers and thoughts. There were 152 (96.8%) Indian respondents and 5 (3.2%) from other nations such Pakistan, Papua New Guinea, Bangladesh, Ethiopia, and Nigeria who filled out the survey. Out of a total of 157 respondents from various institutions, 82 (52.2%) are from government institutes, 64 (40.8%) are from private institutes, and the remaining 11 (7%) are from other types of institutes such deemed universities, autonomous institutions, and the like (Kang, 2020).

Methodology

The descriptive survey research design and a mixed method approach was adopted for this study. The population was 243 library personnel (237 library personnel & 6 university librarians) from Federal Universities in Southwest Nigeria. Total enumeration was used. A validated questionnaire was used to elicit response from 237 respondents of the sampled universities, while 6 Librarians were interviewed accordingly. A reliability coefficient value for each variable in this study was recorded as follows; Cloud Computing (CC) = 0.85, Service Quality (SQ) = 0.82.

Analysis

The demographic profiles of respondents by gender show that 104 (51.5%) were male, 93 (46.0%) were female, and 5 (2.5%) did not disclose their gender, indicating a slight male majority. The age profile reveals that most respondents (43.6%) were between 35 and 44 years, with smaller groups in other age ranges: 50 years and above (15.8%), 30-34 years (13.9%), under 25 years (4.5%), and 25-29 years (4.0%). Two respondents (1.0%) did not disclose their age. In terms of rank or cadre, 47 respondents (23.3%) were Library Officers,

36 (17.8%) were Assistant Librarians, and 34 (16.8%) were Principal Librarians, with smaller percentages in other ranks. Three respondents (1.5%) did not disclose their rank. Most respondents worked in the readers' services (29.2%) and technical sections (27.7%), with others in the e-library (21.3%) and serials management (16.3%). Eleven respondents (5.4%) did not disclose their library section.

Analysis of Research Questions

Research Question One: What is the level of service quality provided by library personnel in academic libraries in federal universities in Southwest, Nigeria?

Table 1: Level of Service Quality Provided by Library Personnel in Academic Libraries in Federal Universities, Southwest, Nigeria

Affect of service	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Mean**
Majority of library personnel in my library understand users' information need	106 (52.5%)	88 (43.6%)	8 (4.0%)	0 (0.0%)	3.49
Majority of library personnel in my library are willing to help users	**79 (39.1%)**	**118 (58.4%)**	**5 (2.5%)**	**0 (0.0%)**	**3.37**
Majority of library personnel in my library give users individual attention	78 (38.6%)	115 (56.9%)	9 (4.5%)	0 (0.0%)	3.34
Majority of library personnel in my library instill confidence in users	**63 (31.2%)**	**127 (62.9%)**	**11 (5.4%)**	**1 (0.5%)**	**3.25**
Majority of library personnel in my library have enough knowledge to answer user questions	73 (36.1%)	115 (56.9%)	13 (6.4%)	1 (0.5%)	3.29
Weighted Mean					**3.35**
Library as place					
My library is conducive for study and learning	93 (46.0%)	106 (52.5%)	3 (1.5%)	0 (0.0%)	3.45
My library has separate spaces for individual and group activities	80 (39.6%)	107 (53.0%)	11 (5.4%)	4 (2.0%)	3.30
My library building is located in a welcoming and comfortable environment	90 (44.6%)	107 (53.0%)	4 (2.0%)	1 (0.5%)	3.42
My library has attractive and aesthetic features	81 (40.1%)	109 (54.0%)	9 (4.5%)	3 (1.5%)	3.33
My library has comfortable furniture and equipment	82 (40.6%)	115 (56.9%)	4 (2.0%)	1 (0.5%)	3.38
Weighted Mean					**3.38**
Information control					
My library provides unrestricted access to electronic information resources	80 (39.6%)	108 (53.5%)	11 (5.4%)	3 (1.5%)	3.31
My library has modern equipment that allow users to easily access needed information	81 (40.1%)	109 (54.0%)	11 (5.4%)	1 (0.5%)	3.34
My library has access tools that allow	82	115	4	1	3.38

users to find materials on their own	(40.6%)	(56.9%)	(2.0%)	(0.5%)	
My library has website/information system that enhance quick access to needed information	86 (42.6%)	109 (54.0%)	4 (2.0%)	3 (1.5%)	3.38
My library makes information resources easily accessible for individual use	83 (41.1%)	112 (55.4%)	7 (3.5%)	0 (0.0%)	3.38
Weighted Mean					**3.36**
Overall Weighted Mean					**3.36**

