ASSESSING LIBRARIANS' PREPAREDNESS FOR ADOPTION OF EMERGING TECHNOLOGIES FOR EFFECTIVE SERVICE DELIVERY

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Abstract

This study investigated the awareness, readiness, and barriers to adopting emerging technologies among librarians in Nigerian academic libraries. Using a descriptive survey design, data were collected from 275 librarians via a structured Google Form distributed across professional online platforms. Analysis revealed high levels of awareness of technologies such as artificial intelligence and machine learning, but limited exposure to blockchain and robotics. Despite strong interest, only 63.6% of respondents had received formal training, and infrastructural challenges—including inadequate funding and lack of strategic policies—were prevalent. Barriers such as resistance to change, limited management support, and cybersecurity concerns further hindered adoption. The study concludes that while librarians are digitally aware, systemic gaps must be addressed to enable full integration of emerging technologies. Recommendations include expanding training, improving infrastructure, developing policies, and fostering leadership support to drive innovation in library services.

Keywords: Emerging technologies, librarians, digital transformation, academic libraries, Nigeria, technology adoption

Introduction

Emerging technologies have significantly transformed how information is created, accessed, and shared. Libraries, being pivotal in the dissemination of knowledge, are directly influenced by these technological advancements. The preparedness of librarians to embrace and integrate next-generation technologies is critical for ensuring effective service delivery in libraries and to the different categories of users.

The development of technologies such as Artificial Intelligence (AI), blockchain technologies, and virtual reality have demonstrated an unprecedented transformative potential and promises a great improvement in the organization, retrieval, and dissemination of information. Some of those emerging technologies that are reshaping numerous industries, of which libraries are no exception: from their recently advancements include: Data, the Internet of Things (IoT), Block Chain Technology, Augmented Reality (AR), Robotics, Artificial Intelligence (AI), Expert Systems, Semantic Web, etc. (Din & Ali, 2024).

Considering librarians crucial place in the information hubs called libraries and been mandated to as a necessity serve a diverse populations while adapting to the ever-changing needs of society are seriously influenced or forced to embrace and integrate to these cutting-edge technologies (Rahoo, et al., 2020). According to Rahoo, et al. (2020), library professionals ought to advance their skills and competencies in order to be able to adapt and fit into the changing trends in present age. This implies that the rapid pace of technological innovation demands that librarians not only remain aware of new tools but also acquire the skills necessary to deploy them effectively.

With so many new technologies emerging every now and then, the library and information professionals despite the constant appreciation and hopefulness are faced with the daunting question of whether librarians are prepared for the next generations of emerging technologies. The answer to this question is vital, as the successful adoption of these tools can enhance library services, improve accessibility, and ultimately ensure user satisfaction. While some libraries have made strides in upgrading their infrastructure and training staff, others struggle with financial constraints and resistance to change. With the level of of pressure mounted on libraries and librarians challenges such as competition from search engines and free databases, regulated finance and the unrelenting growing user expectations (Adegbite et al., 2023), technological changes and the need for adapting, the questions remains; are librarians prepared for the new influx of technological changes?

This study aims to assess the preparedness of librarians to adopt emerging technologies, focusing on their level of knowledge, available infrastructure, professional development opportunities, and barriers to implementation. By doing so, this research seeks to provide insights that will guide library stakeholders in creating a roadmap for the future.

Research Objectives
1. To determine librarians' level of knowledge and awareness regarding emerging technologies;
2. To assess the availability of infrastructure and resources for technology adoption in libraries;
3. To analyze barriers to the integration of emerging technologies in library services.

Research Questions

1. What is the level of librarians knowledge and awareness regarding emerging technologies?

2. To what extent are infrastructure and resources for technology adoption availability in libraries?

3. What are the barriers to the integration of emerging technologies in library services?

Literature Review

Knowledge and Awareness of Emerging Technologies

Emerging technologies like Artificial Intelligence (AI), Augmented Reality (AR), and Blockchain have shown great potential in revolutionizing library systems. But, the extent of librarians' familiarity with these tools often varies significantly based on access to information and training. Various studies highlight the importance of technological competence in library professionals. Saibakumo (2021) found in study of the "Awareness and acceptance of emerging technologies for extended information service delivery in academic libraries in Nigeria" that majority of librarians are very much aware of emerging technologies. Agboke and Oladokun (2025) reported that librarians in Nigerian universities are increasingly aware of digital innovations such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT), though practical implementation remains uneven.

Patience (2024) emphasized that while librarians recognize the importance of digital tools, institutional efforts to build technical capacity are often inadequate. In their study, Eze and Nwankwo (2024) found that librarians are more familiar with technologies that have direct applications in cataloging, user services, and digital archiving, while more complex or abstract innovations like blockchain remain underexplored.

