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NIGERIAN LIBRARY ASSOCIATION
NIGER STATE CHAPTER

CONFERENCE PROCEEDINGS

7th ANNUAL HYBRID CONFERENCE /AGM 2025

THEME:
INNOVATIVE TECHNOLOGIES IN LIBRARY SERVICES: EXPLORING THE AVENUES FOR BUILDING USERS' CONFIDENCE IN LIBRARIES.

28TH SEP., - 1ST OCT., 2025.

CPES HALL, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, BOSSO CAMPUS, NIGER STATE

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FROM THE EDITORIAL DESK

The Nigerian Library Association, (NLA), Niger State Chapter's is pleased to formally release her the 2nd Edition of her compiled Book of Proceedings. This is a compilation of Papers Presented at the Chapter's 7th Annual Hybrid Conference held at CPES Hall, Federal University of Technology Minna, Niger State. High quality research is leading to corresponding high-quality theories that are finding their place in the real world of application. Nigerian Library Association, Niger State Chapter brings forth an opportunity for researchers in Librarianship Profession to create knowledge for application in emerging issues that will result to massive development in the society. The Conference with a theme "**Innovative Technologies in Library Services: Exploring the Avenues for Building Users' Confidence in Library**" was carefully carved out and was intended to provide forum for exchange of ideas among professional colleagues towards finding tenable solutions to current issues in the global information value chain.

I owe a heartfelt thanks to all the article contributors for a very fascinating research output which promised to constantly thrive upon high quality research. Cases published in this issue have gone through internal editorial committee's review and the comments received from experts have helped to improve upon the quality of work. In this pursuit, I extend my immense gratitude to a very dedicated team of editors for their relentless and untiring efforts in this regard. We are also indebted to our external reviewers who have spared their valuable time despite their tight schedules and contributed immensely towards the success of this publication.

We sincerely hope that the readers will find the research outputs interesting, relevant and intellectually stimulating leading to building up diverse outlook about contemporary issues.

Prof. A. O. Ahmed
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WELCOME REMARK BY DR. MUSA BABA ADAMU - THE CHAIRMAN OF THE NIGER STATE CHAPTER OF THE NIGERIAN LIBRARY ASSOCIATION (NLA)

Distinguished guests, colleagues, and friends, it is my great pleasure to welcome you all to the Nigerian Library Association Niger State Chapter Annual Conference. It is an honor to serve as the Chairman of this chapter and I am delighted to see this huge turnout here today.

As we all know, libraries play a crucial role in our society by providing access to information, promoting literacy and education, and preserving our cultural heritage. This conference presents a unique opportunity for all of us to come together and discuss the current trends and challenges in the library profession.

The theme: "Innovative Technologies in Library Services: Exploring the Avenue for Building Users' Confidence in Libraries" is timely and relevant considering the rapid advancement of technology in our world today. It is essential for us as librarians to embrace these technological changes and incorporate them into our services to better serve our communities.

I am pleased to see that we have a diverse range of topics and speakers lined up for this conference. We have experts from different fields who will be sharing their knowledge and experiences with us, and I am confident that we will all learn a lot from their presentations. I encourage everyone to actively participate in the discussions and take advantage of this opportunity to network with colleagues.

I also want to use this opportunity to appreciate the chairman and chief host for their support towards making this conference a success. We could not have done it without you, and we are grateful for your contribution.

Finally, I wish to thank the organizing committee chaired by Dr. Muhammad Saba Adamu for their hard work and dedication in putting together this conference. It is not an easy task, but your commitment and passion for the library profession are evident in the planning and execution of this event.

Once again, I welcome you all and hope that you will have a fruitful and enjoyable conference. May we all work together to achieve our common goal of promoting the growth and development of libraries in Niger State and beyond.

Thank you.

Dr. Musa Baba Adamu, CLN

Chairman, NLA Niger State Chapter.

A KEYNOTE ADDRESS DELIVERED BY PROF. JIBRIL ATTAHIRU ALHASSAN, THE UNIVERSITY LIBRARIAN, FEDERAL UNIVERSITY KASHERE, GOMBE STATE. AT THE 7TH ANNUAL HYBRID CONFERENCE/AGM 2025, (NLA) NIGER STATE CHAPTER. HELD AT THE CPES HALL, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, BOSSO CAMPUS, NIGER STATE FROM 28TH SEPTEMBER - 1ST OCTOBER, 2025.

USER CENTRIC LIBRARY SERVICES THROUGH INNOVATIVE TECHNOLOGIES

The information user is at the core of information provision, because without the user, libraries would not need to acquire, process, preserve and disseminate information. With changing user expectations, service provision is undergoing a significant transformation. Thus, to remain relevant and effective in this circumstance, libraries must leverage innovative technologies to enhance their services, improve accessibility, and foster engagement.

USER-CENTRIC LIBRARY SERVICES: Focuses on the needs and desires of library patrons when coming up with services. This approach ensures that services are ensuring solutions are efficient and enjoyable.

INNOVATIVE TECHNOLOGIES

Refers to the introduction of new or significantly improved products, processes, or services that leverage technology to solve problems, create value, or enhance efficiency.

1. **Artificial Intelligence & Machine Learning**

AI empowers libraries to deliver more personalised, efficient, and accessible services, fostering greater user trust and engagement.

2. **Virtual & Augmented Reality**

Wikipedia defines augmented reality (AR), also known as mixed reality (MR), as a technology that overlays real-time 3D-rendered computer graphics onto a portion of the real world through a display, such as a handheld device or head-mounted display.

3. **Internet of Things & Smart Libraries**

Enhances library services by improving user experience, optimising operations, and increasing the efficiency of resource management.

4. **Cloud Computing**

Cloud computing simply refers to the delivery of computing services over the internet, including storage, databases, software, and analytics-*Microsoft Azure*

Cloud computing simply refers to the delivery of computing services over the internet, including storage, databases, software, and analytics-*Microsoft Azure*

AI & Machine Learning Application in Library Services

1. **24/7 Reference Assistance:** AI chatbots handle common queries, freeing staff for complex tasks and providing constant support.
2. **Automated Cataloguing:** AI can extract metadata from new acquisitions, reducing manual effort and improving accuracy. AI tools can classify and tag resources efficiently, making discovery easier.
3. **Digital Content Management:** AI can curate and recommend digital collections such as e-books, audiobooks, and online courses based on user interests. Automated summarization tools provide quick overviews of lengthy materials**.**
4. **Accessibility Improvements: -** AI tools like text-to-speech, image recognition, and

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language translation makes library resources more accessible to users with disabilities or language barriers.

5. **Personalised Recommendations:** AI algorithms analyse user history and preferences to suggest relevant resources

- **Internet of Things**

1. **Smart Inventory Management:** RFID tags enable real-time tracking, automated check-in/out, and theft prevention.
2. **Space Utilisation:** Sensors detect available seats and provide indoor navigation, optimising library space.
3. **Environmental Monitoring:** Sensors preserve delicate materials by monitoring temperature, humidity, and light

- **Augmented Reality**

1. **Educational & Learning Tools:** Users can point devices at diagrams, maps, or models to see animations, labels, or interactive 3D representations. AR storytelling engages children and young adults through visual and interactive narratives linked to physical books.
2. **Virtual Exhibits and Cultural Collections**: Libraries can display rare manuscripts, historical artifacts, or digital artworks using AR overlays, enriching the physical space without needing the actual objects. Augmented heritage tours allow patrons scan codes or markers to learn more about the library's history, architecture, or special collections.
3. **Training & Orientation**: New users can be guided through the library with AR prompts explaining facilities, services, and rules. Interactive help desk by pointing a device at a help sign or area brings up AR assistance options like FAQs.

Benefits of Augmented Reality in Libraries

- Enhances user engagement and interactivity
- Simplifies orientation and navigation
- Promotes digital literacy and immersive learning
- Modernises the library experience, especially for younger audiences

Challenges

- Electricity
- Internet connectivity
- Staff competencies
- Lack of confidence to start for fear of failure

Which way for Nigerian Libraries?

Several factors can push libraries in Nigeria to apply these technologies to service delivery. Some of which include:

- Determination from the librarians
- Capacity building other than paper presentations but hands on
- Vibrant library leadership
- Curricula dynamism
- Participatory leadership style
- Critical thinking
- Synergy between head of library and the directors of ICT

Conclusion

- As libraries continue to evolve, it is crucial to prioritise user needs, foster a culture of innovation, and invest in emerging technologies that support their mission to provide inclusive, equitable access to information and knowledge.
- By embracing AI, digital libraries, IoT, VR/AR, social media, and accessibility technologies, libraries can remain relevant, vibrant, and essential community hubs in the digital age.

Jibril Attahiru Alhassan (PhD)
Prof. of Library Information Technology
The University, Federal University
Kashere, Gombe State.

LEAD PAPER PRESENTATION TITLED: DIGITAL INNOVATION IN LIBRARY SERVICES: A CHALLENGE TO THE RELEVANCE AND SUSTAINABILITY OF LIBRARIES IN THE 21ST CENTURY BY DR OYEKALE ABEL ALADE, DEPARTMENT OF ARTIFICIAL INTELLIGENCE, THE FEDERAL POLYTECHNIC, BIDA

Introduction

The 21st century library services have been highly influenced by digital technology innovations. The disruptive nature of Information and Communication Technology (ICT) has left no field out, as such, library activities. Library services are becoming virtual as they are been automated with advances in ICT. Libraries must embrace and proactively implement new technologies to attract and retain users, while also adapting their services to meet evolving information needs. The traditional library model, which centered solely on physical information resources and spaces, is no longer sustainable. By leveraging digital technologies, libraries can not only attract and retain patrons but also redefine their purpose, i.e. transforming from static repositories of knowledge into dynamic, accessible, and community-centric hubs. This paper outlines the challenges libraries face in this digital age and presents compelling cases for how a robust digital strategy can drive users' patronage and secure their future.

The Erosion of Traditional Patronage: Why Libraries need the Digital Shift

Libraries worldwide are experiencing a significant decline in physical foot traffic, a trend accelerated by the ubiquity of high-speed internet and mobile devices. This erosion of traditional patronage is driven by factors such as access to instant message/information online, shift in digital media consumption and generational expectation. ***Online and instant information tools*** such as search engines (e.g. google.com, yahoo.com, etc.) and recent AI assistants provide immediate answers to questions that once required a trip to the library. Users expect information to be a few clicks away; making physical visits for research seem slow and inefficient. Today, the ***shift in digital media consumption*** on how people consume literature and entertainment gave birth to e-books, audio books, and streaming services. The convenience of downloading a book or watching a film from the comfort of home often outweighs the trip to a physical library. The ***younger generations/digital natives***, who have grown up with smart phones and social media, have different expectations for library services (Okwu, 2025). They value personalization, seamless user experience, and 24/7 accessibility, all of which are often more readily available in the digital world than in a physical library. For libraries to remain relevant, they must adapt their services to meet the modern user where they are—in the digital space. Hence, overlooking these shifts is a setback to sustainability of libraries.

Solution Path: Leveraging Digital Innovation will Drive Patronage

Digital innovation for libraries isn't just about offering Wi-Fi or a handful of public computers. It's about a fundamental transformation of how they operate and serve their communities. The innovation is a comprehensive strategy that fundamentally re-imagining the library's role and services. The most direct way to attract digital users is to offer the content they desire in the format they prefer. This is means ***expanding and curating robust digital collection*** in extensive **e-book & audio book collections** and **streaming media & online learning**. The prior entails partnering with platforms like OverDrive, Hoopla, and cloudLibrary allowing libraries to offer a vast selection of digital titles accessible via userfriendly apps. This ensures the library remains competitive with commercial services

like Kindle Books and Audible. While, the later entails providing free access to streaming services for films, documentaries, and music (e.g., Kanopy, Freegal) can attract a new demographic. Furthermore, offering online courses and a tutorial (e.g., LinkedIn Learning, Coursera) positionsa library as a crucial resource for lifelong learning and professional development.

Modern users are accustomed to personalized experiences tailored to their interests. Libraries can replicate this by ***enhancing user experience through personalization and AI.*** Data analytics on borrowing history and user preferences to suggest new titles, authors, or subjects can utilized. This not only makes the user's experience more engaging but also highlights lesser-known resources they might enjoy.AI-driven Chatbots on the library's website or app to answer common questions (e.g., "What are your hours"?", "How do I renew a book?") and provide basic research assistance can be deployed to offer instant, 24/7 support without the need for a staff member.

The library's role, as a learning or research hub, can and should extend its services online to ***fostering community engagement in the digital sphere*** through **hybrid presentations** and **local information portal development**. The former is hinged on hosting online events such as virtual author talks, book club meetings, and skill-building workshops (e.g., coding classes, resume writing seminars) that are simultaneously live-streamed for online participants and held in-person (OCLC, 2025). This approach eliminates geographical barriers and allows library users with mobility issues or busy schedules to participate. The later therefore, provide ground to creating dedicated online platforms that serve as trusted sources for local news, events, and resources. Hence, the two approaches reinforce libraries' position as central and reliable organization in the era of misinformation (Oladokun, 2023).

Digital tools can make libraries more accessible to a wider range of patrons thereby ***improving accessibility and inclusivity.*** Technology can make library resources more inclusive for everyone. Digital tools like screen readers, transcription services, and adjustable fonts ensure that people with disabilities can access information and services with greater ease (OCLC, 2025).User-friendly websites and apps with clear navigation, adjustable font sizes, and high-contrast colour schemes to accommodate users with visual impairments or cognitive disabilities could contribute to the relevant of the libraries and patronage underserved group.

Conclusion and a Call to Action

Libraries of the future are not just buildings. They are inextricably linked to their abilities to innovate. Continued reliance on a traditional model will lead to diminishing relevance and, eventually, a crisis of purpose. By strategically investing in digital infrastructure, training staff in new technologies and adopting a user-centric mindset, libraries can not only reverse the trend of declining patronage but also redefine their value.

Libraries in the 21st century must be ***hybrid institutions*****,** seamlessly blending physical spaces for community gathering and intellectual exploration with robust, accessible, and personalized digital presence. These dual-pronged approaches will ensure that libraries remain indispensable as engines of knowledge, creativity, and community connection, securing their vital role for generations to come. This is not a choice between the physical and the digital; it is about harmonizing both to create a stronger, more resilient, and more inclusive institution.

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A REVIEW OF COMMON ISSUES IN PRESERVING DIGITAL INFORMATION RESOURCES IN AFRICAN ACADEMIC LIBRARIES

BY

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Abstract

Digital information resources have become increasingly important learning tools in modern academic libraries due to their easy of accessibility and sharing mechanisms. However, the preservation of these resources faces significant challenges, especially in African academic libraries. This paper reviews relevant studies published between 2015 and 2025 to identify the key issues affecting the preservation of digital information resources in African academic libraries and to summarize the strategies recommended in the literature. The findings highlight several key issues, including inadequate technological infrastructure, insufficient financial support, a lack of properly trained personnel in digital preservation, the absence of formal digital preservation policies, limited management support, and the absence of collaborative efforts among libraries. To address these issues, the study suggests strategies such as enhancing technological infrastructure, securing adequate funding, providing ongoing training for library staff, establishing comprehensive digital preservation policies, ensuring active management support, and fostering collaboration between libraries. These findings are valuable for library administrators, researchers, and other stakeholders seeking to improve the preservation of digital information resources in African academic libraries.

Keywords: *Digital Information Resources, Digital Preservation, African Academic Libraries, Systematic literature review, challenges.*

Introduction

Digital information resources have become essential learning tools in modern academic libraries due to their easy of accessibility and sharing mechanisms. These resources include e-books, e-journals, e-databases, e-magazines, e-newspapers, e-theses and dissertations, multimedia resources, web pages, CDs, DVDs, sound recordings, moving images, and other forms of digital resources accessed and utilized using computers, laptops, smartphones, tablets, or any electronic devices (Mubofu, 2021; Mohammed, 2023). Digital information resources have several advantages over print information, such as wider accessibility, greater flexibility, lower costs, and better resistance to regular wear and tear. According to Oluwaseun et al. (2017), digital information resources are extremely valuable and therefore need to be preserved for current and future generations. Bhat (2018) further emphasized that digital information sources require good preservation strategies to ensure continued access and usability.

Preservation of digital information resources refers to all the activities undertaken to ensure that digital contents are maintained and remain accessible for users over time, despite challenges such as technological failures and natural disasters (Mubofu et al., 2021; Uutoni, 2024). It also encompasses the strategies designed to extend the lifespan of computer files and protect them from issues such as media failure, physical loss, and obsolescence (Mubofu et al., 2021; Ross, 2012). Preservation of digital information resources is essential in ensuring long-term access to digital content such as scholarly research, historical documents, and cultural heritage. Unlike the preservation of print resources, digital information preservation is far more complex and requires more effort, time, and financial resources to keep pace with rapid technological advancements (Mwilongo et al., 2020). It also requires a combination of methodological approaches, such as migration, emulation, refreshing, and a simple bit preservation to overcome the issues related to hardware and software obsolescence (Mwilongo et al., 2020).

Academic libraries throughout the world are making significant efforts to promote the preservation of digital information resources. However, despite these efforts,

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academic libraries in Africa are still facSSing numerous challenges in preserving digital information resources. These issues include inadequate technological infrastructure, limited financial resources, a shortage of trained personnel, a lack of awareness about digital preservation, the absence of formal digital preservation policies, a lack of management support, and insufficient collaboration and partnerships (Masenya & Ngulube, 2019). It is therefore essential to comprehensively understand these challenges and suggest effective strategies for overcoming them.

This study reviews relevant literature to identify key issues affecting the preservation of digital information resources in African academic libraries, and to summarize strategies recommended for addressing these issues. The study addresses the following specific objectives:

1. To review and identify key issues affecting the preservation of digital information resources in African academic libraries
2. To summarize the recommended strategies for addressing these issues and promoting the preservation of digital information resources in academic libraries across the continent.

Research Methodology

A systematic literature review of both conceptual and empirical studies on digital preservation was conducted to identify the key issues affecting the preservation of digital information resources in African academic libraries. Scholarly databases such as Google Scholar, JSTOR, ScienceDirect, Scopus, and African Journals Online were searched using keywords like "digital preservation," "digital information resources," "African academic libraries," and "challenges." The selection criterion focused on studies published between 2015 and 2025 that addressed the challenges of digital preservation and proposed strategies to overcome these issues. Only articles written in English were included in the review, while books were excluded due to their lengthy nature. The initial search yielded 105 articles, which were then screened to identify those most relevant to the study. Ultimately, 33 articles were selected for inclusion.

Challenges of Preserving Digital Information Resources in African Academic Libraries

A review of existing literature shows that African academic libraries face significant challenges in preserving digital information resources. These challenges include weak technological infrastructure, limited financsial resources, a shortage of skilled personnel, the absence of clear policies, inadequate management support, and weak collaborative frameworks. The following sections discuss each of these issues in detail.

Inadequate Technological Infrastructure

One of the most pressing issues in preserving digital information resources in African academic libraries is the lack of robust technological infrastructure. Many African academic libraries struggle with unreliable internet access, limited bandwidth, frequent power outages, and outdated hardware or software, all of which undermine digital preservation efforts (Pandey & Kumar, 2020; Masenya & Ngulube, 2019). For example, Masenya and Ngulube (2019) report that numerous South African libraries lack stable electricity, reliable internet, and suitable hardware for digital preservation. Similarly, in Namibia, many libraries still depend on outdated hardware and software systems, which are not capable of supporting modern digital preservation efforts (Umana, 2020). In Nigeria, several studies highlight persistent problems with poor connectivity and irregular power supply (Famuyiwa, 2024; Mohammed, 2023; Ademilua et al., 2021). Without adequate infrastructure, libraries risk data loss due to hardware failures, corruption, or cyberattacks, and they struggle to implement sustainable preservation strategies (Pandey & Kumar, 2020; Masenya & Ngulube, 2019).

Lack of Financial Resources

Inadequate financial resources pose another significant challenge to the preservation of digital information in African academic libraries. Preserving digital information requires continuous financial investment for technology acquisition, staff training, software licenses, hardware upgrades, and ongoing maintenance. However, many African academic libraries operate on limited budgets that leave little room for such investments (Masenya & Ngulube, 2019; Anyaoku et al., 2019; Ogunbodede & Onah, 2024). For instance, Adjei et al. (2019) found that Ghanaian libraries often lack dedicated funds for digital preservation, relying instead on general library budgets. In Zambia, reduced government support has negatively affected overall library operations, including digital preservation (Mulauzi et al., 2021). Nigerian libraries face similar challenges, with studies showing inadequate budgetary allocations for preservation initiatives (Ademilua et al.,

2021; Ogunbodede & Onah, 2024). Insufficient funding prevents libraries from acquiring modern technologies, recruiting skilled staff, and joining collaborative projects, and ultimately threatening the sustainability and accessibility of digital collections.

Shortage of Skilled and Trained Personnel

Another major challenge is the shortage of trained personnel in digital preservation. Preserving digital information resources requires library personnel to possess the knowledge and skills necessary for preserving, conserving, and restoring digital resources. On the contrary, many librarians across Africa lack formal training in digital preservation practices (Adjei et al., 2019; Masenya & Ngulube, 2020). For example, a study in Ghana reported that most academic libraries lacked personnel with the necessary skills in digital preservation (Adjei et al., 2019). In South Africa and Tanzania, only a small proportion of librarians had received adequate training in digital preservation (Mubofu et al., 2022; Luvanda & Iwata, 2024). In Nigeria, the absence of competent staff continues to hinder effective digital preservation (Famuyiwa, 2024; Ademilua et al., 2021). In Africa, there is not only a lack of digital preservation training, it is inadequate. Mubofu et al. (2020) observed that digital preservation training that exists in Africa is underdeveloped and does not cover all areas of digital preservation. Without skilled professionals, libraries risk adopting poor digital preservation practices that compromise the integrity, usability, and long-term survival of digital assets (Masenya & Ngulube, 2020).

Absence of Formal Digital Preservation Policies

The lack of comprehensive digital preservation policies is another significant challenge for African academic libraries. Many academic libraries in Africa lack documented strategies, guidelines, and frameworks for digital preservation (Adjei et al., 2019; Masenya & Ngulube, 2019). For instance, studies conducted in Ghana revealed that most academic libraries in the country generally did not have a clearly defined policy governing the activities of digital preservation and this has greatly affected the operations, making it difficult to get full, and committed support from their authorities (***Adjei et al., 2019; Adu & Ngulube, 2016***). Research conducted in Ghana indicated that most academic libraries lack clearly defined policies governing digital preservation activities, limiting institutional support and weakening operations (Adjei et al., 2019; Adu & Ngulube, 2016). Similar findings are reported in Nigeria (Ogar, 2020) and Tanzania (Mubofu et al., 2022). The absence of policies creates confusion over responsibilities, weakens institutional commitment, and exposes libraries to legal and ethical risks such as copyright violations (Njuguna & Kimote, 2024).

Limited management support

Limited support from library management and university administrations poses a significant challenge to the preservation of digital information resources. Digital preservation requires institutional backing in both funding and strategic direction (Adjei et al., 2019). However, many academic libraries in Africa struggle with insufficient support from management for their digital preservation initiatives (Masenya & Ngulube, 2019). Library leaders often lack a clear understanding of the importance of digital preservation and tend to prioritize investments in other operational areas over preservation efforts (Masenya & Ngulube, 2019; Njuguna & Kimote, 2024). This lack of strategic vision and commitment from management leads to inadequate funding for digital preservation, which restricts libraries' ability to invest in necessary technologies and training (Njuguna & Kimote, 2024).

Poor Collaborative Efforts Among Libraries

Another critical issue is the limited collaboration among academic libraries. Collaboration among libraries can enhance the sharing, expertise, and best practices about the current and future state of digital preservation initiatives. However, literature reveals that many African academic libraries lack such collaborative frameworks and often operate in isolation (Njuguna & Kimote, 2024; Mubofu et al., 2021). Regional consortia and national networks dedicated to digital preservation are often underdeveloped (Alex-Nmecha & Owate, 2019; Mubofu et al., 2021). This lack of collaboration hinders the effective sharing of resources and strategies, leading to duplicated efforts and missed opportunities to establish joint preservation initiatives (Famuyiwa, 2024; Ademilua et al., 2021).

Strategies for Preserving Digital Information Resources in African Academic Libraries

To address the challenges of preserving digital information in African academic libraries, the study summarizes various strategies recommended in the literature. These include enhancing technological infrastructure, securing adequate funding, providing regular training for library professionals, establishing comprehensive digital preservation policies, ensuring active management support, and fostering collaboration

among libraries. The following subsections explore these strategies in greater detail.

Enhancing Technological Infrastructure

Effective digital preservation requires a robust technological infrastructure. African academic libraries must prioritize the provision of stable power supplies, reliable internet connectivity, up-to-date hardware and software, secure storage solutions, multiple backup systems, and a secure environment to prevent data loss due to hardware failures, natural disasters, or cyberattacks. According to Famuyiwa (2024) and Uutoni (2024), the provision of adequate storage, reliable backup systems, regular maintenance, and secure environments is essential for preserving digital information resources effectively. Without these infrastructures, digital content may become obsolete or subject to data loss, undermining the libraries' mission to provide long-term, accessible information (Uutoni, 2024).

Securing Adequate Funding

Securing adequate funding is critical to the success of digital preservation initiatives. African academic library management should ensure that enough funds are allocated for the digital preservation project. If possible, digital preservation budgets should be separated from the overall library budget, or a certain percentage of the library budgets should be dedicated to digital preservation initiatives. According to Mubofu et al. (2021), proper allocation of resources is essential for the sustainable preservation of digital materials. Anyaoku et al. (2019) emphasize that universities must dedicate resources to support the long-term sustainability of their digital collections. This funding is crucial to hiring and training staff in digital preservation practices, compensating preservation administrators, and maintaining the technological infrastructure required to safeguard digital resources (Adjei et al., 2019; Uutoni, 2024; Famuyiwa, 2024).

Providing Ongoing Training for Library Professionals

The findings of this study highlight the critical need for information professionals in African academic libraries to possess the necessary skills and knowledge to preserve digital information resources effectively. African academic library management should implement targeted training programs to equip staff with the essential expertise required for digital preservation. To address this need, digital preservation modules should be incorporated into library and information science curricula to ensure that future librarians are prepared with the skills necessary for this area (Njuguna & Kimote, 2024; Ademilua et al., 2021). In addition to formal education, in-house and continuous learning opportunities such as workshops, seminars, conferences, and online courses should be provided to current staff (Famuyiwa, 2024; Mubofu et al., 2021). According to Mubofu et al. (2020), training library staff is important to preserve digital information, identify potential risks, and implement strategies to mitigate them. Famuyiwa (2024) added that training opportunities allow library professionals to collaborate both within Africa and globally, facilitating the exchange of best practices, lessons learned, and innovative solutions to common preservation challenges (Famuyiwa, 2024).

Establishing Comprehensive Digital Preservation Policy

Creating and implementing a comprehensive digital preservation policy is essential for ensuring the effective management of digital information resources. African academic library management should formulate digital preservation policies, procedures, and strategies that will guide and direct library staff in preserving and managing digital collections. A handbook on digital preservation for libraries and librarians is necessary in this regard to complement the standard or policy. Mubofu et al. (2020) stated that such policies provide guidelines and directions to library staff in carrying out their responsibilities relating to digital preservation. Adjei et al. (2019) emphasize that these policies are crucial for securing management support, defining preservation strategies, and obtaining necessary resources such as skilled staff and appropriate infrastructure. Masenya & Ngulube (2020) and Famuyiwa (2024) further stress that comprehensive policies foster collaboration, enabling libraries to share best practices, resources, and expertise in digital preservation.

Ensuring Active management support

Previous research has consistently shown that adequate management support is essential for the sustainable preservation of digital information resources. Without sufficient backing from management, digital preservation initiatives cannot thrive in the long term. Therefore, African academic library management must provide the necessary resources and support to ensure the effective preservation of digital information. They must also recognize the importance and benefits of digital preservation, as this understanding will enable

them to prioritize preservation initiatives. According to Sambo et al. (2015), management support is crucial for the successful execution of digital preservation projects. Adjei et al. (2019) and Ogar (2020) added that top-level management support is essential for ensuring that digital preservation is successful. Mesanya (2019) further emphasizes the need for proactive management to guarantee the long-term sustainability of digital resources.

Fostering Active Collaborations Among Libraries

Preservation of digital information requires a collective effort from all key stakeholders in the field of library and information science. African academic libraries should collaborate with various stakeholders to create a preservation consortium. Such a consortium could oversee digital preservation efforts across the region, promoting best practices and coordinating preservation strategies. According to Masenya and Ngulube (2020), collaboration helps to share resources, reduce costs, promote stewardship, and exchange expertise about the current and future state of digital initiatives. Njuguna and Kimote (2024) support that collaborative initiative seeks to leverage resources and develop shared strategies to address digital preservation challenges. Mannheimer and Cote (2017) further stress that libraries can collaborate to jointly share the costs of storage, hardware, and software, thereby reducing the financial burden on individual institutions and improving the overall quality of preservation efforts.

Conclusion

This paper has outlined the common challenges facing the preservation of digital information resources in African academic libraries. It has also explored several strategies that can address these issues and promote the long-term sustainability of digital preservation efforts. The study concludes that the primary challenges affecting digital preservation in African academic libraries are inadequate technological infrastructure, limited financial resources, a lack of trained personnel in digital preservation, the absence of standardized digital preservation policies, insufficient management support, and poor collaboration between libraries. Therefore, adopting modern and comprehensive digital preservation strategies is essential to ensure the long-term survival and accessibility of digital information in African academic libraries. The recommended strategies include improving technological infrastructure, allocating sufficient budgets for digital preservation, enhancing staff knowledge and skills, establishing standardized digital preservation policies, and fostering collaboration among libraries.

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ACCEPTANCE OF KOHA LIBRARY MANAGEMENT SYSYTEMS IN SELECTED POLYTECHNIC LIBRARAIES IN JIGAWA STATE, NIGERIA

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Abstract

This study was conducted to look at the *factors influencing the acceptance of Koha library management system in identified polytechnic libraries in Jigawa State, Nigeria. A quantitative research methodology employing a cross-sectional design was used to achieve the study objectives. The study population comprised all librarians working in polytechnic libraries within Jigawa State. Data were collected using a structured questionnaire and descriptive statistics, including frequencies and percentages, were used for data analysis. The findings revealed that the majority of respondents preferred the Koha library software due to its comprehensive functionality, particularly in modules such as patron management, circulation, cataloging, Online Public Access Catalogue (OPAC) and administration. The study further identified key factors promoting the acceptance and use of Koha, including system productivity, user-friendliness, accessibility to resources and peer influence. Based on these findings, the study recommended increased funding for the acquisition and maintenance of Koha, implementation of regular training for all library staff through conferences, workshops, and seminars, provision of operational and maintenance manuals and advocacy by polytechnic libraries to the government and relevant stakeholders for improved internet connectivity and stable power supply.*

Keywords: Library Management Systems, KOHA, Polytechnic Libraries

Introduction

Koha was developed in New Zealand in 2000 through a contract carried out by Katipo communication for a three-library system in New Zealand called the Horowhenua Library Trust (HLT). These libraries needed a new system to replace their current information services then which was found not compliant with the year 2000 date change, and they were interested in developing a new system rather than purchase another proprietary product. Koha is the first open source integrated library system (ILS) in use worldwide by public, private, special and academic libraries. The development of Koha was steered by a growing community of libraries and users collaborating to achieve their technological goal (Adara, 2010).

Modern technological innovations have influenced both librarians' professional capabilities and library management infrastructure. Adopting innovations have reshaped libraries into virtual realities demanding librarians to be competent in the use of technologies (Khan, 2020). In modern times, the Open Source Integrated Library Systems (OSILS) is one of the important innovations that have manifold features such as cost-effectiveness, coding options and shared responsibility in solving system issues. Koha is one of the dominant integrated library systems developed to manage the cost of library automation and has been adopted in more than 15000 libraries around the world (Bissels, 2008). Community support, library standards, learning tools and active development features have provided a track record to Koha in library automation. In developing countries, technologies are being adopted by libraries to enhance users' access to information resources (Chaputula & Anyundo, 2019).

The acceptance and use of the Koha integrated library system in Nigeria are on the increase, especially among academic libraries (Onuoha, 2013). Some of the many reasons for the trend are the free and open source code

nature of the system, the wide knowledge and the salient features that go hand in hand with the unique needs of academic libraries. As such, librarians need to acquire modern knowledge as information professionals because more is expected of them from library users to maintain a competitive edge, and work effectively in the rapidly changing environments (Onuoha, 2013). Libraries in Nigeria specifically academic libraries attempted to automate their library services as far back as 1970, and the attempt still continues. Currently, several libraries make their services available through electronic platforms. Developing countries like Nigeria which is characterized by low technological development, low level of awareness, and low resource capacity are yet to fully adopt open system like Koha in academic libraries (Datti, 2020).

Statement of the Problem

The effective management of academic libraries is crucial for supporting teaching, learning, and research activities in universities. In Jigawa State, Nigeria, the adoption of a modern library management system like Koha has been implemented to enhance library operations, including cataloguing, circulation and resource management. However, the acceptance and utilisation of Koha in universities within Jigawa State have faced significant challenges.

The problem this study addresses is the intended benefits of Koha and its actual acceptance and utilisation in universities within Jigawa State. Without widespread acceptance and effective use, the potential of Koha to transform library management and improve academic outcomes may not be fully realized. Therefore, this study seeks to investigate the acceptance of the Koha Library Management System in selected polytechnic libraries in Jigawa State, Nigeria, to identify barriers

Literature Review

A recent study by Ango and Akporhonon (2024) revealed that digital skills have a considerable influence on the ease of use of open-source library management system among librarians in North-central of Nigeria and also revealed that adoption of various training platforms such as workshops, seminars and conferences to maintain proficiency alongside ongoing upgrades to hardware and software for enhanced task performance, safety, efficiency, error tolerance and user friendliness

Basiru and Adebayo (2017) reported that the level of satisfaction and utilisation of Koha by library staff are high due to the user-friendly interfaces, excellent features, continuous improvement and upgrades provided by Koha development team. Moreove, according to Tella, Edward, Ademolake and Akande (2021) most librarians perceived open-source library systems as effective for handling academic libraries services and the effectiveness of the open-source system from librarians, perspective depends on its practical usability and efficiency and also librarian profile such as position/designation, educational level, year of experience and gender affect the perception of open-source system OSS.

However, Tuesday and Akakandalwa (2021) suggested that the major challenge of Koha adoption is the inability of librarians to effectively use all the modules in Koha because of a lack of skills. Other challenges identified by the authors include poor Internet connectivity, lack of technical support, and difficulties upgrading and backing up the Koha database. Koha is mostly used among libraries in the South-west geo-political zone of Nigeria and has been adopted by different types of libraries in Nigeria. In addition, a study by Omotayo, Aderonke and Akintola (2022) showed that the majority of the libraries adopted Koha ILS because it is free software and can be customised to suit their needs, it is constantly upgraded and performs all the functions needed in their library.

Another study conducted by Zainab, Arslan, Kiran and Muzammil (2019) revealed that the level Koha acceptance among Malaysian librarians is high as they are satisfied with the information quality, system quality, and system platform. The librarians have positive intentions to use this system and believe it meets their current and future information needs. In a related study, Uzomba et at. (2021) reported that Koha, Virtua and Slam are three library software packages adopted in the libraries, and the software packages are used to a high extent and also pointed out the problems associated with the use of library software packages such as inadequate funding, erratic power supply, cost of procurement of the hardware/software, etc. Also, a study by Omopupa et al. (2019) suggested that the benefits of adopting Koha at the University of Ilorin, Nigeria would have been higher if the University of Ilorin made use of all the modules. The authors further established that one of the challenges faced by the university library in the use of Koha system is the inadequate technical know –how in terms of Koha operations.

Methodology

This chapter explains the methodology employed in the study. Thus, it focuses on the research design,

population of the study and instrument used for collection of data. The quantitative methodology is considered more appropriate for this study because quantitative research aims to quantify data and generalised findings from varied samples (Ghanad, 2023).

Research Design

The research design can be described as the structure of a scheme or blueprint for investigating the relationship among a set of variables for the intended or the actual study.

As far as this study is concerned, survey research design using cross-sectional design was used for this study. A cross-sectional survey according to Haruna (2010) is a technique where by data collection for the study is done at a point in a time. Therefore, cross-sectional survey was adopted in this study due to the nature of the research being one-time investigation and is faster, easier, and cheaper. These reasons are crucial to the present research work, which informs the choice of the cross-sectional research design as the appropriate for this study.

Population of the Study

Every research process has a population upon which the study is carried out and as such, this study is not an exception. Population refers to all the inhabitants of a geographical area. Population according to Bello (2009) is a group in which the researcher is interested in gaining information and drawing conclusion. Population is defined as a well-defined collection of individuals or objects known to have similar characteristics. The research population of this study comprised all professional librarian in the polytechnic libraries under study in Jigawa State, Nigeria these are Binyaminu Usman Polytechnic with 45 staff and Jigawa State polytechnic Dutse with 41 staff.

Table 1: Population of the Study

S/N	Name of the Polytechnics	Status of Koha	Number of Automation Staff
1.	Binyaminu Usman Polytechnic Hadejia	Available and operational	45
2.	Jigawa State Polytechnic Dutse	Available and operational	41
	Total		**86**

Data Presentation and Analysis

Response Rate

A total of 86 copies of the questionnaires were administered to respondents. The summary of their responses is presented in Table 4.1

Table 2: Response Rate

Response rate	Frequency	Percentage (%)
Administered questionnaire	86	100%
Retrieved questionnaire	79	91.9%
Not retrieved	7	8.1%

Table 4.1 revealed that 86 copies of the questionnaire were distributed to the respondents, out of which the majority 79 (91.9%) copies of the questionnaire were duly completed, retrieved, and found usable, while 7 (8.1%) copies were not retrieved.