Decision rule: < 2.5 = low; 2.5 = moderate; > 2.5 = high

Table above revealed that on the average, the responses indicatea mean value of 3.29. The weighted mean has a value of 3.35 which suggest that the respondents agreed to high level of affect of service. On the average, the responses indicatea mean value of 3.38 which was high. The weighted mean has a value of 3.38 which also suggest that the respondents agreed to high level of library as place. More so, On the average, the responses indicatea mean value of 3.38. The weighted mean has a value of 3.36 which suggest that the respondents agreed to a high level of information control. The overall weighted mean for level of service quality provided by library personnel in academic libraries in federal universities in Southwest, Nigeria is 3.36. This suggests that there is high level of service quality by library personnel in academic libraries in federal universities in Southwest, Nigeria.

Research Question Two: What are the perceived characteristics of cloud computing by library personnel in academic libraries in federal universities in Southwest, Nigeria?

Table 2: Perceived Characteristics of Cloud Computing by Library Personnel in Academic Libraries in Federal Universities, Southwest, Nigeria

Relative advantage	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Mean**
Using cloud computing is cost effective and can help the library reduce cost of infrastructure, saving financially	89 (44.1%)	107 (53.0%)	6 (3.0%)	0 (0.0%)	3.41
Adoption of cloud computing will provide a more protective environment than using library servers	66 (32.7%)	126 (62.4%)	10 (5.0%)	0 (0.0%)	3.28
Adoption of cloud computing improves the quality of library services than using other similar technologies	69 (34.2%)	120 (59.4%)	12 (5.9%)	1 (0.5%)	3.27
Libraries using cloud computing are seen as more advanced than	68 (33.7%)	119 (58.9%)	13 (6.4%)	2 (1.0%)	3.25

those who use only stand-alone storage					
Weighted Mean					**3.30**
Compatibility					
Cloud computing is easily compatible with the existing IT infrastructure in my library	78 (38.6%)	106 (52.5%)	15 (7.4%)	3 (1.5%)	3.28
I think using cloud computing fits well with the way my library has been operating	69 (34.2%)	120 (59.4%)	12 (5.9%)	1 (0.5%)	3.27
I have used other technologies similar to cloud computing	67 (33.2%)	118 (58.4%)	17 (8.4%)	0 (0.0%)	3.25
I have previous positive experience with the use of cloud computing	61 (30.2%)	127 (62.9%)	11 (5.4%)	3 (1.5%)	3.22
Cloud computing services have the right features to meet the types of services my library need to provide	68 (33.7%)	120 (59.4%)	12 (5.9%)	2 (1.0%)	3.26
Weighted Mean					**3.26**
Complexity					
Using cloud computing is simple and straightforward	53 (26.2%)	131 (64.9%)	11 (5.4%)	7 (3.5%)	3.14
Any library personnel can easily learn how to make use of cloud computing services	63 (31.2%)	126 (62.4%)	9 (4.5%)	4 (2.0%)	3.23
Majority of cloud computing services usually come with easy-to-understand instructions	73 (36.1%)	108 (53.5%)	15 (7.4%)	6 (3.0%)	3.23
Weighted Mean					**3.20**
Overall Weighted Mean					**3.25**

Decision rule: < 2.5 = low; 2.5 = moderate; > 2.5 = high

Table two above reveals that on the average, the responses indicatea mean value of 3.25. The weighted mean has a value of 3.30 which suggest that the respondents agreed to high level of relative advantage. More so, on the average, the responses indicatea mean value of 3.26. The weighted mean has a value of 3.26 which also suggest that the respondents agreed to high level of compatibility. The weighted mean has a value of 3.20 which suggest that the respondents agreed to a high level of complexity as necessary consideration. The overall weighted mean for perceived characteristics of cloud computing by library personnel in academic libraries in federal universities in Southwest, Nigeria is 3.25. This suggests that perceived characteristics of cloud computing by library personnel in academic libraries in federal universities in Southwest, Nigeria is high.