Saibakumo's study which sampled 90 librarians from public, private and academic libraries selected from the east, west and south-south Nigeria also revealed that despite this high level of awareness that level of adoption is low; Saibakumo also observed that librarias prefer to make use of readily available emerging technologies such as social media, institutional repositories, Cybrary, library websites, WebOPAC, RFID, Integrated library management system, use of Library Guide application and Internet of Things for effective service delivery; the librarians were ready and prepared to adopt more emerging technologies for better information service delivery. And that these desires to improve were limited by poor funding, lack of power super, poor maintenance to mention just a fews.

Jaja and Emerole (2024) studied the level of awareness, availability and use of emerging technologies for effective curriculum implementation by Librarians and Teachers of Senior Secondary schools in Karu LGA of Nasarawa State. Their study population was 120 librarians

and teachers drawn from public and private schools in Karu Local Government Area of Nasarawa State and it sampled forty schools, picking one librarian and two teachers from each school sampled. It was found that while there was a low extent of awareness of AI, Robotics, Internet of Things, Machine learning and blockchain technologies. The extent of awareness of Computer System, Internet connectivity, Social Media, E-Book and Area Network was very high. While the current study investigates this issue of awareness further it focused on librarians in university libraries.

Infrastructure and Resources
Research suggests that limited funding and outdated systems hinder librarians' ability to adapt to these advancements effectively. Modern library setups demand cloud storage, advanced search algorithms, and interactive platforms.

For any technology to be meaningful and useful to libraries and librarians there must be adequate technological infrastructure on ground for integrating them in libraries. Jaja and Emerole (2024) established that availability of such technologies and the level of utilization among librarians and teachers in the schools they studied were very low. Agboke and Oladokun (2024) noted that successful use of any systems to a large extent is dependent on solving the issue of infrastructure challenges and ensuring that staff and users are adequately trained.

Akawu et al. (2024) examine the evaluation of LMS in Nigerian federal university libraries, focusing their importance in streamlining library workflows. The scholars observed that these systems besides enhancing satisfaction among users also ensure a reduction in manual labor, freeing library staff to pay more attention to other services areas. Odeyemi, (2019) looked at robots in Nigerian academic libraries; the scholar investigated infrastructural readiness and potential for library services. This study's finding revealed that librarians were aware of the use of Robots in the library. Okenwa and Lawal (2024) identified financial constraints and outdated equipment as major barriers to digital transformation in Nigerian libraries.

The authors further concurred that robots are used for day-to-day activities of the library and are part of the library's innovative progress. Disruptive technology, economy, and competition have created a desire to do work in less time, for instance, library management robot (LMR) will mitigate the problems by collecting the books from the library counter and then arranging the books, one by one, into shelves. They also agreed that the deployment of robotic systems will minimize the efforts required to arrange books in a library because libraries consist of thousands of books and there are few employees to arrange them which will save time. Considering the advantages of robots in the circulation of library services, Agboke and Oladokun (2024) pointed out that the number one obstacle to the use of technology is the inadequate technological infrastructure in academic libraries in Nigeria.

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Barriers to Adoption

Resistance to change, lack of training opportunities, and financial constraints are some of the primary barriers to the integration of emerging technologies. Studies suggest that overcoming these challenges requires strategic planning and support from governmental and non-governmental organizations.

Poor infrastructural funding coupled with many other daunting challenges has always impeded the use of academic libraries and their services (Odeyemi, 2019). Similarly, in their study, Akawu et al. (2024) observed that inadequate funding and technical expertise can hinder complete implementation of library management systems. Inadequate technological infrastructure in academic libraries in Nigeria constitutes a major challenge to the adoption and use of technologies (Agboke & Oladokun, 2024). Chukwuma and Edeh (2024) argued that successful technology adoption requires not only infrastructure but also cultural and administrative shifts.

Oyetola et al. (2023) blamed the absence of stable internet connectivity, inadequate electricity supply, and continues retention of outdated hardware for the inability of librarians to leverage artificial intelligence (AI) and robotic technologies in libraries. For Tella (2020), deficiencies in infrastructure that hamper have the deployment of robotics. Tella noted further that a lot of libraries do not have both physical and technical environment needed to use such systems.

Oladokun et al. (2023) pointed out that the cost of acquiring and maintaining emerging technologies, such as AI and robotics, by far dwarfs the budgetary allocation to most academic libraries. This problem of financial coupled with low funding by government and the absence of alternative source of finance for investments in technologies further compound the challenges before academic libraries. Oladokun and co also questioned the readiness and capacity of library staff to adopt and utilize emerging technologies. Lund and Wang (2023) added that a lack of adequate training and opportunities for librarians professionally develop themselves and acquire necessary technical skills needed for AI and robotics ion libraries.