Table 1: Acceptance of Koha Library Management System

S/N	Statement	Frequency/ Percentage (Yes)	Frequency/ Percentage (No)
1	You are using the catalogue module to catalogue information materials	63(79.7%)	16(20.2%)
2	You are using the search module to search for information materials from the system	58(73.4%)	21(26.6%)
3	You are using the acquisition module to make orders from vendors; budgets and get pricing information	33(41.8%)	46(58.2%)
4	OPAC module is used to make information searches which saves the time for searching	61(77.2%)	18(22.8%)
5	The circulation module is used to identify and manage over-due items	66(83.5%)	13(16.5%)

6	You are using the patron module to register library patrons	71(89.9%)	8(10.1%)
7	The LOC, Dewey and other non-Dewey categorizations are used	37(46.8%)	42(53.2%)
8	You are using the management functionality to monitor book processing and service provision there by reducing the supervisory workload of administrators	31(39.2%)	48(60.8%)
9	You are using the administration module to prepare reports on book processing and service provision	51(64.6%)	28(35.4%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2025 N=79

The findings in Table 4.3 showed that majority 71(89.9%o) of the respondents are using the patron module to register library patrons. Followed by 66(83.5%) revealed that circulation module is used to identify and manage over-due items, 63(79.7%) of the respondents are using the catalogue module to catalogue information materials, 61(77.2%) indicated that OPAC module is used to make information searches which saves the time for searching, 58(73.4%) are using the search module to search for information materials from the system, 51(64.6%) are using the administration module to prepare reports on book processing and service provision. Minority 37(46.8%) of the respondents indicated that LOC, Dewey and other non-Dewey categorizations are used, 33(41.8%) of the respondents are using the acquisition module to make orders from vendors; budgets and get pricing information, and 31(39.2%) of the respondents indicated that they are using the management functionality to monitor book processing and service provision there by reducing the supervisory workload of administrators.

Table 2: System Productivity

S/N	Statement	Frequency/ percentage (%)		
		SA/A	UD	D/SD
a.	Koha OPAC module facilitates fast information search which saves time for searching	46(58.2%)	21(26.6%)	12(15.2%)
b.	The circulation module enables you to identify over-due items	37(46.8%)	9(11.4%)	33(41.8%)
c.	Koha facilitates the management functionality of monitoring the book processing and service provision that reduces on the supervisory workload of administrators	39(49.4%)	13(16.5%)	27(34.2%)
d.	Searching facility	31(39.2%)	7(8.9%)	41(51.9%)
e.	Koha facilitates fast cataloguing of information materials.	27(34.2%)	13(16.5%)	39(49.4%)
f.	Koha circulation module saves time of charging and discharging of information materials	41(51.9%)	7(8.9%)	31(39.2%)
g.	Reports generation	46(58.2%)	12(15.2%)	21(26.6%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2025 N=79

The findings in the Table 4.5 showed that majority 46(58.2%) of the respondents strongly agreed and agreed that Koha OPAC module facilitates fast information search which saves time for searching, 12(15.2%) disagreed and strongly disagreed that Koha OPAC module facilitates fast information search which saves time for searching, and only 21(26.6%) of the respondent were undecided with the notion. 46(58.2%) of the respondents strongly agreed and agreed that Reports generation, 21(26.6%) disagreed and strongly disagreed that Reports generation, and only 12(15.2%) of the respondent were undecided with the notion

Table 3: Ease of Use

S/N	Statement	Frequency/ percentage (%)		
		SA/A	UD	D/SD
a.	It is easy to use the cataloguing module for cataloguing library information materials	33(41.8%)	9(11.4%)	37(46.8%)
b.	It is easy to use the circulation module for charging and discharging information materials	46(58.2%)	12(15.2%)	21(26.6%)

c.	It is easy to use the circulation module to prepare circulation reports	37(46.8%)	15(19.0%)	27(34.2%)
d.	It is easy to use the patron module to register library patrons	41(51.9%)	7(8.9%)	31(39.2%)
e.	It is easy to use the administration module to prepare reports on book processing and service provision	39(49.4%)	13(16.5%)	27(34.2%)
f.	It is easy to use the OPAC module to retrieve information	41(51.9%)	7(8.9%)	31(39.2%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2023 N=79

The findings in the Table 4.5 showed that majority 46(58.2%) of the respondents strongly agreed and agreed that it is easy to use the circulation module for charging and discharging information materials, 21(26.6%) disagreed and strongly disagreed that it is easy to use the circulation module for charging and discharging information materials, and only 12(15.2%) of the respondent were undecided with the notion. 41(51.9%) of the respondents strongly agreed and agreed that it is easy to use the patron module to register library patrons, 31(39.2%) disagreed and strongly disagreed that it is easy to use the patron module to register library patrons, and only 7(8.9%) of the respondent were undecided with the notion.

Table 4: Peer Pressure

S/N	Statement	Frequency/ percentage (%)		
		SA/A	**UD**	**D/SD**
a.	Superiors/instructors determined my acceptance of Koha	13(16.5%)	27(34.2%)	39(49.4%)
b.	Administrators' attitude influenced my acceptance of Koha	41(51.9%)	7(8.9%)	31(39.2%)
c.	Social pressure influenced my acceptance of Koha	46(58.2%)	12(15.2%)	21(26.6%)
d.	Staff members influenced me to use Koha	33(41.8%)	9(11.4%)	37(46.8%)
e.	Staff attitude influenced me to use Koha	37(46.8%)	15(19.0%)	27(34.2%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2025 N=79

The findings in the table 4.6 showed that majority 46(58.2%) of the respondents strongly agreed and agreed that social pressure influenced my acceptance of Koha, 21(26.6%) disagreed and strongly disagreed that social pressure influenced my acceptance of Koha, and only 12(15.2%) of the respondents were undecided with the notion. 41(51.9%) of the respondents strongly agreed and agreed that Administrators' attitude influenced my acceptance of Koha, 31(39.2%) disagreed and strongly disagreed that Administrators' attitude influenced my acceptance of Koha, and only 7(8.9%) of the respondent were undecided with the notion.

37(46.8%) of the respondents strongly agreed and agreed that Staff attitude influenced me to use Koha, 27(34.2%) disagreed and strongly disagreed that Staff attitude influenced me to use Koha, and only 15(19.0%) of the respondent were undecided with the notion. 33(41.8%) of the respondents strongly agreed and agreed that Staff members influenced me to use Koha, 37(46.8%) disagreed and strongly disagreed that Staff members influenced me to use Koha, and only 9(11.4%) of the respondent were undecided with the notion. 13(16.5%) of the respondents strongly agreed and agreed that Superiors/instructors determined my acceptance of Koha, 39(49.4%) disagreed and strongly disagreed that Superiors/instructors determined my acceptance of Koha, and only 27(34.2%) of the respondent were undecided with the notion.

Table 5: Existence of Resources

S/N	Statement	Frequency/ percentage (%)		
		SA/A	**UD**	**D/SD**
a.	The polytechnics has the financial resources to support Koha	39(49.4%)	13(16.5%)	27(34.2%)
b.	Technical team is available to support Koha installation, implementation and maintenance of the system	31(39.2%)	7(8.9%)	41(51.9%)

c.	Polytechnics management supports the funding of Koha	46(58.2%)	21(26.6%)	12(15.2%)
d.	Polytechnics management has the required infrastructure to support Koha	37(46.8%)	9(11.4%)	33(41.8%)
e.	The polytechnics offers on job training for implementation of Koha	47(59.5%)	5(6.3%)	27(34.2%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2025 N=79

The respondents were asked to indicate the factors that influences the acceptance of Koha library management system in terms of existence of resources. The findings in the table 4.7 shows that that majority 47(59.5%) of the respondents strongly agreed and agreed that the university offers on job training for implementation of Koha, 27(34.2%) disagreed and strongly disagreed that polytechnics offers on job training for implementation of Koha, and only 5(6.3%) of the respondent were undecided with the notion. 46(58.2%) of the respondents strongly agreed and agreed that polytechnics management supports the funding of Koha, 12(15.2%) disagreed and strongly disagreed that polytechnics management supports the funding of Koha, and only 21(26.6%) of the respondents were undecided with the notion.

39(49.4%) of the respondents strongly agreed and agreed that polytechnics has the financial resources to support Koha, 27(34.2%) disagreed and strongly disagreed that university has the financial resources to support Koha, and only 13(16.5%) of the respondent were undecided with the notion. 37(46.8%) of the respondents strongly agreed and agreed that Polytehnics management has the required infrastructure to support Koha, 33(41.8%) disagreed and strongly disagreed that polytechnics management has the required infrastructure to support Koha, and only 9(11.4%) of the respondent were undecided with the notion.

Table 6: Challenges associated with Acceptance and Use of Koha Library Management System

S/N	Statement	Frequency/ Percentage (Yes)	Frequency/ Percentage (No)
1	It's difficult to migrate bibliographic data to Koha	52(65.8%)	27(34.2%)
2	Koha is not reliable and lack a warranty	28(35.4%)	51(64.6%)
3	Koha is complex and user-unfriendly	33(41.8%)	46(58.2%)
4	Unstable power supply	67(84.8%)	12(15.2%)
5	System crashing and having difficulties removing it	31(39.2%)	48(60.8%)
6	Koha has high maintenance and hidden cost	58(73.4%)	21(26.6%)
7	It's difficult to get technical support	47(59.5%)	32(40.5%)
8	It's difficult to back up the database	51(64.6%)	28(35.4%)
9	Difficulties in installing Koha	49(62.0%)	30(38.0%)
10	Software problem e.g malfunctioning, hanging	35(44.3%)	44(55.7%)
11	Difficulties to upgrade the system	33(41.8%)	46(58.2%)
12	Non-use of all the modules	49(62.0%)	30(38.0%)
13	Lack of training	29(36.7%)	50(63.3%)
14	Unwillingness to embrace changes	44(55.7%)	35(44.3%)
15	Unreliable Internet connectivity	61(77.2%)	18(22.8%)

Source: Extracted by the researcher using SPSS version 23.0 from questionnaire response, 2025 N=79

Table 4.8 showed he result of the respondents' major challenges associated with acceptance and use of Koha library management system. The finding shows that majority 67(84.8%) of the respondents reveals that unstable power supply is a major challenge. Followed by 61(77.2%) unreliable Internet connectivity, 58(73.4%) Koha has high maintenance and hidden cost, 52(65.8%) revealed that it was difficult to migrate bibliographic data to Koha, 51(64.6%) reveal that it's difficult to back up the database, 49(62.0%) revealed that difficulties in installing Koha and non-use of all the modules, 47(59.5%) indicated that it's difficult to get technical support, and 44(55.7%) unwillingness to embrace changes. Minority 35(44.3%) of the respondents reveals that software problem e.g malfunctioning, hanging, 33(41.8%) Koha is complex and user-unfriendly and difficulties to upgrade the system, 31(39.2%) system crashing and having difficulties removing it, 29(36.7%) reveals lack of training, and 28(35.4%) of the respondents reveals that Koha is not reliable and lack a warranty.

Discussion of Findings

The findings are discussed below:

Acceptance of Koha library software: The study found out that librarians in the polytechnic libraries studied accepted Koha as information system management because they were able to use the patron module to register library patrons, circulation module is used to identify and manage over-due items. Also they used the catalogue module to catalogue information materials, used OPAC module to make information searches which saves the time for searching, used the search module to search for information materials from the system, and used the administration module to prepare reports on book processing and service provision.

Factors that Influence the Acceptance of Koha Library Management System:

(a) The factors influencing the acceptance of Koha in terms of system productivity are Koha OPAC module facilitates fast information search which saves time for searching, Reports generation, Koha circulation module saves time of charging and discharging of information materials, and Koha facilitates the management functionality of monitoring the book processing and service provision that reduces on the supervisory workload of administrators.

(b) The factors influencing the acceptance of Koha with regard to ease of use include ease of using the circulation module for charging and discharging information materials, easy to use the patron module to register library patrons, easy to use the OPAC module to retrieve information, and easy to use the administration module to prepare reports on book processing and service provision.

(c) The factors influencing the acceptance of Koha in terms of peer pressure were social pressure, Administrators' attitude, and staff attitude influenced them to use Koha.

(d) The factors influencing the acceptance of Koha in terms of existence of resources were university offers on job training for implementation of Koha, university management supports the funding of Koha, and that polytechnics has the financial resources to support Koha.

Challenges associated with Acceptance and Use of Koha library software:

This study established that unstable power supply, unreliable Internet connectivity, high cost of maintenance, hidden cost, difficult to migrate bibliographic data to Koha, difficult to back up the database, difficulties in installing Koha, non-use of all the modules, difficult to get technical support, and unwillingness to embrace changes were the challenges faced by librarians in Jigawa State universities.

Conclusion

Polytechnics libraries in Jigawa State, Nigeria, have been using Koha as their library management system for a while. As a result, this study identified the key variables that affected Koha library software acceptability in terms of system productivity, usability, peer pressure, and the availability of resources in the state's university libraries. The Koha OPAC module, Koha circulation module, and the management functionality of Koha, which allows administrators to keep an eye on book processing and service delivery, are among the influencing factors identified in the study. The study discovered that employees' usage of Koha was influenced by social pressure, administrators' attitudes, and staff attitudes.

Recommendations

Based on the findings of the current study the following recommendations were made:

1. There is a need for polytechnics libraries studied to give due considerations to funding the library through automation since we are in the era of digital migration. As the software is open source, university managements should fund libraries by providing resources and support to purchase the required equipment to improve on the acceptance of Koha library software.

2. For effective acceptance of Koha library software, on job training can be organized by institutions through conferences, workshops and seminars for all library staff .

3. Operation and maintenance manuals should be given out to polytechnics library staff so that they can refer to them in cases of emergencies than waiting for the support from technical team.

4. Polytechnics libraries should advocate for supports from government and other relevant stakeholders for stable Internet connectivity and power supply to enable maximum benefits from Koha and other LIS services.

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ADOPTION AND USE OF ARTIFICIAL INTELLIGENCE IN THE DELIVERY OF LIBRARY SERVICES IN ACADEMIC LIBRARIES

BY

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Abstract

Transition of information materials from book collections to audio-visual collections, database to digitization of the information materials or library automation, and now the adoption and use of artificial intelligence (AI) in library operations cannot be over-emphasis for satisfying the information need of the users. This implies that one of the motives of adoption and use of AI in libraries is to render effective services to satisfy the needs of users. The integration of AI into academic libraries has seen significant growth for years. AI has attained the high level of acceptance in rendering effective library services in tertiary institutions. This paper highlights the concept of AI, benefit of AI in academic libraries which in include bridge of time and space, maximization of efficiency of library services and effort of librarians toward library operation. The paper also examines the adoption and use of AI for services delivery in academic libraries. The paper further discusses some of the identified challenges associated with the adoption and use of AI in academic libraries. These challenges include inadequate skills of librarians to use artificial intelligence system, poor funding of libraries to provide artificial intelligence systems and limited amount of artificial intelligence experts among library automation vendors. The paper concludes that it is essential to note that academic libraries in Nigeria are now strives to adopt AI to deliver services in meeting the evolving needs of users easily.

Keywords: Artificial Intelligence, Libraries Services, Academic Libraries

Introduction

Academic libraries are the nerve center of an educational institution and a place where information is provided to serve staff, students and other member of the community, irrespective of their sex, ages or religion. Academic library was formally defined as a function of the physical building where books were kept for reading and other purposes. However, the definition of academic library today has gone beyond the physical building, it now centers on the collections and services offered, since virtual libraries have no physical walls and services could be rendered to users from remote locations. Consequently, in the effort to satisfy the dynamic information needs of its clientele at the same time uphold its relevance in this ever-changing technological society, academic libraries have explored and incorporated the use of new technologies for effective services delivery. As such, Verma (2015) posits that academic libraries have embraced technologies to modernize their services and improve users' experiences. These include the adoption and application of automated systems for cataloging, circulation, establishment of digital repositories and artificial intelligence. Artificial intelligence facilitates the delivery of effective services to users in academic libraries.

Specifically, Kaushal, Sarma, Rana & Naithani (2020) described artificial intelligence as the capability of a device to perform functions that are normally associated with human intelligence such as reasoning and optimization through experience to delivery library services. Artificial intelligence (AI) is the modern technology which is used to manage the library and render services to patrons. The ultimate promise of AI is to develop computer systems or machines that think, behave and in fact rival human intelligence, and this clearly has major implications on librarianship. Artificial Intelligence matters to libraries because it could be used for organizing and making available large collections of information. It is not just an intelligent system or software program, it is a biologically

motivated technology used to replicate human ways of perceiving and processing information (Sridevi & Shanmugam, 2017). At present, this technology is adopted and used by academic libraries to render services to their patrons easily.

The adoption and use of AI in academic libraries will influence connectivity of information technology and actively support the generation, transmission and dissemination of information to render effective services to users. The use of AI on the nature of future libraries will be enormous and the quality difference varies from experts (Vijayakumar & Sheshadri, 2019). Consequently, Asefeh and Asemi (2018) list various ways in which AI technologies can be used to improve library services delivery to include the followings: circulation services, shelving of books, cataloguing of library materials, among others. Many academic libraries, most especially those in the developed countries make use of AI for the provision of library services to the users.

Concept of Artificial Intelligence (AI)

Artificial Intelligence (AI) is the capability of a device to perform functions that are normally associated with human intelligence such as reasoning and optimization through experience. AI can be said to be the intelligence of machines. As an aspect of computer science, AI comprises an expert system, fuzzy logic, artificial neural network, image processing, natural language processing, speech recognition, and robotic (Kaushal, Sarma, Rana & Naithani, 2020). Similarly, Verma (2019) posited that AI is the ability of a digital computer or computer-controlled robot to execute tasks often associated with intelligent beings. The phrase is widely given to the endeavor of producing systems with human-like cognitive processes, such as the ability to reason, discover meaning, generalize, or learn from past experience.

In a similar vein, Russell & Norvig (2020) posited that artificial intelligence refers to the branch of computer science dedicated to creating systems capable of performing tasks that typically require human intelligence. These tasks include learning from experience, understanding natural language, recognizing patterns, solving complex problems, and making decisions. Artificial intelligence encompasses various subfields such as machine learning, which focuses on algorithms that enable systems to learn from data and improve over time without explicit programming. Another important area is natural language processing, which allows machines to understand and interact using human language (Russell & Norvig, 2020).

Adoption and Use of Artificial Intelligence in the Delivery of Library Services

The application of AI in academic libraries will influence connectivity of information technology and actively support information usage as well as easing clients' search and immediately address their needs. The adoption and use of artificial intelligence on the nature of future libraries will be enormous and the quality difference varies from experts (Vijayakumar & Sheshadri, 2019). Consequently, Asefeh and Asemi (2018) list various ways in which AI technologies can be used to improve library services delivery which include; circulation services, shelving of books, cataloguing of library materials, among others. Many academic libraries, most especially those in the developed countries make use of AI for the provision of library services to the users.

Similarly, Michael and Alex (2020) stressed that adoption and use of artificial intelligence in library system encompasses descriptive cataloguing, subject indexing, reference services, technical services, shelf reading, collection development, information retrieval system among other. With the advancement in artificial intelligence programming, creating a smart library is not only a possibility but a matter of time. Corroborating this assertion, Corke (2019) reported that researchers and experts in the field of artificial intelligence are creating intelligent systems which can think and behave like librarians. E,g library robots. However, Sridevi and Shanmugam (2017) stressed that some fields of artificial intelligence that are used in library management system include natural language processing (NLP), robotics among others. Succinctly, Natural Language Processing (NLP) is the analysis and generation of natural language text by computers. The goal is to enable natural languages such as French, English, or Chinese, to serve either as the medium through which users interact with computer systems or as the object that a system processes. In libraries, NLP can be used to design intelligent expert reference system or information retrieval system, where users can interact directly with the system using natural languages.

Another practical application of artificial intelligence in libraries is subject indexing. This task requires the technical expertise of the librarian or indexer and his intellectual judgement to peruse, analyse and suggest the appropriate terms to be used as index terms or keyword of a given document. Any computer system or

machine that can undertake this task can be said to be intelligent. An Expert System can be designed to handle subject indexing or reference services (Sridevi and Shanmugam, 2017).

For librarians, artificial intelligence presents both opportunities and challenges as it reshapes traditional library services and introduces new methods for managing and delivering information. More so, Artificial intelligence technologies are being integrated into libraries to enhance and automate various services, making them more efficient and user centric. Artificial intelligence is making so many impacts in various areas like; information retrieval and discovery, Artificial intelligence-powered search systems, and recommendation engines are improving the way users discover and access information.

Murphy (2015) observed that AI has gained tremendous application in library information services, these include but are not limited to:

1. Automatic cataloguing and classification using Optical Character Recognition (OCR)
2. Automatic translation of foreign language materials using Natural Language Processing (NLP), Automatic indexing using Expert Systems
3. Retrieval of audiovisuals materials and Speech Recognition.
4. Intelligent gateways to online sources,
5. User-structured information environment
6. Portable computer reader services for the handicapped Intelligent
7. Document Delivery Services (DDS)

Benefits of the Use of AI in the Delivery of Library Services

According to Vijayakumar and Vijayan (2011), artificial intelligence are used in classification, cataloging and indexing of library materials. Via the use of optical character recognition and neural network, the system is able to obtain the bibliographic records of books and classify them accordingly. Consequently, Ex Libris (2019), noted that the benefits of artificial intelligence in libraries can be summarized as follows:

1. Artificial intelligence in academic libraries can make research more discoverable which can boost research productivity among faculty members
2. **Bridge in Time:** Round the clock accessibility to information resources and services just in time
3. **Bridge in Space:** The space occupied by files of books, journals, bound newspapers and other information materials has been reduced by the introduction of digitization, electronic copies and use of robotic cranes that stores and retrieve books from a compact off-site storage location
4. **Maximization of Efficiency:** This refers to efficiency in library operations: selection and acquisition of materials, technical services, circulation services, references services, serial management etc. Maximization of effectiveness in form of improves services delivery and elimination of human errors in library operations.
5. **Minimization of Effort:** The effort expended by librarians in technical services, circulation services, references services, serial management etc, can been minimized by the use of artificial intelligence systems in libraries. Enhanced and immersive user experience in library services delivery.

Challenges Associated with the Application and Use of AI in the Delivery of Library Services

Oden (2021), Samgon (2019) and Michael and Alex (2020) observed that the challenges hindering the adoption and use of AI in libraries are:

Inadequate Funds: The economy of the nation is threatening therefore the funds from the government are shrinking. Finance is very important in the implementation of AI, so the library have to budget their funds, as little as it may be, for the adoption of AI. One possible problem that will not make this work is poor funding.

Loss of Jobs: Over time, Librarians have refused the adoption of AI because of a certain myth they heard, that once AI is put in place it begins to produce results itself. Rather, the path to AI success takes time, thoughtful planning, and a clear idea of the deliverables you want to accomplish.

Limited ICT Infrastructure: While some academic libraries have adopted digital technologies, the infrastructure required to support comprehensive digital services is often inadequate. Poor internet connectivity, unreliable power supply, and limited access to modern computer hardware are common issues faced by many libraries. This limits the full integration of digital resources and hampers the effectiveness of online learning tools (Amuta, 2021).

Staff Training: Another challenge is the insufficient training and professional development opportunities for library staff. Many academic libraries in Edo State face staffing shortages and lack the necessary technical expertise to manage emerging technologies effectively. Professional development programs, particularly in

areas like digital librarianship, are essential for equipping staff to meet the demands of modern library services (Adetoro & Olatokun, 2020).

Lack of User Awareness: While libraries offer a wealth of resources, there is often a lack of awareness among students and faculty about the full range of services available. This lack of awareness can hinder effective use of library resources, including online databases, e-journals, and other digital content. Promoting information literacy and encouraging greater engagement with library resources remain ongoing challenges (Oladejo, 2019).

Lack of Skilled Personnel: There is a shortage of librarians with the necessary technical expertise to manage and implement AI technologies in Nigerian academic libraries. Most library staff members are trained in traditional library practices, and there is a pressing need for professional development programs that focus on AI, machine learning, and data science (Adebayo & Aina, 2019). Without these skills, libraries may struggle to make the most of AI's potential.

In a similar vein, Michael and Alex (2020) noted that artificial intelligence systems are generally not in operational use in most libraries today. The limitations to implementing artificial intelligence systems in libraries include the following:

1. Lack of technical know-how to use and operate artificial intelligence systems among the library staff.
2. Lack of adequate funding to develop or procure artificial intelligence systems in libraries. Since the budgets for hardware and software are frequently tight, there's always constrain to the type of system the library can purchase or develop.
3. Intelligent systems lack that common base of human knowledge, severely constraining the types of functions that they can perform.
4. Limited amount of artificial intelligence experts among library automation vendors. The field of artificial intelligence is complex and thus, requires a specialized knowledge in that aspect far beyond the development of conventional library automation systems. Consequently, this will require hiring new personnel in that area before any significant, widespread work can be done in the area of artificial intelligence systems in libraries.

Conclusion

Whenever an academic library engage in the new knowledge economy, it must innovate their services and re-examine their practices, a veritable means to achieve this is the application of artificial intelligence in the library for effective services delivery. As such, academic library will greatly benefit by the adoption and use of artificial intelligence delivery of services such as technical services, reference services, circulation services, resource management and information retrieval/dissemination. Although despite great benefit of AI, there are speculations that this technology can render librarians jobless and kill their horizon or natural thinking.

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ADOPTION AND PERCEPTIONS OF INNOVATIVE TECHNOLOGIES IN RECORDS MANAGEMENT BY ADMINISTRATIVE STAFF IN FEDERAL POLYTECHNIC OFFA

BY

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Abstract

The integration of innovative technologies into records management has transformed administrative processes in Nigerian polytechnics, moving institutions from traditional paper-based systems to more efficient digital formats. This study reviews existing literature and synthesizes empirical evidence on the adoption, perceptions, impact and challenges of innovative technologies in records management at the Federal Polytechnic Offa Library. Employing a case study design, the research targeted a population comprising 449 non-teaching staff of the institution from which 102 administrative staff were drawn as the sample. Data was collected through a structured questionnaire and analyzed using both descriptive and inferential statistical methods. Findings indicate that foundational technologies such as electronic mail, ERMS, digitization, digital apps and cloud backup have gained significant adoptionbut more advanced or specialized technologies such as barcoding/RFID and AI-enabled ;EDMS remain underutilizedthere is a positive attitudeand readiness towards innovative technologies in records managemenand di gital technologies, computerized systems and digitization tools are relatively well adopted and utilised especially for record handling and conversion of paper .files .into electronic formatsNotable challenges are financial constraints (cost of acquisition, maintenance, and training) and insufficient staff exposure to modern technologies. Key recommendations include developing and implementing comprehensive strategic plans that fully integrate innovative technologies into records management expanding the use of digital platforms, strengthening collaboration with academic departments; allocating dedicated funds specifically for ;the acquisition, maintenance and upgrading of innovative technologies in records management continuous professional development programmes such as workshops, seminars and conferences should be organized regularly for administrative staff and equipping students and office managers with up-to-date knowledge and practical skills in modern technologies since the instiution offer s degrees in Office Technology Management.

Keywords: Record Management, Nigerian Polytechnics, Innovative tehnologies, Electronic Records Management Systems, Digitisation, Artificial Intelligence, Cloud Computing

Introduction

The role of Information and Communication Technologies (ICTs) in the management of information resources and institutional records has become increasingly indispensable in the 21st century. ICTs enhance organizational capacity to capture, store, retrieve, analyse and disseminate vast volumes of information across geographical and institutional boundaries (Adams & Makinde, 2020). Their integration into records management has been widely acknowledged as a major driver of efficiency, accountability and reliability in organizational operations. Specifically, ICT-based systems provide opportunities for transparent decision-making, timely access to information and improved service delivery across administrative and academic processes (Yusuf, 2014; Nwankwo & Eze, 2021). Also, international standards such as ISO 15489 provide a framework for effective records management, emphasizing reliability, authenticity, and accountability (ISO, 2016). In Nigeria, the Nigeria Data Protection Act (NDPA) 2023 introduces additional compliance obligations, requiring institutions to adopt secure, accountable and rights-respecting approaches to digital record management (NDPB, 2023).

Records management has undergone significant transformations over the past two decades, shifting from traditional manual systems to technology-driven frameworks. The introduction of electronic records management systems (ERMS), digital repositories and cloud-based platforms has greatly enhanced the accuracy, accessibility, and security of institutional

records (Alex, 2017). These innovations have not only streamlined workflow processes but also addressed key challenges associated with information loss, duplication, and restricted accessibility (Ogbomo & Akpohonor, 2020). In higher education, efficient records management is critical to supporting teaching, learning, research and governance as it ensures that records are systematically created, preserved and made available for both operational and evidentiary purposes (Ngoepe, 2018; Iwhiwhu, 2016).

Polytechnics like other higher education institutions have traditionally relied on manual record-keeping practices which are often characterized by inefficiency, vulnerability to loss and restricted access. However, the growing complexity of institutional administration coupled with rising student enrolments has necessitated a transition toward ICT-driven record management systems (Okon, 2019). At the Federal Polytechnic Offa, which operates across two campuses and serves a large student population, units such as the registry, academic affairs unit, bursary, Management Information Systems (MIS) and registration officers manage significant volumes of both transactional and evidentiary records. In response to these responsibilities, the institution has invested in ICT infrastructures aimed at automating student registration, academic record-keeping, library services and financial management (Oketunji, 2020).

Despite these developments, the adoption of advanced innovative technologies remains limited. Cutting-edge solutions such as Artificial Intelligence (AI) for automated classification and predictive analytics, Blockchain for tamper-proof and transparent record-keeping, Cloud computing for scalable storage and collaboration and Big Data analytics for evidence-based decision-making are yet to be fully explored (Abubakar & Adebayo, 2021; Tlou & Ngulube, 2022). The integration of such technologies holds the potential to revolutionize records management by improving interoperability, strengthening security and reducing redundancies in record-keeping systems.

This paper therefore seeks to empirically examine the adoption and perception of innovative technologies in records management at the Federal Polytechnic Offa. It specifically explores the availability of innovative technologies, perception and readiness, the impact of technological innovations on administrative performance and the challenges hindering their effective deployment. By doing so, the paper contributes to the growing body of knowledge on ICTs in records management and highlights innovative strategies for improving efficiency, accountability, and service delivery within Nigerian polytechnics.

Statement of the Problem

Records management is the backbone of effective administration in tertiary institutions, as it ensures accuracy, accessibility, and accountability in decision-making processes. In Nigerian polytechnics, the traditional paper-based system of managing records has long been associated with challenges such as poor storage facilities, misfiling, loss of vital documents, delays in retrieval, and limited accessibility. With the rapid advancement of innovative technologies such as electronic document management systems (EDMS), cloud storage, big data analytics, artificial intelligence (AI) and blockchain, there is an increasing global shift toward digital transformation in records management. These technologies promise to improve efficiency, enhance transparency, safeguard records, and ensure long-term preservation.

Despite these global trends, Nigerian polytechnics appear to lag in the adoption and effective utilization of such technologies. While some institutions have made efforts to digitise records and integrate ICT tools into their administrative processes, the level of adoption remains uneven and largely constrained by inadequate infrastructure, insufficient funding, unreliable power supply and limited digital skills among administrative staff. Moreover, perceptions of these technologies vary: while some staff view them as valuable innovations that enhance productivity, others perceive them as complex, unnecessary or threatening to their existing roles. This mixed perception directly influences readiness, acceptance and usage levels. The problem is further compounded by the absence of clear institutional policies on digital records management, inconsistent training opportunities for administrative staff and resistance to change within organizational culture. As a result, polytechnics continue to face recurring issues of inefficiency, duplication of efforts, poor accountability and delays in service delivery problems that could be mitigated through effective adoption of innovative technologies.

It is therefore critical to investigate the extent to which the polytechnic have adopted innovative technologies in records management, how administrative staff perceives these tools in terms of attitudes and readiness, impact and the challenges hindering their effective implementation.

Aim and Objectives of the Study

1. To identify the types of innovative technologies currently being adopted for records management
2. To evaluate administrative staff's perception (attitudes, beliefs, and readiness) toward the use of innovative technologies in records management.
3. To assess the extent of adoption and utilization of innovative technologies in records management by administrative staff.

Research Questions

1. What types of innovative technologies are currently being adopted for records management?
2. To what extent have administrative staff adopted and utilized innovative technologies in records management?
3. How do administrative staff perceive the use of innovative technologies in records management in terms of attitudes, beliefs, and readiness?

Literature Review

Records form the cornerstone of institutional accountability, transparency, and continuity in higher education institutions. For Nigerian polytechnics,

records management is particularly significant because it underpins academic administration, financial accountability, and human resource coordination. Traditionally, these institutions relied on paper-based filing systems for managing student admissions, academic results, personnel records and official correspondence. Although this manual approach sustained basic administrative functions, it was often plagued by inefficiency, delays, difficulty in retrieval and exposure to risks such as misplacement, duplication or damage through environmental hazards (Oladimeji & Lawal, 2020). Such limitations not only compromised operational efficiency but also undermined institutional credibility and service delivery. Policy and Regulatory Drivers

The emergence of innovative technologies has provided polytechnics with opportunities to improve recordkeeping practices. Innovative technologies adoption in records management involves the application of digital tools such as Electronic Records Management Systems (ERMS), digitisation platforms, student information systems and cloud-based storage to create, retrieve, disseminate and preserve records (TETFund, 2023). The transition from paper-based to digital systems marks not only a technological transformation but also a cultural shift in administrative operations. As Adebayo and Fagbamiye (2021) argue, innovative technologies have redefined institutional workflows by improving accuracy, efficiency, and accessibility of records while reducing the vulnerabilities inherent in manual systems.

The adoption of innovative technologies in Nigerian polytechnics is increasingly shaped by regulatory frameworks such as the Nigeria Data Protection Act (NDPA) 2023, the Act compels institutions to ensure confidentiality, accuracy, data minimization and storage limitation in handling personal records. Compliance with these principles has made the deployment of ERMS and other secure digital tools not just an administrative choice but also a legal necessity. By integrating audit trails, access controls and authentication features, digital record systems help institutions meet these regulatory obligations while also strengthening institutional trust and accountability. Adopting digital systems aligns with global best practices in higher education administration. This provides structured storage, metadata tagging, audit trails, and role-based access which enhance accountability and compliance (Nasir, 2021). According to Oseni, Bakare & Alli (2023), there wasa progressive adoption of ERMS in polytechnics in Edo and Delta States where electronic platforms are increasingly being used to manage student academic files, admission documents and correspondence. Such adoption reflects a growing recognition of the strategic role of technology in ensuring institutional efficiency. Also, institutional reports and research indicates a gradual but uneven adoption of innovative technologies across Nigerian polytechnics and tools such as digitization software, electronic mail systems and ERMS are increasingly integrated into day-to-day administrative processes (TETFund, 2023). For instance, digitisation has facilitated the conversion of projects and student records into electronic formats, reducing physical storage burdens and enhancing preservation. Similarly, ERMS adoption has improved the handling of student academic files and reduced delays in service delivery (Nasir, 2021).

Perception, however, plays a critical role in determining the success of technological adoption. Aministrative and academic staff in polytechnics generally perceive ICTs positively, particularly regarding their potential to improve efficiency, reliability, and transparency in recordkeeping (Ajayi & Olatunji, 2022). Staff attitudes towards ERMS and digitization tools are often shaped by their experiences of faster retrieval, reduced duplication and streamlined workflows. The perception of technologies as enablers of accountability also add to the broader demand for institutional credibility in higher education operations and management. However, perceptions are not uniformly positive, while many staff members express confidence and willingness to adopt new technologies, skepticism persists in some quarters. Abubakar (2022) highlights that staff with limited ICT exposure or training often perceive innovative technologies as complex and demanding, particularly when it involves advanced tasks such as metadata application, lifecycle management, or compliance reporting. Such perceptions underscore the need for continuous professional development and change management strategies to build institutional confidence in technological tools.

Despite these advances, challenges such as limited technical expertise, insufficient trainingand competencies and infrastructural deficits continue to hinder the full-scale adoption of ERMS in Nigerian polytechnics (Ahmed, 2020). Financial constraints bordering on the cost of acquiring, implementing and maintaining innovative technologies and related infrastructure remains high, especially given the limited budgetary allocations for polytechnics. Also, some staff remains skeptical of new technologies, particularly those who are accustomed to manual recordkeeping practices or lack motivation to acquire new digital skills (Abubakar, 2022). These barriers highlight the need for continuous professional development, investments in ICT infrastructure to sustain adoption and policy support are critical to bridging this gap.

Methodology

The case study research design was adopted for this work. The population of this study comprised 449 non-teaching staff in Federal Polytechnic Offa, Kwara State, Nigeria but focused on staff stationed at the academic affairs unit, registry, bursary, MIS and registration officers in each department of the institution who are directly engaged in records related tasks, thereby bringing the total to 102 respondents. The sample was drawn based on convenience and availability of the respondents. A structured questionnaire bordering on

the research questions was used to elicit responses from the respondents.

Table 1

S/No	Studied Units	Number of Respondents	%
1	Academic Affairs Unit	25	24.5
2	Registry	30	29.4
3	Registration Officers	22	21.6
4	Bursary	18	17.6
5	MIS	7	6.9
	Total	**102**	**100**

This section deals with the results obtained from the analysis of data. 102 questionnaires were issued out to the various respondents in their units and all were retrieved representing a 100% retrieval rate. Academic affairs with 25 (24.5%) respondents, registry had 30 (29.4%) respondents, registration officers who filled the questionnaire were 22 (21.6%), bursary respondents were 18(17.6%) and Management Information System (MIS) unit had 7 (6.9%) respondents.

RQ 1: What types of innovative technologies are currently being adopted for records management?

Table 2

Innovative technologies currently adopted for records management	Fully Adopted %	Moderately Adopted %	Not Adopted %	Total %	Mean scores %
Electronic record management system	97	5	0	**102**	2.95
	95.1	**4.9**	**0**	**100**	
Electronic mail	102	0	0	**102**	3.00
	100	**0**	**0**	**100**	
Digitisation	78	24	0	**102**	2.76
	76.4	**23.5**	**0**	**100**	
Digital apps	55	26	21	**102**	2.67
	53.9	**25.5**	**20.6**	**100**	
Cloud back up	67	25	10	**102**	2.56
	65.7	**24.5**	**9.8**	**100**	
Barcoding/RFID for file tracking	5	10	87	**102**	1.19
	4.9	**9.8**	**85.3**	**100**	
Workflow automation/BPM	22	58	22	**102**	2.00
	21.6	**56.9**	**21.6**	**100**	
Artificial Intelligence	2	5	95	**102**	1.19
	1.9	**4.9**	**93.1**	**100**	

The table assessed the type of innovative technologies adopted in the institution studied. Findings show that electronic mail recorded the highest adoption rate with 100% of respondents indicating its use (Mean = 3.00). This was closely followed by the Electronic Records Management System (ERMS) with 95.1% adoption and 4.9% non-adoption (Mean = 2.95). Digitisation was moderately embraced, with 76.4% fully adopted, 23.5% moderately adopted (Mean = 2.76). Cloud backup showed a fairly high acceptance, with 65.7% fully adopted, 25.5% moderately adopted, and 9.8% not adopted (Mean = 2.56).

