Library Waves: A Biannual Peer Reviewed Journal of Library and Information Science
Volume 10, Issue 2 (July-December, 2024); ISSN: 2455-2291 (Online); Website: www.librarywaves.com

Librarians' Awareness, Perceptions, and Adoption of Cloud Technologies in the Four State-Owned Universities of Delta State, Nigeria

Efe Francis Ejedafiru[#]** * Festus Ogbogbaidi**

*****Senior Lecturer, Department of Library and Information Science, Faculty of the Social Sciences, Delta State University, Abraka, Nigeria; Email: ejedafiruefe@yahoo.com, eejedafiru@delsu.edu.ng
****** Department of Library and Information Science, Faculty of the Social Sciences, Delta State University, Abraka, Nigeria; Email: fogbogbaidi@gmail.com
# Corresponding author.

Received: 23 October 2024 ***Accepted: 24 December 2024***

Abstract

This study investigates librarians' awareness, perceptions, and adoption of cloud technologies in the four state-owned universities of Delta State, Nigeria. The study used a descriptive survey research approach, including 61 librarians from four universities. A total enumeration sampling method was adopted, and data were obtained using a standardized questionnaire that had been validated prior to delivery. Key findings show that librarians are well-versed in cloud-based technology, and their positive opinion and uptake in library practices is encouraging. These data point to a rising embrace of digital transformation in libraries. However, other problems were discovered, including limited technical skills, insufficient infrastructure, excessive expenses, gaps in computing literacy, unstable power supply, and a bad maintenance culture. In conclusion, while librarians have a favorable awareness and view of cloud technology, addressing the issues through specific measures such as infrastructure improvements, policy formulation, and ongoing training is critical for successful adoption. To address difficulties and boost cloud technology adoption, the report proposes investing in library infrastructure, providing ongoing training for librarians, developing ICT polices, and fostering a maintenance culture and facilitate cloud technology adoption. These efforts would position libraries to better harness the benefits of cloud solution and remain aligned to modern trends.

Key Words: Librarians, Awareness, Perception, Adoption and Cloud Technologies.

1. Introduction

Libraries have always been crucial in advancing civilization by meeting the information needs of users. However, the rapid evolution of technology presents new challenges for university libraries. To stay relevant, libraries must embrace information and communication technologies (ICT), such as digitalization and institutional repositories, to meet the evolving needs of users (Aiyebelehin, Makinde, Odiachi & Mbakwe, 2020). One of the most significant innovations in libraries today is cloud computing, which allows the sharing of resources and services over the internet, removing the reliance on local servers and personal devices (Akinyoola, 2023).

Cloud computing refers to the delivery of computing services, including storage, software, and data access, over the internet, without requiring users to understand the infrastructure behind it. It offers benefits such as easy access to shared resources from any device with an internet connection. This subscription-based service has revolutionized the library field by enabling digital transformations in service delivery and access to scholarly content. According to Idahosa & Eireyi-Edewede (2023), cloud computing provides data access, storage, and retrieval without users needing to know the structure or location of the computing infrastructure. Cloud-based solutions, such as Google Apps and OCLC's Worldshare Management Services, have streamlined library operations, making it easier to manage data and collections. The rise of cloud-based technologies has made libraries more efficient, with applications for hosting websites, storing data, and offering easy access to bibliographic resources. Idhalama and Fidelis (2020); Kroski (2019) note that cloud computing has facilitated digital library development and improved information storage, management, and retrieval, leading to enhanced accessibility and collaboration worldwide.

However, the adoption of cloud technologies in libraries varies globally. While many universities in Western countries have fully embraced cloud solutions, African countries, including Nigeria, have been slower to adopt these innovations. Research by Akinyoola (2023) highlights that Nigerian university libraries still rely on traditional technologies, such as local hardware systems, for data storage and management. This slow adoption can be attributed to a lack of awareness and understanding of cloud computing among Nigerian librarians. Idhalama and Fidelis (2020) argue that without a clear understanding of cloud computing's benefits and potential, librarians may be hesitant to adopt these technologies. Awareness is a key factor in the successful adoption of cloud technologies. It refers to the level of knowledge and understanding librarians have regarding cloud computing, including its features, benefits, and challenges. Librarians must be informed about various cloud-based tools, such as cloud storage and library management systems, to make informed decisions about integrating them into library operations (Akinyoola, 2023). Unfortunately, many librarians lack sufficient knowledge of cloud technologies, which hinders their use in libraries (Muhammad, Iqbal, & Muhamma, 2024; Idahosa & Eireyi-Edewede, 2023).