Regression Analysis for Influence Characteristics of Cloud Computing on Service Quality of Library Personnel in Academic Libraries in Federal Universities in Southwest, Nigeria

a. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.536[a]	.287	.284	.29752

a. Predictors: (Constant), Perceived Characteristics

b. ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.137	1	7.137	80.631	.000[a]
	Residual	17.703	200	.089		
	Total	28.841	201			

a. Predictors: (Constant), Characteristics
b. Dependent Variable: Service Quality

c. Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error		Beta	t	Sig.
1	(Constant)	1.728	.183		9.462	.000
	Perceived Characteristics	.500	.056	.536	8.979	.000

a.DependentVariable:Service Quality

The characteristics of cloud computing have a moderate positive correlation (R = 0.536) with service quality among library personnel in academic libraries in federal universities in Southwest Nigeria. The coefficient of determination (Adj. R^2 = 0.284) shows that cloud computing characteristics explain 28.4% of the variance in service quality, while 71.6% is due to other factors. The model is significant ($F(1, 200) = 80.631$, $p < 0.05$), and a unit change in cloud computing characteristics leads to a 0.50 increase in service quality ($B = 0.500$, $p < 0.05$). Therefore, the null hypothesis is rejected, confirming a significant relationship.

Interview Responses

Questions on Service Quality

The University Librarians offered various perspectives on the quality of service in their libraries. The University Librarian of the University of Lagos described the service quality as

high, supported by user feedback praising library personnel. Similarly, the University Librarians of Obafemi Awolowo University and Federal University of Technology, Akure, also reported commendable and excellent service quality. However, the University Librarian of Federal University of Agriculture, Abeokuta, noted that the quality is "moderately high," reflecting ongoing improvements, while the University Librarian of the University of Ibadan echoed that the quality is relative. The University Librarian of Federal University, Oye-Ekiti, acknowledged the challenges posed by staff shortages but affirmed that the existing staff still strive to deliver quality services.

Regarding complaints, the University Librarians of University of Lagos and Federal University, Oye-Ekiti, highlighted feedback mechanisms, including comment boxes and interactions at the circulation desk. Federal University of Technology, Akure, reported a good service relationship with clients, while the University Librarian of University of Ibadan said feedback is regularly received. In contrast, the University Librarians of Obafemi Awolowo University and Federal University of Agriculture, Abeokuta, stated they rarely receive complaints, with Abeokuta focusing on encouraging reading habits among users.

Question on Cloud Computing

University librarians highlighted several areas where cloud computing is useful for their libraries. The University Librarian of the University of Lagos mentioned the digital repository, LLM, and resource provision (databases). Obafemi Awolowo University listed cataloguing, reference services, and OAU publications. The Federal University of Agriculture, Abeokuta, and the Federal University of Technology, Akure both cited databases and KOHA, with Akure also mentioning the repository. The University of Ibadan uses cloud computing in almost all library services. However, Federal University, Oye-Ekiti noted limited engagement, using KOHA mainly for cataloguing and classification.

Regarding the general perception of cloud computing among library personnel, the University of Lagos reported a positive attitude, with well-trained staff adapting to innovation. Obafemi Awolowo University noted minimal awareness, while Federal University of Technology, Akure described it as highly efficient, with a positive attitude. At the Federal University of Agriculture, Abeokuta, 60-70% of staff embraced cloud computing, while others lacked the technical skills. The University of Ibadan noted growing tech-savviness, especially among

older staff, though there was initial technophobia. Lastly, Federal University, Oye-Ekiti reported that most staff embraced cloud computing after in-house training.