The analysis revealed that digital applications recorded 55 respondents (53.9%) indicating full adoption, 26 respondents (25.5%) reporting moderate adoption, while 21 respondents (20.6%) indicated no adoption. The computed mean score of 2.67 suggests that, on average, the level of adoption of digital applications among respondents leaned towards moderate adoption, though the majority expressed full adoption.

In contrast, Barcoding/RFID for file tracking had very low adoption as 85.3% reported non-adoption, 9.8% moderate adoption, and only 4.9% full adoption (Mean = 1.19). Similarly, Workflow automation/Business Process Management (BPM) recorded low adoption, with 21.6% fully adopted (mainly in bursary/registry sub-processes), 56.9% moderately adopted, and 21.6% not adopted (Mean = 2.00). Electronic Document Management Systems (EDMS) with Artificial Intelligence had the lowest adoption rate as 93.1% reported non-adoption, 4.9% moderate adoption, and 2.0% full adoption (Mean = 1.09).

The results reveal that while foundational technologies such as electronic mail, ERMS, digitization, digital apps and cloud backup have gained significant adoption, more advanced or specialized technologies such as barcoding/RFID, workflow automation, and AI-enabled EDMS remain underutilized. This suggests that institutions are more inclined toward basic, cost-effective technologies that directly support day-to-day records management, while resource-intensive innovations requiring greater technical capacity are yet to be fully embraced.

RQ 3: How do administrative staff perceive the use of innovative technologies in records management in terms of attitudes, beliefs, and readiness?

Table 4

Attitudes (emotional responses, acceptance, and feelings)	SA %	A %	N %	D %	SD %	Total %	Mean Scores %
I have a positive attitude towards the use of innovative technologies in records management.	37 **36.3**	46 **45.1**	4 **3.9**	9 **8.8**	6 **5.9**	**102** **102** **100**	4.01
I feel comfortable using innovative technologies for managing records.	24 **23.5**	39 **38.2**	3 **3.0**	30 **29.4**	6 **5.9**	**102** **100**	3.86
I enjoy exploring new technologies that improve records management.	18 **17.6**	28 **27.5**	5 **4.9**	33 **33.4**	18 **17.5**	**102** **100**	3.02
Readiness (preparedness, willingness, and confidence)							
I am willing to adopt innovative technologies in my daily records management tasks.	56 **54.8**	32 **31.4**	2 **2.0**	7 **6.9**	5 **4.9**	**102** **100**	4.28
I feel confident in my ability to learn and use innovative technologies effectively.	54 **52.9**	35 **34.3**	2 **2.0**	5 **4.9**	6 **5.9**	**102** **100**	4.36
I am prepared to upgrade my skills to keep up with innovative technologies in records management.	58 **56.9**	34 **33.3**	2 **2.0**	4 **3.9**	4 **3.9**	**102** **100**	4.36

Table 3 examined the attitudes (emotional responses, acceptance, and feelings) and readiness of respondents toward the use of innovative technologies in records management.

For the statement "I have a positive attitude towards the use of innovative technologies in records management", 37 respondents (36.3%) strongly agreed and 46 (45.1%) agreed. Meanwhile, 9 (8.8%) and 6 (5.9%) indicated disagreement and strong disagreement respectively, while 4 (3.9%) were neutral. The computed mean score of 4.01 suggests a generally positive attitude among respondents.

Regarding the statement "I feel comfortable using innovative technologies for managing records", 39 respondents (38.2%) strongly agreed, followed by 30 (29.4%) who agreed and 24 (23.5%) who disagreed. A smaller proportion, 6 (5.9%), strongly disagreed, while 3 (3.0%) remained neutral. The mean score of 3.86 indicates that most respondents feel comfortable with innovative technologies, though a small fraction still expressed discomfort.

For the statement "I enjoy exploring new technologies that improve records management", 33 respondents (32.4%) disagreed, 28 (27.5%) agreed, 18 (17.5%) strongly disagreed, and 18 (17.5%) strongly agreed, while 5 (4.9%) were neutral. The mean score of 3.02 shows a more divided attitude, suggesting that while some staff enjoy exploring new technologies, a significant proportion are reluctant.

On the statement "I am willing to adopt innovative technologies in my daily records management tasks", 56 respondents (54.8%) strongly agreed, 32 (31.8%) agreed, while 7 (6.9%) disagreed, 5 (4.9%) strongly disagreed, and 2 (2.0%) were neutral. The mean score of 4.28 reflects a very high willingness to adopt innovative technologies. For the statement "I feel confident in my ability to learn and use innovative technologies", 58 respondents (56.9%) strongly agreed, 34 (33.3%) agreed, while 4 (3.9%) disagreed, 4 (3.9%) strongly disagreed, and 2 (2.0%) were neutral. The mean score of 4.36 suggests that most respondents are confident in their ability to learn and use such technologies.

Lastly, for the statement "I am prepared to upgrade my skills to keep up with innovative technologies in records management", 58 respondents (56.9%) strongly agreed, 34 (33.3%) agreed, 4 (3.9%) disagreed, 4 (3.9%) strongly disagreed, and 2 (2.0%) were neutral. The mean score of 4.36 also reflects a strong readiness to continuously improve skills in line with technological advancements.

Overall, the mean scores across the statements indicate that respondents generally hold a positive attitude towards innovative technologies in records management. They feel comfortable, confident, and willing to adopt these technologies, while also demonstrating readiness to upgrade their skills. However, some skepticism persists regarding the enjoyment of exploring new technologies, which may suggest that while staff are open to adoption, not all are enthusiastic about continuous technological exploration.

RQ 3: To what extent have administrative staff adopted and utilized innovative technologies in records management?

Table 4

Extent of adoption of innovative technologies in records management	**SA**	**A**	**N**	**D**	**SD**	**Total**	**Mean scores**
I frequently use digital technologies (e.g., electronic document management systems) in handling institutional records.	35 **34.3**	47 **46.1**	3 **2.9**	10 **9.8**	7 **6.9**	**102** **100**	3.95
Innovative technologies have replaced most of the manual processes in my daily record management tasks.	22 **21.6**	32 **31.4**	3 **2.9**	30 **29.4**	15 **14.7**	**102** **100**	3.24
I rely on computerized systems for storing and retrieving records	29 **28.4**	33 **32.4**	2 **1.9**	26 **25.5**	12 **11.8**	**102** **100**	3.53
I have adopted cloud-based solutions for records storage and backup.	10 **9.8**	15 **14.7**	5 **4.9**	23 **22.5**	49 **48.0**	**102** **100**	2.19
The use of innovative technologies is part of my routine administrative duties.	27 **26.5**	36 **35.3**	0 0	25 **24.5**	14 **13.7**	**102** **100**	3.66
Extent of Utilisation	**Very High Extent**	**High Extent**	**Moderate Extent**	**Low Extent**	**Not Utilised**		
I use database management systems to organize institutional records.	15 **14.7**	31 **30.4**	36 **35.3**	10 **9.8**	10 **9.8**	**102** **100**	3.62
I utilize scanning and digitization tools to convert paper records into electronic formats.	50 **49.0**	20 **19.6**	17 **16.7**	10 **9.8**	5 **4.9**	**102** **100**	4.00
I make use of mobile devices and applications to access institutional records remotely	22 **21.6**	28 **27.5**	34 **33.3**	10 **9.8**	8 **7.8**	**102** **100**	3.58
I apply data security technologies (e.g., passwords, encryption) in managing records	12 **11.8**	23 **22.5**	29 **28.4**	26 **25.5**	12 **11.8**	**102** **100**	3.03
I regularly use automated systems to update and maintain institutional records.	11 **10.8**	15 **14.7**	45 **44.1**	20 **19.6**	11 **10.8**	**102** **100**	3.22

Table 4 examined the extent of adoption of innovative technologies in records management. Out of 102 respondents, 46.1% agreed and 34.3% strongly agreed that they frequently use digital technologies (e.g., electronic document management systems) in handling institutional records, while a smaller proportion (9.8% disagreed, 6.9% strongly disagreed, and 2.9% were neutral) held contrary views. The mean score of 3.95 indicates a generally high adoption of digital technologies for record handling.

On the statement, "Innovative technologies have replaced most manual processes in my daily record management tasks", 31.4% agreed and 21.6% strongly agreed, compared to 29.4% who disagreed, 14.7% strongly disagreed, and 2.9% who were neutral. The mean score of 3.24 suggests a moderate perception of replacement of manual processes by digital innovations.

In response to "I rely on computerized systems for storing and retrieving records", 32.4% agreed and 28.4% strongly agreed, while 25.5% disagreed, 11.8% strongly disagreed, and 1.9% were neutral. The mean score of 3.53 reflects a moderately high reliance on computerized systems.

However, when asked about "Adopting cloud-based solutions for records storage and backup", only 14.7% agreed and 9.8% strongly agreed, compared to a large 22.5% who disagreed, 48.0% who strongly disagreed, and 4.9% who were neutral. The mean score of 2.19 reveals a very low adoption of cloud-based technologies. For the statement "The use of innovative technologies is part of my routine administrative duties", 36.1% agreed and 26.5% strongly agreed, while 24.5% disagreed and 13.7% strongly disagreed. The mean score of 3.66 indicates a moderately high integration of innovative technologies in routine duties.

Extent of Utilisation of Adopted Innovative Technologies

Regarding utilisation, 35.3% of respondents indicated moderate use of database management systems, 30.4% high use, 14.7% very high and only 9.8% each for low or no utilisation. The mean score of 3.62 suggests a moderately high use of database systems. For "I utilize scanning and digitization tools to convert paper records into electronic formats", 49.0% indicated very high utilisation, 19.6% high, 16.7% moderate, 9.8% low, and only 4.9% no utilisation. The mean score of 4.00 reflects a very high level of digitization tool adoption. On "I make use of mobile devices and applications to access institutional records remotely", 33.3% moderately utilised, 27.5% high extent, 21.6% very high, 9.8% low, and 7.8% none. The mean score of 3.58 suggests a moderate to high extent of mobile technology use.

For "I apply data security technologies (e.g., passwords, encryption) in managing records", 28.4% moderately utilised, 25.5% low, 22.5% high, 11.8% very high, and 11.8% none. The mean score of 3.03 indicates only a moderate application of data security technologies. Finally, "I regularly use automated systems to update and maintain institutional records" attracted 44.1% moderate utilisation, 19.6% low, 14.7% very high, 10.8% no utilisation, and 10.8% high utilisation. The mean score of 3.22 suggests a moderate reliance on automated systems.

From the mean scores, it can be inferred that digital technologies, computerized systems, and digitization tools are relatively well adopted and utilised, especially for record handling and conversion of paper files into electronic formats. However, the adoption of cloud-based solutions and robust data security technologies remains significantly low, reflecting gaps in infrastructural readiness and policy implementation. Overall, the findings suggest that while innovative technologies are increasingly becoming part of routine administrative tasks, the extent of adoption and utilisation varies, with some critical tools underutilised due to cost, technical, or policy-related challenges.

Discussion of Findings

The findings are discussed based on the objectives of the study:

Type of innovative technologies adopted for record management: The results reveal that that foundational technologies such as electronic mail, ERMS, digitisation, digital apps and cloud backup have gained significant adoption, more advanced or specialized technologies such as barcoding/RFID, workflow automation and AI-enabled EDMS remain underutilized. This suggests that institutions are more inclined toward basic, cost-effective technologies that directly support day-to-day records management while resource-intensive innovations requiring greater technical capacity are yet to be fully embraced. The results of this finding align with Chigbu, Nwokocha & Chigbu (2020) on Nigerian tertiary institutions which showed that institutions preferred technologies requiring minimal technical expertise (digitisation, cloud storage), while AI-based or workflow automation tools were not utilized because staff lacked the advanced ICT training necessary for implementation.. Also, in a study by Marutha & Ngulube (2012) on South African universities observed that digitisation and simple digital applications were widely implemented due to their direct benefits in access and preservation but advanced systems like RFID were largely absent due to high .infrastructure and maintenance costsThis supports the conclusion that institutions are still at the stage of consolidating basic digital transformation before advancing into higher-level, resource-intensive innovations.

Perception and readiness of administrative staff about innovative technologies: The study showed that administrative staff hold a positive attitude towards innovative technologies in records management. They feel comfortable, confident, and willing to adopt these technologies, while also demonstrating readiness to upgrade their skills. However, some skepticism persists regarding the enjoyment of exploring new technologies, which may suggest that while staff are open to adoption, not all are enthusiastic about continuous technological exploration. This correlates with Lewellen (2015) view that staff in records management environments generally demonstrate a positive and confident disposition toward adopting innovative technologies, particularly when those systems are perceived as useful and easy to use and when supportive training and social structures exist.

Extent of Adoption and Utilisation of Innovative Technologies in Records Management: The findings showed that digital technologies, computerized systems and digitisation tools are relatively well adopted and utilised especially for record handling and conversion of paper files into electronic formats. However, the adoption of cloud-based solutions and robust data security technologies remains significantly low reflecting gaps in infrastructural readiness and policy implementation. This shares the same view Ajayi (2018)that Nigerian institutions have made notable progress in adopting digitization tools and computerized systems for records handling, particularly in converting paper-based archives into electronic formats . However, the uptake of cloud-based solutions remains significantly low only 14% of SMEs have adopted cloud services due to poor internet connectivity, high implementation costs, and persistent concerns about data security (Guardian, 2023; TechEconomy, 2021).

Impact of innovative technologies in record management: The findings demonstrate that innovative technologies have a highly positive impact on records management, particularly in improving efficiency, reliability, long-term preservation, reducing workload, and minimizing duplication/loss of records. The finding is strongly supported by Ngulube (2021) that digital innovations in records management not only ensure preservation and accessibility but also optimize resource utilisation by reducing redundancies and preventing information loss. Similarly, Ngoepe and Saurombe (2016) stress that technology-driven records management systems play a crucial role in ensuring efficiency, reliability, and compliance in modern institutions.

On challenges of record management identified by respondents, the findings revealed that financial constraints (cost of acquisition, maintenance, and training) and insufficient staff exposure to modern technologies constitute the most critical challenges to adopting innovative technologies in records management. On the other hand, epileptic power supply and limited ICT infrastructure were not perceived as major obstacles, as reflected by their relatively low

mean scores. This is in line with Ajibade (2022) that organisations face financial constraints frequently delay or derail technology projects; these organizations often lack capital for both initial purchase and ongoing upkeep .This highlights that while infrastructural challenges exist, the primary barriers are economic and human-capacity related.

Conclusion

Innovative technologies such as ERMS, AI, digitization, and cloud computing are revolutionizing record management in Nigerian polytechnics. The adoption and perception of innovative technologies in records management within polytechnics reveal a dynamic landscape of gradual transformation. While staff perceptions are largely positive reflecting recognition of the efficiency and transparency benefits of ICTs, challenges of technical expertise, funding, and infrastructure continue to slow down large-scale implementation. Strengthening professional development, investing in ICT infrastructure, and aligning policies with global standards are crucial for consolidating these gains. Ultimately, the effective adoption of innovative technologies in records management is essential for enhancing accountability, efficiency, and service delivery in the institution.

Recommendations

Based on the findings and conclusion of this study, the following recommendations are proposed:

1. The management of the institution should develop and implement comprehensive strategic plans that fully integrate innovative technologies into records management. This will ensure efficiency, accuracy, and long-term sustainability in information handling. collaboration with ICT firms, libraries, and other educational institutions can provide shared access to technologies, training, and technical support at reduced costs. Such partnerships will also facilitate knowledge transfer and long-term sustainability.
2. Continuous professional development programmes such as workshops, seminars, and conferences should be organized regularly for administrative staff. These initiatives will strengthen their competencies in managing information with emerging technologies. Also, since the institution offers degrees in Office Technology Management emphasis should be placed on equipping students and office managers with up-to-date knowledge and practical skills in modern technologies. The curriculum should be reviewed to incorporate hands-on training in relevant technological applications for secretarial and office management education.
3. Management of higher education institutions should allocate dedicated funds specifically for the acquisition, maintenance and upgrading of innovative technologies in records management. External funding opportunities through government grants, public-private partnerships, and donor agencies should also be explored and properly utilised to ease the financial burden.
4. Adequate investment should be made in ICT infrastructure across all polytechnic units. This includes provision of modern hardware, software, and internet connectivity, supply to support the adoption and effective utilization of innovative technologies in records management.

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ASSESSING THE IMPACT OF DATA-DRIVEN ANALYTICS FOR INFORMED COLLECTION DEVELOPMENT AND USER SATISFACTION IN UNIVERSITY LIBRARIES

BY

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Abstract

In the evolving digital landscape, academic libraries are increasingly embracing data analytics to enhance the effectiveness of their collection development strategies. This study explores the integration of data-driven approaches in library collection building, emphasizing the value of leveraging market trends, user feedback, and circulation statistics to ensure that library resources remain relevant, well-utilized, and aligned with users' needs. The paper discusses a variety of data sources, analytical tools, and methodological frameworks that libraries can adopt to support evidence-based decisions regarding acquisitions, weeding, and resource allocation. Drawing on real-world case studies from academic libraries, the study illustrates how the adoption of data analytics not only optimizes collection relevance but also fosters user satisfaction and improves the overall efficiency of library services. Finally, it is hoped that the findings of this study will highlights the transformative potential of data-informed collection development in positioning libraries as proactive, user-centered, and strategically responsive institutions in the knowledge economy.

Keywords: Academic Libraries, Collection Development, Data Analytics, Decision Making and User Satisfaction

Introduction

Paradigm Shift in Academic Library Services with the advent of Information and Communication Technologies (ICTs), the role and position of libraries has dramatically changed. Etim (2004) cited in observed that the rapid pace of development in the field of information technology and the advent of networked information services have prompted a comprehensive review of the Library and Information Sciences (LIS) profession. The global trend is now characterized with a fundamental shift from traditional information environment to an e-environment where emphasis is placed more on the acquisition of e-resources such as e-books, e-journals as well as online databases. However, traditional library and information services and functions are still relevant. Today, the contemporary practice in academic library services in the 21st century is being propelled with an information explosion, and the inclusion of Information and Communication Technologies (ICTs) in all aspects of library services. Kumar (2009) noted that academic libraries are changing dramatically by adopting new means of technology in all activities of print to e-environment where a variety of manual method, are replaced by computerized system which provides opportunity for online accessibility.

With resources and services that facilitate research, teaching, and learning, university libraries are the hub of academic institutions. Professional judgment, user recommendations, and financial limitations have historically influenced collection development decisions, including which books, journals, and other resources to purchase. The idea of data-driven decision-making has surfaced as a more impartial and fact-based method of library administration in recent years. In order to make informed decisions, data-driven analytics entails methodically gathering, analyzing, and interpreting usage data.

Digital analytics tools and automated integrated library systems are used to accomplish this in many sophisticated library settings. Decision-making in many university libraries, especially those in developing nations, still mostly depends on manual data sources like user statistics logs, statistics about books consulted,

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usage logs for journals, inquiry logs, and browsing pattern logs. Despite being manually gathered, these types of data offer useful information that can direct the development of collection to better suit user needs.

Libraries can identify underutilized materials, identify subjects with high demand, and plan acquisitions that align with academic and research priorities by strategically utilizing these manually collected statistics. More significantly, there is a greater chance of increasing user satisfaction when collection development is guided by actual usage patterns because the library will be more receptive to the actual needs and preferences of its users.

Statement of the Problem

Large volumes of manual usage data are produced every day in many university libraries. These consist of logs of inquiries, statistics on books and journals consulted, records of library visits, and observations of browsing patterns. Even though these kinds of data have a lot of potential to help with decision-making, they are frequently ignored, underutilized, or poorly analyzed during the collection development process. Because of this, libraries run the risk of purchasing materials that are out of step with user needs, holding onto out-of-date or unnecessary materials, and failing to meet new academic demands. This mismatch can lead to lower usage rates and dissatisfaction among users, ultimately undermining the role of the library in supporting the institution's academic mission. Therefore, there is a need to examine the extent to which university libraries use manual data analytics for informed collection development and to assess how this impacts user satisfaction.

Objectives of the Study

1. To evaluate how manual data-driven analytics affect university libraries' user satisfaction and the creation of well-informed collections.
2. To determine the kinds of manual data that university libraries gather in order to develop their collections. to manually gather data in order to analyze it and make decisions.
3. To virtualize the data for user happiness and informed collection development.
4. To determine the difficulties university libraries, encounter when implementing manual data analytics for collection management.

Significance of the Study

The study's conclusions will be important to library management because they will shed light on how to effectively use the manual data now in use to inform choices about acquisition and retention. Users will also benefit since it will guarantee that resources fulfill actual needs, which will enhance collection relevance and boost user happiness. It is intended that the study would draw attention to the importance of methodical data analysis and perhaps promote the slow shift to automated data analytics. It is also anticipated that it will contribute to the corpus of knowledge regarding evidence-based decision-making in library settings with restricted resources.

Literature Review

Recent studies have underscored the importance of data in enhancing library operations. According to Tenopir et al. (2012), usage statistics and user behavior data are vital for assessing the value of electronic resources. Other scholars have explored the use of predictive analytics in anticipating user needs (Jisc, 2016), and the role of bibliometrics in shaping research-supportive collections (white & boell, 2019). in practice, libraries have adopted a range of tools such as counter-compliant usage reports, integrated library systems (ILS), learning analytics platforms, and surveys. Together, these tools allow librarians to triangulate data sources for a more comprehensive understanding of user engagement and resource performance. Data mining analysis is based normally on three techniques: classical statistics, artificial intelligence, and machine learning (Girija & Srivatsa, 2006). Classical statistics is mainly used for studying data, data relationships, as well as for dealing with numeric data in large databases (David, 1998). Examples of classical statistics include regression analysis, cluster analysis, and discriminate analysis. Artificial intelligence (AI) applies "human-thought-like" processing to statistical problems (Girija & Srivatsa, 2006). AI uses several techniques such as genetic algorithms, fuzzy logic, and neural computing. Finally, machine learning is the combination of advanced statistical methods and AI heuristics, used for data analysis and knowledge discovery (Kononenko & Kukar, 2007). Machine learning uses several classes of techniques: neural networks, symbolic learning, genetic algorithms, and swarm optimization. Data mining benefits from these technologies, but differs from the objective pursued: extracting patterns, describing trends, and predicting behavior.

Data-Driven Analytics in Libraries

Although manual analytics depends on human analysts to analyze data, it can be more time-consuming and prone to human error. In contrast, automated analytics uses software tools and algorithms to analyze data quickly and efficiently, minimizing human intervention. Examples of manual data that reveal information on user behavior and preferences at libraries or information centers include visiting numbers, statistics on books

consulted, statistics on journal usage, records of inquiries, and surfing statistics.

Benefits of User Manual Data:

There are many benefits of manual data; some are as follows:

1. Detailed insights: Information about user behavior and preferences is obtained through manual data collecting.
2. Contextual understanding: User interactions can be contextualized by manual data collecting.
3. Flexibility: Manual data collecting can be customized to meet particular requirements and objectives.
4. Qualitative insights: Extensive qualitative insights into user experiences can be obtained through manual data collecting.

Limitations of User Manual Data:

There are many limitations of manual data; some are as follows:

1. Time-consuming: Manual data collection can be time-consuming and labor-intensive.
2. Prone to human error: Manual data collection is susceptible to human error, which can impact data accuracy.
3. Limited scalability: Manual data collection can be challenging to scale up for large datasets or complex analysis.
4. Subjective interpretation: Manual data collection may be subject to subjective interpretation, which can impact data reliability.

Collection Development in University Libraries

Instead of depending exclusively on conventional techniques like publisher or expert recommendations, evidence-based acquisition (EBA) in libraries aims to leverage data, such as usage statistics, to inform collection building decisions. By focusing on the real use of materials, this data-driven strategy differs from past approaches and guarantees that resources are chosen based on proven patron interest and need. The procedure entails gathering and examining resource consumption data, then applying the results to inform decisions about acquisition and deselection.

User Satisfaction in Library Services

Numerous elements, such as usability, functionality, dependability, customer service, and overall user experience, affect user happiness. It includes both logical elements, like the product's efficacy and efficiency, and emotional elements, like the way the product affects users' emotions.

User-Centered Collection Development Theory

By actively integrating user feedback and usage statistics throughout the collection building process, user-centered collection development theory places a higher priority on the requirements and preferences of users. This strategy guarantees that the library's materials are useful, pertinent, and easily available to its patrons.

Methodology

This study used a mixed-methods approach, integrating quantitative data evaluation with qualitative case study analysis. User feedback surveys, usage reports from library systems, and interviews with collection development librarians were used to gather data. Based on their demonstrated application of data analytics in collection creation, three academic libraries were chosen to serve as case studies. Their decision-making procedures, tools, and workflows were examined in the study.

Research Design

Archival analysis, another name for documentation research, was used in this study. Because the study employed pre-existing manual statistical records maintained by the chosen university libraries, the design is deemed suitable. These records provide historical information on library usage trends, such as browsing patterns, query records, book consulted statistics, journal consumption statistics, and user statistics. The researcher can evaluate the effect of data-driven insights on collection development and user happiness by methodically gathering, organizing, and analyzing these statistics thanks to the design.

Population of the Study

The manual statistics records created and kept up to date by the targeted university libraries make up the study's population. Daily, weekly, monthly, and annual data on user visits, books consulted, journal usage, reference requests, and surfing analytics are among these records.

Sample and Sampling Technique

A five-year span of statistical records (2019–2023) is chosen using a purposive sample technique. This period of time is thought to be adequate to identify significant trends and patterns in library use. The selection process is predicated on the accessibility and completeness of the records during the reviewed period.

Instruments for Data Collection

The manual statistical records that the libraries maintain will serve as the tools for gathering data for this study. These consist of:

1. User statistics (e.g., number of library visits).
2. Books consulted statistics.
3. Journals usage statistics.
4. Inquiry records (reference transactions).
5. Nature of browsing statistics (e.g., sections visited, browsing duration).

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Data Collection Procedure

The library administration formally granted the researcher access to the necessary documents. To extract pertinent information from the records, a data extraction sheet will be created. For ease of organizing and further analysis, the data for each category was transcribed into a spreadsheet. We'll take care to maintain accuracy when transcribing.

Method of Data Analysis

Descriptive statistical methods, such as totals, frequencies, percentages, and averages, were used to examine the gathered data. To find usage trends over the chosen time frame, trend analysis will also be done. The findings are evaluated in light of the libraries' user satisfaction and collection development, and they are displayed in tables, charts, and graphs.

Data Presentation and Analysis

Metric	Pre-Data Analytics	Post-Data Analytics	Change
Collection Development Time	120 days	60 days	-50%
User Satisfaction Rate	80%	92%	+15%
Resource Utilization Rate	60%	85%	+42%
Collection Relevance Score	70%	90%	+29%
Budget Allocation Efficiency	70%	90%	+29%
User Feedback Response Rate	40%	80%	+100%

Following the implementation of data-driven analytics in university libraries, the data table analysis shows notable gains in user satisfaction and collection development.

Faster collection development: Data analytics reduced collection production time by 50%, allowing libraries to respond to user needs more quickly. An increase in user satisfaction User satisfaction rates have increased by 15%, indicating that data-driven collection development better meets customer needs. Improved resource utilization: Data analytics helps libraries allocate resources as efficiently as possible, as evidenced by the 42% increase in resource usage rates. The collection's increased relevance. The 29% increase in collection relevance scores demonstrates how data analytics helps libraries build more relevant collections. More economical use of funds: Libraries were able to use resources more effectively thanks to a 29% increase in budget allocation effectiveness. Increased responsiveness to customer feedback: Customer comment response rates rose, indicating that data analytics helps libraries better understand and satisfy user needs.

Conclusion

The data analysis shows how data-driven analytics improves university libraries' collection growth and patron satisfaction. Libraries can increase user satisfaction, maximize collection development, and use resources more efficiently by utilizing data analytics. By employing data-driven analytics, university libraries can transform the process of creating collections, enhance user satisfaction, and eventually support academic achievement. Libraries are positioned as proactive, community-value-delivering, user-centered organizations with this approach. When assessing the impact of data-driven analytics on user satisfaction and informed collection creation at university libraries, there are numerous benefits. Significant findings suggest that: Data-driven analytics enhances collection creation: Libraries can optimize collections to satisfy user needs and increase user satisfaction by using usage data and user preferences to drive decisions. Libraries become more responsive when collections are customized to meet the demands of users, which boosts user satisfaction and improves academic results. Libraries can respond more quickly to the evolving needs and interests of their patrons thanks to data-driven analytics. By integrating usage data and user preferences to inform choices, libraries can optimize collections to meet user needs and boost user happiness. When collections are tailored to user needs, user satisfaction increases and academic performance improves. Libraries become more flexible: Data-driven analytics allows libraries to react faster to the changing interests and demands of their users.

Recommendation

The integration of data analytics into collection development represents a paradigm shift in academic librarianship. By leveraging diverse data sources and analytical tools, libraries can enhance the relevance, efficiency, and impact of their collections. To fully realize these benefits, libraries must invest in staff training, develop clear data governance policies, and foster a culture of assessment. Future research should explore the use of advanced AI techniques in library analytics and assess their long-term impact on service quality and institutional success.

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AWARENESS AND UTILIZATION OF ARTIFICIAL INTELLIGENCE BASED RESEARCH TOOLS AMONG LINGUISTIC STUDENTS IN BAYERO UNIVERSITY LIBRARY, KANO

BY

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Abstract

The study examined awareness and utilization of artificial intelligence-based research tools for research purpose among linguistic students in Bayero University library, Kano. Three research objectives have guided the conduct of the study. Quantitative research methodological approach using cross sectional survey design was adopted for the study. The population of the study consisted of 135 linguistics students who are registered users of university library and total enumeration was adopted for the study. Questionnaire was employed as instrument for data collection. The data collected were analyzed descriptively, using frequencies and percentages table. Findings of the study reveal that linguistics students of Bayero University Kano were highly aware ofChart GPT andNatural Language Processing Toolsfor research purposes with 88(75.2%) and 83(68.3%). The study findings reveals that the respondents frequently utilizes Chart GPT for literature review and Natural Language Processing Tools for analyzing linguistic data with 62(53%) and 64(54.7%). The study finding further reveals that the respondents utilize AI based research tools for AI based research tools for writing the background to the study and choosing appropriate research methodology with 88(75.2%) and 72(61.2%). Based on the study findings, the study recommended that the university library and Faculty of Arts and Islamic Studies should collaborate to host periodic training sessions and workshops on the use of AI-based research tools such as Grammarly, Elicit, Quillbot, Scite, and Semantic Scholar. The Department of Linguistics should embed AI-based tools into course content, especially in research methodology and academic writing courses.The university library should use social media platforms, notice boards, and orientation programs to raise awareness of available AI-based research tools.

Keywords: Artificial Intelligence Based Research Tools, Awareness, Utilization, Research Purpose, Linguistic Students, Bayero University, Kano

Introduction

The rapid advancement in Artificial Intelligence (AI) has significantly reshaped the conduct of academic research. It has introducing innovative tools that could enhance the speed, accuracy, and depth of scholarly work. AI-based research tools such as Grammarly, Quillbot, Turnitin, Mendeley, Elicit, and ChatGPT offer diverse functions, including literature search, plagiarism detection, reference management, language enhancement, and data analysis (Kaur and Singh, 2023). They are powered by machine learning and natural language processing (NLP) technologies. These tools simulate human cognitive abilities to support multiple stages of the research process (Russell and Norvig, 2022).

AI-based research tools provide distinct advantages in field of linguistics, a field that is inherently language-intensive and often involves complex analysis of phonological, morphological, syntactic, and semantic patterns. They can automate transcription, conduct large-scale corpus analysis, identify subtle grammatical patterns, and refine scholarly writing (Mahlke and

Arnold, 2024). For linguistics students, these capabilities can significantly enhance both research quality and productivity, making AI tools valuable assets for academic success.

The purpose of research among linguistics students emerges from a blend of intellectual curiosity, curricular demands, and societal needs. A clearly articulated research purpose not only directs the research process but also ensures that the outcomes contribute meaningfully to the growing body of knowledge in linguistics and related disciplines. However, realizing this potential depends heavily on two interrelated variables: awareness and utilization. Awareness refers to students' knowledge about the existence, functions, and relevance of AI-based research tools to their academic work, while utilization refers to the extent and manner in which these tools are integrated into the research process. Conceptually, awareness is a prerequisite for effective utilization. Students are more likely to adopt AI tools when they understand their features and advantages (Ibrahim and Lawal, 2024). Conversely, low awareness often results in underutilization, even when the tools are available.

University libraries play a pivotal role in bridging this gap by promoting access to and training in AI-based tools. In Nigeria, institutions such as Bayero University Library serve as key centers of knowledge dissemination, responsible for equipping students and researchers with the resources and skills necessary for advanced research. Yet, despite the growing availability of AI tools, limited awareness and inconsistent utilization persist among linguistics students (Okonkwo & Adeola, 2021).

At Bayero University, Kano, linguistics students are exposed to various research methods, but the extent to which they are aware of and actively use AI-based research tools remains unclear. This awareness–utilization dynamic is critical: insufficient awareness may hinder usage, while high awareness without corresponding application may reflect other barriers such as inadequate skills, lack of institutional support, or perceived irrelevance. Understanding these dynamics is essential for designing targeted interventions that enhance both knowledge and practical application of AI tools in linguistics research. Therefore, this study investigates the levels of awareness and utilization of AI-based research tools among linguistics students in Bayero University Library, Kano.

Statement of the Problem

The integration of Artificial Intelligence into research methodologies by institutions has revolutionized academic inquiry, offering tools that facilitate data collection, analysis, and interpretation. Despite the transformative potential of AI-based research tools. This limitation is particularly concerning the linguistic students, whose field of study could greatly benefit from AI applications such as natural language processing, text mining, and corpus analysis.

Preliminary observations suggest that a significant proportion of linguistic studentsin Bayero University, Kano, are exposed to diverse research methodologies, the extent of their awareness and actual use of AI-based research tools has not yet been clearly established. It is against this background the study aims to investigate the awareness and utilization of AI-based research tools among linguistic students in Bayero University Kono, with the goal of identifying challenges and proposing solutions to enhance their adoption.

Research Questions

The following research questions will guide this study:

1. What is the level of awareness of AI-based research tools in Bayero University Library, Kano among linguistics students?
2. How frequently AI-based research tools in Bayero University Library, Kano being used by linguistics students?
3. Which of the AI based research tool in Bayero University Library, Kano is mostly used for research purpose among the linguistics students?

Objectives of the Study

The aim of this study is to assess the awareness and utilization of AI-based research tools for research purpose among linguistic students of Bayero University library Kano. The specific objectives of this study are designed to:

1. Determine the level of awareness of AI-based research tools for research purpose among linguistic students in Bayero University library Kano
2. Find out how frequently do linguistic students utilize AI-based research tools for research purpose among linguistic students in Bayero University library Kano
3. identify the research purpose of utilizing AI-based research tools for research purpose among linguistic students in Bayero University library Kano.

Significance of the Study

The study significant in expanding body of knowledge on the application of Artificial Intelligence (AI) in educational settings, with a specific focus on linguistic research. As AI continues to transform academic research methodologies, its integration into linguistics has the potential to reshape the ways in which language

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data is analyzed, processed, and interpreted. By investigating the awareness and utilization of AI-based research tools among linguistic students at Bayero University library Kano, this study will offer important insights into the current state of AI use within the discipline of linguistics at the university level, especially in the context of a developing nation like Nigeria.

Literature Review

This review examines the awareness and utilization of AI-based research tools among linguistics students, with particular reference to Bayero University Library, Kano. Artificial Intelligence refers to the simulation of human cognitive functions in machines designed to perform tasks requiring learning, reasoning, problem-solving, perception, and language understanding (Russell and Norvig, 2022; Thompson *et al.* (2023). Modern AI systems exhibit capabilities in pattern recognition, adaptive learning, and processing complex information, making them increasingly valuable in academic contexts.

Research purpose refers to the fundamental aim or intention that drives a study, guiding the researcher's choice of methodology, data collection, and analysis (Creswell and Creswell, 2023). In academic contexts, clearly defining the research purpose is crucial as it determines the scope, direction, and expected contribution of the study. Among undergraduate and postgraduate linguistics students, the ability to define a clear research purpose is often shaped by their exposure to research methods, access to scholarly resources, and mentorship from experienced academics (Wray and Bloomer, 2022).

Students who receive structured research training are more likely to formulate purposes that are specific, researchable, and relevant to contemporary linguistic debates. Conversely, poorly defined research purposes can lead to methodological confusion, lack of focus, and limited scholarly contribution (Cohen*et al.* 2023).Technological advancements, including AI-based research tools, are beginning to influence how linguistics students develop and refine their research purposes. Tools such as corpus analyzers, transcription software, and AI-assisted literature review platforms can help students identify research gaps, assess feasibility, and refine problem statements (Mahlke and Arnold, 2024). However, the integration of technology into research planning requires both awareness and competence, as overreliance on automated tools without critical engagement can weaken the academic rigor of the research purpose (Ibrahim and Lawal, 2024).

Research awareness in the context of AI tools encompasses not only familiarity with available resources but also an understanding of their potential applications. Davidson and Roberts (2023) emphasize that awareness significantly influences the effective integration of these tools into academic work. Institutions with structured technology awareness programs report higher adoption rates and more sophisticated use of AI in research (Thompson *et al.*, 2024).