Librarians' perceptions of cloud computing also influence its adoption. Perception refers to how librarians evaluate the potential impact of cloud technologies on library services and operations. Some librarians view cloud computing as an opportunity to enhance services, while others may be concerned about issues like data security, reliability, and the need for technical expertise (Isebe, 2024). Many librarians' reluctance to adopt cloud computing stems from a lack of ICT skills and technological fear, emphasizing the importance of targeted training and support (Idhalama & Fidelis, 2020). Given that previous studies have largely focused on other regions, this research aims to investigate librarian awareness, perceptions, and the adoption of cloud technologies in the four state-owned universities in Delta State, Nigeria.

2. Review of Related Literature

The intriguing thing about cloud computing is that it began as a technology for the public, with services such as Facebook and Flickr (Idahosa and Eireyi-Edewede, 2023). Library services are increasingly becoming inextricably linked to information technology (IT) in terms of content distribution, communication, and collaboration. The demand for servers, storage, and software is high in universities and libraries. According to Sudhier and Seena (2018), cloud computing technologies

can help libraries improve computing performance, storage capacity, universal accessibility, and reduce costs. This can benefit the library by lowering fixed and maintenance costs associated with IT investments in hardware, software, and computer services. Librarian's awareness of cloud technology adoption can be characterized as librarians' knowledge, comprehension, and familiarity with the existence, characteristics, benefits, and potential issues connected with cloud technologies in the library setting. Furthermore, their understanding of cloud technologies includes an assessment of potential risks, issues, and barriers to acceptance and implementation. The Technology Acceptance Model (TAM), as defined by Cherry (2021), is a well-known framework that offers insight on the link between perception and behavior. According to TAM, people's views of a technology's ease of use and perceived usefulness have a direct impact on their desire to accept and use it.

Cherry (2021) goes on to say that perception is a complicated interaction of ideas, beliefs, and behaviors aimed at diverse components, such as physical items, people, and objects. These perceptions might be good, negative, or ambiguous, depending on the environment and individual experiences. According to Afebuameh, Aiyebelehin, Makinde Odiachi and Mbakwe (2020), one important reason for the failure of cloud computing technology implementation in libraries in underdeveloped countries is that librarians plan without adequate knowledge of hardware, software, and power supply needs. Afebuameh et al. (2020) correctly observed that librarians' predisposition to accept cloud-based technology is a multifaceted landscape driven by a variety of circumstances. Within this complex environment, the level of acceptance varies greatly. Awareness and comprehension, budget limits, data security and privacy issues, user experience, customization and integration, stability and uptime, community and peer influence, and training and support are all important considerations. Each librarian's unique viewpoint and experiences complicate the situation, making it difficult to provide a precise response. Nonetheless, these elements influence the librarian's decision-making process, deciding their readiness to use cloud technology into their professional pursuits.

The majority of public university libraries in the Western world now use cloud-based technologies. For example, libraries in the Western world frequently employ OCLC's web cataloging tools, which are the most visible instances of cloud-based technology in libraries. However, the adoption rate of cloud-based technologies in African university libraries, notably in Nigeria, remains low since many libraries have yet to embrace the use of cloud-based technologies in the delivery of library services. Observation also suggests that the majority of Nigerian university libraries have yet to implement cloud-based technologies. Adeleye (2017) discovered that university libraries in Nigeria still choose to save library data using hardware technology, with no cloud backup.

Aviamu (2019) investigated a fundamental feature of cloud computing adoption: how academic libraries preserve research data. The study's findings shed light on a troubling trend: cloud computing adoption is particularly low among African university libraries. This finding highlights the difficulty that academic institutions throughout the continent confront in leveraging the benefits of cloud technology to protect critical research data. This low adoption rate is most likely due to insufficient resources, worries about data security, and a lack of comprehensive cloud computing policy. The use of cloud-based technology into library systems has created a plethora of potential and benefits, ranging from increased accessibility to streamlined operations. However, this change is not without problems. There are numerous challenges associated with cloud computing, according to Idahosa and Eireyi-Edewede (2023), who state that integrity, trust, privacy, expectations, control, regulations, and

intellectual property management have raised three critical issues: technical, legal, and organizational policy. In a previous study, Achugbue (2018) identified barriers to the adoption of cloud-based technology in South-South Nigerian public university libraries. These challenges included high acquisition and maintenance costs, the need for advanced computing literacy, unreliable power supply affecting cloud technology use, occasional system failures, limited staff training opportunities, insufficient ICT infrastructure, poor ICT equipment maintenance practices, frequent hardware and software obsolescence, and the lack of ICT policies impeding cloud computing adoption.