Discussion of findings

The study revealed a high level of service quality provided by library personnel in academic libraries of federal universities in Southwest Nigeria, with an overall weighted mean of 3.36. This was supported by interviews that noted library staff, though insufficient in number, delivered quality services to the best of their abilities. A corroborative study examined academic staff's perception of library service quality using SERVQUAL dimensions, finding library staff to be helpful, instilling confidence, and positively impacting teaching, learning, and research, with overall satisfaction rated just above average (Kiran, 2010). Conversely, another study using SERVQUAL found tangible aspects of service quality exceeded expectations, but components like reliability, responsiveness, assurance, and empathy fell below expectations (Panday, 2018).Further, a gap analysis of libraries at the Islamic Azad University revealed that users highly valued "operation time," "staff," and "circulation," while "press" and "audiovisual materials" were deemed less important. Libraries surveyed had average perceived quality, with "staff," "information literacy," and "environment" performing better, while some libraries like "Theology and Philosophy" and "Medical Engineering" lagged in service quality (Babalhavaeji et. al., 2017).

Whether positive or negative, libraries play a crucial role in the learning process across all education levels. Essential functions include providing references, a conducive environment, and offering good service. E-library services connected to external agencies add value to overall service quality.The study revealed that the overall weighted mean for the characteristics of cloud computing by library personnel in academic libraries in federal universities in Southwest, Nigeria is 3.25, indicating a high level of cloud computing adoption. The qualitative report supports this, highlighting that libraries have transitioned from traditional to digital systems, and personnel must embrace technological innovations to remain relevant (Mahalakshmi & Sornam, 2012). In corroboration, a questionnaire-based study in India found that 98.2% of respondents were aware of cloud computing, with 87.7% familiar with its application in libraries (Njoku& Ken-Agbiriogu, 2021). In Nigeria, a study in Imo State revealed awareness and use of cloud computing in selected academic libraries, emphasizing benefits such as resource economy, cost-effectiveness, and file sharing, though concerns about security, privacy, and multiple taxation were noted. Supporting these findings, scholars have emphasized that cloud computing offers features like internet-based

computing, heterogeneity, on-demand self-service, and scalability (Kaur, Kaur, & Shabaz, 2022). Its key characteristics include elasticity, pay-per-use, secure access to metered services, and flexibility, enabling efficient resource use and fast service configuration (Caballer et. al., 2018).

The test of Hypothesis One found a significant result ($B = 0.500$, $p < 0.05$), leading to the rejection of the null hypothesis. This indicates a significant relationship between the characteristics of cloud computing and the service quality of library personnel in academic libraries across federal universities in Southwest Nigeria.Cloud computing's impact on various professions, including library services, is profound due to its numerous advantages. As highlighted by scholars, educational institutions globally are increasingly reliant on IT to fulfil teaching, learning, service delivery, and commercial needs. Cloud computing represents a significant advancement, building on previous technological developments like computers and the internet. Based on scholarly injunctions, the implementation of cloud computing in libraries is expected to significantly improve service quality and operational efficiency. This trend is not only transforming libraries in developed countries but also holds promise for advancing library services in regions like Ethiopia and beyond (Dagnaw& Tsigie, 2019; Deng, 2017;Araujo et. al., 2014).

Summary

The findings of the study (Cloud Computing as predictor of quality service in academic libraries in Federal Universities South West, Nigeria) is summarized thus:

1. The study found a high-level service quality rendered by library personnel in academic libraries in federal universities in Southwest, Nigeria, however, there is room for improvement on the part of the management and staff.
2. The study found a high perceived characteristics of cloud computing by library personnel in academic libraries in federal universities in Southwest, Nigeria.
3. The study found that Cloud computing has significant influence on service quality library personnel in academic libraries in federal universities in Southwest, Nigeria.

Conclusion

Cloud computing like all other technological outputs have the potentials of presenting a significant advancement, building on previous technological developments like computers

and the internet. Based on scholarly injunctions and the findings of this study, the implementation of cloud computing in libraries is expected to significantly improve service quality and operational efficiency.

Recommendations

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

1. Library personnel in the federal universities in Southwest, Nigeria should endeavor to engage in training unceasingly so as to stay relevant in the everchanging world.
2. Library personnel in federal universities are advised to maximize the benefit of cloud computing. This will go a long way in enhancing service quality.

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