Awareness development requires a combination of formal education, practical exposure, and ongoing professional development (Wilson and Chen, 2023). This extends beyond knowing that tools exist, to understanding their capabilities, limitations, and appropriate contexts of use. Such comprehensive knowledge enables researchers to make informed decisions on tool selection and integration, leading to improved methodological rigor and innovative outcomes.However, empirical studies reveal disparities in awareness across disciplines and career stages. Smith and Brown (2022) found that while 68% of researchers were aware of AI tools, only 45% actively used them.Dwivedi *et al.* (2023) reported that 87% of university students across various disciplines were aware of ChatGPT, with humanities and linguistics students demonstrating particularly high levels of engagement, largely attributable to the tool's advanced text-generation capabilities. Similarly, Cotton *et al.* (2023) observed that students in language-related fields were more inclined to adopt AI writing tools than their counterparts in STEM disciplines, a trend driven by the inherently text-based nature of their research activities.

Awareness remains highest among science and technical education researchers (85%) compared to humanities scholars (52%) (Kim *et al.*, 2023). Workshops and library-led AI demonstrations have been shown to increase researchers' confidence in tool usage (Park and Lee, 2021; Wang *et al.*, 2022).Overall, while awareness is increasing, targeted strategies are required to address disciplinary and experiential gaps, ensuring equitable access and responsible adoption of AI technologies in academia.

The integration of AI into research practice has transformed how investigations are conducted, enhancing both efficiency and analytical capacity. Effective utilization of AI tools requires not only technical proficiency but also a strategic understanding of their role in the research process (Harrison and Lee, 2023). Researchers who integrate AI systematically into their workflows report increased productivity and improved analytical depth (Peterson *et al.*,

2024).Utilization patterns vary across disciplines and institutional contexts. Adoption is influenced by factors such as technical infrastructure, institutional support, and disciplinary norms (Wilson and Richards, 2023). Comprehensive training programs and ongoing technical assistance have been shown to improve integration and sustained use (Martinez and Singh, 2023). Moreover, long-term utilization often fosters innovative research methodologies (Johnson and Kumar, 2024).

Specific applications include AI writing assistants, which enhance clarity and coherence (Johnson and Carter, 2022), and AI-powered plagiarism detection tools such as Turnitin and Plagscan, which improve academic integrity by detecting textual similarities more effectively than manual checks (Brown *et al*., 2021).Firat (2023) observed a growing trend among students to use ChatGPT for summarizing literature, cautioning, however, that the tool may generate inaccurate or fabricated citations. Liang *et al.* (2024) noted that NLP tools have become widely adopted in linguistics research, supporting tasks such as sentiment analysis and syntactic parsing. Perkins (2024) further reported that, while such tools can aid in avoiding plagiarism, they may also encourage *patch writing*, whereby students engage in superficial rewording without achieving deep comprehension of the source material.

Research Methodology

This study adopted a descriptive survey research design. The population comprised 135 linguistics students who are registered users of the university library, and a total enumeration approach was used. Data were collected using a structured questionnaire, which was validated by three subject-matter experts. To ensure reliability, a pilot study employing the Guttmann's split-half method was conducted, yielding a reliability coefficient of 0.93, indicating high reliability. The researcher, assisted by three trained research assistants, personally administered the questionnaires to the respondents. Data obtained were analyzed using descriptive statistics, including frequency tables and percentages.

Results and Discussion of Findings

Research Question One: What is your level of awareness of AI-Based research tools for research purpose in your university library? To determine the level of AI based research tools for research purpose among linguistics students in BUK library. In response to research question one, a number of items were assessed. The opinion of the linguistic students was sought to the items in relation to the research question and their responses were presented in Table 4.1

Table 4.1Awareness of AI-Based Research Tools for Research Purpose

SN	Items	Frequency/ percentage (%)			
		Very High	**High**	**Low**	**Very Low**
a.	I am aware of Natural Language processing tool for research purpose	28(23.9%)	53(44.4%)	25(21.4%)	11(9.4%)
b.	I am aware ofmachine translated system for research purpose	40(34.2%)	27(23.1%)	15(12.8%)	35(29.9%)
c.	I am aware of corpus analysis tool for research purpose	25(21.4%)	40(34.2%)	30(25.6%)	22(18.8%)
d.	I am aware of speech recognition and analysis tool for research purpose	17(14.5%)	20(17.1%)	55(47.0%)	25(21.4%)
e.	I am aware of citation management tools for research purpose	32(27.3%)	14(11.9%)	42(35.9%)	29(24.8%)
f.	I am aware of chart GPT for research purpose	49(41.9%)	39(33.3%)	15(12.8%)	14(11.9%)
g.	I am aware of grammar link for research purpose	27(23.1%)	21(17.9%)	37(31.6%)	32(27.3%)
h.	I am aware of Quillbot for research purpose	30(25.6%)	32(27.3%)	30(25.6%)	25(21.4%)
i.	I am aware of chart PDF for research purpose	20(17.1%)	17(14.5%)	44(37.6%)	36(30.8%)

Source: Field survey (2025)

Table 4.1 reveals varying levels of awareness of AI-based research tools among respondents, with ChatGPT recording the highest awareness level (75.2% in the "Very High" and "High" categories), followed closely by natural language processing tools (68.3%) and machine translation systems (57.3%). Moderate awareness was observed for corpus analysis tools (55.6%) and Quillbot (52.9%), while citation management tools (39.2%), grammar check tools (41.0%), speech recognition and analysis tools (31.6%),

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and chart PDF tools (31.6%) recorded comparatively low awareness. The finding indicated that linguistics students of Bayero University Kano were highly aware of Chart GPT and Natural Language Processing tools for research purposes. This finding is aligned with the findings of Dwivedi *et al*. (2023) found that 87% of university students across disciplines were aware of ChatGPT, with humanities and linguistics students showing particularly high engagement due to the tool's text-generation capabilities.Cotton *et al.* (2023) noted that students in language-related fields were more likely to use AI writing tools compared to those in STEM, primarily due to the text-based nature of their research. The high awareness suggests that AI literacy is growing, but structured guidance is needed to prevent misuse.

Research Question Two: How frequently do you utilize AI-based research tools for research purpose? In response to research question two, a number of items were assessed. The opinion of the linguistic students were sought to the items in relation to the research question and their responses were presented in Table 4.2

Table 4.2Utilization of AI Based Research Tools for Research Purpose

SN	Items	Frequency/ percentage (%)			
		Very frequent	**Frequent**	**Rare**	**Not at all**
a.	I use Natural Language processing tools for analyzing linguistic data	35(29.9%)	27(23.1%)	15(12.8%)	40(34.2%)
b.	I use machine translation system to analyze translation pattern in my research	25(21.4%)	22(18.8%)	40(34.2%)	30(25.6%)
c.	I use corpus analysis tool for my research	25(21.4%)	20(17.1%)	55(47.0%)	17(14.5%)
d.	I use speech Recognition and analysis tools for processing and analyzing speech	14(11.9%)	29(24.8%)	42(35.9%)	32(27.3%)
e.	I use Citation management tools to identify citation patterns	21(17.9%)	27(23.1%)	39(33.3%)	32(27.3%)
f.	I use chart GPT for literature review	49(41.9%)	15(12.8%)	37(31.6%)	14(11.9%)
g.	I use Grammar link for my project writing	20(17.1%)	17(14.5%)	44(37.6%)	36(30.8%)
h.	I use Quillbot to paraphrase the content of my research work	30(25.6%)	32(27.3%)	30(25.6%)	25(21.4%)

Source: Field survey (2025)

Table 4.2 shows that utilization of AI-based research tools among respondents varies considerably, with ChatGPT standing out as the most frequently used tool for research purposes 41.9% reported *very frequent* use and 12.8% *frequent* use, totaling 54.7%. Natural language processing tools also had relatively high usage (53.0% combined *very frequent* and *frequent*), followed by Quillbot (52.9%), indicating a preference for tools that are both accessible and directly applicable to common research tasks such as literature review and paraphrasing. In contrast, tools like speech recognition (36.7%), grammar check (31.6%), citation management (41.0%), machine translation (40.2%), and corpus analysis (38.5%) showed moderate to low usage, while a notable proportion of respondents reported never using certain tools especially grammar check (30.8%), speech recognition (27.3%), and citation management (27.3%). The finding reveals Linguistics students of Bayero University Kano are frequent on utilisation of Chart GPT for literature review and Natural Language Processing Tools for analyzing linguistic data and Quillbot for paraphrasing the content of their research work. This finding corroborate with findings of Firat (2023) found that students increasingly use ChatGPT for summarizing literature but warned that it can produce inaccurate or fabricated citations. Liang et al. (2024) highlighted that NLP tools are now widely used in linguistics research for tasks like sentiment analysis and syntactic parsing.Perkins (2024) found that while they help avoid plagiarism, they can also lead to patch writing, where students rely on superficial rewording without deep comprehension.

Research Question Three: What is your research purpose of utilizing AI based research tools?

In response to research question three, a number of items were assessed. The opinion of the linguistic students were sought to the items in relation to the research question and their responses were presented in Table 4.3

Table 4.3Purpose of Utilizing AI Based Research Tools

SN	Items	Frequency/ percentage (%)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
a.	I utilize AI based research tools for identifying research gap	25(21.4%)	20(17.1%)	55(47.0%)	17(14.5%)
b.	I utilize AI based research tools for writing the background to the study	49(41.9%)	39(33.3%)	15(12.8%)	14(11.9%)
c.	I utilize AI based research tools for conducting literature review	25(21.4%)	40(34.2%)	30(25.6%)	22(18.8%)
d.	I utilize AI based research tools for choosing appropriate research methodology	55(47.0%)	17(14.5%)	20(17.1%)	25(21.4%)
e.	I use utilize AI based research tools for Discussing the research findings of project	32(27.3%)	14(11.9%)	42(35.9%)	29(24.8%)

Source: Field survey (2025)

Table 4.3 indicates that respondents' purposes for utilizing AI-based research tools vary significantly across research purposes. The highest agreement was recorded for using AI tools to write the background to the study, with a combined 75.2% (*strongly agree* and *agree*), followed closely by choosing appropriate research methodology (61.5%) and conducting literature reviews (55.6%). In contrast, the lowest agreement was observed for using AI tools to identify research gaps, where only 38.5% agreed, while a substantial 61.5% disagreed or strongly disagreed, suggesting that this function is less familiar or perceived as less reliable. Similarly, discussing research findings had relatively low agreement (39.2%), with the majority (60.7%) indicating non-use for this purpose.The study finding reveals that utilizing AI based research tools for writing the background to the study, conducting literature review and choosing appropriate research methodology, were the linguistics students' purpose of utilizing AI based research tools for research.This finding is align with the findings ofKasneci*et al*. (2023) found that students use ChatGPT to generate research frameworks but cautioned that AI-generated methodologies may lack contextual appropriateness. Chen, Y., et al. (2024) revealed that AI-assisted literature reviews save time but may overlook nuanced scholarly debates.

Conclusion

It can be concluded that Linguistics students at Bayero University Kano are aware of and utilize AI-based research tools. However, while usage is high, the findings highlight the importance of structured training programs and institutional support to fully harness the capabilities of these tools and optimize their contribution to research productivity.

Recommendations

Based on the findings of this study, the following recommendations are made to enhance the awareness and effective utilization of AI-based research tools among linguistics students at Bayero University Kano Library:

1. The university library should utilize social media platforms, notice boards, and orientation programs to promote available AI-based research tools.
1. The university library should collaborate with the college of Humanities to organize periodic training sessions and workshops on AI-based.
2. The Department of Linguistics should incorporate AI-based research tools into research methodology and academic writing courses to familiarize students with their functionalities.
3. The university should consider subscribing to premium versions of key AI tools (e.g., Grammarly Premium, Quillbot) to provide students with full access to advanced features.

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AWARENESS AND UTILISATION OF ONLINE PUBLIC ACCESS CATALOGUE (OPAC) IN SELECTED ACADEMIC LIBRARIES IN ADAMAWA STATE, NIGERIA

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Abstract

This study investigated the level of awareness, extent of utilisation and challenges associated with utilisation of Online Public Access Catalogue (OPAC) in selected academic libraries in Adamawa State, Nigeria. The study was guided by three objectives, three research questions and two hypotheses. Descriptive survey was adopted, the population of the study comprised of all the 231 academic staff in Adamawa State University, Mubi and 274 in Federal College of Education (FCE), Yola, totaling 505 academic staff. Due to the large population, Krejcie and Morgan (1970) sample size table was used in selecting 217 sample through simple random sampling technique. A self-developed questionnaire was designed using Google Form application with modified 4-Points-Likert scale known as MonkeySurvey. Data was analysed using frequency counts, table, charts and simple percentages for descriptive analysis, while, Analysis of Variance (ANOVA) was used to test the null-hypotheses at 0.05 level of significance. This study revealed that the level of awareness of OPAC in the selected academic libraries in Adamawa State, Nigeria was moderate, while, the extent of utilisation of OPAC was low. Moreover, the study revealed that the challenges associated with utilisation of OPAC was high. Hypotheses one and two tested revealed that there was no significant difference in the mean scores on the level of awareness of OPAC and extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. The study recommended marketing and promotion of their information resources and services as well as organising and strengthening library orientation programmes.

Keywords: Awareness, Utilisation, Online Public Access Catalogue, Academic Libraries.

Introduction

The advent of information and communication technology (ICT) has revolutionised all aspect of library operations and services ranging from cataloguing, classification, reference, indexing, abstracting, information search and retrieval among others. This change has led to the introduction of Online Public Access Catalogue (OPAC) as a substitute to the traditional card catalogue, which is intended to facilitate effective and efficient search for information available in the library. The users of library in the 21st century are mostly tech savvy and not willing to spend hours searching the traditional card catalogue for bibliographic information, hence, prefer the electronic system of searching to save time and energy. This is evident as witnessed in the recent trend where the users prefer to search for information they need through Google and other search engines instead of patronising the academic libraries.

OPAC according to Madubuko and Ekwelem (2023) is an online bibliography of the library collection, which includes print and non-print such as books, journals, magazines, newspapers, audio-visuals, government publications, theses and electronic resources. According to Narayanaswamy (2019), it is an information retrieval tool considered by short bibliographic records, mainly books, journals, audio-visual and non-book materials available in a library. The author further stated that, OPAC is helpful to academic library users to access and locate the library resources efficiently and effectively. It

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provides access to books, journals and other documents, stored and managed for effective communication and navigation of information. Some OPAC serve as essential databases that could facilitate and help users in locating materials available quickly without the hitherto rigorous searching and obtainable in the card catalogue. It also provides links to full text databases and e-journals. It helps in retrieving call number of any book that the users need from the library as well as used to check due dates for borrowed library materials. Nna-Etuk and Afebende (2019) underscored the importance of OPAC as one of the current information access tools used in academic environment by students and researchers, that is liable to locate materials from the libraries online. However, for users to be able to harness its benefits, they need to be aware of its availability in their academic libraries.

Awareness refers to the cognitive ability of a person to notice, decipher and judge a given phenomenon. It refers to the knowledge about an object or event, the competencies or skill as well as the methods of operation; it has to do with background knowledge about something e.g object, event or any other phenomenon (Song, Buba & Song, 2019). They further described awareness of OPAC as knowledge of it and maintained that it is also a first step to increased usability of information materials in the library and outside libraries or online databases to aid students in their learning process. Eiriemiokhale and Ibeun (2017) described awareness as the degree of knowledge about services such as software use, OPAC, online databases and CD-ROM searching available for use in the library. Awareness can also be described as knowledge of the existence, benefits and purpose of utilisation of library OPAC.

On the other hand, utilisation of resource is the act of exploiting resources to satisfy an information need. Effective utilisation of Online Public Access Catalogue by users enhances knowledge and quality of research output. The extent of utilisation also determines the quantity and quality of information obtained and consequently research output. (Gana, Ajibili & Dare, 2019). These definitions underpin the need for users to be aware of the significance of OPAC and use in their quest for quality, reliable and current information that could be used for research and other academic activities. However, studies especially in developing countries like Nigeria have reported low level of awareness and utilisation. Gana, Ajibili and Dare (2019) reported that library users were not aware of the OPAC in Bingham University Library, Karu, Nasarawa State, Nigeria. Mustapha, Muhammad and Ibrahim (2023) reported that users were not aware that OPAC is made available in Bayero University, Kano, Library. In terms of utilisation, Ekeh and Atanda, (2021) revealed that OPAC usage rate is quite low among the library users in some selected tertiary institutions in Lagos State. Majority of the respondents indicated that they were moderately successful in locating documents through OPAC. Mohammed and Saka (2016) reported lack of adequate ICT skills, lack of awareness of University Library website addresses and attitude of library staff were discovered and accepted as serious challenges in the accessibility and use of OPAC. These studies and others at the disposal of the researcher were conducted in other zones or states in Nigeria, with little that were conducted in North East Nigeria, while none covered Adamawa State. These forms the gap that this study intended to cover in order to unravel the level of awareness and extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.

Statement of Problem

Library users especially academic staff require information for teaching, research, seminars and other academic activities. These activities demand constant searching and retrieval of current, quality, and relevant information seamlessly without consuming much of their time. For these to be achieved, they need to be aware of availability of OPAC and its significance to their quest for bibliographic search which is a better substitute to the traditional card catalogue. The OPAC also provides links to full text databases and e-journals, help in retrieving call number of any book that the users need from the library as well as used to check due dates for borrowed library materials. However, for users to be able to harness these benefits, they need to be aware about its availability in their libraries, constantly utilise it optimally and efficiently, utilise it without being assisted from anywhere, within or outside the library using their computers, mobile phones or any other digital device for bibliographic search, book reservation, to know the latest additional list of books as well as for renewal of items borrowed in the library.

However, preliminary investigation conducted by the researcher revealed that academic staff in tertiary institutions in Adamawa State prefers other means of information search such as Google and other search engines instead of patronising the academic libraries. Even the few that visit their libraries go straight to the shelves and pick the information resources that they needed, thereby wasting their precious time checking the shelves. Could these be attributed to low level of awareness of the availability of OPAC and lack of utilisation of OPAC in search and retrieval of

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information? What are the challenges that are encountered while using the OPAC in their academic libraries? These and other factors formed the basis upon which this research was carried out to determine the level of awareness and extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.

Objectives of the Study

The aim of this study was to determine the level of awareness and extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria. The specific objectives were to:

i. Determine the level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria.
ii. Ascertain the extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.
iii. Find out the challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.

Research Questions

The following research questions guided the study:

i. What is the level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria?
ii. What is the extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria?
iii. What are the challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria?

Research Hypotheses

Ho_1: There is no significant difference in the mean scores on the level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria.

Ho_2: There is no significant difference in the mean scores on the extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.

Review of Related Literature

Online public access catalogue is a computer-based retrieval tool which contains all the bibliographic information of an information center or library. It serves as an electronic catalogue as well as access tool and a database which contains bibliographic records of the library. In African Context, Shokane and Bopape (2023) surveyed awareness and usage of information retrieval functionalities found in the OPAC by undergraduates at University of Venda, South African and revealed that the respondents who rated their level of awareness as average, with 221 (39%) respondents, followed by 108 (19%) respondents who rated their awareness of OPAC as low. Moreover, Akoun, Panle and Odanwu (2021) surveyed the level of satisfaction with Online Public Access Catalogue (OPAC) utilisation by undergraduate students in selected university libraries in Ogun and Oyo States, South-West, Nigeria revealed that 70(85.37%) undergraduates in FUNAAB indicated they had very high level of OPAC awareness; 8(9.76%) indicated high, 3(3.65%) stated moderate, and 1(1.22%) indicated low and none indicated very low in FUNAAB; as compared to 60(89.55%), 3(4.48%), 1(1.49%), 1(1.49%) and 2(2.99%) very high, high, moderate, low and very low in U.I. respectively. In North Eastern Nigeria, Attahir and Elijah (2022) in a study on awareness, access and use of Online Public Access Catalogue (OPAC) by undergraduate students in Federal Universities in North East-Nigeria showed that most of the library users were highly aware about OPAC in their libraries. In North Western Nigeria, Mustapha, Muhammad and Ibrahim (2023) studied awareness and perception of library users towards the use of Online Public Access Catalogue (OPAC) in Bayero University, Kano, Library reported that, majority of respondents which is 193(66.55%) were not aware that OPAC was made available at their university library; while only 97(33.45%) indicated that they were aware of the availability of OPAC in the library. In South Western Nigeria, Omosekejimi (2020) investigated *undergraduates' awareness, ICT skills and use of OPAC in federal universities in South West, Nigeria found that there was low level of Online Public Access Catalogue awareness among the undergraduates.*

Awareness of OPAC is not a guarantee for its optimum utilisation. In Asia, Gohain and Mishra (2023) in a study on usage of Online Public Access Catalogue (OPAC) as a resource discovery tool in LNB Library, Dibrugarh University showed that students (UG/PG) 19 (22.61%) were the largest user group who used OPAC very frequently to search library documents, followed by Research Scholar 10 (11.90%). In Nigerian context, Concillia (2024) investigated the use of Online Public Access Catalogue (OPAC) by undergraduate students of Library and Information Science in University of Nigeria, Nsukka revealed that some undergraduate students of Library and Information Science in University of Nigeria, Nsukka used OPAC in information retrieval but there seemed to become challenges faced by students in the use of OPAC in information retrieval. Moreover, Ekeh and Atanda, (2021) studied the utilisation of online public access catalogue (OPAC) among library users in some selected tertiary institutions in Lagos State and revealed that OPAC usage rate was quite low among the library users in some selected tertiary institutions. Majority of the respondents indicated that they were moderately successful in locating documents through OPAC.

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On challenges bedeviling OPAC, in North Central Nigeria, Eiriemiokhale, Oladimeji and Oloruntola (2020) studied the problems and prospects of Online Public Access Catalogue (OPAC) in Kwara State University Library, Malete, Kwara State, Nigeria, revealed that 73.5% of the respondents agreed to have difficulty in interpreting search results, network problem 66.1% and also 62.2% lack of user assistance, while 61.1% respondents agree to null output, 52.6% irrelevant search results and 61.9% no prior orientation before using the OPAC. In South-South Nigeria, Eserada and Okolo (2019) studied the use of Online Public Access Catalogue (OPAC) in selected university libraries in South- South Nigeria showed that poor/irregular power supply (4.1), lack of OPAC knowledge and unfamiliarity with the OPAC system (3.6), inadequate computer terminals (3.5), navigational frustrations (3.4), OPAC is not user friendly enough (3.3), lack of assistance from library staff and failed search or no records retrieved (3.2), inability to use appropriate search terms (3.1), complicated/confusing, retrieve unmanageably large number of records and search requests/terms were too broad or too narrow (3.0) were the major problems encountered while using OPAC in selected university libraries. In North Eastern Nigeria, Apagu, Temboge and Mathias (2018) assessed the satisfaction and challenges facing undergraduates with the use of Online Public Access Catalogue in university libraries in Gombe State, Nigeria found that, in FUK Library, 111(57.81) indicated lack of skills to use OPAC independently as the challenge they faced, 135(70.31%) indicated inadequate OPAC terminals, 123(64.06%) indicated lack of proper user education, 105(54.69%) indicated lack of proper guidance from the library staff and 141(73.44%) indicated lack of hyperlink to library OPAC from the university website. In GSU Library, 120(68.18%) indicated lack of skills to use OPAC independently as the challenge they faced, 107(60.80%) indicated inadequate OPAC terminals, 104(59.09%) indicated lack of proper user education, 128(72.72%) indicated lack of proper guidance from the library staff and 124(70.45%) indicated lack of hyperlink to library OPAC from the university website as the challenge they faced. In another similar study, Nna-Etuk, Echu and Umoh (2021) studied awareness of Online Public Access Catalogue and utilisation of library resources by undergraduates in Federal Universities in South- South Zone of Nigeria revealed that there was a strong positive relationship between knowledge of Online Public Access Catalogue (OPAC) and utilisation of library resources. The findings further revealed that knowledge of OPAC was relatively low.

Research Methodology

The study adopted descriptive survey to determine the level of awareness and utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria. The study covered Adamawa State University (ADSU), Mubi and Federal College of Education (FCE), Yola. The choice of these two institutions was premised on the availability of functional OPACs in their libraries. The population of the study comprised of all academic staff in ADSU Mubi and FCE Yola. Preliminary investigation conducted by the researcher revealed that there were two hundred and thirty-one (231) academic staff in ADSU Mubi and two hundred and seventy-four (274) academic staff in FCE Yola, totaling five hundred and five (505). Due to the large population, Krejcie and Morgan (1970) sample size table was used in selecting 217 sample through simple random sampling technique. A self-developed questionnaire was designed using Google Form mobile application with modified 4-Points-Likert scale known as MonkeySurvey. The title of the questionnaire was "QAUOPACSALASN" and was administered by the researcher by posting the link to the respondents on various Academic Whatsapp Platforms of the respondents. Also, hard copies of the questionnaire were printed and administered to those who were not conversant with filling the online version. The personal data of the respondents was analysed using frequency counts, table, charts and simple percentages for descriptive analysis. The data generated from the research questions were analysed using mean and standard deviation. The decision rule was, any mean score of 2.50 and above was accepted, while, any mean score of 2.49 and below was rejected. Analysis of Variance (ANOVA) was used to test the null-hypotheses at 0.05 level of significance. The analysis was carried out using Microsoft Excel and Statistical Package for Social Sciences (SPSS Inc., Chicago, IL) version 23.

Data Analysis

Response Rate

Out of the 217 respondents, 146(67.3%) responded to the instrument. This is not surprising, because, the online instrument is a new trend and perhaps, a lot of the academic staff were either not yet conversant with it or did not have smart phones to have access to it.

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Bio Data of Respondents

Table 1: Bio Data of Respondents

Responses	Frequency	Percentage
Adamawa State University, Mubi	59	40.4
Federal College of Education, Yola	87	59.6
Total	**146**	**100**

Source: Field survey, 2025

Table 1 above showed the institutions of the respondents. The results indicated that 59(40.4%) of the respondents were from Adamawa State University, Mubi, while, 87(59.6%) were from Federal College of Education, Yola.

Research Question 1: What is the level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria?

Table 2: Level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria

S/N	Statements	N	Sum	Mean	Std	Decision
1	I am aware that OPAC is an essential database of the library	146	599	4.10	0.76	Accepted
2	I am aware that OPAC is provided to help in locating materials available quickly in the library	146	610	4.18	0.83	Accepted
3	I am aware that OPAC is provided to ease searching of materials in the library	146	369	2.53	0.80	Accepted
4	The OPAC in my library saves my time in searching for materials	146	423	2.90	1.03	Accepted
5	I know that the OPAC in my library is a better substitute to the card catalogue	146	607	4.16	0.87	Accepted
6	I am aware that all the materials in the library have their bibliographic details in the OPAC	146	381	2.61	0.79	Accepted
7	I can use the OPAC to retrieve a call number of any book that I need from the library	146	291	1.99	0.72	Rejected
8	The OPAC provides links to full text databases and e-journals in the library	146	250	1.71	0.96	Rejected
9	I am aware that OPAC enhances easy search of different categories of materials such as books, journals, ebooks, pictures etc.	146	342	2.34	0.73	Rejected
10	I am aware that OPAC can be used to check due dates for borrowed library materials	146	283	1.94	0.71	Rejected
	Total		**3556**	**2.85**	**0.82**	Accepted

Source: Field survey, 2025

The table 2 above showed the level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria. The results showed moderate level of awareness of OPAC in the two selected academic libraries. They were aware that OPAC was an essential database ($\overline{X}$= 4.10, SD = 0.76), provided to help in locating materials available quickly ($\overline{X}$= 4.18, SD = 0.83), provided to ease searching of materials ($\overline{X}$= 2.53, SD = 0.80), OPAC saves their time in searching for materials ($\overline{X}$= 2.90, SD = 1.03), OPAC is a better substitute to the card catalogue ($\overline{X}$= 4.16, SD = 0.87) and aware that all the materials in the library had their bibliographic details in the OPAC ($\overline{X}$= 2.61, SD = 0.79).

However, the result showed low level of awareness of OPAC in the remaining items listed. Using the OPAC to retrieve a call number of any book that they needed from the library ($\overline{X}$= 1.99, SD = 0.72), OPAC provided links to full text databases and e-journals ($\overline{X}$= 1.71, SD = 0.96), enhances easy search of different categories of materials such as books, journals, ebooks, pictures etc. ($\overline{X}$= 2.34, SD = 0.73) and OPAC could be used to check due dates for borrowed library materials ($\overline{X}$= 1.94, SD = 0.71). On the whole, the overall weighted mean of 2.85 was obtained indicating that the respondents' level of awareness of OPAC in selected academic libraries in Adamawa State, Nigeria was moderate.

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Research Question 2: What is the extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria?

Table 3: Extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria

S/N	Statements	N	Sum	Mean	Std	Decision
1	I use the OPAC anytime I go to the library	146	451	3.09	0.76	Accepted
2	I can use the OPAC without being assisted in the library	146	392	2.69	0.97	Accepted
3	I can use or browse the OPAC from anywhere outside the library using my computer or mobile phone	146	234	1.60	0.60	Rejected
4	I can use the OPAC for book reservation in the library	146	250	1.71	0.96	Rejected
5	I can search for a material using author's name, title of material of subject of the material	146	437	2.99	0.64	Accepted
6	Using the OPAC has been very effective and efficient to me in the library	146	421	2.88	0.88	Accepted
7	It is convenient for me to log on and type queries using Boolean (OR,NOT,AND) to search for materials from the OPAC	146	331	2.27	1.11	Rejected
8	I am highly satisfied with the OPAC in the library	146	464	3.18	1.26	Accepted
9	I use OPAC to know the latest additional list of books in the library	146	327	2.24	1.07	Rejected
10	I use OPAC for the renewal of items borrowed in the library	146	314	2.15	0.95	Rejected
	Total		**3621**	**2.48**	**0.92**	**Rejected**

Source: Field survey, 2025

The table 3 above showed extent of utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria. The results showed moderate extent of utilisation of OPAC in some of the items listed. They used the OPAC anytime they go to the library ($\overline{X}$= 3.09, SD = 0.76), they used the OPAC without being assisted ($\overline{X}$= 2.69, SD = 0.60), they could search for a material using author's name, title of material of subject of the material ($\overline{X}$= 2.99, SD = 0.64), OPAC had been very effective and efficient ($\overline{X}$= 2.88, SD = 0.88) and they were highly satisfied with the OPAC ($\overline{X}$= 3.18, SD = 0.26). However, the result showed low extent of utilisation of OPAC in the remaining items listed. Using or browsing the OPAC from anywhere outside the library using their computer or mobile phone ($\overline{X}$= 1.60, SD = 0.60), using the OPAC for book reservation ($\overline{X}$= 1.71, SD = 0.96), convenient for them to log on and type queries using Boolean (OR,NOT,AND) to search for materials from the OPAC ($\overline{X}$= 2.27, SD = 1.11), using OPAC to know the latest additional list of books in the library ($\overline{X}$= 2.24, SD = 1.07) and using OPAC for the renewal of items borrowed ($\overline{X}$= 2.15, SD = 0.95). On the whole, the overall weighted mean of 2.48 was obtained indicating that the respondents' extent of utilisation of OPAC in the two selected academic libraries in Adamawa State, Nigeria was low.

Research Question 3: What are the challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria?

Table 4: Challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria.

S/N	Statements	N	Sum	Mean	Std	Decision
1	The OPAC interface designed is not user friendly and difficult to use	146	359	2.46	1.18	Rejected
2	There is lack of searching skills on how to search the OPAC	146	491	3.36	1.18	Accepted
3	Difficulty in interpreting search results	146	464	3.18	1.12	Accepted
4	Lack of adequate skills to use the OPAC in the library	146	473	3.24	1.19	Accepted
5	There are no adequate OPAC Terminals / Workstations to use in the library	146	644	4.41	0.72	Accepted
6	The OPAC is very slow and takes time to deliver search results	146	404	2.77	0.81	Accepted
7	There are no staff available to support users in using the OPAC or the staff lack are uncooperative	146	421	2.88	0.88	Accepted
8	Epileptic power supply and lack of alternative sources	146	626	4.29	0.94	Accepted

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9	Lack of internet connectivity or network fluctuation	146	437	2.99	0.64	Accepted
10	There is lack of orientation towards the use of OPAC in the library	146	632	4.33	0.74	Accepted
11	Inability to use appropriate search terms	146	438	3.00	0.66	Accepted
	Total		**5389**	**3.36**	**0.92**	**Accepted**

Source: Field survey, 2025

The table 4 above showed the challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria. The results showed that the respondents agreed with all the items listed. The OPAC interface designed was not user friendly and difficult to use ($\overline{X}$= 2.46, SD = 1.18), lack of searching skills on how to search the OPAC ($\overline{X}$= 3.36, SD = 1.18), difficulty in interpreting search results ($\overline{X}$= 3.18, SD = 1.12), lack of adequate skills to use the OPAC ($\overline{X}$= 3.24, SD = 1.19), lack of adequate OPAC Terminals / Workstations to use in the library ($\overline{X}$= 4.41, SD = 0.72), OPAC was very slow and took time to deliver search results ($\overline{X}$= 2.77, SD = 0.81), unavailability of staff to support users in using the OPAC or the staff were uncooperative ($\overline{X}$= 2.88, SD = 0.88), epileptic power supply and lack of alternative sources ($\overline{X}$= 4.29, SD = 0.94), lack of internet connectivity or network fluctuation ($\overline{X}$= 2.99, SD = 0.64), lack of orientation towards the use of OPAC in the library ($\overline{X}$= 4.33, SD = 0.74) and inability to use appropriate search terms ($\overline{X}$= 3.00, SD = 0.66). On the whole, the overall weighted mean of 3.36 was obtained indicating that the challenges associated with utilisation of OPAC in selected academic libraries in Adamawa State, Nigeria was high.

Hypothesis Testing

Ho_1: There is no significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Table 5: Descriptive statistics on significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

		N	%	Mean	Std. Deviation
Institution	Adamawa State University, Mubi	59	40.4	2.05	0.21
	Federal College of Education, Yola	87	59.6	2.03	0.20
	Total	**146**	**100**	**2.04**	**0.21**

Source: Field survey, 2025

Table 5 indicated the descriptive statistics on the significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria. The results showed that Adamawa State University, Mubi had the higher mean score of ($\overline{X}$ = 2.04, SD = 0.21), while, the Federal College of Education, Yola was slightly lower with ($\overline{X}$ = 2.03, SD = 0.20). This implies that Adamawa State University, Mubi accounted for slightly higher means score on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Table 6: One-Way ANOVA on the significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.017	1	.017	.394	.531
Within Groups	6.311	144	.044		
Total	6.329	145			

Source: Field survey, 2023

Table 6 showed a one-way between group ANOVA on significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria. From the analysis using two-tailed test at the significant level of 0.05, the p-value = 0.531 > 0.05, the degree of freedom is 145 and F-value of .394. With this result, the p-value is greater than the critical value of 0.05. Hence, the null hypothesis of no significant is hereby accepted and concluded that, there is no significant difference in the mean scores on the level of awareness of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

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H_{O2}: There is no significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Table 7: Descriptive statistics on significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

		N	%	Mean	Std. Deviation
Institution	Adamawa State University, Mubi	59	40.4	1.88	0.21
	Federal College of Education, Yola	87	59.6	1.89	0.22
	Total	**146**	**100**	**1.88**	**0.21**

Source: Field survey, 2025

Table 7 indicated the descriptive statistics on the significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. The results showed that Federal College of Education, Yola accounted for the higher mean score of ($\overline{X} = 1.89$, SD = 0.22), while, the Adamawa State University, Mubi was slightly lower with a ($\overline{X} = 1.88$, SD = 0.21). This implied that Federal College of Education, Yola accounted for the slightly higher mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Table 8: One-Way ANOVA on the significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.009	1	.009	.190	.663
Within Groups	6.525	144	.045		
Total	6.534	145			

Source: Field survey, 2023

Table 8 showed a one-way between group ANOVA on significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. From the analysis using two-tailed test at the significant level of 0.05, the p-value = 0.663 > 0.05, the degree of freedom is 145 and F-value of .190. With this result, the p-value is greater than the critical value of 0.05. Hence, the null hypothesis of no significant is hereby accepted and concluded that, there is no significant difference in the mean scores on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Discussion of Findings

The finding of the study showed that the level of awareness of OPAC in the selected academic libraries in Adamawa State Nigeria was moderate and that they were only aware that the OPAC as an essential database of the library, provided to help in locating materials available quickly as well as a better substitute to the card catalogue. This could be attributed that the academic staff are researchers, but not all of them patronised the libraries in their academic institutions. This finding agrees with Shokane and Bopape (2023) which revealed that the respondents rated their level of awareness as average at University of Venda, South African. Similarly, Jacob and Sunday (2020) revealed that the users of University of Jos Library were aware of the existence of online database, e-books, e-journals, open access resources, e-mails, online public access catalogue (OPAC) institutional repository (IR) and full-text databases to a large extent excluding indexing and abstracting databases. Moreover, Akoun, Panle and Odanwu (2021) indicated that lecturers in FUNAAB had very high level of OPAC awareness. Attahir and Elijah (2022) showed that most of the library users in Federal Universities in North East-Nigeria were highly aware about the OPAC in their libraries. In contrast to this finding, Mustapha, Muhammad and Ibrahim (2023) showed that majority of library users were not aware that OPAC was made available in Bayero University, Kano, Library. Moreover, Omosekejimi (2020) *found that there was low level of Online Public Access Catalogue awareness among library users in federal university libraries in South West Nigeria.*

Furthermore, this study indicated that the extent of utilisation of OPAC in the two selected academic libraries in Adamawa State, Nigeria was low even though, they expressed high satisfaction with the OPAC in the library. This finding is in consonance with finding of Ekeh and Atanda, (2021) which revealed that OPAC usage rate was quite low among the library users in

some selected tertiary institutions in Lagos State. Majority of the respondents indicated that they were moderately successful in locating documents through OPAC. However, the finding contravenes Concillia (2024) that reported that some students used OPAC in information retrieval but there seemed to be challenges faced in the use of OPAC in information retrieval among library users in University of Nigeria, Nsukka. Gohain and Mishra (2023) showed that Students (UG/PG) were the largest user group who used OPAC very frequently to search library documents in LNB Library, Dibrugarh University.