Akinyoola (2023) investigated librarians' knowledge and perceptions of cloud-based technologies in academic libraries in Southwest Nigeria. The study sampled 132 professional and non-professional librarians using a simple random sampling technique. A structured questionnaire, with reliability coefficients of $r = 0.76$ and $r = 0.82$, was used for data collection. Findings revealed that librarians were knowledgeable about cloud-based technology and used some applications in their libraries. However, their overall perception of cloud technology was negative, indicating a need for initiatives to improve their attitudes toward adoption. Idahosa and Eireyi-Edewede (2023) explored awareness and attitudes toward cloud computing deployment in South-South Nigerian university libraries. Using a descriptive survey design, data were collected from 246 librarians, achieving a response rate of 77% (190 respondents). The study revealed that while librarians exhibited low awareness of cloud computing, their attitudes toward its adoption were positive. The researchers highlighted the need for enhanced awareness campaigns to facilitate broader adoption of cloud technologies. Temitope et al. (2024) examined the adoption of cloud computing in academic libraries across Lagos and Ogun States. A survey research design was employed with a sample of 152 library personnel, selected randomly. The study found high levels of awareness and significant adoption of cloud computing for collaboration, resource accessibility, and digital storage. However, challenges such as financial constraints, data security concerns, staff resistance, and a lack of technical expertise were noted. Recommendations included targeted training and addressing infrastructural and financial barriers to improve adoption.

Muhammad et al. (2024) conducted a study on university librarians' perceptions of cloud computing in Punjab, Pakistan. Data collected from 212 librarians highlighted the benefits of cloud computing, including enhanced data security, improved accessibility, and efficient collaboration. Popular services such as web-OPAC, email, and cloud backup were widely used. However, the study identified major challenges like high implementation costs, data security concerns, and unreliable internet connectivity. The researchers recommended strategic planning and user engagement to address these barriers effectively. Isebe (2024) explored librarians' perceptions and competencies regarding Fourth Industrial Revolution (4IR) technologies in university libraries in Southern Nigeria. Using a total enumeration sampling technique, the study analyzed data from 684 librarians, achieving an 81% response rate. Findings indicated a positive perception of 4IR technologies, but inadequate skills to effectively utilize them. Identified challenges included insufficient ICT infrastructure, lack of technical skills, and limited experience with technologies like artificial intelligence, augmented reality, and cloud computing. Recommendations emphasized the importance of training programs and infrastructural improvements for effective adoption.

Although the literature review indicates that a significant number of studies have been conducted on the topic of the study, the majority of these studies have focused primarily on librarian awareness and perceptions of cloud technology adoption, but the majority of these literatures were from countries,

states, local government areas, or schools outside of our scope of study. To the best of the researchers' knowledge, there has been little or no research into librarian awareness, perception, and uptake of cloud technology in Delta State University libraries. This is the gap that the study aims to fill.

3. Statement of the Problem

Preliminary examinations by the researchers found that little can be said about library customers' awareness, perception, and acceptance of cloud technology for addressing their information needs. Furthermore, the researchers revealed that a large proportion of librarians had little interest in using cloud technologies to improve their services. This lack of enthusiasm was due to concerns about the time and effort required, as well as doubts about their awareness, perception, competency, and capacity to comprehend the workings of cloud technology. However, these observations are not definitive; therefore, the study seeks to evaluate the librarians' awareness, perceptions, and adoption of cloud technologies in the four state-owned universities of Delta State, Nigeria.

4. Research Questions

The following research questions guided this study:

1. What is the level of librarians' awareness of cloud-based technology in Delta State University Libraries?
2. What is the perception of librarians towards the adoption of cloud-based technology in Delta State University Libraries?
3. What is the level of librarians' willingness to adopt cloud-based technology in Delta State University Libraries?
4. What are the perceived benefits associated with the use of cloud-based technology in Delta State University Libraries?
5. What are the perceived challenges associated with the use of cloud-based technology in Delta State University Libraries?

5. Methods and Procedure

This study used the descriptive survey research approach. The study's population consists of 61 librarians from four state-owned universities of Delta State. The total enumeration sampling approach was used, with the entire librarian population serving as the study's sample. This is backed by Aiyebelehin et al. (2020), who claims that no sampling was done because the population is small, reasonable, and controllable. The instrument utilized was a questionnaire created by the researchers. The face and content technique was utilized to establish the instrument's validity, and the questionnaire was thoroughly scrutinized and examined by measurement and assessment experts. The dependability of this instrument was verified using the test-retest procedure. The instrument was administered to thirty (30) librarians at the Edo State University library in Epkoma, Edo State. The first test was administered and documented, and then the identical test was repeated after a two-week gap. The Pearson Product Moment Correlation Coefficient (r) was used to assess reliability. The reliability index was 0.82. This index demonstrated item consistency and was graded satisfactory. The researchers individually distributed questionnaire copies to the responders. Data were evaluated using descriptive statistical tools, including simple frequencies and mean ($\bar{x}$). This is selected because of the descriptive character of the study. Decisions were made based on a criterion mean of 2.5.