Methodology

This study adopted a descriptive survey research design. The design was chosen to enable the collection of quantitative data from a large population of librarians regarding their knowledge, awareness, and attitudes toward emerging technologies in library services. The survey method allowed for the systematic gathering of standardized responses suitable for statistical analysis. The population of the study comprised librarians working in academic libraries. These professionals were targeted due to their direct involvement in library technology adoption and service delivery. A total of 275 respondents participated in the study. The sample was selected

using purposive sampling, targeting librarians who are active on professional online platforms such as Nigerian Library Association (NLA forums), WhatsApp groups, and social media communities where library-related discussions occur. This approach ensured that participants were likely to be informed and engaged with current technological trends. A structured questionnaire was administered via Google Forms, and the data collected were analyzed using Google Forms' built-in analytics tools, which provided automatic tabulation of responses, frequency counts, and percentage distributions. The results were exported and further interpreted using descriptive statistics such as tables to summarize key findings.

Results

Table 1: Knowledge and Awareness Regarding Emerging Technologies – Part A

Statement	SA	A	D	SD	Total (%) Agree (SA+A)
I am familiar with emerging technologies relevant to library services.	120	95	40	20	78.2%
I understand how artificial intelligence can be applied in library tasks.	110	90	50	25	72.7%
I regularly update my knowledge on technological trends in librarianship.	100	85	60	30	67.3%
I have received training on emerging library technologies.	95	80	60	40	63.6%
I can confidently explain the benefits of adopting new technologies.	115	90	45	25	74.5%

Table 1 above is the part A of the test of the level of knowledge and awareness regarding emerging technologies amongs librarians. With majority of the respondents indicating they are familiar with various forms of emerging technologies and even understand the associated benefits of same, it can be said that librarians have a good knowledge of and are aware of such technologies. However, only 63.6% of the respondents have received formal training on how they function in rerlation to their job and how to use them, clearly indicating a need for more structured professional development for librarians.

Table 2: Knowledge and Awareness– **Part B**

Technology	Aware (Frequency)	Aware (%)
Artificial Intelligence	235	85.5%
Augmented Reality	170	61.8%
Blockchain	130	47.3%
Robotics	140	50.9%

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Internet of Things	190	69.1%
Machine Learning	220	80.0%

Table 2 is the part B of the attempt to measure which emerging technologies librarians are most knowledgable and aware of. The analysis shows that their level of awareness is highest for Artificial Intelligence - 83.5% and Machine Learning – 80.%, while awareness of Blockchain and Robotics is less with 47.3% and %0.9% respectively. They are also moderately aware of Augmented Reality and Internet of Things – 61.8% and 69.1% respectively. This suggests librarians level of knowledge and awareness is average as the number of emerging technologies they are moderately and less aware of by far outweighs those they know. More awareness programmes and trainings should be geared towards lesser-known technologies.

Table 3: Availability of Infrastructure and Resources

Statement	SA	A	SD	Total (%) Agree (SA+A)
Our library has access to high-speed internet and reliable infrastructure.	105	90	30	70.9%
The library is equipped with up-to-date computers and digital tools.	95	85	35	65.5%
There is adequate funding for technology acquisition and maintenance.	80	75	50	56.4%
Staff have access to technical support when using new technologies.	90	85	40	63.6%
Our library has a policy guiding the integration of new technologies.	85	80	45	59.9%

Table 3 which is on availability of infrastructure and resources indicates that while internet access and equipment availability are relatively strong, funding and policy support remain moderate. This highlights the need for institutional investment and strategic planning to improve on not only the level of librarians knowledge and awareness of the next ghenerations emerging technologies, but also to enable them effectively harness them into library operations and services.

Section E: Barriers to Integration of Emerging Technologies

Statement	SA	A	D	SD	Total (%) Agree (SA+A)
Lack of staff training is a major barrier to technology integration.	120	95	40	20	78.2%
Resistance to change among library staff affects technology	110	90	50	25	72.7%

adoption.					
Inadequate funding hinders the implementation of new technologies.	130	85	40	20	78.2%
There is a lack of management support for technology-based innovations.	100	85	55	35	67.3%
Cybersecurity and data privacy concerns limit the use of emerging tech.	95	80	60	40	63.6%

Table 5 above measured barriers to integration of emerging technologies, while, all the barriers presented to the respondents were considered very important to the need to ensure that librarians are not only aware of but also are ready to adopt emerging technologies to improve service delivery in libraries, the most significant barriers are seen to be inadequate funding and lack of staff training (both at 78.2%). Resistance to change and limited management support also contribute to slow adoption (72.7% and 68.3%), Cybersecurity concerns was moderately acknowledged. This implies that inadequate funding, staff training, management support and resistance to change are the major barriers hindering the integration of emerging technologies in libraries and prepare them for handling of the next generation of such technologies,