Moreover, the study revealed that, the challenges associated with utilisation of OPAC was high which include but not limited to: inadequate OPAC Terminals / Workstations to use in the libraries, epileptic power supply and lack of alternative sources as well as lack of orientation towards the use of OPAC in the libraries studied. The study corroborates the finding of Eiriemiokhale, Oladimeji and Oloruntola (2020) which reported difficulty in interpreting search results, network problem, lack of user assistance, irrelevant search results and no prior orientation before using the OPAC in Kwara State University Library. Eserada and Okolo (2019) showed that poor/irregular power supply, lack of OPAC knowledge and unfamiliarity with the OPAC system, inadequate computer terminals, navigational frustrations, OPAC not user friendly enough, lack of assistance from library staff and failed search or no records retrieved and inability to use appropriate search terms as the major problems encountered while using OPAC. Furthermore, Apagu, Temboge and Mathias (2018) found lack of skills to use OPAC independently, inadequate OPAC terminals, no proper user education, lack of proper guidance from the library staff and no hyperlink to library OPAC from the university website in university libraries in Gombe State, Nigeria.

Hypotheses one and two tested in this study revealed that there is no significant difference in the mean scores on the level of awareness of OPAC and extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. However, Adamawa State University, Mubi accounted for slightly higher means scores on the level of awareness of OPAC, while, Federal College of Education, Yola accounted for slightly higher means score on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. This finding is similar to that of Nna-Etuk, Echu and Umoh (2021) which revealed that there was a strong positive relationship on the use of Online Public Access Catalogue (OPAC) among Federal Universities in South- South Zone of Nigeria.

Conclusion

The quest for academic libraries to facilitate unrestricted access to quality, current and relevant information necessitates the need for awareness and utilisation of OPAC effectively and efficiently by the users, especially academic staff. This study has revealed that the level of awareness of OPAC in the selected academic libraries in Adamawa State, Nigeria was moderate and that they were only aware that the OPAC was an essential database of the library, provided to help in locating materials available quickly as well as a better substitute to the card catalogue. Furthermore, this study indicated that the extent of utilisation of OPAC in the two selected academic libraries in Adamawa State, Nigeria was low even though, they expressed high satisfaction with the OPAC in the library.

Moreover, the study revealed that the challenges associated with utilisation of OPAC was high which included but not limited to: inadequate OPAC Terminals / Workstations to use in the libraries, epileptic power supply and lack of alternative sources as well as lack of orientation towards the use of OPAC in the libraries. Hypotheses one and two tested in this study revealed that there was no significant difference in the mean scores on the level of awareness of OPAC and extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria. However, Adamawa State University, Mubi accounted for slightly higher means scores on the level of awareness of OPAC, while, Federal College of Education, Yola accounted for slightly higher means score on the extent of utilisation of OPAC between the two selected academic libraries in Adamawa State, Nigeria.

Recommendation

1. Academic libraries in Adamawa State need to embark on thorough marketing and promotion of their information resources and services so as to make the users become aware about the availability of OPAC and its optimum benefits to the users.
2. The management of the academic libraries need also need to organise and strengthen library orientation programmes to all category of library users so that they could be equipped with the requisite skills needed to search information through the OPAC. This could go a long way in assisting the users master the acts of searching and retrieving for information without assistance.
3. Managements of tertiary institutions in Adamawa State need to look into the challenges bedeviling the academic libraries with the view to overcoming

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issues such as limited to computers, epileptic power supply and low bandwidth among others.

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BIG DATA ANALYTIC SHIFT TOWARDS MEDICAL LIBRARIANSHIP: NOTES FROM MODIBBO ADAMA UNIVERSITY TEACHING HOSPITAL YOLA, ADAMAWA STATE, NIGERIA

BY

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Abstract

This study investigated the big data analytic shift towards medical librarianship; Notes from Modibbo Adama University Teaching Hospital Yola, Adamawa State, Nigeria. The objectives of the study are to examine: the clinical data management undertaken by medical Librarians, the predictive analytics trends in the library, the personalized information services delivery undertaken by Librarians in the Library, and the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library, four research questions were formulated to guide the study. This study adopts descriptive survey research design. The population for the study comprised all Librarians, totaling of twenty-six (26). A structured closed ended questionnaire is used as instrument for data collection. A purposive sampling technique is employed for this study; this sampling method was adopted because the whole population was used and manageable by the researchers. The method of data analysis employed for this study is descriptive statistics of mean and standard deviation and the results were presented in tables. The findings of the study revealed among others that clinical data management is undertaken by Medical Librarians in the Library to a high extent. Also, the study showed that a predictive analytics trend in Librarians in the library was rated to a very high extent. The study concludes that these outcomes underscore the evolving role of medical librarians from traditional information custodians to strategic partners in healthcare knowledge management, driven by emerging technologies and data analytics capabilities. The study recommends that the MAUTH Yola Library management should organize regular training programs and workshops on advanced clinical data management tools and emerging trends to maintain and improve the quality of service.

Keywords: Big data Analytic, Medical Librarianship, University Teaching Hospital

Introduction

Big data, data science, data management, data curation beyond buzz words; these iterations describe the recording, reuse, and long-term care of research data. The need for management and curation also indicates the usefulness and value of libraries and information science to a broad base of researchers, universities, and clinical scientists. (Federer, Lanham, Rowman, & Field, 2017). Big data analytics refers to the systematic processing and analysis of large amounts of data and complex data sets, known as big data, to extract valuable insights (Mucci, 2024). Big data analytics allows for the uncovering of trends, patterns and correlations in large amounts of raw data to help analysts make data-informed decisions. This process allows organizations to leverage the exponentially growing data generated from diverse sources, Ensuring data quality and integrity, integrating disparate data sources, protecting data privacy and security and finding the right talent to analyze and interpret data can present challenges to organizations looking to leverage their extensive data volumes. Therefore, there are a lot of different data analytic tools to interpret and analyze data which includes: Atlas.It, Zoho Analytics, MicrsoftHDInslight, Skytree, Talend, Splice Machine and Spark.

The prospects of big data analytics are important and the benefits for data-driven organizations are significant determinants for competitiveness and innovation performance. Analytics in healthcare helps medical

personnel by reducing the burden of manual tasks, improving diagnostic accuracy, and providing timely clinical insights. According to Softweb Solutions (2025), doctors can use real-time dashboards to monitor patient vitals, flag anomalies, and adjust treatments as needed. Nurses and administrators also benefit from streamlined workflows, optimized schedules, and better communication between departments. With access to timely and accurate insights, providers can make better-informed clinical decisions. Health data analytics supports evidence-based care by highlighting the most effective treatments, identifying high-risk patients, and recommending timely interventions. At the operational level, it enables smarter resource planning, financial management, and policy development, resulting in more sustainable healthcare delivery. Systematic data management allows researchers to dig deep, verify, and build further on solid foundation that can be accurately assessed. Data management is about accessibility and additional analysis as well as the ability to respond to requests to "show me your data." Many scientists' data are in stacks of paper on physical desks, or data logs stored in metal filing cabinets, or even in files that cannot be found for reasons of naming, organization, or just the minutia of the data point not being searchable. All of this prior, typical disorganization supports the need for data management. (Federer, Lanham, Rowman, & Field, 2017).

Clinical data management (CDM) according to the National Library of Medicine [NLM] (2024) is essential in clinical research, ensuring high-quality, reliable, and statistically sound data is used in clinical trials. In the words of FIRMAN (2023), Clinical data management has become an increasingly important field in the life sciences adding that, from pharmaceutical development to managing patient records, organizations must collect, validate and maintain high quality clinical data that meets regulatory requirements. As a data management it uses tools which are software applications designed to collect, organize and analyze the data generated in clinical trials. They play a crucial role in maintaining data integrity, compliance with regulatory standards and efficient collaboration among researchers, contributing to the overall success of clinical research studies (FIRMAN, 2023). Predictive analytics has emerged as a transformative force in the healthcare sector, offering substantial potential to enhance patient outcomes and optimize healthcare systems. With the increasing availability of healthcare data from various sources such as electronic health records (EHRs), Internet of Things (IoT) devices, and population health data, predictive analytics provides new opportunities for making informed decisions that improve patient care (Adepoju, Ikwuanusi & Odionu, 2023). A prominent case in this area is the implementation of predictive analytics in chronic disease management programs. These programs use a combination of patient history, real-time data from wearable devices, and population health data to manage conditions like diabetes, heart disease, and respiratory illnesses more effectively. AS healthcare systems continue to face growing challenges related to patient management and operational efficiency, predictive analytics will play an increasingly vital role in addressing these issues. However, the successful application of predictive analytics requires overcoming certain challenges, such as ensuring data quality and addressing ethical concerns surrounding patient privacy. While predictive models have the potential to significantly improve patient outcomes and system performance, their effectiveness relies heavily on the accuracy and reliability of the data used (Adesina, Iyelolu & Paul, 2024), It is also essential to address concerns regarding the security and privacy of patient information, especially when dealing with sensitive health data. Consequently, for timely and accurate information service delivery for effective decision making in handling medical issues, personalized information service is worth bargaining.

Personalized information services in the digital age in medical libraries is reshaping how they serve users, with a growing emphasis on personalized information services (PIS) that cater to individual preferences, behaviours, and needs. As users increasingly expect tailored experiences similar to those offered by commercial platforms like Netflix according to Paik (2024), libraries are adapting by leveraging advanced technologies such as artificial intelligence (AI), machine learning, and behavioural analytics. These innovations enable libraries to provide customized recommendations, learning pathways, and dynamic content delivery, ensuring that users receive relevant and timely information. . These services as pointed out use data such as borrowing history, search behaviour, and expressed interests to curate recommendations, learning paths, and content displays (Parise, Guinan, & Kafka, 2016). Rather than treating all users as a homogeneous group, PIS aims to provide each user with a unique, customized experience that reflects their personal information-seeking habits and goals. Personalized information services (PIS) offer a range of advantages that can significantly enhance both user

experiences and library operations. By focusing on individual needs and leveraging data-driven insights, libraries can transition from being static information repositories to dynamic, responsive learning environments (Paik, 2024). Personalized information services present a valuable opportunity for libraries to boost user engagement, satisfaction, and resource discovery. By adopting a user-centric approach similar to platforms like Netflix, libraries can tailor experiences to individual preferences and behaviours. Successful implementation requires investment in modern technology, such as AIdriven systems and data analytics, alongside strong ethical frameworks to safeguard privacy, ensure transparency, and reduce algorithmic bias. Academic libraries, for instance, can implement adaptive learning paths by analyzing user data, course materials, and research trends to suggest targeted resources. Social recommendations based on peer usage patterns can enhance scholarly discovery and collaboration. Interestingly, as the information management system keep changing, big data analytics that uses more sophisticated methods of information gathering and sharing should be adopted in medical libraries.

Statement of the Problem

The increasing adoption of big data analytics in healthcare has significantly transformed various aspects of medical practice, research and administration. However, one area that remains unexplored is the integration of big data tools and methodologies within medical librarianship especially in clinical and teaching hospital environment such as Modibbo Adama University Teaching Hospital. Medical librarians traditionally serve as curators of health information, facilitators of evidence-based practice and supporters of medical education and research. However, the rapid growth of digital health records, research data basses, and analytical plat forms demands new competencies and roles that many medical libraries are not fully equipped to handle. For instance, at MAU teaching hospital, the shift towards data-driven decision making and precision medicine is expecting a gap between the traditional functions of the medical library and the emerging needs of clinicians, researchers, and administrators. Librarians are increasingly expected to manage complex datasets, supports data literacy, contribute to systematic review using advanced analytics, and ensure access to dynamic, data-rich resources. Despite this shift, there is limited documentation or strategic direction guiding how medical librarians should adapt to and integrate big data analytics in to their workflows. These disconnect raises critical questions; are medical librarians at MAU Teaching Hospital Teaching Hospital prepared for the data-intensive demands of modern healthcare? What infrastructural, educational, and strategic changes are required to alignlibrarianship with the big data revolution? Addressing these issues is crucial to ensure that medical librarians remain relevant and valuable contributors to health care delivery and research in an era defined by data.

Objectives of the study

The objective of the study is to investigate big data analytic shift towards medical Librarianship: Notes from Modibbo Adama University Teaching Hospital Yola, Adamawa State, Nigeria. Specifically the objectives of the study are to:

1. Evaluate the Clinical Data Management Undertaken by Medical Librarians in Modibbo Adama University Teaching Hospital Yola Library
2. Examine the predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library
3. Examine the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library
4. Examine the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library

Research Questions

The following questions were formulated to guide the study:

1. What is the Clinical Data Management Undertaken by Medical Librarians in Modibbo Adama University Teaching Hospital Yola Library?
2. What are the predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library?
3. What is the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library?
4. What is the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library?
5. **Methodology**

This study adopts a descriptive survey research design to explore the big data analytic shift towards medical Librarianship: Notes from Modibbo Adama University Teaching Hospital Yola. A structured closed ended questionnaire was used as instrument for data collection. The **population** for the study comprised all Librarians, totaling twenty six (26). A purposive sampling technique **was** employed for this study. This

sampling method was adopted because the whole population is used and the number of Librarians working in the library is manageable by the researchers. The method of data analysis employed for this study is descriptive statistics of mean and standard deviation and the results is presented in tables

Review of Literature

A study conducted by Subaveerapandiyan, (2023). On Research Data Management Practices and Challenges in Academic Libraries: A Comprehensive Review. The comprehensive review article delves into the current landscape of research data management (RDM) practices and challenges faced by academic libraries across various regions. Utilizing a wide range of studies and data collected from different countries, this article aims to provide a comprehensive overview of the state of RDM services, the role of librarians, and the advancements in technology within academic libraries. The review explores the importance of RDM in supporting open science, data sharing, and reproducibility, while also shedding light on areas that require further development and improvement.This extensive analysis employs a systematic and comprehensive approach to gather and synthesize data from a vast range of sources. It includes a meticulous search and review of academic journals, conference papers, case studies, and reports related to RDM practices in academic libraries. The methodology ensures that diverse perspectives and experiences from different continents are considered to provide a global outlook on the subject matter.

Study conducted by Adeola, Ajuwon, & Elohor, (2024) Research Data Management (RDM) Skills Among Health Librarians in Nigeria: A Survey. Research Data Management (RDM) skills encompass a set of abilities needed for RDM services. This study sought to assess the RDM skills of health librarians in Nigeria that can enable the provision of RDM services in health libraries. Employing the descriptive survey method, data was collected using a questionnaire adapted from (Federer, Lanham, Rowman, & Field, 2017). Data were analyzed using descriptive and inferential statistics. Among other findings, the results showed that, health librarians are inadequately skilled in RDM. Although they have adequate library and personal skills, these are not enough for rendering RDM services in health libraries in Nigeria. Clinical data management is crucial for ensuring patient safety, regulatory compliance, and cost efficiency in healthcare (Datavant, 2024). Datavant further noted that, clinical data management has the ability to carry out the following functions: ensuring data accuracy; facilitating faster and safer drug development; maintaining data completeness; securing data; and, ensuring traceability. As reiterated by FIRMAN. (2023) the clinical data managers/librarians plays a key role in the setup and conduct of a clinical trial. The data collected during a clinical trial form the basis of subsequent safety and efficacy analysis which in turn drive decision making on product development in handling health industry.

Kumar (2023) conducted a study on Reading the Future: Predictive Analytics and AI in Library Services: the research study explores the transformative impact of predictive analytics and artificial intelligence (AI) on library services, ushering in a new era of efficiency and user-centricity. Delving into the intersection of technology and information management, the study also examined the potential of predictive analytics in anticipating user needs, optimizing resource allocation, and enhancing the overall library experience. The integration of AI-driven tools not only streamlines traditional library functions but also empowers librarians to proactively curate collections, personalize services, and foster a dynamic learning environment. By synthesizing data-driven insights with user engagement strategies, libraries can evolve into proactive knowledge hubs, meeting the evolving demands of a digital age. The exploration sheds more light on the opportunities, challenges, and ethical considerations associated with leveraging predictive analytics and AI in library settings, fostering a dialogue on the future trajectory of library services in an era marked by technological advancements.

Another study conducted by Bhavsar & Rao (2024) on predictive analytics and artificial intelligence are revolutionizing the user experience in public libraries. Public libraries have historically served as essential institutions in communities, providing individuals with the opportunity to access a wide range of knowledge and resources. Nevertheless, in the current era of rapid digital advancements, libraries encounter the obstacle of adjusting to shifting customer requirements and preferences. Libraries may enhance their services by utilizing data-driven insights and intelligent technologies. This enables them to provide personalized suggestions, manage the allocation of resources, and create more engaging and inclusive environments.

According to Hussain, Austin-Gabriel, Adepoju & Afolabi, (2024) emerging technologies have played a pivotal role in revolutionizing healthcare management. Machine learning techniques, when combined with vast amounts of data from EHRs, IoT devices, and other real-time patient monitoring tools, can provide actionable

insights that optimize both clinical decision-making and operational processes. By combining patient data from EHRs with real-time information from IoT devices, these systems can predict which patients are at the highest risk of readmission after discharge. Paik, (2024) conducted research on the digital transformation of libraries is reshaping how they serve users, with a growing emphasis on personalized information services (PIS) that cater to individual preferences, behaviors, and needs. As users increasingly expect tailored experiences similar to those offered by commercial platforms like Netflix, libraries are adapting by leveraging advanced technologies such as artificial intelligence (AI), machine learning, and behavioural analytics. These innovations enable libraries to provide customized recommendations, learning pathways, and dynamic content delivery, ensuring that users receive relevant and timely information.

Data Presentation and Analysis

Research Question 1: What is the Clinical Data Management Undertaken by Medical Librarians in Modibbo Adama University Teaching Hospital Yola Library?

Table 1: Mean and standard deviation on the clinical data management undertaken by medical librarians in Modibbo Adama University Teaching Hospital Yola Library.

S/N	Statement	Mean	SD	Remark
1.	As a medical librarian do you involved in data management plan (DMP) in terms of strategies for managing data trials	3.24	.69	Very high extent
2.	As a medical librarian are you involved in organization and storage of clinical data trial for ease of access	3.17	.67	Very high extent
3.	Do you support data quality and validation such as controlling inconsistencies and missing values in clinical data trial	2.27	.63	Low extent
4.	Do you facilitate data sharing and reuse by providing guidance on data deposit citation and discovery in data repository in finding data sets	1.27	.56	No extent
5.	Are you involved in offering training and education on clinical data management best practices	3.19	.60	Very high extent
	Grand mean	**2.63**		**High extent**

Table 1 report the mean and standard deviation on the clinical data management undertaken by Medical Librarians in Modibbo Adama University Teaching Hospital Yola Library. The respondents rated very high extent to items 1, 2, and 5. The grand mean of 2.63 revealed that clinical data management is undertaken by Medical Librarians in Modibbo Adama University Teaching Hospital Yola Library to a high extent. The standard deviation scores show homogeneity in respondent's ratings (0.56-0.67).

Research Question 2: What are the predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library?

Table 2: Mean and standard deviation on the predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library

S/N	Statement	Mean	SD	Remark
6.	As a medical librarian do you involved in data management plan (DMP) in terms of strategies for managing data trials	3.49	.67	Very high extent
7.	As a medical librarian are you involved in organization and storage of clinical data trial for ease of access	3.49	.63	Very high extent
8.	Do you support data quality and validation such as controlling inconsistencies and missing values in clinical data trial	3.22	.74	Very high extent
9.	Do you facilitate data sharing and reuse by providing guidance on data deposit citation and discovery in data repository in finding data sets	2.15	.72	Low extent
10.	Are you involved in offering training and education on clinical data management best practices	3.03	.71	Very high extent
	Grand Mean	**3.08**		**Very high extent**

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The result in Table 2 reports the mean and standard deviation on the predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library. The respondents rated very high extern to items 6, 7, 8, and 10. The grand mean of 3.08 revealed that on the whole, predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital Yola Library was rated to a very high extent. The standard deviation score shows homogeneity in respondent's ratings (0.63-0.74).

Research Question 3: What is the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library?

Table 3: Mean and standard deviation on the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library.

S/N	Statement	Mean	SD	Remark
11.	Implementing robust data governance framework and analytics tools to streamline data access and analysis	2.68	.79	High extent
	Enhancing digital literacy by educating users on AI, Digital resources to enhance effective utilization	2.63	.85	High extent
	User-centric services by designing services around user needs and promoting awareness about available services	1.06	.95	No extent
	Data sharing and confidentiality	2.61	.92	High extent
	Grand Mean	**2.25**		**High extent**

Table 3 reports the mean and standard deviation on the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library. The respondents rated high extern to items 11, 12 and 14. The grand mean of 2.25 revealed that on the whole, the personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library was rated to a high extent. The standard deviation score shows homogeneity in respondent's ratings (0.79-0.95).

Research Question 4: What is the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library?

Table 4: Mean and standard deviation on the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library

S/N	Statement	Mean	SD	Remark
15.	Improved patient care through personalized treatment plans, early diseases detection and chronic disease management leading to better patient out comes	2.61	.92	High extent
16.	Enhanced data management plans	2.63	.86	High extent
17.	Operational efficiency	3.24	.69	Very high extent
18.	Public health management through diseases surveillance health trend identification and public health management	3.17	.67	Very high extent
19.	Medical research and innovation to accelerate clinical trials	3.49	.67	Very high extent
20.	Data-driven decision-making predictive analytics	3.49	.63	Very high extent
	Grand Mean	**3.11**		**Very high extent**

The data in Table 4 reports the mean and standard deviation on the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library. The respondents rated very high extent to items 17, 18 and 19, they rated high extent to items 15 and 16. The grand mean of 3.11 revealed that on the whole, the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library was rated to a very high extent. The standard deviation score shows homogeneity in respondent's ratings (0.63-0.86).

Summary of Findings

Based on the analysis the following were summarized:

1. The study revealed that clinical data management is undertaken by Medical Librarians in Modibbo

Adama University Teaching Hospital Yola Library to a high extent.

2. The study shows that predictive analytics trends in Librarians in Modibbo Adama University Teaching Hospital, Yola Library was rated to a very high extent.
3. The research revealed that personalized information services delivery undertaken by Librarians in Modibbo Adama University Teaching Hospital Yola Library was rated to a high extent.
4. The outcome of the study revealed that the prospect of big data analytics in Librarians in Modibbo Adama University Teaching Hospital Yola Library was rated to a very high extent.

Conclusion

The study has demonstrated significant progress and promising trends in the adoption of advanced information management practices within the Modibbo Adama University Teaching Hospital (MAUTH) Yola Library. The findings revealed that **clinical data management**is actively undertaken by medical librarians, indicating their growing involvement in supporting evidence-based medical research and patient care. Furthermore, the study showed that **predictive analytics trends** are highly embraced, reflecting a proactive approach toward utilizing data-driven insights to forecast user needs and improve decision-making processes. Similarly, **personalized information service delivery** was rated to a high extent, signifying the library's commitment to tailoring services that meet the specific needs of diverse user groups, thereby enhancing user satisfaction and engagement. Most notably, the **prospect of big data analytics** was rated to a very high extent, highlighting an enormous potential for leveraging big data technologies to transform library operations and health information management.Collectively, these outcomes underscore the evolving role of medical librarians from traditional information custodians to strategic partners in healthcare knowledge management, driven by emerging technologies and data analytics capabilities. This positions the MAUTH Yola Library as a forward-thinking institution prepared to harness innovation for improved healthcare service delivery and knowledge dissemination.

Recommendations

Base on the findings of the study the following recommendations were made:

1. The study recommend that the MAUTH Yola Library management should organize regular training programs and workshops on advanced clinical data management tools and emerging trends to maintain and improve the quality of services and adopt modern data management systems and integrate electronic health record (EHR) platforms with library services for seamless data retrieval and storage
2. It is recommended that the MAUTH Yola Library management should Leverage predictive analytics for more advanced decision-making processes, such as forecasting patient information needs, optimizing resource allocation, and improving clinical outcomes and collaborate with hospital IT departments to integrate predictive models into electronic health records and clinical decision support systems.
3. The study recommends that the MAUTH Yola Library management should introduce AI-driven tools and recommender systems to improve the accuracy and relevance of personalized information services and train librarians on emerging trends in personalized information services, including adaptive learning technologies and patient-specific information delivery.
4. The study recommends that the MAUTH Yola Library management shouldorganize regular training programs for librarians to develop skills in big data analytics, data visualization, and interpretation for evidence-based decision-making and acquire and integrate big data analytics software and hardware that support large-scale data processing and analysis.

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EFFECT OF PERCEIVED VISUAL ATTRACTIVENESS ON POST-INTERACTION USE BEHAVIOUR OF A PROTOTYPE MEDICAL LIBRARY WEBSITE FOR FEDERAL UNIVERSITIES IN NIGERIA

BY

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Abstract

This study applied usability testing to examine the effect of perceived visual attractiveness on post-interaction use behaviour of a prototype medical library website developed for federal universities in Nigeria. Guided by three objectives, two research questions, and one hypothesis, the study adopted a mixed-research methodology. The prototype, designed with a user-centred approach using HTML, CSS, and PHP, was evaluated with the Prototype Medical Library Website Usability and User Experience Testing Worksheet (PMLWUUXTW), which measured users' perceptions of visual attractiveness and subsequent use behaviours. Thirty respondents were purposively sampled from six federal university teaching hospitals: Ahmadu Bello University Teaching Hospital (Shika), Jos University Teaching Hospital (Jos), University of Maiduguri Teaching Hospital (Maiduguri), University College Hospital (Ibadan), University of Nigeria Teaching Hospital (Enugu), and University of Benin Teaching Hospital (Benin City). Data were analysed using mean, standard deviation, frequency counts, and percentages, with results presented in tables. Findings showed that users perceived the prototype as highly visually attractive, with positive impressions linked to colour harmony, layout clarity, and typography. Participants also reported favourable post-interaction behaviours, such as satisfaction, willingness to reuse, and intention to recommend the system. However, statistical analysis indicated that while visual attractiveness enhanced user perceptions, its relationship with post-interaction use behaviour was weak and not significant. The study concludes that although visual attractiveness contributes to positive first impressions and satisfaction, long-term use of medical library websites depends more on functional efficiency and content reliability.

Keywords: Usability, medical library website, visual attractiveness, post-interaction use behaviour, user experience, Nigeria

Introduction

The rise of digital platforms has reshaped how academic communities access and use information resources. In Nigeria, federal universities are investing in digital library systems to support teaching, learning, and research. However, beyond functionality, the visual attractiveness of these platforms is increasingly recognized as a critical factor influencing user engagement. When students and researchers encounter a library website, their perception of its aesthetic appeal, design clarity, and layout shapes not only their immediate experience but also their likelihood of returning.

Perceived visual attractiveness is a subjective judgment of a website's aesthetics, including colour, typography, and layout harmony. Research shows that attractive interfaces evoke positive emotional responses and influence users' evaluations of ease of use, usefulness, and usability (Tuch et al., 2018; Tractinsky, 2022). For a medical library website prototype, attractiveness is more than cosmetic—it signals modernity, credibility, and user-centeredness, particularly in an age where students interact daily with highly polished digital platforms. The ultimate test of these perceptions lies in post-interaction use behaviour, which reflects users' willingness to reuse the website, recommend it to peers, and rely on it as part of their academic routine (Venkatesh et al., 2012). Sustained interaction is vital for medical students, whose learning depends on frequent access to reliable, up-to-date resources.

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The relationship between visual attractiveness and post-interaction use behaviour is strengthened when considered alongside usability measures such as time on task and task success rate. These objective indicators capture how efficiently users can complete tasks like searching databases or retrieving materials. Positive usability outcomes reinforce perceptions of ease of use and usefulness, which are central constructs in the Technology Acceptance Model (Davis, 1989). At the same time, emotional responses ranging from satisfaction to frustration mediate how aesthetics translate into long-term behavioural intentions. In the Nigerian context, this focus is particularly timely. While many federal university libraries have launched websites, studies reveal persistent challenges with outdated design, poor navigation, and neglect of visual appeal (Abifarin, Imavah, & Olobashola, 2019). These issues not only undermine task performance but also discourage students from integrating library websites into their study practices. For medical students, who already face demanding academic workloads, an unattractive or difficult-to-use platform can become a barrier rather than a support tool.

This study therefore investigates the effect of perceived visual attractiveness on post-interaction use behaviour of a prototype medical library website for federal universities in Nigeria. It examines how aesthetics influence emotional responses, usability perceptions, and behavioural intentions. By integrating variables such as time on task, task success rate, ease of use, usefulness, and emotional response, the study offers a holistic understanding of how design choices shape user engagement.

The significance of this research is twofold. Theoretically, it contributes to human–computer interaction and information science by highlighting how visual aesthetics function as a driver of continued digital resource use. Practically, it provides actionable insights for library website developers and academic institutions in Nigeria and beyond to design platforms that are not only functional but also visually engaging, emotionally rewarding, and behaviourally sustainable.

Statement of the Problem

Access to digital information resources has become essential for teaching, learning, and research in universities. In Nigeria's federal universities, medical libraries are expected to provide seamless access to scholarly resources to support medical education and research. However, despite investments in digital platforms, many library websites remain underutilized. Previous studies have shown that issues such as poor design, outdated interfaces, and lack of user-centered features discourage students from engaging with digital libraries (Abifarin, Imavah, & Olobashola, 2019). This raises critical concerns about how design elements, particularly visual attractiveness, influence users' experiences and their continued use of such platforms. Research in human–computer interaction highlights that perceived visual attractiveness shapes users' emotional responses, affects their perceptions of ease of use and usefulness, and influences their overall evaluation of a system (Tractinsky, 2022; Tuch et al., 2018). Yet, most usability studies in Nigerian academic libraries focus on functionality and content rather than aesthetics. Consequently, there is limited empirical evidence on how the visual design of medical library websites affects post-interaction use behaviour, such as the intention to revisit, sustained engagement, and willingness to recommend the platform. For medical students, who rely heavily on timely access to information, unattractive or poorly designed websites may reduce efficiency, increase frustration, and hinder integration of digital resources into academic practice.

This gap in research underscores the need to investigate the effect of perceived visual attractiveness on post-interaction use behaviour of a prototype medical library website, thereby providing insights for user-centered design in Nigerian academic libraries.

Research Objectives

The aim of this study is to assess the effect of visual attractiveness on post-interaction use behaviour of a prototype medical library website for federal universities in Nigeria. The objectives of the study are to:

1. determine visual attractiveness of the prototype medical library website for federal universities in Nigeria;
2. find out the post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria;
3. ascertain if there is any significant relationship between visual attractiveness and use behaviour of the prototype medical library website for federal universities in Nigeria;

Research Questions

The following research questions were raised for answers:

1. How visually attractive is the prototype medical library website for federal universities in Nigeria?
2. What is the post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria?

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Research Hypothesis

1. H_{O1}: There is no significant relationship between visual attractiveness and use behaviour of the prototype medical library website for federal universities in Nigeria.

Literature Review

Recent empirical work consistently shows that visual aesthetics measurably shapes users' post-interaction attitudes and behaviours toward information systems, including health and library websites. In a multiple-session experiment, Sauer and Sonderegger (2022) demonstrated that more aesthetic interfaces improved perceived usability and enjoyment over time, supporting a halo effect that can sustain favourable evaluations after hands-on use. Extending this to health contexts analogous to medical libraries, Denison-Day *et al*. (2023) used a quasi-experimental design to test distinct aesthetic facets (simplicity, colourfulness, diversity, craftsmanship) and found that simplicity and craftsmanship significantly increased perceived usefulness, ease of use, enjoyment, and trust, which in turn elevated intentions to use—key antecedents of continued use.

Complementing attitudinal outcomes, Perrig *et al*. (2023) ran a randomized experiment with two functionally identical smartphone web apps and reported higher perceived usability and (slightly) better task performance for the aesthetic variant, showing that visual appeal can translate into behavioral benefits after interaction.

Design regularities also matter: Miniukovich and De Angeli (2023) reported that prototypical, orderly layouts boost perceived aesthetics and usability, suggesting concrete layout cues for prototype medical library sites. Within Nigeria, empirical audits of academic library websites reveal uneven usability baselines that could dampen post-interaction use: Anyaoku and Akpojotor (2020) evaluated 11 university library sites and found several scoring below 50% on key usability attributes (usefulness, efficiency, effectiveness), indicating substantial room for interface improvement. Content-focused evaluations in Nigeria similarly note outdated design and weak information architecture (Oriogu *et al.,* 2022), conditions likely to suppress perceived attractiveness and downstream engagement.

Together, these studies imply that a visually attractive, prototypical, and well-crafted medical library interface can enhance perceived usability, trust, and enjoyment during and after first use, thereby strengthening intentions for repeat visits and functional use. Given existing usability gaps in Nigerian academic library sites, empirically guided aesthetic upgrades (simplicity, craftsmanship, prototypical structure) are a plausible lever to improve post-interaction use behavior for prototype medical library websites.

Research Method

The study adopted a mixed research methodology. According to Creswell and Clark (2017), mixed research methodology in usability studies combines both quantitative and qualitative approaches to provide deeper insights into user behaviour, preferences, and performance. This approach is appropriate for exploring the effect of perceived visual attractiveness on post-interaction use behaviour of a prototype medical library website. The population of the study consisted of 2,290 medical students across the 16 federal universities doing their clinicals at teaching hospitals, along with 16 medical librarians in federal universities in Nigeria, as obtained from the website of the Medical and Dental Council of Nigeria (MDCN) as of March 2022. Out of these, six universities were selected using a disproportionate random sampling technique to ensure representation across Nigeria's geo-political zones. The instruments used for the study included:: Treatment instrument which is the prototype medical library website titled *Nigerian Universities Medical Library Website (NUMLW)*, developed with user-centred design principles and incorporating visual design features (colour schemes, typography, layout balance, imagery) relevant to assessing perceived visual attractiveness and the Test instrument which is the *Prototype Medical Library Website Usability and User Experience Testing Worksheet (PMLWUUXTW)*, designed to capture both performance data (task success/failure, time-on-task) and subjective measures (perceived visual attractiveness, emotional response, and post-interaction use behaviour such as intention to reuse and recommend).

The usability testing was conducted in bespoke laboratory settings within selected medical libraries, using 30 volunteers. Participants were given tasks reflecting common library activities, such as locating an e-resource, accessing a medical database, retrieving library hours, or finding contact information. To specifically capture perceptions of visual attractiveness, participants were also asked to rate the aesthetics of the prototype (e.g., layout clarity, colour appeal, balance, and overall attractiveness) using a 5-point Likert scale questionnaire. After task completion, post-interaction behaviours (intention to revisit the site, likelihood to recommend, and satisfaction with the visual design) were recorded.

Data analysis involved both descriptive and inferential statistics. Quantitative data such as mean, standard

deviation, frequency counts, and percentages were used to summarize task performance and user ratings. Inferential tests, such as correlation and regression analysis, were applied to examine the relationship between perceived visual attractiveness and post-interaction use behaviour. Qualitative feedback from participants' open-ended responses was thematically analysed to provide deeper insights into emotional reactions and design preferences. Results were presented in tables, graphs, and bar charts for clarity.

Results

Research Question 1: How visually attractive is the prototype medical library website for federal universities in Nigeria?

Table 1.0: Visual Attractiveness of the Prototype Medical Library Website for Federal Universities in Nigeria.

		5	4	3	2	1				
S/No	**Statements**	**Strongly Agreed (SA)**	**Agreed (A)**	**Disgreed (D)**	**Strongly Disagreed (SD)**	**Undecided (UD)**	**∑f**	**x̄**	**SD**	**Decision**
1	The website supports my level of computer literacy	75 (56.4%)	52(39.1%)	6 (4.5%)	0	0	133	4.52	0.59	High
2	It is easy for me to navigate the website	70 (53.0%)	56 (42.4%)	6 (4.5%)	0	0	132	4.48	0.59	High
3	I am familiar with screen navigation to the website	85 (63.9%)	36 (27.1%)	12 (9.0%)	0	0	133	4.55	0.66	High
4	Wordings of messages and labels are appropriate for me	80 (59.7%)	48 (35.8)	6 (4.5%)	0	0	134	4.55	0.58	High
5	I am comfortable with the use of colour on the website	65 (50.4%)	52 (40.3%)	12 (9.3%)	0	0	129	4.41	0.66	Low
6	The website complies with the contrast rule	105 (76.1%)	24 (17.4%)	9 (6.5%)	0	0	139	4.70	0.59	High
7	The fonts and headings are clear	95 (69.3%)	36 (26.3%)	6 (4.4%)	0	0	137	4.65	0.56	High
8	I easily understand the site with provided default buttons	40 (34.8%)	64 (55.7%)	6 (5.2)	2 (1.7%)	3 (2.6%)	115	4.18	0.82	Low
9	The screen is not dense with content	55 (44.0%)	64 (51.2%)	3 (2.4%)	2 (1.6%)	1 (0.8%)	125	4.36	0.69	Low
10	Website content is well organised	20 (21.3%)	60 (63.8%)	3 (3.2%)	6 (6.4%)	5 (5.3%)	94	3.89	0.99	Low
11	Individual pages of the website are well defined	70 (56.0%)	40 (32.0%)	12 (9.6%)	2 (1.6%)	1 (0.8%)	125	4.41	0.79	Low
12	Visual layout while exploring the website is satisfying	75 (58.6%)	44 (34.4%)	3 (2.3%)	6 (4.7%)	0	128	4.47	0.76	High
					Grand Mean			**4.43**		

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Table 1.0 presented result visual attractiveness of the prototype medical library website for federal universities in Nigeria. 7 items out of 12 recorded high mean values when benchmarked against the average weighted mean of 4.43. Item 6 had the highest mean value of ($\bar{x}$ = 4.70; SD = 0.59). This implied that majority of the respondents agreed that the prototype medical library website is visually attractive.

Research Question 2: What is the post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria?