6. Data Analysis, Presentation of Results and Discussion of Findings

Table - 1: University Libraries of the Respondents

Universities of Respondents	Copies Administered	Copies Retrieved	Percentage Copies Retrieved
Delta State University library, Abraka	21	17	81
University of Science and Tech. library, Ozoro	16	16	100
Denis Osadeba University library, Asaba	12	12	100
University of Delta library, Agbor	13	13	100
Total	61	58	95.2

Table 1 presents the percentage distribution of responses from university libraries. The Delta State University Library in Abraka recorded a response rate of 81.0% (17 out of 21), while the University of Science and Technology Library in Ozoro had 100.0% (16 out of 16). Also both Denis Osadeba University Library in Asaba and the University of Delta Library in Agbor achieved a perfect response rate of 100% (12 out of 12 and 13 out of 13, respectively). Overall, 95.2% of the administered copies (58 out of 61) were retrieved, indicating a high level of engagement across all institutions.

Research Question One: What is the level of librarians' awareness of cloud-based technology in Delta State University Libraries?

Table - 2: Level of Librarians 'Awareness of Cloud-Based Technology

Awareness	HA	A	NA	NHA	$\bar{x}$
1. Cloud-based technology can enhance the efficiency of library services	31	23	3	1	3.45
2. Cloud-based technology can be used to store information over a network	29	20	7	2	3.31
3. Cloud-based technologies enables librarians to share information with other libraries over a network	27	21	8	2	3.26
4. Information stored with cloud-based technologies can be accessed in any part of the world.	22	31	2	3	3.24
5. Cloud based technology can transform the way information system are built and services delivered in libraries	23	28	5	2	3.24
6. Cloud based technology allow users access to the library anywhere and anytime	26	24	4	4	3.24
7. By using cloud based services, a library can increase computing performance, storage capacity, universal and cost reduction (PTO)	23	31	2	2	3.29
8. With cloud computing, librarians can avoid technological challenges such as computer system crashes and data loss.	26	22	4	6	3.21
Aggregate Mean					**3.28**
Criterion Mean					**2.50**

According to table 2, the aggregate mean of 3.28 surpasses the criterion mean of 2.50, illustrating that librarians are well-versed in cloud-based technologies. This familiarity stems from their understanding of how cloud technology significantly enhances library operations. For instance, librarians acknowledge that cloud-based technology improves library services ($\bar{x}$ = 3.45), enabling more efficient management of resources and operations. They recognize its capacity to store information via a network ($\bar{x}$ = 3.31), which ensures secure and centralized data management. Moreover, librarians value the ability of cloud-based systems to facilitate information sharing among libraries ($\bar{x}$ = 3.26), fostering collaboration and resource accessibility. The global accessibility provided by cloud technology ($\bar{x}$ = 3.24) is another notable benefit, alongside its role in transforming information systems and service delivery. Additionally, cloud computing enhances processing performance, increases storage capacity, and reduces costs ($\bar{x}$ = 3.29), making it an essential tool for modern library services. Librarians also appreciate the 24/7 access to library resources enabled by cloud-based platforms ($\bar{x}$ = 3.24), which benefits both users and staff. Furthermore, the ability of cloud services to minimize data loss and prevent system breakdowns ($\bar{x}$ = 3.21) underscores their reliability. These findings confirm that librarians are well-acquainted with the capabilities and advantages of cloud-based technologies.

Research Question Two: What is the perception of librarians towards the adoption of cloud-based technology in Delta State University Libraries?

Table - 3: Perception of librarians towards the Adoption of Cloud-based Technology

Perception	**SA**	**A**	**D**	**SD**	**$\bar{x}$**
1. I believe that adopting cloud-based technology in our library would improve access to digital resources	26	27	3	2	3.33
2. I think that cloud-based technology can enhance the efficiency of our library's operations.	24	31	2	1	3.34
3. I understand that cloud-based technologies in libraries require high technical knowledge of computing	26	29	2	1	3.38
4. I possess the necessary skills required for the adoption and maintenance of cloud-based technologies.	23	30	3	2	3.28
5. I feel that the adoption of cloud-based technologies in libraries is not beyond the financial reach of most libraries	33	22	1	2	3.48
6. I know that the use of cloud-based technologies in libraries will make certain services easy.	24	27	5	2	3.26
7. I feel the adoption of cloud-based technologies in libraries enhances storage and preservation of information materials	20	29	7	2	3.16
8. I feel cloud-based is easy to maintain and adopt in libraries	20	29	4	5	3.10
9. I feel libraries can build a community power through cloud-based technologies	16	28	8	6	2.93
Aggregate Mean					**3.25**
Criterion Mean					**2.50**