Discussion of Findings

The findings of this study reveal a growing awareness and cautious adoption of emerging technologies among librarians in Nigerian academic libraries. A significant proportion of respondents (78.2%) indicated familiarity with emerging technologies relevant to library services, and 74.5% could confidently explain their benefits. This aligns with Agboke and Oladokun (2025), who reported that librarians in Nigerian universities are increasingly aware of digital innovations such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT), though practical implementation remains uneven. Despite high levels of awareness, only 63.6% of respondents had received formal training on emerging technologies. This gap between awareness and training reflects the findings of Patience (2024), who emphasized that while librarians recognize the importance of digital tools, institutional efforts to build technical capacity are often inadequate. The lack of structured professional development programs limits the ability of staff to fully engage with and apply these technologies in their daily operations. Also, awareness levels varied across specific technologies. AI and machine learning were the most recognized (85.5% and 80%, respectively), while blockchain and robotics had lower awareness rates (47.3% and 50.9%). These results are consistent with the study by Eze and Nwankwo (2024), which found that librarians are more

familiar with technologies that have direct applications in cataloging, user services, and digital archiving, while more complex or abstract innovations like blockchain remain underexplored.

Infrastructure and resource availability were moderate. While 70.9% of respondents agreed that their libraries had reliable internet access, only 56.4% believed there was adequate funding for technology acquisition and maintenance. This supports the findings of Okenwa and Lawal (2024), who identified financial constraints and outdated equipment as major barriers to digital transformation in Nigerian libraries. Furthermore, only 59.9% of respondents confirmed the existence of institutional policies guiding technology integration, indicating a lack of strategic direction.

Barriers to adoption were clearly identified. Inadequate funding (78.2%) and lack of staff training (78.2%) were the most cited challenges, followed by resistance to change (72.7%) and limited management support (67.3%). These findings echo Chukwuma and Edeh (2024), who argued that successful technology adoption requires not only infrastructure but also cultural and administrative shifts. Cybersecurity concerns were acknowledged by 63.6% of respondents, reflecting growing awareness of data privacy risks associated with digital platforms.

The study explored librarians' awareness, infrastructure readiness, and barriers to adopting emerging technologies in Nigerian academic libraries. Key findings include:

- **High Awareness**: A majority of respondents (over 78%) were familiar with emerging technologies such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT). However, awareness of blockchain and robotics was significantly lower.
- **Training Gap**: Only 63.6% of respondents had received formal training on emerging technologies, indicating a disconnect between awareness and practical readiness.
- **Infrastructure and Policy Limitations**: While 70.9% reported access to reliable internet, only 56.4% believed their libraries had adequate funding for technology acquisition. Furthermore, only 59.9% confirmed the existence of institutional policies guiding technology integration.
- **Barriers to Adoption**: The most cited barriers were inadequate funding (78.2%), lack of staff training (78.2%), resistance to change (72.7%), and limited management support (67.3%). Cybersecurity concerns were also noted by 63.6% of respondents.

Conclusion

The study concludes that Nigerian academic librarians demonstrate strong awareness and interest in emerging technologies, but face significant barriers to implementation. These

include infrastructural deficits, insufficient training, lack of strategic policies, and cultural resistance. Without deliberate efforts to address these challenges, the potential of emerging technologies to transform library services will remain underutilized. To achieve meaningful digital transformation, libraries must invest in capacity building, infrastructure development, and inclusive policy frameworks that support innovation and continuous learning.

Recommendations

Based on the findings, the following recommendations are proposed:

1. **Expand Training Programs:** Libraries should organize regular workshops and certification programs to equip staff with practical skills in emerging technologies.
2. **Improve Infrastructure and Funding:** Institutions must prioritize investment in digital infrastructure, including high-speed internet, modern equipment, and maintenance budgets.
3. **Develop Strategic Policies:** Clear policies should be formulated to guide the integration, evaluation, and sustainability of technology initiatives in libraries.
4. **Foster Leadership and Management Support:** Library leadership should actively champion technology adoption and provide incentives for innovation.
5. **Promote Awareness of Lesser-Known Technologies:** Targeted campaigns should be launched to educate staff on underutilized technologies such as blockchain and robotics.
6. **Address Cultural and Behavioral Resistance:** Peer mentoring and change management strategies should be implemented to reduce resistance and promote collaboration.
7. **Strengthen Cybersecurity Protocols:** Libraries must adopt robust data protection measures to ensure safe and ethical use of digital platforms.

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