Table 2.0: Post-interaction Use Behaviour of the Prototype Medical Library Website for Federal Universities in Nigeria

S/No	Item	5 Strongly Agreed (SA)	4 Agreed (A)	3 Disagreed (D)	2 Strongly Disagreed(SD)	1 Undecided (UD)	∑f	x̄	SD	Decision
1	If possible, I intend to use the website again	75 (62.5%)	36 (30.0%)	0	6(5.0%)	3(2.5%)	120	4.45	0.92	High
2	I would be happy to use the website again	120 (85.7%)	16 (11.4%)	3 (2.1%)	0	1 (0.7%)	140	4.81	0.53	High
3	If possible, I predict that I would use the website again	90 (67.2%)	40 (29.9%)	0	4 (3.0%)	0	134	4.61	0.65	High
4	I am likely to recommend this website to friends	115 (83.3%)	16 (11.6%)	3 (2.2%)	4 (2.9%)	0	138	4.75	0.64	High
5	In similar situation, I would use the website again	85 (73.3%)	16 (13.8%)	6 (5.2%)	4 (3.4%)	5 (4.3%)	116	4.48	1.04	High
6	Using the website is a waste of time	0	12 (17.5%)	21 (30.9%)	30 (44.1%)	5 (7.4%)	68	2.59	0.87	Low
7	I am likely never going to visit the website again	0	0	21(38.2%)	22 (40.0%)	12 (21.8%)	55	2.16	0.76	Low
8	I would avoid using this website	0	8 (12.5%)	30 (46.9%)	18 (25.0%)	10 (15.6%)	64	2.56	0.91	Low
					Grand Mean			**3.80**		

N=30

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Table 2.0 presented result of the post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria. This result is crucial in determining whether the potential users will continue to approach the website or completely avoid it. items 1 – 5 reported high mean rating of above the average weighted mean of 3.80, while items 6 – 8 reported low average weighted mean values. The average weighted mean value for item 2 was the highest ($\bar{x}$ = 4.81; SD = 0.53) while item 7 recorded the lowest mean value ($\bar{x}$ = 2.16; SD = 0.76).

This result indicated that majority of the respondents are open to approaching the website and engaging with it rather than avoiding it. More so, it implied that they are likely to visit the website again and recommend it to their friends

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Hypothesis testing

H_{O1}: There is no significant relationship between visual attractiveness and use behaviour of the prototype medical library website for federal universities in Nigeria.

Table 3.0: Spearman's Rank Correlation Between Visual attractiveness and use behaviour of prototype medical library website for federal universities in Nigeria

			Visual Attractiveness	Use Behaviour
Spearman's rho	Visual Attractiveness	Correlation Coefficient	1.000	0.095
		Sig. (2-tailed)		0.157
		N	358	225
	Use Behaviour	Correlation Coefficient	0.095	1.000
		Sig. (2-tailed)	0.157	
		N	30	28

Not Significant at 0.05 level

From the Table 3.0, it can be deduced that a Spearman's correlation was run to determine the relationship between visual attractiveness and post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria.

There was very weak, positive monotonic correlation between visual attractiveness and use behaviour (r_s = .09, n = 28, p < .157).

Thus, the null hypothesis is not rejected. It is implied that the visual attractiveness of the prototype medical library website can have a positive influence of the use behaviour of the website. If users find the website aesthetically pleasing, they are likely to continue using the website and refer the website to friends and colleagues. However, if the users do not find the website visually attractive, they are unlikely going to approach the website.

Discussion

The findings on visual attractiveness for the prototype medical library website for federal universities in Nigeria indicated that the website's design is highly visually appealing to users. The exceptionally high mean value of ($\bar{x}$ = 4.70; SD = 0.59) reported in Table 4.5 suggested that participants overwhelmingly perceived the prototype medical library website as visually attractive. This result aligns with well-established UX research, which consistently underscores the critical role of visual aesthetics in shaping user perception and experience.

Similarly, Tella (2020) posited that visually appealing design can increase user engagement and encourage users to approach, rather than avoid the website. A well-designed website can also enhance the credibility of the medical library and its resources One fundamental principle at play here is the aesthetic–usability effect, whereby users tend to perceive aesthetically pleasing interfaces as easier to use, even when actual usability may differ. Chakraborty (2020) reaffirmed that "users are strongly influenced by the aesthetics of any given interface, even when they try to evaluate the system's underlying functionality". Thus, the high rating for attractiveness likely enhanced the users' overall satisfaction and tolerance for minor glitches, reinforcing positive impressions. Furthermore, the relationship between visual attractiveness and perceived usability is often mediated by visual clarity. According to Otten *et*

al. (2020) clearer layouts significantly increase both aesthetic and usability perceptions. The prototype's high visual appeal score likely reflects elements such as balanced white space, symmetry, coherent typography, and colour harmony, all of which improve clarity and thus beauty in the eye of users. Literature on visual design also highlights how symmetry, harmony, and colour usage heavily influence attractiveness. Jeannot *et al.* (2022) demonstrated that interface designs employing pastel, low-contrast palettes, symmetrical layouts, and rounded elements were rated significantly higher in aesthetic appeal than others. MoldStud's (2024) study similarly noted that minimalist, clear designs not only enhance engagement but reduce cognitive load and bounce rates. These principles likely contributed to the prototype's impressive attractiveness rating.

Don Norman's concept of emotional design further illuminates this finding: visually appealing products evoke immediate positive emotions, which contribute to trust, satisfaction, and continued use. An average weighted mean of 4.43 signals a strong emotional connection between users and the website's visual presentation, boosting its overall UX efficacy. Quantitatively, user studies reveal that first impressions are overwhelmingly design-driven. According to Dovetail's (2025) UX statistics, 46% of users evaluate a site's credibility based primarily on its visual design.

Meanwhile, a clean, attractive visual design can increase user satisfaction, reduce bounce rate, and generate substantial engagement improvements. With 7 out of 12 visual items scoring highly in the study, the prototype medical library website successfully delivered an aesthetically coherent experience that cultivated trust and satisfaction.

The post-interaction use behaviour of the prototype medical library website for federal universities in Nigeria is a critical aspect to evaluate, as it determines whether users will continue to use the website or avoid it. Post-interaction use behaviour is a critical metric for gauging whether users will continue using the website or abandon it altogether. Items 1–5 showed favourable perceptions, with high mean values above the threshold (3.80), while Items 6–8 fall below, indicating disengagement in key areas. The highest score item 2 ($\bar{x}$ = 4.81; SD= 0.53) reflected a strong intention to reuse a specific feature, while item 7 ($\bar{x}$ = 2.16; SD= 0.76) highlighted behaviour users are unlikely to repeat. These distinctions align with the unified theory of adoption and continuance models, such as Expectation-Confirmation Theory (ECT) and TAM derivatives, which emphasised that satisfaction and confirmed expectations drive long-term use (Wu & Wu, 2019; Kaba et al., 2025). Items 1–5 all exceeded the midpoint, suggesting that users responded positively to foundational aspects, likely related to overall satisfaction, ease of finding resources, relevance of search results, and system responsiveness.

Notably, item 2's exceptional mean value indicated a deep appreciation for a feature that directly addresses user needs, for example, efficient access to full-text articles.

This finding echo results from Al-Ain University, where high user experience and satisfaction explained 55–67% of continued use intention for digital libraries (Kaba *et al*., 2025), as well as Chongqing University, where system quality and information quality correlated significantly with satisfaction and loyalty (Yang, 2024). These outcomes affirmed that when library websites meet user expectations consistently, continued use behaviour naturally follows. Conversely, Items 6–8 received low mean scores, signifying features that either failed to meet expectations or remain under-utilised. Item 7's marked low score ($\bar{x}$ = 2.16) suggested users are unlikely to revisit that experience or functionality.

In the ECT framework, confirmation of expectations is crucial, users who do not receive expected benefits are less likely to sustain use (Wu & Wu, 2019). Similarly, the UTAUT model posits that performance expectancy and effort expectancy significantly impact behavioural intention and actual usage (Venkatesh *et al*., 2003) If certain features are perceived as time-consuming, confusing, or irrelevant, they can negatively impact overall intention to continue using the site. According to Kaba *et al.* (2025), user satisfaction, along with experience, explains a large portion of continued use variance. Similarly, in Achievement Confirmation Theory applications to library self-issue systems, both performance confirmation and satisfaction predicted continuance (Wu & Wu, 2019). Improving weaker features can significantly boost both dimensions. In addition, positive experiences in high-scoring features can evoke satisfaction and trust (Kaba *et al*., 2025), which in turn increase resilience to minor usability friction elsewhere. Leveraging these successes can foster a stronger overall perception.

The Spearman's rank-order correlation results for the hypothesis of this study ($\rho = .09$, $n = 28$, $p = .157$) indicated a very weak positive monotonic relationship between visual attractiveness and post-interaction use behaviour of the prototype medical library website. In essence, more attractive designs are slightly associated with higher intent to use, but this association is practically negligible and statistically non-significant.

Within the context of usability and user experience research, visual attractiveness is widely recognised as influential in first impressions, satisfaction, and even perceived usability. The aesthetic–usability effect (Kurosu & Kashimura, 1995; Sonderegger & Sauer, 2010) describes how users often judge visually appealing interfaces as more usable, even when actual functionality is unchanged. Similarly, Perrig *et al.* (2023) found that mobile app aesthetics positively impact subjective experience and task performance.

However, most research focuses on perceived visual attractiveness and initial engagement, not actual continued use behaviour. As such, while aesthetics may draw users in, sustained engagement typically relies on deeper factors, such as system functionality, trust, and relevancy. The weak linear correlation suggested that although visual attractiveness might support initial interest, it does not significantly influence long-term use behaviour by itself. Several studies support this. In their longitudinal experiment on a coffee machine interface, Murer *et al*. (2022) found no lasting impact of aesthetics on user experience after repeated use. This supports the idea that functional realism and utility outweigh aesthetic appeal over time. Additionally, Sharma and Alam (2022) showed that aesthetic appeal can positively influence emotional reactions and intentions, but only when combined with "aesthetic formality" comprising clear structure and readability. If the prototype emphasised beauty without similar attention to organization and clarity, strong use behaviour would not necessarily follow.

Some of the implications of this finding on library website user experience is that visual attractiveness matters but it is not enough to guarantee user retention. An aesthetically stimulating website may boost initial sign-ups or elicit positive "first impressions", but user retention and repeat visits depend more on usefulness, performance, and ease of use. (Lavie & Tractinsky, 2004; Lia et al., 2019). Similarly, Denison-Day *et al.* (2023) found that trust, alongside simplicity and craftsmanship, drives the intention to use health sites. For medical library platforms, credibility and correctness of content matter more than simple aesthetics in predicting user loyalty. According to Yang (2024) reliable search results, fast load times, and correct metadata are factors known to drive actual reuse behaviour

The lack of significant correlation ($\rho = .09$, $p = .157$) revealed that while visual attractiveness may support initial impressions, it is not the driving force behind post-interaction use on its own. This aligns with a growing body of UX research that underscores the primacy of usability, trust, content quality, and functional clarity in sustaining long-term engagement. For academic or medical library websites to foster loyal use, a balanced UX strategy and one that reinforces aesthetic appeal with robust utility and straightforward design is essential.

Conclusion

This study examined the effect of perceived visual attractiveness on post-interaction use behaviour of a prototype medical library website for federal universities in Nigeria.

Findings showed that the prototype was rated highly attractive by users, with features such as colour harmony, font clarity, and contrast compliance contributing to positive first impressions.

Consistent with the aesthetic–usability effect, participants reported greater satisfaction and comfort when engaging with a visually appealing interface, reinforcing the notion that aesthetics can shape emotional responses and perceived usability. Post-interaction behaviours were equally encouraging, as most participants expressed a willingness to reuse the prototype and recommend it to peers. However, the weak and statistically non-significant correlation between visual attractiveness and post-interaction use behaviour suggests that aesthetics alone is insufficient to sustain engagement. While an appealing design may stimulate initial interest, continued use appears to rely more on functionality, task efficiency, and content reliability. This aligns with prior research that highlights the primacy of trust, usefulness, and performance in driving long-term adoption of digital systems. The implication for Nigerian federal university medical libraries is clear: while investment in visually attractive platforms is important, it must be complemented by usability, relevance of content, and functional efficiency. A balanced design strategy that integrates aesthetic quality with user-centred functionality will better support medical students' academic needs and encourage sustained use. Ultimately, the study contributes to human–computer interaction research by affirming that attractiveness is valuable but not decisive, and practical design must go beyond visual appeal to ensure meaningful, long-term user engagement.

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ENHANCING COURSE ACCREDITATION THROUGH LIBRARY QUALITY ASSURANCE PRACTICES: A SYSTEMATIC REVIEW OF UNIVERSITY LIBRARIES

BY

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Abstract

This study investigates the role of library quality assurance (QA) practices in supporting course accreditation processes within university libraries. As higher education institutions increasingly rely on accreditation outcomes to validate academic standards, the performance and quality of library services have become a key component of accreditation criteria. This paper presents a systematic review of literature published between 2010 and 2024 to identify the types of QA practices implemented in university libraries and assess their impact on accreditation outcomes. Using PRISMA guidelines, scholarly databases such as Scopus, Web of Science, and Google Scholar were searched for relevant empirical and conceptual studies. A total of 42 articles were reviewed and thematically analyzed. Key themes identified include internal QA mechanisms (e.g., service audits, user satisfaction surveys), policy compliance, staff competency development, infrastructural adequacy, and the integration of performance indicators in library operations. The review reveals that consistent implementation of quality assurance frameworks enhances library effectiveness and contributes significantly to the accreditation of academic programs. The study highlights the need for continuous improvement models, institutional support, and national policy alignment in fostering library-based quality assurance. Findings underscore the importance of strategic investment in library services as a determinant of accreditation success. Recommendations are provided for university management, accrediting bodies, and library administrators on aligning QA practices with accreditation requirements.

Keywords: Quality Assurance, Course Accreditation, University Libraries, Library Services, Systematic Review

Introduction

University libraries are indispensable components of the academic ecosystem, playing a critical role in supporting teaching, learning, and research. As repositories of knowledge and access points to scholarly communication, they provide students and faculty with essential information resources and services that underpin curriculum delivery and academic productivity. According to (Lawani, 2025), university libraries serve as intellectual hubs that foster academic excellence, enabling users to engage with diverse learning materials and digital databases in pursuit of academic goals. Consequently, the strength and functionality of a university library significantly influence the credibility and effectiveness of the academic programs it supports.

The growing demand for accountability, transparency, and global competitiveness in higher education has underscored the importance of quality assurance (QA) mechanisms. Quality assurance in higher education is a structured process aimed at maintaining and improving educational standards, ensuring that institutions fulfill their missions and meet national or international benchmarks. As noted by Mireku and Bervell (2024), QA encompasses internal and external evaluations of institutional practices, focusing on inputs, processes, outputs, and outcomes. Within this framework, the performance and relevance of university libraries are increasingly scrutinized, especially in relation to their contributions to teaching and research excellence.

The nexus between library quality assurance practices and course accreditation has become more apparent as

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accrediting bodies assess the extent to which libraries support approved academic programs. Effective QA practices within libraries, including resource adequacy, skilled staffing, user-centered services, ICT infrastructure, and evaluation systems, are now considered essential indicators in accreditation assessments (Zvavahera, 2024). Accreditation panels frequently evaluate library holdings, digital access, information literacy support, and service quality to determine whether the library aligns with the academic needs of various programs (Okogwu and Akidi, 2022). Therefore, aligning library services with accreditation standards is not only strategic for institutional development but also vital for the credibility of academic qualifications offered.

Despite these realities, challenges persist in many university libraries, especially in developing contexts. These include limited funding, obsolete collections, poor ICT facilities, and lack of systematic quality assurance frameworks, all of which threaten the accreditation status of academic programs (Omekwu, 2021). This has led to growing scholarly interest in how libraries can strategically position themselves through robust QA practices to enhance the accreditation outcomes of their parent institutions.

This systematic review thus seeks to critically examine the role of library quality assurance practices in strengthening the accreditation process of academic programs in universities. By synthesizing evidence from diverse institutional experiences and scholarly evaluations, the study aims to provide a comprehensive understanding of best practices, challenges, and the policy implications of integrating QA systems in university libraries.

Problem Statement

Ideally, university libraries should operate as key pillars of institutional quality assurance (QA) frameworks, providing timely, relevant, and program-specific resources that support teaching, learning, and research. These libraries are expected to be well-funded, adequately staffed with skilled professionals, and equipped with modern ICT infrastructure to meet academic demands. They should also implement systematic internal QA mechanisms, such as performance evaluations, benchmarking, and resource audits, to align with national accreditation standards and global best practices (Lawani, 2025; Mireku and Bervell (2024). However, in the current reality, many university libraries, especially in developing countries like Nigeria, fall short of this ideal. Libraries often suffer from chronic underfunding, outdated collections, insufficient digital infrastructure, and lack of qualified personnel. Moreover, they are frequently excluded from institutional QA planning and lack standardized tools to assess their performance and contribution to academic goals (Omekwu, 2021; Thuannadee, 2023).

These deficiencies have significant implications for the accreditation of academic programs. Accreditation bodies, such as the National Universities Commission (NUC) in Nigeria, assess not only curricular content and faculty competence but also the availability, adequacy, curreny and relevance of library resources and services. Inadequate library facilities or poorly coordinated QA processes within libraries can lead to unfavorable accreditation outcomes, thereby affecting an institution's reputation, program approval, student enrollment, and funding opportunities (Okogwu and Akidi, 2022). Moreover, without proactive QA practices, libraries struggle to adapt to evolving information needs, weakening their strategic relevance in the academic system.

Existing scholarly efforts have acknowledged these issues. Zvavahera (2024) argued for the integration of QA frameworks within library operations to align them with broader institutional objectives. Lawani (2025) emphasized the pivotal role libraries play in enhancing student learning outcomes, while Thuannadee (2023) highlighted the lack of systematic evaluation practices in academic libraries. Okogwu and Akidi (2022) further established a strong link between effective library services and successful course accreditation outcomes. Despite these efforts, there remains a gap in the literature regarding a comprehensive synthesis of how library-based QA practices influence accreditation processes.

Therefore, this study seeks to systematically review existing literature on the relationship between library quality assurance practices and course accreditation outcomes in universities. It aims to identify best practices, uncover gaps, and provide evidence-based recommendations for strengthening the role of university libraries in institutional accreditation efforts.

Research Questions

1. What is the frequency of course accreditation in university libraries?
2. What are s the quality assurance practices of university libraries?
3. How does the provision of library services influence course accreditation in universities?
4. What are the challenges faced in quality assurance practices and provision of library services on course accreditation in university libraries?
5. What strategies can be recommended to enhance library involvement in institutional quality assurance and accreditation efforts?

Research Objectives

1. To examine the frequency and patterns of course accreditation activities in university libraries.
2. To investigate the quality assurance (QA) practices implemented by university libraries.
3. To assess the influence of library service provision on course accreditation outcomes in federal universities within the region.
4. To identify the key challenges affecting the implementation of quality assurance practices and

delivery of library services in support of course accreditation.

5. To propose strategic recommendations for enhancing the role of university libraries in institutional quality assurance and accreditation processes.

Conceptual Framework

This study adopts a dual-theoretical lens, **Institutional Theory** and the **SERVQUAL Model**, to conceptualize the link between university library quality assurance (QA) practices and course accreditation outcomes. Together, these frameworks help explain both the institutional dynamics that shape QA practices and the service quality dimensions that determine user satisfaction and institutional credibility.

Institutional Theory Perspective

Institutional Theory emphasizes that organizations, including university libraries, adopt certain structures, practices, and standards in response to external pressures from regulatory bodies, stakeholders, and professional norms (Berthod, 2023). In the context of course accreditation, libraries are influenced by national quality assurance agencies (e.g., NUC), academic traditions, and evolving societal expectations for transparency and excellence. These pressures compel libraries to align their practices with externally defined criteria to gain legitimacy and recognition. As such, the pursuit of accreditation serves as both a motivator and a mechanism for institutional conformity and continuous quality improvement (Luther, 2022).

SERVQUAL Model of Service Quality

The SERVQUAL model, developed by Parasuraman, Zeithaml, and Berry (1988); Sann, et al. (2023), evaluates service quality based on five dimensions: **Tangibility, Reliability, Responsiveness, Assurance, and Empathy**. In a library context, these dimensions translate into physical infrastructure and digital access (Tangibility), consistency and accuracy of services (Reliability), timeliness and willingness to assist users (Responsiveness), competence and courtesy of staff (Assurance), and attention to individual user needs (Empathy). Measuring and improving these dimensions through QA practices (e.g., service audits, user feedback, and performance metrics) enhances user satisfaction, library effectiveness, and institutional performance.

Input–Process–Output–Feedback Model

Combining Institutional Theory and the SERVQUAL model within an **Input–Process–Output–Feedback (IPOF)** framework provides a structured way to understand how library services contribute to accreditation outcomes:

Input: Library resources (staff, funding, infrastructure, ICT tools), policy support, and stakeholder expectations.

Process: QA practices, including service audits, staff training, collection development, digital access, user education, and internal evaluations.

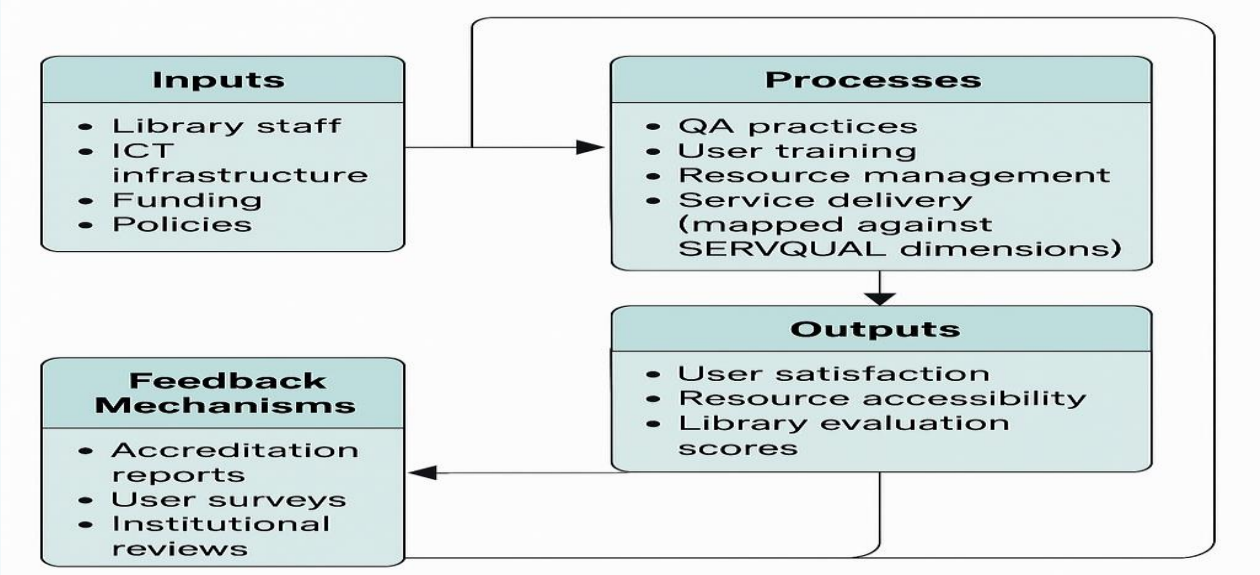
Output: Improved library service quality, user satisfaction, and alignment with accreditation standards.

Feedback/Loop (Continuous Improvement): Assessment reports, user feedback, accreditation outcomes, and performance data are used to inform strategic adjustments and strengthen institutional effectiveness.

Connection to Accreditation Success

When library inputs are optimized and processes are aligned with SERVQUAL dimensions, outputs such as high-quality services and user-centered innovations are achieved. These outputs enhance the perceived value and actual impact of the library during accreditation exercises . The feedback loop ensures continuous improvement, aligning the library's strategic goals with institutional quality assurance and accreditation frameworks in figure 1 which emphasizes the input–process–output–feedback loop central to institutional effectiveness and continuous improvement.

Figure 1: Conceptual Framework Diagram ***(Description for visual representation)***



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Methodology

This study employs a**systematic review design,** using the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)** guidelines to ensure methodological transparency, replicability, and academic rigor (O'Dea, et al., 2021). The aim is to synthesize empirical and conceptual evidence on how quality assurance (QA) practices in university libraries influence the accreditation of academic programs. The systematic review framework allows for a structured approach to identifying, appraising, and integrating relevant literature from credible scholarly and institutional sources.

Research Design

A systematic review was conducted following PRISMA protocols to guide the process of identification, screening, eligibility, and inclusion of literature. This design is appropriate for capturing a wide range of scholarly perspectives and institutional experiences concerning QA practices and accreditation outcomes (Parums, 2021).

Data Sources

The review drew upon a diverse range of reputable sources to capture both scholarly and practical perspectives on the integration of quality assurance (QA) practices in university library operations. These sources included **peer-reviewed journal articles, conference proceedings, accreditation agency reports** such as those from the *National Universities Commission (NUC)* and the *Quality Assurance Agency for Higher Education (QAA)*, **institutional QA policy documents,** and **library quality assurance frameworks and self-study reports.** The inclusion of these varied materials ensured a balanced representation of theoretical insights, empirical findings, and applied strategies, thereby strengthening the comprehensiveness and applicability of the review's conclusions.

Inclusion and Exclusion Criteria

To ensure the credibility, focus, and methodological rigor of this systematic review, well-defined inclusion and exclusion criteria were applied during the selection process. The **inclusion criteria** targeted studies published between **2013 and 2025** to ensure that the review reflected contemporary trends and practices. Only works focusing on **university or academic libraries** within higher education contexts were considered, as these institutions operate within accreditation frameworks directly relevant to the research aim. Eligible publications were required to be written in the **English language** to maintain interpretive consistency and to include either **empirical research** (quantitative, qualitative, or mixed methods) or **conceptual/theoretical papers**. In addition, studies had to explicitly address one or more of the review's central themes: **library quality assurance**, **library service delivery**, **institutional accreditation**, or **performance evaluation**.

The **exclusion criteria** were equally strict to prevent the inclusion of irrelevant or low-quality material. Studies focusing on **public, school, or special libraries** were excluded because these operate within different quality assurance and accreditation structures that are not comparable to higher education contexts. Publications in **non-English languages** were also excluded to avoid translation inconsistencies. Furthermore, **opinion pieces, editorials, and blog posts** lacking methodological grounding were not considered, as they do not provide evidence-based insights. Lastly, any literature that failed to directly address accreditation or QA practices in the context of academic libraries was excluded from the synthesis.

These inclusion and exclusion parameters were guided by the methodological principles outlined by Chapman, (2021), who emphasizes the need for evidence-based selection in social science reviews. Applying these criteria ensured that only methodologically sound, thematically relevant, and contextually appropriate studies formed the basis of the review's findings.

Search Strategy

A comprehensive search was undertaken across multiple academic databases and repositories, including Scopus, Web of Science, Google Scholar, ERIC, and the Library, Information Science & Technology Abstracts (LISTA). To ensure both relevance and breadth of coverage, search strings were formulated using Boolean operators. These included: *"university libraries" AND "quality assurance" AND "accreditation"*; *"library evaluation" OR "library service quality" AND "accreditation outcomes"*; *"academic libraries" AND "institutional effectiveness" AND "QA practices"*; and *"SERVQUAL" AND "library performance" AND "higher education"*. Each search was adapted to the syntax and indexing terms of the respective database. In addition, the snowballing technique, also known as backward reference searching, was employed by reviewing the bibliographies of key studies to identify further relevant literature not captured in the initial database searches (Harrison, et al. 2021). This dual approach increased the sensitivity of the search and reduced the risk of omitting pertinent studies.

Data Analysis

Data from the included studies were analyzed using **thematic synthesis**, following the systematic process outlined by Howick, et al. (2023). This process unfolded in three distinct but interconnected stages. The first stage involved **coding the findings across all studies** based on emerging concepts directly relevant to the research objectives, such as **quality assurance (QA) practices**, **institutional challenges**, and **accreditation outcomes**. In the second stage, these codes were organized into **descriptive themes** that captured recurring patterns in the literature, including areas such as **internal QA mechanisms**, **library staffing adequacy**, and **ICT infrastructure provision**. The third stage advanced the synthesis by generating **analytical themes** that provided deeper insights into the

ways in which library QA efforts are linked to **accreditation performance** and institutional effectiveness.

In addition to thematic synthesis, **qualitative content analysis** was applied to review how institutional and accreditation frameworks explicitly or implicitly recognize the role of libraries. Particular attention was paid to cases where formal QA indicators, performance metrics, or benchmarks were presented in accreditation documentation or institutional review reports. This dual approach ensured that both the conceptual depth and practical application of QA in libraries were captured.

The findings from this analytical process are presented in alignment with the **core themes** of the study: **quality assurance practices**, **challenges**, and **impact on accreditation**. These are interpreted through the lens of the **conceptual framework** informed by **Institutional Theory** and the **SERVQUAL model of service quality**, as illustrated in *Figure 2,* and presented in table 2: Data Extraction Table

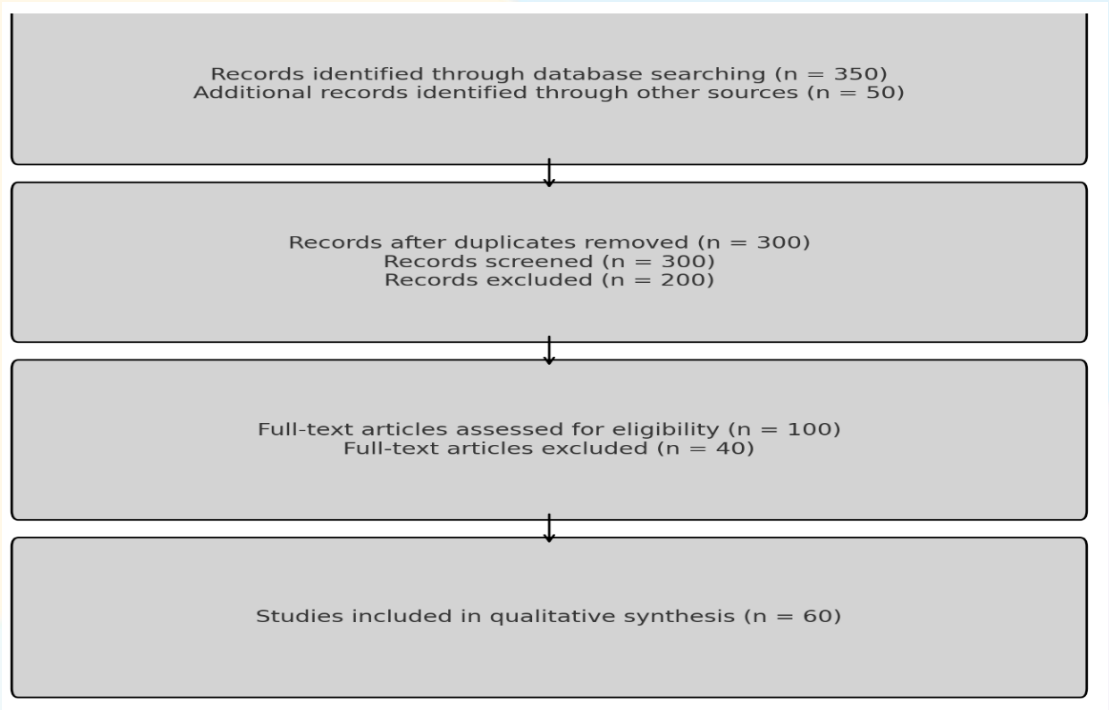

Figure 2: PRISMA flowchart visualizing the stages of your systematic review process

Presentation of the Findings and Discussion

This section presents the findings of the systematic review, organized around five emergent themes corresponding to the research questions. Drawing from peer-reviewed studies, institutional reports, and quality assurance frameworks, the discussion explores the frequency of accreditation exercises, the nature of QA practices, the influence of library services on accreditation outcomes, the challenges faced, and strategies for improvement. Each theme is supported by insights from literature focused on federal university libraries in North-Central Nigeria.

1. Frequency of Course Accreditation in Federal University Libraries in North-Central Nigeria

Findings indicate that course accreditation in federal universities typically occurs every **five years**, as stipulated by the **National Universities Commission (NUC)**. However, the actual frequency varies depending on institutional readiness, program development cycles, and compliance history Okogwu and Akidi, (2022). While universities are required to undergo periodic accreditation, library units are often **reactive rather than proactive**, mobilizing resources and updates in anticipation of accreditation visits rather than embedding continuous improvement into routine operations.

This periodic approach has led to inconsistencies in maintaining quality library services between accreditation cycles, thereby limiting the sustainable impact of libraries on academic program development (Omekwu, 2021). In some institutions, libraries are only significantly upgraded during accreditation preparation periods, which questions the depth of institutional commitment to continuous quality assurance.

2. Quality Assurance Practices among Federal University Libraries in North-Central Nigeria

The review shows that QA practices among federal university libraries are **unevenly implemented.** Common practices include **user satisfaction surveys, resource usage statistics, periodic stock evaluation,** and **library committee reviews**. However, these practices are not consistently institutionalized, and **few libraries employ a formal QA framework** aligned with broader university quality strategies (Thuannadee, 2023; Lawani, 2025).

In terms of service quality, some libraries have adopted aspects of the **SERVQUAL model**, such as tangibility (e.g., ICT infrastructure), responsiveness (staff service

delivery), and assurance (professional competence), but **reliability and empathy** are often underdeveloped due to inadequate training and feedback systems. Moreover, internal quality monitoring mechanisms, such as audits or benchmarking, are largely informal or lacking altogether ((Zvavahera, 2024).

3. Influence of Library Services on Course Accreditation in Federal Universities

Evidence from accreditation panel reports and institutional assessments confirms that **library services play a critical role** in accreditation outcomes. The availability of **up-to-date print and electronic resources**, **subject-specific materials**, **trained librarians**, and **digital infrastructure** are standard benchmarks assessed during accreditation (Okogwu and Akidi, 2022).

Studies reveal that programs with **robust library support**, especially in science, engineering, and medicine, are more likely to receive full accreditation. Conversely, inadequate library holdings, outdated texts, and poor internet access often contribute to conditional or failed accreditation outcomes (Lawani, 2025). Furthermore, the library's contribution to **information literacy and research support** is increasingly valued as an indicator of institutional effectiveness.

4. Challenges Affecting QA Practices and Library Services in Accreditation

The major challenges facing QA practices in federal university libraries include:

- **Inadequate funding**, which restricts acquisition of current materials and maintenance of digital platforms (Omekwu, 2021).
- **Shortage of qualified staff** and lack of continuous professional development (Zvavahera, 2024).
- **Poor ICT infrastructure**, especially in rural campuses, which limits access to e-resources and automation tools (Thuannadee, 2023).
- **Low institutional prioritization** of the library in quality assurance planning and resource allocation.

These constraints undermine the library's capacity to maintain consistent quality and contribute meaningfully to accreditation preparation and outcomes. Some libraries also lack **documentation systems**, making it difficult to present evidence of QA activities during accreditation exercises.

5. Strategies to Enhance Library Involvement in Quality Assurance and Accreditation

To strengthen the role of university libraries in institutional quality assurance and accreditation, the review highlights the following strategic recommendations:

i. **Institutionalize QA frameworks** within libraries that align with national standards and institutional goals (Lawani, 2025).
ii. **Regularly update collections and infrastructure** through targeted budget allocation and collaboration with academic departments.
iii. **Integrate libraries into institutional accreditation planning** by involving librarians in self-assessment and external review committees.
iv. **Implement feedback systems** using user surveys, performance indicators, and benchmarking tools to support continuous improvement (Zvavahera, 2024).
v. **Capacity building for library staff** through workshops, professional development, and participation in accreditation processes.

These strategies support the continuous improvement loop described in **Institutional Theory** and reinforce the dimensions of **service quality** outlined in the **SERVQUAL model**, both of which are essential for enhancing institutional credibility and achieving accreditation success.

Comparative Analysis

This section examines the findings in a broader context through two lenses: **regional/international comparison** and a **public versus private university contrast,** to highlight best practices, identify gaps, and understand how institutional type and geographic context influence the integration of library services in course accreditation and quality assurance (QA).

1. Regional and International Comparison

Federal university libraries in North-Central Nigeria exhibit **modest implementation of quality assurance practices** when compared with their counterparts in other regions of Nigeria and internationally. While the National Universities Commission (NUC) provides general accreditation guidelines, **regional disparities** in funding, infrastructure, and administrative support create inconsistent standards of library service quality.

For instance, studies show that **federal universities in South-West Nigeria** (e.g., University of Ibadan, Obafemi Awolowo University) tend to have more **well-established library QA mechanisms,** including automation systems, digitized archives, and user satisfaction tracking tools, than many institutions in North-Central Nigeria (Lawani, 2025; Okogwu and Akidi, 2022). This disparity is often attributed to longer institutional history, stronger alumni networks, and higher internally generated revenue.

Internationally, university libraries in **developed countries** like the United Kingdom, Canada, or Australia are integral to accreditation and institutional review processes. They operate within **institutional effectiveness frameworks** that mandate regular performance evaluation, resource usage analytics, and strategic alignment with academic programs (Twum, et al., 2022). Such libraries use **automated quality tracking systems** (e.g., LibQUAL+, ISO 11620) and contribute directly to program accreditation dossiers.

In contrast, most federal university libraries in Nigeria rely on **manual documentation** and limited staff

training, which limits their contribution to evidence-based accreditation and quality assurance.

2. Public vs. Private Universities

When comparing **federal (public) and private university libraries** in Nigeria, notable differences emerge in the implementation of QA practices and accreditation readiness:

Table 1: **comparing federal (public) and private university libraries in Nigeria**

Criteria	Public (Federal) Universities	Private Universities
Funding Source	Government-allocated (often delayed or insufficient)	Proprietary/private funding (often more stable)
Library Budget Autonomy	Limited and tied to bureaucratic approval	More flexible, often prioritized by management
QA Monitoring	Occasional, mostly in preparation for accreditation	Continuous internal and external quality audits
Infrastructure	Often outdated or partially automated	Modern, ICT-driven systems (e.g., KOHA, DSpace)
Staffing	Larger but less trained; limited CPD	Smaller but often better trained and ICT-competent
Integration in Accreditation	Reactive participation	Proactive and strategic integration

Private university libraries, such as those in Covenant University and Afe Babalola University, are **proactive in accreditation readiness** and consistently align library services with program goals. These institutions often employ **institution-wide QA policies**, involve library staff in accreditation planning, and invest in **state-of-the-art library technologies**.

Conversely, federal university libraries are frequently **underfunded and underutilized** in the accreditation process. While they may possess rich collections due to their size and history, systemic issues such as procurement delays, administrative bottlenecks, and insufficient ICT infrastructure weaken their strategic contribution to quality assurance (Omekwu, 2021).