The data in table 3 indicate that the aggregate mean of 3.25 exceeds the criterion mean of 2.50, demonstrating that librarians hold a positive impression of cloud-based technology. This favorable perception is evident in their belief that adopting cloud-based technology enhances access to digital

materials ($\bar{x}$ = 3.33) and improves the efficiency of library operations ($\bar{x}$ = 3.34). These technologies are seen as transformative tools for modern library practices. Despite recognizing that cloud-based technologies may require advanced technical expertise ($\bar{x}$ = 3.38), many librarians feel equipped with the essential skills for their adoption and maintenance ($\bar{x}$ = 3.28). They also perceive these technologies as financially viable solutions for most libraries ($\bar{x}$ = 3.48), offering cost-effective means to simplify services ($\bar{x}$ = 3.26). Furthermore, librarians value the role of cloud-based technologies in enhancing information storage and preservation ($\bar{x}$ = 3.16), and consider them relatively straightforward to implement and maintain ($\bar{x}$ = 3.10). However, there is slightly less agreement regarding the potential of cloud-based technologies to foster community empowerment, as reflected by a lower mean score ($\bar{x}$ = 2.93). Despite this, the overall perception remains positive. Librarians acknowledge the broad advantages of cloud-based technology, reinforcing its relevance and potential for advancing library services.

Research Question Three: What is the level of librarians' willingness to adopt cloud-based technology in Delta State University Libraries?

Table - 4: Willingness to Adopt Cloud-Based Technology in the Library

Willingness	**VHL**	**HL**	**LL**	**VLL**	**$\bar{x}$**
1. Adopt and use OCLC's Worldshare Management Services	24	28	4	2	3.28
2. Adopt and use Google Apps to migrate from desktop to web accessible applications	19	32	4	3	3.16
3. Adopt and use Koha ILS and maintenance subscription offered by OSS labs (which uses Amazon's elastic cloud computing platform)	23	26	7	2	3.21
4. Adopt and use Polaris (Polaris Library Automation System) for standard acquisition and processing in the library	23	31	1	3	3.28
5. Adopt and use Dropbox (a file hosting service operated by Dropbox) to store data	21	26	7	4	3.10
6. Adopt and use duraspace (a collaboration of the Dspace digital library software and Fedora Commons) in the library	16	37	2	3	3.14
7. Adopt and use DSpace institutional repository hosting and software in the library	13	38	3	4	3.03
8. Adopt and use web-based applications such as Gmail, Google Calendar, and Google Talk as communication tools	20	26	8	4	3.07
9. Adopt and use cloud-based technology such as Google Docs: text files, Google drive, spreadsheets, and presentations as productivity tools	25	20	8	5	3.12
Aggregate Mean					**3.15**
Criterion Mean					**2.50**

Data from table 4 reveal that the aggregate mean of 3.15 exceeds the criterion mean of 2.50, demonstrating that librarians are enthusiastic about adopting cloud-based technologies in their libraries. This readiness reflects their recognition of the benefits these technologies offer for enhancing library services. Librarians express a strong preference for utilizing OCLC's Worldshare Management Services ($\bar{x}$ = 3.28) and the Polaris Library Automation System ($\bar{x}$ = 3.28) for efficient acquisition and processing of library resources. There is also a high level of interest in embracing

Google Apps to facilitate the transition to web-accessible applications ($\bar{x}$ = 3.16). Koha Integrated Library System (ILS), supported by Amazon's cloud platform, is another favored option, with a mean score of 3.21. Other tools librarians are inclined to adopt include Dropbox for secure data storage ($\bar{x}$ = 3.10) and Duraspace for digital library management ($\bar{x}$ = 3.14). Additionally, they show significant interest in productivity tools such as Google Docs ($\bar{x}$ = 3.12) and web-based communication applications like Gmail and Google Calendar ($\bar{x}$ = 3.07), which simplify collaboration and task management. However, the readiness to implement DSpace institutional repository hosting software is slightly lower ($\bar{x}$ = 3.03), though it remains above the criterion mean, indicating overall positivity toward its adoption. In summary, librarians exhibit high enthusiasm and preparedness to adopt a wide range of cloud-based technologies, underscoring their commitment to advancing library operations and ensuring efficient service delivery.

Research Question Four: What are the perceived benefits associated with the use of cloud-based technology in Delta State University Libraries?

Table - 5: Benefits Associated with the Use of Cloud-based Technology in University libraries.