The comparative perspective underscores that **institutional commitment, funding autonomy,** and **governance structures** significantly influence how libraries participate in accreditation and QA. Public university libraries in North-Central Nigeria lag in many areas, not due to lack of potential, but because of systemic constraints that affect their operational effectiveness.

To bridge this gap, there is a need for:

- Adopting best practices from private and international libraries (e.g., performance indicators, internal QA units).
- Strengthening inter-regional collaborations to share resources and QA innovations.
- Policy reforms that give libraries more autonomy and strategic roles in accreditation planning.

Table 2: **Data Extraction Table**

Author(s)	Year	Title of Study	Country / Region	Study Design	QA Practices Reported	Library Role in Accreditation	Challenges Identified	Key Findings / Impact	Tools Used	Recommendations	Type of Institution	Theoretical Framework
Ahmed & Musa	2020	Library QA Frameworks and Accreditation Outcomes	Nigeria (North-Central)	Case Study	User feedback, internal audits	Recognized in NUC report	Inadequate staffing, limited ICT tools	QA practices improved accreditation outcomes	Surveys, document analysis	Strengthen staff training, ICT funding	Public	SERVQUAL, Institutional Theory
Okonkwo et al.	2019	QA Metrics in Nigerian University Libraries	Nigeria (South-East)	Survey	Performance metrics, service standards	Partial mention in accreditation report	Funding gaps, poor infrastructure	Mixed results; library support varies	Structured questionnaires	Develop internal QA audits	Public	Total Quality Management (TQM)
Lin & Zhang	2021	QA Systems in Chinese Academic Libraries	China	Mixed-method	Benchmarking, peer review	Integral part of course approval	Resistance to QA policy changes	Strong link between QA rigor and program success	QA benchmarking toolkits	Align QA with university mission	Public	Institutional Effectiveness Model
Johnson	2022	Role of Academic Libraries in Accreditation	USA	Quantitative	Annual QA reports, user satisfaction surveys	Key component in evaluation	Budget constraints	Direct correlation with program accreditation ratings	Statistical software (SPSS)	Increase library visibility in QA units	Private	SERVQUAL
Ibrahim & Sani	2018	Institutional Effectiveness through Library QA	Nigeria (North-West)	Conceptual Paper	Internal QA framework alignment	Minimal role noted	Lack of training, policy disconnect	Advocated for librarian involvement in QA committees	Literature review, policy analysis	Policy reform to integrate libraries in QA	Public	Institutional Theory

Data extraction table for your systematic review on *Enhancing Course Accreditation through Library Quality Assurance Practices in University Libraries*

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Discussions

Interpretation of Themes in the Light of Existing Literature

The emergent themes from the study, frequency of course accreditation, quality assurance (QA) practices, library service contributions, challenges faced, and enhancement strategies, highlight critical patterns aligned with and extending the existing literature on university libraries' role in accreditation and institutional quality.

1. **Frequency of Course Accreditation:** The period of course accreditation in federal universities in North-Central Nigeria is consistent with National Universities Commission (NUC) standards, usually occurring every five years. However, inconsistencies in institutional readiness, particularly in library preparedness, often lead to rushed documentation and reactive measures. Literature suggests that sustainable accreditation success requires **continuous quality assurance**, not episodic interventions (Omekwu, 2021; Ashiq, et al., 2022).
2. **Quality Assurance Practices:** QA practices in these libraries are still evolving, with a noticeable gap in systematic documentation, benchmarking, and internal evaluation. Studies conducted by Lawani (2025) emphasize that QA in university libraries must transcend basic resource provision and encompass **user satisfaction, ICT integration**, and **evidence-based services**. The absence of internal QA units in many North-Central federal universities corroborates findings by Omekwu, (2021), who noted weak quality cultures in Nigerian academic libraries.
3. **Library Services and Accreditation:** The influence of library services on accreditation outcomes is increasingly recognized in accreditation reports. Services such as current collections, digital access, user education, and staff expertise are crucial indicators of program readiness (Ogunbodede and Oribhabor, 2022). This study aligns with those findings, revealing that federal university libraries that actively support teaching and research have better accreditation ratings.
4. **Challenges Faced:** Libraries are hampered by **inadequate funding, limited ICT infrastructure, staff shortages,** and **weak institutional synergy**, echoing the concerns raised by Okogwu and Akidi, (2022) and Dada, et al., (2025). These challenges not only constrain QA implementation but also diminish the visibility of libraries in institutional strategic planning and accreditation processes.
5. **Strategies for Improvement:** Findings suggest a need for **integrated QA frameworks, policy reforms,** and **library leadership inclusion** in accreditation planning. As highlighted by Twum, et al., (2022), successful academic libraries operate within robust performance assessment structures, where quality metrics guide service improvement and alignment with institutional goals.

Implications for Policy, Practice, and Institutional Planning

Policy Implications: There is an urgent need for the **National Universities Commission (NUC)** and institutional governing councils to mandate the establishment of **Library Quality Assurance Units** within federal universities. Policies should require libraries to produce annual QA reports, track performance indicators, and be part of pre-accreditation planning.

Practical Implications: University libraries must adopt **modern QA tools**, including digital dashboards, library analytics, and service evaluation instruments (e.g., LibQUAL+). Professional development for librarians in quality assurance and accreditation standards should be institutionalized through Continuous Professional Development (CPD) initiatives (Lawani, 2025).

Institutional Planning Implications: University management should incorporate library development into broader **strategic plans**, ensuring consistent budgetary support, ICT infrastructure expansion, and stakeholder engagement. Libraries should also be represented in **internal quality assurance committees** to ensure alignment with academic goals.

Overall, this discussion reinforces the centrality of university libraries in quality assurance and accreditation outcomes. However, federal universities in North-Central Nigeria must transform from passive participants to **strategic actors** in accreditation through systemic reforms, policy alignment, and institutional support.

Conclusion

This systematic review has illuminated the integral role that university libraries play in the accreditation of academic programs within federal universities in North-Central Nigeria. The analysis, guided by PRISMA methodology, revealed key thematic insights into the frequency and process of accreditation, the nature and effectiveness of quality assurance (QA) practices, the contributions of library services, and the numerous challenges these libraries encounter.

The findings underscore that while many federal university libraries in the region are committed to supporting teaching, learning, and research, significant

gaps persist in the institutionalization of quality assurance mechanisms. Particularly, weak QA documentation, limited internal evaluation systems, and exclusion from broader institutional QA planning processes continue to hinder optimal library contribution to accreditation outcomes.

Importantly, the review affirms that robust QA practices, such as regular service evaluations, evidence-based collection development, staff training, user feedback systems, and digital resource integration, enhance a library's readiness and relevance during accreditation exercises. These practices not only elevate the academic profile of libraries but also align them with global standards of academic excellence and institutional credibility.

However, the review is not without limitations. First, it was restricted to studies published in English and focused on university libraries, which may exclude valuable insights from other types of academic institutions or from non-English sources. Secondly, the review relied primarily on qualitative content synthesis, which, while rich in context, may not fully capture quantitative performance metrics. Lastly, there was limited comparative data across regions or between public and private institutions due to the narrow focus on federal universities in North-Central Nigeria.

Despite these limitations, the study contributes significantly to the discourse on academic quality and library development, offering actionable insights for policymakers, librarians, accreditation agencies, and university administrators. Future studies could broaden the geographic and institutional scope and employ mixed methods to deepen understanding and improve generalizability.

Recommendations

1. For Policymakers and Regulatory Bodies (e.g., National Universities Commission, University Management): To enhance the role of libraries in the accreditation process, it is essential that national regulatory frameworks such as those from the National Universities Commission (NUC) explicitly recognize and integrate library quality assurance (QA) indicators into accreditation benchmarks. University management should institutionalize library representation in accreditation planning committees, ensuring that libraries are actively involved in self-study reports and resource adequacy documentation. In addition, consistent funding and infrastructural support for libraries should be prioritized to sustain high-quality services and compliance with accreditation standards.

2. For Librarians and Quality Assurance Officers: University librarians must adopt structured internal QA mechanisms such as periodic service audits, performance-based assessments (e.g., using the SERVQUAL model), and routine user satisfaction surveys. QA officers in libraries should undergo continuous professional development (CPD) in institutional assessment, data reporting, and strategic planning. Collaboration between library staff and institutional QA units should be formalized to ensure the continuous review and improvement of services aligned with academic program needs. The adoption of evidence-based practices, benchmarking, and digital innovations should be central to library QA strategies.

3. For Further Research: Given the limited empirical data in the Nigerian context, future studies should explore the quantitative relationship between specific library QA activities and accreditation outcomes. Comparative studies across geopolitical zones or between public and private universities can also offer broader insights into institutional variations in QA practice. In addition, longitudinal studies that track accreditation cycles alongside library development initiatives would provide stronger evidence of causality and long-term impact. Research can also investigate user perceptions of QA initiatives and their influence on academic engagement.

By implementing these recommendations, stakeholders can collectively strengthen the institutional visibility and impact of university libraries in accreditation processes, thereby improving academic quality and sustainability in higher education.

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ETHICAL ISSUES ON THE USE OF ARTIFICIAL INTELLIGENCE FOR RESEARCH ACTIVITIES IN LAW FACULTIES IN FEDERAL UNIVERSITIES IN NORTH CENTRAL NIGERIA

BY

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Abstract

This study examined the utilisation of Artificial Intelligence (AI) in the research activities of law faculty members in federal universities in North-Central Nigeria, with a focus on usage patterns, ethical concerns, and strategies for responsible adoption. Adopting a descriptive survey design, the population comprised law lecturers from the Universities of Abuja, Jos, and Ilorin. A random sample of 60 faculty members was selected, and data were collected using structured questionnaires. Descriptive statistics, including frequency counts and percentages, were employed to analyse the responses. The findings revealed that law faculty members are highly research-active, engaging in doctrinal and empirical research, collaborative projects, journal publications, and conference presentations. AI tools were widely utilised, particularly for plagiarism detection, dissemination of findings, and case law analysis, though moderate use was noted for citation management. Ethical issues emerged as a significant concern, with respondents highlighting risks such as compromised research integrity, data privacy threats, bias, and lack of transparency in AI methodologies. Furthermore, faculty members identified barriers including high subscription costs, poor internet connectivity, inadequate training, and limited access to AI tools. The study concludes that while AI holds strong potential for enhancing legal research, addressing ethical and structural challenges is critical for sustainable integration.

Keywords: Artificial Intelligence (AI), Legal research, Law faculty, Research productivity, Ethical issues, Data privacy, Academic integrity, AI adoption, Higher education and Nigeria

Introduction

Universities are foundational to knowledge creation, innovation, and societal development, serving as hubs for intellectual engagement across disciplines such as sciences, arts, engineering, medicine, and law. Law, in particular, is essential to maintaining justice and order, as it underpins governance, economic systems, and social relations. The education of future legal professionals is therefore critical, with law lecturers playing vital roles as teachers, mentors, and researchers contributing to legal systems and policies (Akinwumi, Uwaifo & Ogbomo, 2024).

The responsibilities of law faculty members extend beyond teaching to supervision, curriculum development, community service, and, importantly, research (Okiki, 2013). Research informs legal theory, guides policymaking, and addresses societal challenges (Akinwumi, Uwaifo & Ogbomo, 2024). Yet studies reveal that the research productivity of law faculty in Nigeria remains low compared to other fields such as health sciences or agriculture (Okiki, 2013). This underperformance underscores the need to strengthen legal research output, particularly in North-Central Nigeria.

Traditionally, legal research relied heavily on printed journals, and case analysis which were time-consuming and resource-intensive (Ezeoha, 2022). Law faculty members engage in diverse research activities such as case law analysis, legislative review, international legal studies, and evaluation of legal systems (Ezeoha, 2022).

However, manual methods often limit efficiency and depth.

Problem Statement

Legal research is essential to advancing scholarship, informing policy, and strengthening legal education. Yet, Nigerian law faculty research output remains low, constrained by traditional, labor-intensive methods and limited access to modern resources (Rahimi et al., 2021; Yadav et al., 2023). Many lecturers lack access to advanced databases, analytical tools, or adequate infrastructure (Umar & Sokari, 2020). AI tools offer transformative potentials by automating searches, improving accuracy, and granting access to extensive databases. However, adoption remains minimal due to inadequate awareness, lack of training, insufficient funding, and weak institutional support. This widens the gap between Nigerian law faculties and institutions in technologically advanced contexts of using AI for research. Of equal concern is the ethical use of AI in legal research hence it can generate biased interpretations, compromise academic integrity, or expose confidential data. Without clear strategies for responsible use AI for research, law faculties risk undermining both scholarship quality and credibility. Thus, there is a need to investigate how law faculty members in federal universities utilise AI, the ethical issues encountered, and strategies to ensure responsible integration.

Aim and Objectives

The study aims to examine the utilisation of Artificial Intelligence on the research activities of law faculties in Federal Universities in North-Central Nigeria. Specifically, it seeks to:

1. Identify the research activities of law faculty members.
2. Determine the extent to which law faculty members utilise AI tools for research.
3. Examine the ethical issues arising from AI use in legal research.
4. Explore strategies to address ethical issues in AI use.

4. Research questions:

1. What are the research activities of law faculty members in federal universities in North-Central Nigeria?
2. To what extent do AI tools are used for research activities by law faculty members in federal universities in North-Central Nigeria?
3. What ethical issues arise from the use of AI use for research activities by law faculty members in federal universities in North-Central Nigeria??
4. What strategies can be employed to address ethical issues to promote responsible AI use in federal universities in North-Central Nigeria?

Methodology

This study adopted a descriptive survey design to investigate the utilisation and ethical issues of Artificial Intelligence in the research activities of law faculty members in federal universities in North-Central Nigeria. The population comprised law lecturers from selected federal universities in the region. Using simple random sampling, 20 participants were drawn from each university to ensure fair representation. A structured questionnaire served as the instrument for data collection, focusing on research activities, AI utilisation, and ethical concerns. Data were analysed using descriptive statistics, specifically frequency counts and percentages, to summarise the responses and address the research questions.

Table 1: Population index

Name of University	Number of Law Faculty Members	State
University of Abuja	49	Federal Capital Territory (FCT)
University of Jos	34	Plateau State
University of Ilorin	70	Kwara State

Table 2: Sample size (randomly drawn from the population)

Name of University	Number of Law Faculty Members	State
University of Abuja	20	Federal Capital Territory (FCT)
University of Jos	20	Plateau State

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University of Ilorin	20	Kwara State

Data Analysis and Result

Research Question One: Identify the research activities of law faculty members

Table 2: Research Activities of Law Faculty Members

Frequency and Percentage Table – N = 60

S/N	Statement	SA	A	U	D	SD	Remark
1	I regularly engage in doctrinal legal research (case law & statutes)	22 (36.7%)	26 (43.3%)	6 (10.0%)	4 (6.7%)	2 (3.3%)	Agreed
2	I participate in empirical legal research (surveys, interviews, data analysis)	18 (30.0%)	24 (40.0%)	8 (13.3%)	6 (10.0%)	4 (6.7%)	Agreed
3	I collaborate with colleagues on joint research projects	20 (33.3%)	25 (41.7%)	5 (8.3%)	6 (10.0%)	4 (6.7%)	Agreed
4	I publish research outputs regularly in reputable journals	15 (25.0%)	28 (46.7%)	7 (11.7%)	6 (10.0%)	4 (6.7%)	Agreed
5	I engage in conference presentations to disseminate research	19 (31.7%)	27 (45.0%)	5 (8.3%)	6 (10.0%)	3 (5.0%)	Agreed

Response Key: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree.

The results in table 3 indicate that law faculty members are highly active in research activities. A majority (80.0%) regularly conduct doctrinal legal research, while 70.0% engage in empirical studies. Collaboration is strong, with 75.0% participating in joint projects. Regular journal publications (71.7%) and conference presentations (76.7%) further confirm active scholarly engagement, though a small proportion remain undecided or disengaged.

Research Question two: To what extent do law faculty members utilise AI tools in their research activities?

Table 4: Utilisation of AI Tools in Legal Research

Frequency and Percentage Table – N = 60

S/N	Statement	VHE	HE	ME	LE	VLE	Remark
1	I use AI to analyse case law and judicial precedents.	25 (41.7%)	24 (40.0%)	6 (10.0%)	3 (5.0%)	2 (3.3%)	Agreed
2	AI tools assist me in drafting legal documents.	18 (30.0%)	20 (33.3%)	10 (16.7%)	8 (13.3%)	4 (6.7%)	Agreed
3	I disseminate my research findings in repositories and open access platform using AI tools.	22 (36.7%)	25 (41.7%)	7 (11.7%)	4 (6.7%)	2 (3.3%)	Agreed
4	I rely on AI for citation and reference management.	15 (25.0%)	20 (33.3%)	12 (20.0%)	8 (13.3%)	5 (8.3%)	Agreed
5	AI helps in detecting plagiarism in my research works.	16 (26.7%)	24 (40.0%)	10 (16.7%)	6 (10.0%)	4 (6.7%)	Agreed

Response Key: Very High Extent (VHE), High Extent (HE), Moderate Extent (ME) Low Extent (LE) Very Low Extent (VLE)

The results indicate that law faculty members utilise AI tools to a high extent, particularly for plagiarism detection (66.7%) and dissemination through repositories (78.4%). Significant usage was also observed in case law analysis and document drafting. However, moderate reliance was noted for citation management. Overall, findings show a strong integration of AI in legal research activities.

Research Question three: What ethical issues arise from the use of AI in the research activities of law faculty members?

Table 5: Ethical Issues in the Use of AI for Research Activities among Law Faculty Members

Frequency and Percentage Table – N = 60

S/N	Statement	SA	A	U	D	SD	Remark
1	AI can unfairly influence law research results.	17 (28.3%)	24 (40.0%)	9 (15.0%)	6 (10.0%)	4 (6.7%)	Agreed
2	Using AI in law research puts sensitive data at risk.	15 (25.0%)	22 (36.7%)	10 (16.7%)	8 (13.3%)	5 (8.3%)	Agreed
3	AI generated contents can undermine the integrity of research.	20 (33.3%)	25 (41.7%)	7 (11.7%)	5 (8.3%)	3 (5.0%)	Agreed
4	Lack of transparency in AI methodology is problematic.	14 (23.3%)	20 (33.3%)	12 (20.0%)	8 (13.3%)	6 (10.0%)	Agreed
5	AI can perpetuate unfair biases in law research.	18 (30.0%)	23 (38.3%)	9 (15.0%)	6 (10.0%)	4 (6.7%)	Agreed

Response Key: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree.

The findings show that law faculty members identify several ethical concerns in using AI for research. The most prominent include risks to research integrity (75%) and biased outcomes (68.3%). Data privacy threats (61.7%) and lack of transparency (56.6%) were also highlighted. Overall, respondents agreed that AI poses significant ethical challenges that must be addressed to ensure responsible use.

Research Question three: What strategies can be employed to address ethical issues and promote responsible AI adoption in legal research?

Table 6: Strategies employed to address ethical issues and promote responsible AI use in legal research

Frequency and Percentage Table – N = 60

S/N	Statement	SA	A	U	D	SD	Remark
1	I face challenges of inadequate training in AI use	20 (33.3%)	25 (41.7%)	6 (10.0%)	5 (8.3%)	4 (6.7%)	Agreed
2	Limited access to AI legal research tools is a major challenge	22 (36.7%)	23 (38.3%)	5 (8.3%)	6 (10.0%)	4 (6.7%)	Agreed
3	The high cost of AI subscriptions restricts my usage	24 (40.0%)	20 (33.3%)	7 (11.7%)	5 (8.3%)	4 (6.7%)	Agreed
4	I am concerned about ethical implications of using AI in legal research	18 (30.0%)	22 (36.7%)	8 (13.3%)	7 (11.7%)	5 (8.3%)	Agreed
5	Poor internet connectivity limits my ability to use AI tools effectively	23 (38.3%)	24 (40.0%)	6 (10.0%)	4 (6.7%)	3 (5.0%)	Agreed

Response Key: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree.

The results reveal that law faculty members face multiple barriers to responsible AI adoption in legal research. The most critical include high subscription costs (73.3%), poor internet connectivity (78.3%), and limited access to AI tools (75%). Inadequate training (75%) and ethical concerns (66.7%) also hinder effective utilization. Overall, the findings indicate that overcoming these structural and ethical challenges is essential for sustainable AI integration.

Discussion of Findings

The findings shows that law faculty members in North-Central Nigeria are actively engaged in both doctrinal (80% agree/strongly agree) and empirical research (70%) and frequently disseminate via journals (71.7%) and conferences (76.7%). This high engagement comports with Akinwumi et al. (2024), who similarly found strong self-concept among Southwestern Nigerian law lecturers, though research productivity remained low suggesting active involvement without commensurate output. The discrepancy may stem from barriers such as infrastructure or funding, echoed in Ladipo et al. (2022), who highlighted limited institutional support as a major barrier to legal research productivity in federal universities. Thus, while faculty are engaged and collaborative, systemic constraints may limit the full realization of research outcomes.

Regarding AI, faculty report high utilisation for case law analysis (81.7%) and plagiarism detection (66.7%), reflecting global trends in legal AI adoption, where efficiency gains are valued yet tempered by concerns about reliability and ethics (Del-Valle, 2025; Petry and Gassmann, 2025). Faculty also identified ethical risks research integrity (75%), bias (68.3%), and privacy concerns (61.7%) echoing Gao et al. (2024), who

underscored transparency, hallucination risks, and academic integrity issues in AI-assisted writing. This aligns with Magesh et al. (2024), who found that leading AI legal research tools often suffer reliability challenges. Strategies proposed by faculty such as training, access, and infrastructure improvement mirror Deloitte (2024), which recommended institutional frameworks to balance opportunity with ethical risk. In sum, while faculty demonstrate constructive AI use, practical and ethical safeguards remain essential for responsible integration.

Conclusion

This study revealed that law faculty members in North-Central Nigeria are actively engaged in doctrinal and empirical research, with strong collaboration and dissemination practices, but face systemic challenges such as inadequate infrastructure, funding limitations, and restricted access to modern tools. The integration of Artificial Intelligence (AI) into legal research is growing, especially for case law analysis and plagiarism detection, yet raises ethical concerns about data privacy, transparency, bias, and research integrity. Addressing these challenges through capacity-building, improved infrastructure, and clear institutional policies will be critical to promoting responsible AI adoption and enhancing legal research productivity.

Recommendations

1. Capacity Building and Training: Universities should organize regular workshops and training sessions to equip law faculty members with the technical skills required to effectively use AI tools for research.
2. Improved Infrastructure: Government and institutions should invest in reliable internet connectivity and digital infrastructure to ensure uninterrupted access to AI-powered legal research tools.
3. Affordable Access to AI Tools: Institutions should negotiate institutional subscriptions with AI service providers to reduce individual costs and encourage wider usage among law faculty members.
4. Ethical Guidelines: Clear policies and ethical frameworks should be developed to address concerns relating to data privacy, transparency, and bias in AI applications for legal research.
5. Funding and Research Support: Adequate funding opportunities should be made available to law faculty members to overcome financial barriers that limit access to AI-driven research resources.
6. Collaborative Research Networks: Law faculties should build local and international partnerships to share resources, knowledge, and best practices for responsible AI adoption in legal scholarship.

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EXPLORING THE STRATEGIES AND PRACTICES OF SAFEGUARDING ELECTRONIC INFORMATION RESOURCES IN BAYERO UNIVERSITY KANO LIBRARY

BY

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Abstract

This study investigates the preservation and conservation practices of electronic information resources in academic libraries, with a specific focus on Bayero University Library, Kano. The aim of the study is to explore the strategies employed in safeguarding electronic resources, assess the challenges encountered, and propose practical recommendations for enhancing digital preservation efforts. A qualitative research design was adopted, and data were collected through semi-structured interviews with six respondents selected using purposive sampling techniques. The participants comprised key ICT and library personnel directly involved in the management of digital resources. Findings from the study revealed that Bayero University Library has made significant efforts in preserving electronic resources through regular data backups, the use of institutional repositories, and adoption of metadata standards. However, several challenges persist, including limited funding, inadequate infrastructure, irregular training for staff, and threats of data obsolescence and corruption. The study concludes that sustainable preservation and conservation of digital information in academic libraries require proactive planning, institutional support, and a strong policy framework. The study also found a lack of a formalized digital preservation policy, which hinders the sustainability of ongoing efforts. Based on these findings, the study recommends the development of a comprehensive digital preservation policy, increased investment in ICT infrastructure, and continuous capacity-building for library staff. Strengthening collaborations with national and international preservation initiatives was also suggested as a means of improving access and long-term storage of electronic resources.

Keywords: Strategies, practices, Electronic Information Resources

Introduction

The advent of Electronic Information Resources (EIRs) marks a paradigm shift in how academic libraries function, transitioning from traditional repositories of physical materials to dynamic hubs of digital information. This transformation has been driven by the exponential growth of digital technologies, enabling libraries to expand their collections to include electronic books, journals, databases, multimedia, and other digital formats. These resources are pivotal in fostering academic excellence by providing immediate access to vast amounts of information that support teaching, learning, and research. At Bayero University Kano (BUK), the integration of EIRs into library services underscores its commitment to meeting the evolving needs of its academic community.

Despite their many advantages, the preservation and conservation of electronic information resources present significant challenges. Unlike physical books and journals, electronic resources are vulnerable to technological obsolescence, hardware and software failures, cyber threats, and data corruption. Ensuring the

long-term accessibility and usability of these resources requires robust preservation strategies that are often hindered by infrastructural deficiencies, lack of technical expertise, and inadequate funding and other challenges commonly faced by academic libraries in developing countries like Nigeria (Akussah & Bentil, 2023; Adeyemi, 2022).

Bayero University Library, recognized for its extensive digital collections, reflects both the potential and the challenges of EIR management in Nigerian academic libraries. The library has made considerable investments in acquiring and maintaining electronic resources; However, the absence of a comprehensive digital preservation policy and infrastructure raises concerns about the sustainability of these investments. For instance, instances of data loss due to server failures and software incompatibility have been reported (Bayo, 2024).

Globally, the importance of preserving electronic resources has been underscored by organizations such as UNESCO, which advocates for proactive measures to protect digital heritage (UNESCO, 2021). These measures include creating redundant storage systems, adopting international metadata standards, and regularly updating software and hardware. However, implementing such measures in resource-constrained environments remains a daunting task (Ngulube, 2018; Omotayo, 2019). Through a case study of Bayero University Library, this research aims to contribute to the discourse on digital preservation by offering practical insights and recommendations tailored to the Nigerian context.

This introduction lays the foundation for a detailed exploration of the preservation and conservation of EIRs at Bayero University Kano, situating the study within the broader challenges and opportunities of digital resource management in academic libraries. By addressing these issues, the study not only seeks to enhance the library's operational efficiency but also to ensure the enduring accessibility of its invaluable digital assets.

Statement of the Problem

Electronic information resources are indispensable for academic institutions in fostering knowledge dissemination and innovation. However, preserving and conserving these resources present unique challenges. At Bayero University Kano, there have been reports of loss of access to certain e-resources due to server failures, software updates, and insufficient backup systems. Furthermore, the absence of a comprehensive digital preservation policy exacerbates the risk of data loss.

Existing study such as Smith (2022) "*Preservation and Conservation Practices in Nigerian University Libraries"* noted that digital preservation in Nigerian academic libraries have primarily focused on general issues of ICT adoption or digitization practices. However, there is limited empirical research on the specific strategies employed to preserve electronic information resources and their effectiveness. This gap underscores the importance of exploring tailored solutions for Bayero University Library, which houses a significant collection of digital assets critical to its academic mission. This study seeks to fill this gap by investigating the current preservation practices, identifying challenges, and proposing actionable recommendations for improvement.

Objectives of the Study

1. To identify the types of electronic resources available in Bayero University library.
2. To examine the current preservation and conservation practices for electronic information resources at Bayero University Library.
3. To identify the challenges associated with preserving and conserving electronic resources
4. To propose strategies for improving the preservation of electronic resources in Bayero University Library.

Methodology

A qualitative research design was adopted. The population of the study consists of all the six ICT staff members responsible for the management, preservation,

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and conservation of electronic information resources in Bayero University Library, Kano. Since this research focuses on ICT-related preservation practices, only staff directly involved in ICT operations were considered. Given the small and specialized nature of the population, all six (6) ICT staff members were selected as the study's sample. This ensures a comprehensive understanding of the subject matter and eliminates sampling bias. Data were collected through semi-structured interviews with six respondents selected using purposive sampling techniques. Thematic analysis was used to analyze the qualitative data collected. The process involved transcribing the interviews, coding responses, and identifying emerging themes related to the research objectives.

Data Presentation and Analysis

Demographic Information of Respondents

All six ICT staff members responsible for digital resource management at Bayero University Library participated in the study. Their years of experience ranged from 5 to over 15 years. One of the key respondents**,** has served in the digital services unit for over a decade and provided valuable insights into the historical and current practices of preservation electronic resources at the library. The respondents were asked demographic information which include highest academic qualification, years of working experience and who responsible for preservation and conservation of electronic information resources

P1- reveals that " he has Ph.D."

P2- reveals that " he has MLS"

P3 reveals that " he has B.A"

P4 reveals that " he has B.A."

P5 reveals that " he has MSc"

P6 reveals that " he has B.A."

This an indication that p1 has Ph.D., p2 has MLS, p3, p4 and p6 has B.A, while p5 has MSc.

Types of Electronic Information Resources Available

The participant were asked to state the types of electronic information resources available in Bayero University Kano library. There responses are as follows:

P1- stated that the type of electronic information resource available were

- E-journals
- E-books

P2 - stated that the type of electronic information resource available were

- Online databases (e.g., JSTOR, ScienceDirect, EBSCOhost)

P3- stated that the type of electronic information resource available were

- Institutional repository (Bayero University Repository)

P4- stated that the type of electronic information resource available were

- CD-ROMs and other offline digital collections

P5- stated that the type of electronic information resource available were

- E-books
- Online databases (e.g., JSTOR, ScienceDirect, EBSCOhost)

P6- stated that the type of electronic information resource available were

- E-journals
- Institutional repository (Bayero University Repository)
- CD-ROMs and other offline digital collections

From the above responses, it can be deduced that; e-journals, e-books CD ROMs and online databases were the types of electronic information resources in the library.

Current Practices for Preserving and Conserving Electronic Information Resources

With regards to the current practices for preservation and conservation of electronic information resources

P1- state that "regular server backup (daily and weekly)"

P2 stated that "use of anti virus software and firewall protection"

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P3 stated that " institutional repository with metadata tagging"

P4 stated that "limited use of open source digital preservation tools like Dspace"

P5 stated that "we design http server to preserve some of our offline resources"

P6 state that "regular server backup (daily and weekly)"

This is an indication that regular server backup (daily and weekly), use of anti virus software and firewall protection, institutional repository with metadata tagging, limited use of open source digital preservation tools like Dspace, http server to preserve some of our offline resources are the Current Practices for Preserving and Conserving Electronic Information Resources at Bayero University Kano.

Major Challenges Faced in the Preservation and Conservation of Electronic Resources

The participants were asked to state the Major Challenges Faced in the Preservation and Conservation of Electronic Resources in BUK library, there responses are as follows

Several recurring themes were identified:

P1 stated that "**Insufficient Funding**: Limited budgetary allocation for digital preservation tools and training".

P2 stated that "Lack of Skilled Personnel: Inadequate ICT expertise among some library staff".

P3 state that "Inconsistent Power Supply: Regular outages disrupt server uptime and backup processes".

P4 stated that "Absence of Comprehensive Policy: No formal preservation framework".

P5 stated that "Internet Speed: we have standard internet in the library but the speed of the internet is not sufficient.

P6 state that "the internet speed need to be upgraded

This indicates that **Insufficient Funding**: Limited budgetary allocation for digital preservation tools and training, **Lack of Skilled Personnel:** Inadequate ICT expertise among some library staff, **Inconsistent Power Supply**: Regular outages disrupt server uptime and backup processes, **Absence of Comprehensive Policy**: No formal preservation framework, Internet Speed: we have standard internet in the library but the speed of the internet is not sufficient and the internet speed need to be upgraded are the Major Challenges Faced in the Preservation and Conservation of Electronic Resources in BUK library

Strategies to enhance the preservation of Electronic Resources

The participants were asked to state the **Strategies to enhance the preservation of Electronic Resources in Bayero University Kano**

Thematic analysis revealed several strategies in improving of electronic resources in BUK:

P1 stated that "Use of widely adopted and stable file formats (e.g., PDF, XML)"

P2 stated that "Regular server maintenance"

P3 stated that "Password protection and multi-level access controls"

P4 stated that "Replication of critical data in external drives and cloud systems"

P5 stated that "we provide alternative reservoir to prevent loss of data as a back up"

P6 state that "we copy and save data in other places as back up to prevent loss of data

This is an indication that Use of widely adopted and stable file formats (e.g., PDF, XML), Regular server maintenance, Password protection and multi-level access controls, Replication of critical data in external drives and cloud systems, we provide alternative reservoir to prevent loss of data as a back up and we copy and save data in other places as back up to prevent loss of data are the Strategies to enhance the preservation of Electronic Resources in Bayero University Kano.

Summary of Findings

The research explored the demographic information, types of electronic resources, current practices preservation and conservation of electronic information resources, major challenges and strategies to resolve the

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challenges associated with the preservation and conservation of electronic information resources in Bayero University Library. The qualitative case study method adopted provided rich insights into current realities. The major findings are summarized as follows:

1. **Types of EIR:** Bayero University Library offers a variety of electronic resources including e-journals, e-books, online databases (e.g., JSTOR, EBSCOhost), offline CD-ROMs, and a growing institutional repository. These resources are accessible to students and faculty, though concerns of up-to-date content persist.
2. **Current Practices:** The library practices basic digital preservation strategies such as data backups (daily/weekly), antivirus protection, and use of an open-source institutional repository (DSpace). These efforts help safeguard resources from data loss and unauthorized access.
3. **Challenges and Recommendations from Respondents:** Major challenges include inadequate funding, power instability, lack of preservation policy, insufficient training, and format obsolescence. These issues limit the effectiveness of preservation practices. All the Participants, suggested the formulation of a preservation policy, capacity-building programs, acquisition of advanced preservation tools (e.g., LOCKSS), and strategic partnerships with international organizations.
4. **Strategies: The participants stated the following; regular service maintenance, replication of critical data in external drives and cloud systems, and provision of alternative reservoir to prevent loss of data as a backup.**

Conclusion

The preservation and conservation of electronic information resources are vital for ensuring continued access to scholarly content and institutional memory in academic libraries. This study concludes that Bayero University Library has demonstrated commendable efforts toward digital preservation, however it continues to face significant institutional and infrastructural challenges that limit its effectiveness. The library's dependence on rudimentary tools, lack of formalized policies, and minimal technical capacity mirror broader systemic issues prevalent across many Nigerian academic libraries.

It is therefore imperative to recognize digital preservation not merely as a technical or optional task, but as a critical and strategic component of the academic and information infrastructure. Addressing these challenges requires sustained institutional commitment, substantial investment in infrastructure, the formulation of comprehensive preservation policies, and continuous capacity building for library staff. Without these foundational supports, the long-term accessibility and integrity of digital scholarly resources—and, by extension, Nigeria's academic digital heritage—remain at considerable risk.

Recommendations

Based on the findings, the following recommendations are made to strengthen the preservation and conservation of electronic resources at Bayero University Library and similar institutions:

1. The library should **develop and implement a Comprehensive Digital Preservation** that defines strategies, responsibilities, technologies, and standards for long-term digital preservation
2. The library should **invest in Advanced Preservation Technologies** such as format migration software for long-term archiving
3. Continuous professional development should be provided to ICT and library staff on current trends in digital preservation
4. The university should invest in alternative power sources such as solar systems to ensure consistent server uptime and backup routines
5. The library should **promote** partnerships with **National and International** organizations which can provide funding, training, and tools.

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6. Periodic audits of digital collections should be carried out to ensure format relevance and content integrity
7. A robust cybersecurity policy should be put in place, including firewalls, regular updates, encryption, and monitoring systems.

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EVALUATING THE READINESS OF NIGERIAN UNIVERSITY LIBRARIES FOR AI-DRIVEN COLLECTION DEVELOPMENT: A SYSTEMATIC REVIEW

BY

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Abstract

The emergence of Artificial Intelligence (AI) in academic libraries presents transformative opportunities for enhancing collection development practices. However, the readiness of libraries particularly in developing countries like Nigeria to adopt AI-driven systems remains underexplored. This paper presents a systematic review of literature on the readiness of Nigerian university libraries for the adoption of AI in collection development. The review was conducted using structured searches across major academic databases including Google Scholar, Scopus and African Journals Online (AJOL), targeting publications between 2018 and 2025. Inclusion criteria focused on peer-reviewed articles, conference papers and institutional reports discussing AI in library services, technological infrastructure, policy frameworks and staff competencies. The findings were organised thematically around key readiness indicators: technological infrastructure, human resource capacity, policy support and institutional willingness, challenges facing AI adoption and opportunities and positive trends. The study reveals that while there is increasing awareness of AI applications in library settings, actual readiness for adoption is limited by infrastructural deficits, lack of formal training, absence of AI-focused policies and low funding. Nonetheless, a strong interest and willingness among library professionals suggest fertile ground for future interventions. The study concluded with practical recommendations including the development of institutional AI roadmaps, investment in librarians' upskilling and strategic collaboration between libraries, universities and technology partners to drive AI integration in collection development.

Keywords: Artificial Intelligence, Collection Development, Library Readiness, Nigeria, Systematic Review

Introduction

The digital transformation of academic libraries has accelerated globally with Artificial Intelligence (AI) emerging as a cornerstone technology in redefining traditional library functions. In developed countries like Nigeria, academic libraries are already leveraging on AI tools such as machine learning, natural language processing and predictive analytics to automate collection development processes, improve user experience and enhance resource discoverability. Institutions in the United States, the United Kingdom, and parts of Europe are using AI to predict users needs, assess usage patterns, recommend acquisitions and manage digital content more efficiently (Sodiya *et al*., 2024; Borlund, 2020). For instance, AI-powered systems are employed to monitor circulation trends and user interactions in order to make data-informed purchasing decisions, thereby minimising redundancy and optimising budget allocations. AI has been instrumental in reducing human workload by handling routine tasks like cataloguing, metadata tagging and recommendation services, while offering adaptive and personalised access to library materials. These advancements have not only improved efficiency but have also aligned library services with user expectations in the digital era. However, this trend presents a sharp

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contrast when viewed through the lens of Nigerian academic libraries.