Benefits	**SA**	**A**	**D**	**S A**	**$\bar{x}$**
1. Keep up with the latest trends in information management	33	18	3	4	3.38
2. Reduce cost in sharing information resources	31	21	5	1	3.41
3. Improved library services and patron satisfaction	31	23	3	1	3.45
4. Facilitates heightened productivity by fostering greater collaboration and ensuring consistency	28	23	5	2	3.33
5. Expand and exp knowledge exchange	29	22	4	3	3.33
6. Obtaining, managing, retaining, and distributing knowledge	31	19	5	3	3.34
7. Eliminating obstacles to accessing knowledge	32	19	5	2	3.40
8. Reduce the need for physical storage space for library materials	29	20	4	5	3.26
9. Enhance the security and preservation of valuable library data and resources	31	17	7	3	3.31
10. Provide remote access to library services and resources	34	21	2	1	3.52
Aggregate Mean					**3.37**
Criterion Mean					**2.50**

Table 5 reveals an aggregate mean of 3.37, which is higher than the criterion mean of 2.50, indicating that librarians recognize numerous benefits associated with the use of cloud-based technologies in university libraries. The most highly rated benefit is the provision of remote access to library services and resources ($\bar{x}$ = 3.52), underscoring the technology's potential to enhance user convenience and accessibility. Increasing the efficiency of library services and patron satisfaction ($\bar{x}$ = 3.45) is also a notable benefit, reflecting librarians' belief in cloud technology's ability to meet the evolving demands of library users. Additionally, it significantly minimizes the cost of sharing information resources among libraries ($\bar{x}$ = 3.41), further enhancing collaborative opportunities and resource utilization. Cloud-based technologies are perceived to improve access to knowledge ($\bar{x}$ = 3.40) and facilitate effective knowledge management ($\bar{x}$ = 3.34). They also foster collaboration among librarians, which enhances productivity ($\bar{x}$ = 3.33). These technologies align with current trends in

information management ($\bar{x}$ = 3.38) and provide improved data security and preservation for library materials ($\bar{x}$ = 3.31). While slightly less emphasized, reducing the demand for physical storage space ($\bar{x}$ = 3.26) remains a valuable benefit, highlighting the shift toward digital solutions in modern library management. In conclusion, the perceived benefits of adopting cloud-based technologies in university libraries are overwhelmingly positive, offering innovative solutions for enhancing service delivery, improving resource management, and meeting user expectations.

Research Question Five: What are the perceived challenges associated with the use of cloud-based technology in Delta State University Libraries?

Table - 6: Perceived Challenges Associated with the Use of Cloud-Based Technology Library

Challenges	**SA**	**A**	**D**	**SA**	**$\bar{x}$**
1. The cost of acquiring and maintaining cloud-based technologies is high	26	27	3	2	3.33
2. Librarians limited technical skills	24	31	2	1	3.34
3. Absence of ICT policies for the adoption and use of cloud computing	26	29	2	1	3.38
4. Inadequate computing literacy skill	23	30	3	2	3.28
5. Epileptic power supply affects the use of cloud-based technologies	33	22	1	2	3.48
6. Inadequate staff training opportunities is a challenge	16	37	2	3	3.14
7. Poor ICT infrastructural facilities	13	38	3	4	3.03
8. Poor maintenance culture of ICT equipment	20	26	8	4	3.07
9. Frequent obsolescence of ICT hardware and Software	25	20	8	5	3.12
Aggregate Mean					**3.24**
Criterion Mean					**2.50**

According to table 6, the aggregate mean of 3.24, which exceeds the criterion mean of 2.50, indicates that librarians identify significant obstacles to adopting cloud-based technology in libraries. The foremost challenge is the epileptic power supply ($\bar{x}$ = 3.48), which disrupts the consistent use of cloud services. Following this is the lack of a clear ICT policy for embracing and implementing cloud computing ($\bar{x}$ = 3.38), highlighting a gap in strategic planning and governance. Poor technical capabilities among librarians ($\bar{x}$ = 3.34) and the high costs associated with acquiring and maintaining cloud-based technologies ($\bar{x}$ = 3.33) further complicate adoption. Inadequate computing literacy skills ($\bar{x}$ = 3.28) among library staff are another critical barrier, pointing to a need for focused skill development initiatives. Limited training opportunities for staff ($\bar{x}$ = 3.14) and weak ICT infrastructure ($\bar{x}$ = 3.03) also hinder the successful integration of cloud technologies. Additionally, poor maintenance culture ($\bar{x}$ = 3.07) and the rapid obsolescence of ICT hardware and software ($\bar{x}$ = 3.12) present ongoing challenges, emphasizing the need for sustainable solutions and regular system upgrades. These obstacles underscore the complexities libraries face in transitioning to cloud-based systems. Addressing these challenges requires robust investment in infrastructure, clear policy frameworks, and ongoing capacity-building programs for library personnel. By overcoming these barriers, libraries can fully harness the transformative potential of cloud-based technologies, improving service delivery and operational efficiency.

7. Discussion of the Findings

The findings of this survey show that librarians have a significant and positive degree of awareness about cloud-based technology, indicating an increased readiness to accept and apply cloud solutions in library operations. This contrasts with Alemayehu's (2010) research, which found a considerable gap in awareness, with 31 out of 45 respondents admitting to having no prior understanding of cloud computing, despite their professional expertise. ehu identified an awareness deficiency, notably in university libraries in South-South Nigeria, implying that the awareness landscape has changed since then. Similarly, the current study differs with Isebe (2024) findings, which revealed that librarians were not only unaware of cloud technologies, but also hesitant to adopt them due to poor ICT skills and a phobia of technology. These divergent results emphasize the changing nature of technology knowledge within the librarian community, emphasizing the significance of ongoing education, skill development, and targeted strategies for the successful incorporation of cloud-based technologies in libraries.

The study demonstrates that librarians have a significantly positive attitude toward implementing cloud-based technologies in their library operations. This contrasts significantly with the findings of Isebe (2024), who highlighted librarians' hesitation to embrace cloud technologies, owing mostly to a lack of ICT skills and a general anxiety about new technology. Such uncertainty posed a substantial impediment to the successful incorporation of cloud solutions into library procedures. Furthermore, Achugbue's (2018) research revealed a typically negative impression of cloud-based technology among librarians in university settings, emphasizing the disparity in sentiments within the librarian community. This disparity reflects the impact of factors such as regional context, institutional assistance, and personal expertise. The positive perception observed in this study suggests that Delta State University librarians are becoming more open to the benefits of cloud-based technologies, most likely due to current trends, targeted educational efforts, and a growing recognition.

The data analysis suggests a significant positive attitude among librarians to utilize cloud-based technologies. This suggests that librarians have a positive attitude and are ready to implement cloud technologies into their library activities. This finding is consistent with Tamuno's (2016) study, which found that many university librarians are willing to utilize cloud technology but face financing challenges. The current study reveals that, while librarians are prepared to embrace cloud technology, financial constraints may impede the widespread implementation of these systems in libraries. Adeleye (2017) found that librarians in Nigerian public libraries prefer old hardware for data storage over cloud options, citing a lack of confidence in sophisticated technologies. This contrast highlights the different opinions and issues facing the librarian community, emphasizing the importance of tackling both financial constraints and confidence shortfalls.

The data study demonstrates numerous important benefits of integrating cloud-based technology in libraries. These benefits include reducing physical storage requirements for library materials, providing remote access to library services and resources, and improving overall library services and patron satisfaction. These findings support Reid (2017); Wang, Zhong and Li (2022); remark that libraries benefit significantly from the extended network connectivity given by cloud computing technology.

The collected data exposes a number of issues related to the integration of cloud-based technologies in libraries. These issues include low technical skills among librarians, insufficient ICT infrastructure,

and the high expenses associated with obtaining and maintaining cloud-based technology. Temitope et al. (2024) emphasizes the expensive costs of installing and operating cloud-based technology in Nigeria, highlighting the complex collection of barriers that prevent efficient integration of these technologies in library settings. Addressing these issues is critical for increasing the use and benefits of cloud-based technologies in libraries.

8. Practical Implications of the Study

This study sheds light on librarians' understanding, perceptions, and use of cloud technology at state-owned university libraries in Delta State. The findings have significant practical implications for the library and information science fields, particularly in terms of improving the effectiveness of library services and overcoming technological obstacles.

1. Policy formulation and advocacy: The study emphasizes the importance of clearly established ICT policies in academic libraries. Policymakers can use the findings to create frameworks that encourage the adoption of cloud technology while addressing the highlighted impediments, such as a lack of technical skills and unstable infrastructure.
2. Training and Capacity Building: Librarians' eagerness to utilize cloud technologies emphasizes the need for ongoing professional development. Libraries should invest in training programs to provide librarians with the essential technical skills and computing literacy, allowing them to efficiently adopt and operate cloud-based systems.
3. Infrastructure Development: The report underlines the importance of strong ICT infrastructure and reliable power supplies. Stakeholders, such as university administrators and funding organizations, can prioritize infrastructure upgrades to ensure seamless integration of cloud technology.
4. Cost Management Strategies: Libraries can cooperate with cloud service providers to find cost-effective solutions, given the high costs of cloud adoption. Additionally, pooled cloud resources among institutions can cut expenses while improving service delivery.
5. Improving Service Delivery: Cloud technologies offer greater remote access, data security, and patron satisfaction, enabling libraries to modernize operations and better serve customers.

9. Conclusion and Recommendations

This study examined librarian awareness, perception, and adoption of cloud technologies in four state-owned university libraries in Delta State. Findings revealed that librarians exhibit a high level of awareness and a positive attitude toward integrating cloud-based solutions into library practices. This enthusiasm reflects a growing acceptance of digital transformation, driven by the recognized benefits of cloud technology. These include improved service delivery, cost efficiency, enhanced data security, and the ability to provide remote access to library resources. Additionally, cloud technologies offer significant advantages such as reducing physical storage requirements and boosting productivity, enabling libraries to remain adaptive to evolving information management needs. Despite these benefits, several barriers impede the full integration of cloud technologies in academic libraries. Key challenges identified include limited technical skills among librarians, inadequate ICT infrastructure, high costs of implementation, computing literacy gaps, and the absence of a comprehensive ICT policy. Furthermore, an unreliable power supply and poor maintenance culture exacerbate these issues, making it difficult to achieve seamless adoption. To

address these challenges and ensure the effective and sustainable use of cloud technologies, focused interventions are crucial. These should include targeted training programs to build technical competence, investment in robust ICT infrastructure, the establishment of clear policies for cloud adoption, and measures to improve the maintenance culture. By tackling these obstacles, academic libraries can leverage the full potential of cloud-based solutions, transforming service delivery and meeting the dynamic needs of their patrons in the digital age.

Based on the findings, various recommendations can be made to improve the successful integration of cloud-based technology in Delta State University Libraries.

1. University management should invest in improving library infrastructure, such as Internet bandwidth, contemporary computing systems, and dependable power supply.
2. Organize ongoing training and development programs to enhance librarians' technological abilities and cloud computing proficiency.

References

1. Aiyebelehin, A. J., Makinde, B., Odiachi, R., & Mbakwe, C. C. (2020). Awareness and use of cloud computing services and technologies by librarians in selected universities in Edo State. *International Journal of Knowledge Content Development & Technology, 10*(3), 7-20. https://doi.org/10.5865/IJKCT.2020.10.3.007
2. Akinyoola, O. G. (2023). Knowledge and perception of librarians towards cloud-based technology in academic libraries in Southwest, Nigeria. *IASSIST Quarterly, 47*(3-4), 1-12.
3. Alemayehu, N. (2010). Is cloud computing really ready for prime time? *IEEE Computer Society*. Retrieved from http://www.leavcom/pdf/cloudcomputing
4. Idahosa, M., & Eireyi-Edewede, S. (2023). Librarians' awareness and attitude towards deployment of cloud computing technologies in university libraries in South-South Nigeria. *International Journal of Librarianship, 8*(1), 82-95. https://doi.org/10.23974/ijol.2023.vol8.1.269
5. Idhalama, O. U., & Fidelis, A. (2020). Perception and attitude of librarians towards cloud computing in the University of Dar es Salaam Library. *Library Philosophy and Practice (e-journal),* 4235. https://digitalcommons.unl.edu/libphilprac/4235
6. Isebe, L. M. (2024). Librarians' perception, competencies, and use of fourth industrial revolution technologies for service delivery in university libraries in South-South Nigeria. *Journal of Contemporary Studies in Library and Information Science, 2*(1), 12-25.
7. Kroski, E. (2019). Library cloud atlas: A guide to cloud computing and storage stacking. *Library Journal.* Retrieved from http://www.libraryjournal.com/article/CA6695772.html
8. Muhammad, I. A., Iqbal, H. A., & Muhammad, N. (2024). Librarians' perceptions about adoption of cloud computing in university libraries of Pakistan. *Annals of Human and Social Sciences, 5*(2), 1-11.
9. Reid, E. M. (2017). Technology innovation for libraries: Key areas for sustainability and growth. *Library Hi Tech News, 34*(10), 8-12.
10. Sudhier, K. G., & Seena, S. T. (2018). Library professionals' adoption of cloud computing technologies: A case study on Kerala university. *Library Philosophy and Practice (e-journal),* 1-18. Retrieved from https://digitalcommons.unl.edu/libphilprac/1832

11. Tamuno, S. O. (2016). Cloud computing adoption by public university libraries: A case study of Nigeria. *The Electronic Library, 34*(1), 91-106.
12. Temitope, O. M., Joshua, B., Pauline, C. A., & Ebunoluwa, B. A. (2024). Adoption of cloud computing in academic libraries in Lagos and Ogun States. *De Gruyter*, *53*(4), 259-266.
13. Wang, D., Zhong, D., & Li, L. (2022). A comprehensive study of the role of cloud computing on the information technology infrastructure library (ITIL) processes. *Library Hi Tech, 40*(6), 1954-1975.

■■■