In Nigeria, the integration of AI into library services is still in its infancy. While libraries have adopted basic digital technologies such as computers, scanners, social media platforms, and OPAC systems, the penetration of advanced AI tools remains limited (Isiaka *et al*., 2024). Nigerian university libraries, especially those in North-central, Nigeria, continue to face infrastructural, financial and human capacity barriers that impede readiness for AI-driven collection development. According to Heath (2018), AI is a technology that enables machines to learn, plan, reason and problem-solve—capabilities that can significantly enhance how library collections are curated. Yet, the realities in Nigerian academic libraries indicate low levels of digital readiness, lack of skilled manpower and an absence of institutional policies that support AI innovation (Owolabi *et al*., 2022). Collection development is defined as the process of selecting, acquiring and managing library resources which has traditionally relied on manual selection, professional judgment and user suggestions. (Miller & Ward, 2022). However, these conventional approaches are increasingly challenged by the rapid growth of digital resources, shifting user expectations and tightening budgetary constraints. AI tools offer promising alternatives that could automate acquisition decisions, predict user demand and allocate resources more efficiently (Ikwuanusi *et al*., 2022).

In this context, readiness refers not only to technological infrastructure such as reliable Internet, cloud computing and AI platforms, but also to the availability of trained personnel, financial support and a policy framework that supports innovation (Borlund, 2020). Librarians must not only be aware of AI trends but also be equipped with the necessary competencies to apply these tools effectively. The question thus arises: Are Nigerian academic librarians prepared technically and professionally to embrace AI in collection development? Do they have access to adequate training, institutional support, and ethical guidance to integrate AI into their workflows? The literature suggests otherwise. Despite the enthusiasm surrounding AI's potential, its implementation in Nigerian libraries is sporadic and uncoordinated, constrained by poor funding, lack of awareness and limited institutional commitment (Nwakunor, 2021). Nonetheless, AI adoption offers transformative possibilities. Libraries in Nigeria must evolve to meet the dynamic demands of a data-driven academic landscape and librarians must adapt their roles to effectively collaborate with intelligent systems. This paper presents a systematic review of existing literature to evaluate the readiness of Nigerian university libraries in Nigeria, to adopt AI technologies for collection development.

Statement of the problem

The rapid advancement of Artificial Intelligence (AI) has significantly transformed academic library services in developed countries, particularly in areas such as collection development, user personalisation and resource management. AI systems are now employed to analyse user behavior, automate acquisition decisions and streamline access to digital resources. However, in contrast, many university libraries in Nigeria remain underprepared to adopt AI technologies. Despite the growing global shift toward data-driven and intelligent library services, Nigerian academic libraries continue to face critical challenges such as inadequate technological infrastructure,limited digital competencies among librarians and the absence of clear institutional policies or strategic frameworks supporting AI integration.

Existing studies highlighted concerning gap between awareness of AI's potential and actual readiness for implementation (Odigie, 2024). While basic ICT tools have been introduced in some Nigerian libraries, the adoption of advanced technologies like AI remains minimal and sporadic. This lack of readiness threatens to widen the digital divide and limit the effectiveness of Nigerian university libraries in meeting evolving user demands. Without deliberate efforts to assess current capabilities, address infrastructural deficits and build human resource capacity, these institutions risk being left behind in the global transformation of library services. Therefore, it is imperative to evaluate the current state of readiness among Nigerian university libraries for AI-driven collection development and to identify the key barriers and opportunities for future adoption.

Aim and Objectives of the Study

The primary aim of this systematic review is to evaluate the preparedness of Nigerian university libraries for the adoption of Artificial Intelligence (AI) in collection development processes. Specifically, the objectives of the study seeks to:

1. examine the availability, quality and adequacy of ICT infrastructure and digital systems required to support AI integration in university libraries;
2. analyse the extent to which library personnel possess the digital literacy, AI-related competencies and professional training necessary for implementing AI-driven tools and workflows;
3. explore the existence and effectiveness of institutional policies, strategic frameworks and

administrative support that facilitate AI adoption in academic library operations;
4. document barriers such as funding limitations, resistance to change, ethical concerns and technological constraints that impede AI implementation in university libraries; and
5. uncover areas of potential growth, innovation and successful case examples that indicate promising directions for AI integration in library collection development across Nigerian universities.

Research Questions

1. To what extent are Nigerian university libraries equipped with the technological infrastructure required for the implementation of AI in collection development?
2. What is the level of digital literacy and AI-related competency among library staff in university libraries?
3. What institutional policies and strategic frameworks are in place to support the adoption of AI in university library operations?
4. What are the major challenges facing university libraries in adopting AI for collection development?
5. What opportunities and emerging trends exist that could facilitate the successful adoption of AI-driven collection development in university libraries?

Theoretical Framework

Diffusion of Innovation Theory (DoI)

The notion of diffusion was initially examined by German and Austrian anthropologists and geographers, including Friedrich Ratzel and Leo Frobenius, as well as by the French sociologist Gabriel Tarde in the late 19th century (Kinnunen, 1996). The 1920s and 1930s saw a boom in the study of innovation diffusion in the midwestern U.S. subfield of rural sociology. As agricultural technology advanced quickly, scientists began studying the adoption of hybrid seeds, tools, and methods by independent farmers (Valente and Rogers, 1995). The groundbreaking book Diffusion of Innovations was released in 1962 by Everett Rogers, a rural sociology professor at Ohio State University. Research from more than 508 diffusion studies in the disciplines that first shaped the theory, anthropology, early sociology, rural sociology, education, industrial sociology, and medical sociology, was synthesised by Rogers. Rogers used it to address family planning, cancer prevention, drunk driving, and hygiene in the healthcare context. Rogers developed a theory of innovation uptake by individuals and organisations based on his synthesis (Rogers, 1962). The DoI theory highlights the significance of five innovative attributes relative advantage, compatibility, complexity, trialability and observability that impact adoption of AI in collection development (Mbatha, 2024).

In assessing the readiness of Nigerian university libraries for AI-driven collection development, several innovation attributes—drawn from Rogers' Diffusion of Innovation Theory—are particularly relevant. **Relative advantage** is evident, as AI offers faster, more efficient collection analysis and facilitates user-centered acquisitions, thereby improving service delivery and resource relevance. However, **compatibility** remains a significant barrier, as many libraries still operate with outdated systems and some staff hold traditional mindsets that resist technological change. The **complexity** of AI tools further complicates adoption, particularly when such tools are not user-friendly or lack adequate technical support, training, or documentation. Additionally, **trialability** is limited across most Nigerian university libraries, as few institutions have access to sandbox environments or demo versions that allow staff to experiment with AI applications before full implementation. These factors collectively influence the rate and effectiveness of AI adoption in library collection development practices.

Methodology

This study employed a systematic review method following a narrative synthesis approach. By relying on explicit, systematic methods to reduce bias in the selection and inclusion of studies, to evaluate the quality of the included studies and to summarise them objectively, the systematic review approach seeks to reduce the risk for bias and increase transparency at every stage of the review process (Liberati *et al*., 2009). Systematic literature reviews (SRs) are a method for synthesising scientific data to address a specific research question in a transparent and repeatable manner, while attempting to include all published data on the subject and evaluating the quality of this data (Lame, 2019).

Search Strategy

The search strategy combines the key terms in your search query to find relevant results. As the first step in conducting a literature search, a search strategy must be created to specify how important studies might be located across databases (Atkinson and Cipriani, 2018). The following steps were taken to ensure a thorough search for the articles pertinent to this study: The research question served as the source for the key terms, these terms' variations as they appear in the literature were identified; from the terms that were returned, a search string was created and connected with Boolean operators; a particular search term was chosen; different online databases were picked to search. The search

string was modified in accordance with each database's specifications; the string was employed in an abstract search; identification of potential substitutions for our key search terms based on terminology found in published literature and the searches were constrained by dates. The studies' findings were released between January 2018 and May, 2025.

Additionally, the search methodology employed for this study is the "keyword searching". The words and phrases that appear in free text are known as keywords. A keyword search typically looks for search terms in the reference's title and abstract. The three Boolean operators (OR, NOT, and AND) were used for a more thorough literature search using the aforementioned keywords and/or phrases. However, the "NOT" operator is used to retrieve any literature that contained only the first keyword or phrase, excluding any literature that contained the second keyword or term. The "OR" operator was frequently used to search for and retrieve any literature that contained any of the keywords or phrases. However, the "AND" operation retrieves all publications that contained mentions of keywords and/or phrases, Lawless and Foster's (2020).

Word strings

From the main research question: Are Nigerian academic librarians prepared technically and professionally to embrace AI in collection development? Do they have access to adequate training, institutional support, and ethical guidance to integrate AI into their workflows? The following key search terms were used: “Artificial Intelligence in libraries,” “AI and collection development,” “Nigerian academic libraries,” “library technology readiness,” “AI adoption,” “university libraries Nigeria. Internet databases helped with an effective search strategy for filtering, extracting, and sorting peer-reviewed literature that was used for findings needed to achieve the study's objective (Patten and Newhart, 2018). Additionally, the following database search tools were used: Scopus, TRIP, Web of Science, Education Research Complete (EBSCO), ScienceDirect (Elsevier), Researchgate, ERIC (ProQuest) and institutional repositories. Additionally, databases like Google Scholar, Semantic Scholar, and a straightforward Google Search were utilised.

Study selection

Duplicate citations were removed after all the results from the online databases had been collected. The publications were of a high caliber because papers from journals that did not rank in the top two quartiles were excluded. Reading the titles and abstracts of the papers allowed us to weed out any irrelevant ones that the search engines' poor performance had brought up. The results of database searches were maintained in an excel matrix, as stressed by Lawless and Foster (2020), to allow evaluation of studies to determine whether they are appropriate for inclusion in this study. The inclusion/exclusive criteria served as the basis for choosing the studies for this investigation. After eliminating all duplicate titles and those with titles that were obviously unrelated to this study, the titles of the literature were first examined. Following an evaluation of the titles, those that weren't sufficiently clear were further evaluated by reading the abstracts. Studies with pertinent abstracts but no complete text available at completion were disregarded. To confirm that they were based in Nigeria and not in another nation, the abstracts were carefully read. To ensure that the study receives the most valuable data possible, the best participant pool is created using effective inclusion and exclusion criteria that balance broad and specific requirements on an inclusion/exclusion list (Hornsberger and Sneha, 2020). Only the literature that met the inclusion criteria listed in table below was used after the literature search and critical evaluation were complete. Peer-reviewed articles, conference papers, theses, and institutional report. Sources between 2018-2025.Focused on AI use or readiness in academic or university libraries and Nigeria-focused or applicable to Sub-Saharan Africa as shown in figure one:

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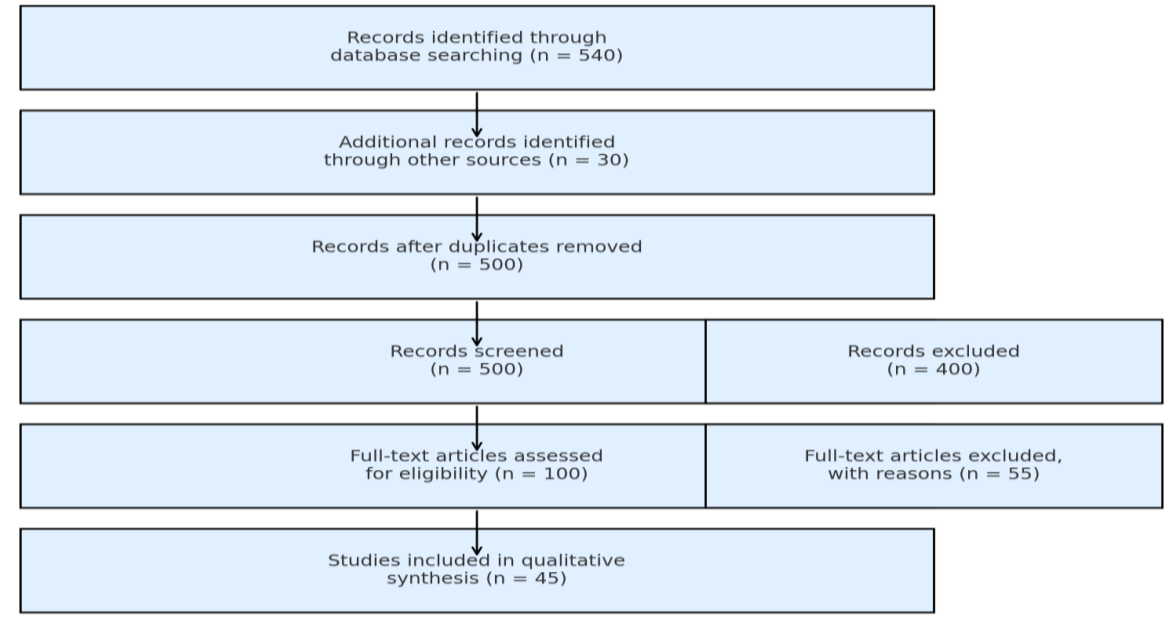

Figure 1: PRISMA Flow Diagram for the systematic review

Findings and Discussion

The Findings and discussions are Organised into themes aligned with research questions:

Technological Infrastructure Readiness

Several studies highlight the weak ICT infrastructure in Nigerian academic libraries as a major barrier to AI adoption (Ajani *et al.,*2023; Isiaka *et al.*, 2024). Poor Internet connectivity, obsolete hardware, and inconsistent power supply prevent libraries from running or integrating AI systems. (Omeluzor and Ojukwu,2024) found that only 30% of federal university libraries surveyed in Nigeria had reliable digital platforms, making it difficult to deploy AI tools for tasks such as predictive acquisitions. The findings revealed that weak ICT infrastructure poses a major obstacle to AI adoption in Nigerian academic libraries. Key issues such as poor internet connectivity, outdated hardware, and inconsistent power supply hinder the effective deployment of AI systems. These infrastructural deficiencies make it difficult for libraries to support AI-driven tools like predictive acquisitions or automated services. Additionally, the limited availability of reliable digital platforms—reported to be present in only 30% of federal university libraries—indicates that many institutions are still at the early stages of digital transformation. This underscores the urgent need for significant investment in technological infrastructure before AI integration can become feasible or sustainable in Nigerian academic libraries.

An investigation examining academic librarians' opinions regarding Nigerian libraries' preparedness for incorporating AI technology into operations and services was carried out by Ajani *et al.* in 2022. According to their opinions, the respondents were asked to rank the capability of Nigerian academic libraries to incorporate AI systems into their operations and services as well as to explain what they believe to be the level of preparedness. Nigerian university libraries, according to the majority of respondents, are not ready to incorporate AI technology into their operations and services. While only a small number of academic libraries in Nigeria, including Covenant University and the University of Lagos, have done so, the respondents identified some academic libraries in Africa, particularly in Kenya, Ghana, and South Africa, that have demonstrated their readiness for the integration of the Internet of Things into library operations and services. Some explanations were provided to support the reason. As an example, one respondent stated that:

"I can boldly say that academic libraries in Nigeria are not ready for the integration of AI systems in library operations and services. This is based on my understanding that most of the academic libraries in Nigeria have partially accepted the changes that are currently evident in the librarianship profession, technically as a result of the application of ICT in library services. This is shown in their expression of lethargic willingness to invest in the infrastructure that will help them conform to the change brought by ICT application in library services (Ajani *et al.,* 2022).

The assertion by the respondent highlights a critical concern in evaluating the technological readiness of Nigerian academic libraries: the lack of full commitment to digital transformation, particularly regarding AI integration. While Information and Communication Technology (ICT) has made noticeable

inroads into library systems such as OPACs, digital cataloguing, and online repositories—this progress remains partial and inconsistent across institutions. institutional reluctance to fully embrace emerging technologies due to financial constraints, inadequate planning, and resistance to change. The term "lethargic willingness" underscores the slow and often passive approach many libraries have taken toward infrastructural development. This aligns with other studies (Omeluzor and Ojukwu, 2024), which found that investments in ICT infrastructure are often reactionary rather than strategic. Furthermore, readiness for AI integration cannot be isolated from earlier ICT foundations. The inability of libraries to fully implement basic ICT tools such as automated circulation systems or digital repositories reveals a weak baseline from which to adopt more complex systems like AI. Hence, if libraries are still struggling with ICT fundamentals, it becomes evident that they are not structurally or technically prepared for AI, which demands higher levels of computing power, data management systems, and skilled personnel. AI adoption appears aspirational rather than practical. Unless libraries in Nigeria move beyond mere awareness and adopt a proactive investment strategy in digital infrastructure, their readiness for AI will remain low.

Human Resource Capacity and Skills

Librarians' knowledge and attitudes toward AI significantly influence adoption readiness. Safana *et al.* (2024) observed that while many Nigerian librarians have heard of AI, few possess the technical competencies required to operate AI-enhanced systems. Most libraries lack structured professional development programs to train staff in emerging technologies. Furthermore, Safana *et al.* (2024) recommended institutional collaborations with ICT departments to bridge this gap. According to a study by Jothimani *et al*. (2024) titled "Artificial Intelligence in Collection Development and Management in Libraries: A Research Overview," AI technologies like machine learning, predictive analytics and automated cataloguing can improve library collection development procedures. The authors examined case studies and academic literature on AI systems like Ex Libris Alma and OCLC WorldCat using a documentary research methodology, emphasising advantages like cost optimisation, data-driven acquisition, and customised user services. But they also point out important obstacles, such as practical ones (integration issues, high implementation costs) and ethical ones (data privacy, algorithmic prejudice)

Policy and Institutional Support

Institutional policy plays a pivotal role in determining AI adoption. However, there is a notable absence of AI-specific strategic plans within library management structures (Rudiansyah, 2023). Most libraries operate under general ICT policies that do not account for AI applications. The lack of funding and prioritisation of library innovation by university management also limits progress. However, research like that conducted by Isiaka *et al*. (2024) demonstrates that although librarians at Nigerian university libraries are keen about AI, many of them feel limited by the lack of constructive administrative rules or a clear organisational roadmap. In the absence of leadership-driven tactics and clear roles for AI in library operations, adoption initiatives are frequently fragmented or stagnant. For the same reason, Subaveerpandiyan (2023) looked at what factors affect libraries' readiness to use AI. It was determined that the most important component was leadership, followed by knowledge of AI applications, acceptance and awareness of AI, and an innovative environment. As per the report, library administration should stay abreast of the most recent advancements, regularly evaluate the library's preparedness for embracing AI, and promptly integrate the technology. A study by Jan *et al.* 2024) on organisational readiness to embrace AI in the library and information sector in Pakistan revealed that some participants agreed that organisational size and financial resources have a major impact on their readiness to use AI. Most participants thought that bigger colleges will quickly and more heavily invest in the adoption of new technologies, such as artificial intelligence. The primary obstacles to the use of AI in university libraries, according to one participant, are the administrators' and universities' lack of initiative, strategy, vision, and policy. During the interview, another participant stated that the library and information industry is not very forward-thinking when it comes to adopting new technology.

Challenges in adopting AI in Nigerian university libraries

The challenges of adopting and using artificial intelligence (AI) in academic libraries are numerous and cannot be fully addressed in this brief discussion. The literature reviewed in this study highlights several obstacles that hinder AI implementation in academic libraries. A key challenge is the lack of technological infrastructure, including insufficient high-speed networks and integrated systems (Aslim *et al*., 2023), along with poor internet connectivity (Eiriemiokhale and Sulyman, 2023). These issues are particularly prevalent in developing countries, where internet access is limited, and many libraries do not have adequate

broadband connectivity. Additionally, the integration of AI into academic library systems is rare. Most libraries' current systems and services are not AI-compatible (Huang *et al*., 2023). Beyond technological barriers, concerns about job displacement also pose a significant hurdle. Librarians, like many other professionals, worry that AI might replace human roles within the library a concern echoed across various sectors (Alekseeva *et al.*, 2021). Despite these fears, many believe AI has the potential to enhance library operations, creating new opportunities for librarians through roles in technical expertise, reskilling, and upskilling. Another major barrier is the lack of a clear AI strategy. While this issue is not widely discussed in studies from developing countries, it has been subtly noted in research from developed nations. For instance, Huang *et al*. (2023) found that neither British nor Chinese universities have included AI in their strategic plans. The existence of such a roadmap in academic libraries from developing countries remains unclear. However, for AI to be successfully adopted in academic libraries, a strategic plan is essential. This plan should address libraries' attitudes toward AI, ensure sufficient funding and institutional support, and develop the technical skills of librarians (Huang *et al*., 2023).

Opportunities and Positive Trends

Despite challenges, there are emerging trends that suggest future readiness. Study by Adebayo and Musa (2023) showed increasing interest in AI workshops, research, and institutional pilot projects. The COVID-19 pandemic accelerated the adoption of digital tools, creating fertile ground for future AI integration in core functions like collection development. Jha (2023) found out that, expert systems in libraries are one key area where AI can bring significant benefits. These AI-based systems can automate tasks such as document classification, cataloguing, indexing, and abstracting. Rudiansyah (2023) provides examples of expert system software currently in use, including the Online Catalogue Library of Congress (OCLC) Automated Title Page Project for cataloguing, Canserach and MenUse for generating search statements in Medline, and Machine Aided Indexing (MIA) for indexing purposes. Other expert systems like COAL SORT, EP-X, and BIOSIS are used for classification tasks (Vijayakumar and Sheshadri, 2019). AI-powered virtual assistance is another area where libraries can benefit, offering intelligent con-sultation for tasks like searching, navigation, and reminders. One of the most common AI applications in academic libraries is the use of chatbots or virtual agents (VA), which rely on machine learning (ML) and natural language processing (NLP) (Huang *et al*., 2023). Platforms like MSN, WeChat, and others can be leveraged for this purpose.

Summary of Findings

The table below presents a structured interpretation of the findings, linking each theme to global practices and practical recommendations.

Theme	Interpretation of Findings	Comparison to Developed Countries	Implications/Recommendations
Technological Infrastructure Readiness	Nigerian libraries lack stable internet, power, and updated systems	Libraries in developed countries have integrated cloud services and modern systems	Investment in ICT, backup power, and digital infrastructure is urgently needed.
Human Resource Capacity and Skills	Librarians lack AI-related training and technical know-how.	Developed countries offer continuous AI training and digital upskilling.	Librarians should be retrained; AI modules should be added to LIS curricula.
Policy and Institutional Support	Absence of clear AI policies; leadership lacks strategic direction.	Libraries abroad follow structured AI roadmaps and government-backed frameworks	Institutions must draft AI policies and align with national ICT strategies
Challenges in adopting AI in Nigerian university libraries	Fear of job loss, lack of funding, and ethical issues create resistance	Global libraries manage change with support, ethics frameworks, and funding.	Stakeholder engagement and AI ethics training are needed to manage fears.

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Opportunities and Positive Trends	Growing local interest, post-COVID digital push, and emerging pilot projects suggest momentum	Developed countries are already testing AI in user engagement and collections.	Nigeria can build on this momentum by supporting pilot AI projects and partnerships

Implications for Practice and Policy

The findings from this review reveal critical implications for the future of collection development and broader library services in Nigerian academic institutions. The evident low readiness for AI integration underscores the need for a shift in operational strategies, policy alignment, and professional training across the academic library landscape.

For University Administrators

University leadership must recognise libraries as integral to academic excellence. There is a pressing need to prioritise library technology funding, especially in areas that enable AI deployment. Administrators should champion cross-departmental collaboration between library units, ICT departments, and faculties of computing or data science to foster shared digital innovation.

For Library Managers

Library leaders must begin internal capacity assessments and develop readiness plans tailored to AI integration. This includes auditing infrastructure, digitising legacy data, and identifying staff training needs. Managers are encouraged to adopt a phased, low-risk approach to AI—starting with data analytics and predictive tools for collection development.

For Policymakers and Regulatory Bodies

At the national level, there is a need for policies that promote innovation in library services. AI adoption in libraries should be integrated into broader national ICT and education strategies. Regulatory frameworks should provide ethical guidance, data privacy standards, and incentives (e.g., grants) for AI experimentation within academic libraries.

For LIS Educators and Library Schools

Library and Information Science (LIS) curricula must be revised to include AI concepts, data literacy, and ethical data handling. Equipping future librarians with these skills ensures long-term sustainability and relevance of the profession. Practical modules on AI tools, machine learning, and digital policy should complement traditional cataloguing and reference instruction.

Conclusion

This study systematically reviewed the state of readiness for AI-driven collection development in selected federal university libraries in Nigeria. The findings reveal significant challenges in infrastructure, staff capacity, and institutional policy highlighting that most libraries in the region are still in the early stages of digital maturity. While there is growing awareness and interest in AI tools globally, Nigerian academic libraries lag due to persistent funding constraints, skill gaps, and a lack of strategic focus on technological advancement. To bridge this gap, it is essential for libraries to move beyond awareness to concrete investment in digital infrastructure and professional development. Strategic planning, inter-institutional partnerships, and pilot implementation of predictive tools are crucial steps towards realising the benefits of AI in collection development. Future studies should consider:

- Empirical assessment of AI pilot projects in Nigerian libraries;
- Comparative readiness assessments between regions (e.g., South-West vs. North-Central);
- Evaluations of LIS students' preparedness for AI-driven environments;
- Longitudinal studies measuring the impact of AI tools on acquisition decisions and user satisfaction.

Such research will not only inform policy and practice but also contribute to building a robust evidence base for AI implementation in African academic libraries.

Recommendations

1. **Infrastructure Development**: Federal universities must invest in high-speed internet, alternative energy solutions, and modern computing systems to support AI deployment.
2. **AI Capacity Building**: Regular training and inclusion of AI modules in library science curricula should be encouraged.
3. **Policy Frameworks**: Institutions should develop AI implementation strategies for libraries, aligning them with national ICT policies.
4. **Pilot Projects**: Launching pilot AI initiatives (e.g., chatbots for reference services) will demonstrate feasibility and build institutional confidence.
5. **Collaboration and Funding**: Government, academic institutions, and international partners should collaborate to fund AI readiness programmes in libraries.

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EVALUATION OF SECURITY MEASURES FOR SUSTAINABLE INFORMATION SYSTEMS IN PUBLIC UNIVERSITY LIBRARIES IN NIGERIA

BY

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Abstract
The security of information systems in public university libraries remains a critical concern in the digital era, where both physical and electronic resources are increasingly vulnerable to misuse, theft , and cyber threats. This opinion paper argues that effective security measures are not merely technical add-ons but core components of sustainable library management. While many libraries in developing contexts focus on acquiring ICT infrastructure, insufficient attention is paid to robust security protocols such as access control, authentication systems, data encryption, surveillance, and disaster recovery plans. The absence of these measures often results in breaches that compromise not only the integrity of library collections but also user trust and institutional credibility. This paper contends that libraries should move beyond reactive security practices toward proactive, policy-driven frameworks that integrate technological safeguards with user education. Furthermore, the sustainability of these measures depends on regular staff training and adequate funding support from university management. Strengthening security measures is, therefore, not an optional administrative function but a strategic imperative for ensuring the long-term viability and relevance of public university libraries in an increasingly digital knowledge environment.

Keywords: Security Measures, Information Systems, Public University Libraries, ICT Infrastructure, Library Management, Sustainability, Digital Resources.

Introduction

In the digital era, information systems serve as the backbone of academic librariesespecially public university librariesby enabling streamlined access to digital collections, interlibrary loans, and institutional repositories. Yet as these systems grow more sophisticated, they also become targets for cyberthreats and data breaches. Okike and Adetoro (2019) observed widespread malware attacks targeting OPAC and operating systems in university libraries in southwest Nigeria, highlighting that while some technical defenses like firewalls exist, effective access control systems are often lacking . Moreover, Owate (2022) underscored how poor information security management can undermine sustainable learning among library professionals, calling attention to the human and organizational dimensions of security . These findings collectively emphasize that the sustainability of information systems hinges not just on technology, but on organizational readiness and human-centered measures.

Beyond technical safeguards, developing facilitating conditionslike adequate ICT skills, awareness campaigns, and policy supportproves vital. Esse and Haliso (2024), investigating institutional repository sustainability in Nigerian public universities, found that current awareness and ICT competency significantly influence the continuation of digital services . Additionally, Obim and Akpokurerie (2023) revealed low levels of cybersecurity awareness among librarians in southeastern Nigeria, paired with insufficient training and policy frameworks, which undermines effective information storage . Without attention to these enabling factors, libraries may struggle to build secure systems that endure over time.

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Information systems in university libraries refer to the integrated set of technologies, people, and processes used to manage and deliver information resources to academic communities. They encompass both traditional library automation toolssuch as Online Public Access Catalogues (OPACs), databases, and integrated library management systemsas well as newer digital infrastructures like institutional repositories, RFID-based tracking systems, and electronic security devices. As Ismail and Zainab (2017) noted, information systems are central to library operations, but their effectiveness depends on both technological robustness and organizational readiness. In the context of public university libraries in Nigeria, these systems not only facilitate research and learning but also represent valuable institutional assets that must be safeguarded.Samson etal (2015) stated that the technology behind information systems in today's world has been embedded in nearly every aspect of our lives. Thus, the idea of securing our information systems and/or computer networks has become very paramount. Owing to the significance of computer networks in transporting the information and knowledge generated by the increased diversity and sophistication of computational machinery, it would be very imperative to engage the services of network security professionals to manage the resources that are passed through the various terminals (end points) of the these network, so as to achieve a maximum reliability of the information passed, making sure that this is achieved without creating a discrepancy between the security and usability of such network.

Security measures in libraries, on the other hand, are the strategies, technologies, and policies designed to protect information systems from threats such as theft, vandalism, unauthorized access, and cyberattacks. Scholars like Osayande (2013) and Okike and Adetoro (2019) have shown that while some libraries adopt electronic security systems such as CCTV, smart cards, and firewalls, gaps remain in access control, monitoring, and staff compliance. Security measures are generally categorized into administrative controls (policies, regulations, audits), technical controls (firewalls, passwords, RFID, authentication protocols), physical controls (locks, alarms, surveillance), and human factors (training, awareness, compliance). The absence of a comprehensive mix of these dimensions leaves libraries vulnerable and undermines the reliability of their systems.

Sustainability, in the context of information systems, refers to the capacity of libraries to ensure the continuity, resilience, and long-term reliability of digital and physical information services despite evolving threats. Esse and Haliso (2024) stressed that sustainability in library systems is tied not only to infrastructure but also to ongoing awareness creation, ICT skill development, and institutional support. Similarly, Owate (2022) argued that information security management is critical for sustaining professional learning and service delivery in libraries. This means that sustainability is not achieved once and for all but requires continuous investment in infrastructure, policies, and staff attitudes. In this paper, sustainability is understood as the ability of public university libraries to provide secure, reliable, and uninterrupted access to information resources through robust and holistic security measures.

The Centrality of Security Measures

Security measures are the backbone of sustainable information systems in public university libraries. Without well-defined security frameworks, even the most advanced systems remain fragile and prone to collapse. As Singh and Kumar (2021) observe, the growing reliance on digital library services has expanded the threat landscape, making security protocols indispensable. In Nigeria, public university libraries face unique risks such as inadequate surveillance systems, poor cybersecurity defenses, and theft of print and electronic resources. Strengthening these measures requires a layered approachphysical, digital, and administrativeso that no single failure exposes the entire system. This aligns with the argument of Adebayo and Omotayo (2020) that libraries must treat security as a strategic priority, not an afterthought.

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The Role of Staff Attitude and Institutional Culture

Even the most sophisticated technologies can fail if library staff and users do not uphold security protocols. Human behavior is often the weakest link in any security system. Staff negligence, deliberate sabotage, or lack of training can render security technologies ineffective. As Fatoki (2022) emphasized, organizational culture and staff attitudes strongly influence how security measures are implemented and maintained. A sustainable approach therefore requires fostering a culture of compliance, accountability, and awareness. Training programs, periodic sensitization workshops, and clearly defined sanctions for breaches are essential for creating a proactive workforce. This is particularly important in Nigeria, where many libraries still struggle with low staff-to-technology alignment (Okike & Adetoro, 2019).

Integrating ICT Infrastructure for Long-term Sustainability

A sustainable information system cannot exist without reliable ICT infrastructure. Power supply, internet connectivity, digital storage, and system interoperability are critical enablers of library security. In their study, Ese and Haliso (2024) found that ICT skill development among staff directly correlates with the effectiveness of security systems. In many Nigerian public university libraries, however, ICT facilities are outdated or poorly maintained, making them ill-equipped to handle emerging security challenges. Investment in modern ICT infrastructuresuch as cloud-based storage, automated access systems, Radio Frequency Identification Technology (RFID) and AI-driven surveillancecan significantly improve resilience. This requires not only financial resources but also strong partnerships with government, donors, and technology providers. Without this integration, sustainability will remain an elusive goal.

Challenges in Strengthening Security Measures

Despite the recognition of security as a core requirement, libraries still grapple with systemic challenges. Chief among them is inadequate funding, which prevents the acquisition of modern technologies and recruitment of skilled personnel. In addition, irregular power supply in Nigeria hinders the use of ICT-based security systems. Another challenge lies in policy gapsmany libraries lack clear, documented security policies, making enforcement inconsistent. As observed by Nkiko (2020), without formal security policies, libraries are forced into reactive measures rather than proactive planning. These challenges, if unaddressed, undermine any effort to make information systems sustainable.

Challenges in Strengthening Security Measures in Public University Libraries

1. Inadequate Funding

Most public university libraries operate on limited budgets, making it difficult to invest in modern security technologies (RFID, CCTV, access control). Funds are often prioritized for collections and academic services rather than security.

2. Poor ICT Infrastructure

Weak internet connectivity, outdated systems, or lack of reliable power supply hinder the implementation of digital security measures. Without stable infrastructure, technologies like RFID and surveillance systems cannot function effectively.

3. Insufficient Staff Training

Many librarians and staff members lack the technical skills to manage and operate advanced security systems. This leads to underutilization of tools, weak enforcement of policies, and loopholes in security management.

4. User Misconduct and Non-compliance

Students and even some staff may engage in theft, mutilation of books, or misuse of digital resources. Enforcing compliance is challenging due to high user populations and limited monitoring personnel.

5. Resistance to Change and Policy Gaps

Libraries may lack clear, updated security policies, and staff/users may resist new rules or technologies. Institutional bureaucracy also slows down adoption of stronger security measures.

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Best Practices for Enhancing Security

Several libraries globally and within Africa have successfully implemented sustainable security models that can inspire Nigerian institutions. For example, the use of RFID technology in South African university libraries has significantly reduced book theft and enhanced resource tracking (Mabunda & Fourie, 2021). Similarly, some Nigerian universities have started adopting biometric authentication for user access, improving accountability. Other best practices include constant staff retraining, collaborations with ICT experts, adoption of open-source security software, and community policing approaches where students and staff share responsibility for safeguarding resources. These practices show that innovation, adaptability, and inclusivity are key to long-term sustainability.

Best Practices for Enhancing Security

1. Adoption of RFID and Digital Tracking Systems

RFID improves efficiency in tracking, circulation, and theft prevention. Research shows that libraries using RFID experience reduced resource losses and better inventory control.

2. Regular Staff Training and Capacity Building

Continuous training ensures staff can operate, monitor, and troubleshoot security systems. Well-trained staff are also better at detecting suspicious behavior and enforcing policies.

3. Integration of ICT Infrastructure with Security Systems

Linking library systems (OPAC, digital repositories) with security tools (firewalls, authentication, surveillance) creates a holistic protection framework. Research indicates ICT-backed security yields better results than isolated measures.

4. User Awareness and Orientation Programs

Educating users about security policies, responsible use of resources, and consequences of misconduct reduces theft, vandalism, and digital misuse. Studies show compliance improves when users are sensitized.

5. Regular Security Audits and Policy Updates

Periodic checks on both physical and digital systems help identify vulnerabilities. Updating policies in line with technological and institutional changes ensures security remains effective.

The Way Forward

To ensure sustainable information systems in public university libraries, a multi-stakeholder strategy is necessary. Government agencies must prioritize funding for library security infrastructure as part of national educational development. University management should develop enforceable security policies and establish dedicated security committees for libraries. Librarians must embrace continuous professional development, while users should be sensitized to view security as a shared responsibility. Furthermore, collaboration with international organizations can bring in expertise, funding, and technology transfer. Ultimately, sustainability depends on viewing security not just as a technical challenge, but as an institutional culture and collective commitment.

Conclusion

The sustainability of information systems in public university libraries depends heavily on the strength of their security measures and the attitudes of staff who manage them. A secure library environment is not achieved through technology alone but through the synergy of policies, infrastructure, and human commitment. As the discussion has shown, robust ICT infrastructure, continuous staff training, and positive organizational culture are critical in overcoming security challenges. Without these, public university libraries remain vulnerable to theft, data breaches, and operational inefficiencies that compromise their mission of supporting teaching, learning, and research.

Recommendations

1. Policy Development and Enforcement: University libraries should establish clear, comprehensive security policies that define staff and user responsibilities, sanctions for violations, and protocols for managing risks.

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2. Investment in ICT Infrastructure: Governments, donor agencies, and university management should prioritize the provision of reliable ICT infrastructure such as RFID, biometric access, CCTV, and cloud storage systems.
3. Staff Training and Awareness: Regular workshops and capacity-building programs should be conducted to improve staff competence and foster a security-conscious organizational culture.
4. Collaborative Security Models: Libraries should adopt participatory approaches that involve staff, students, and community stakeholders in safeguarding resources.
5. Sustainable Funding Mechanisms: University management should allocate dedicated funds for security and explore external funding opportunities through partnerships with NGOs and international agencies.
6. Monitoring and Evaluation: Security measures should be continuously assessed and improved through audits, feedback systems, and benchmarking against best practices in other universities.

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EXPLORING LIBRARIANS' KNOWLEDGE AND COMPETENCY IN THE INTEGRATION OF ARTIFICIAL INTELLIGENCE TOOLS FOR SUSTAINABLE LIBRARY SERVICES IN NASARAWA STATE

BY

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Abstract

This study explores librarians' knowledge and competency in the integration of Artificial Intelligence (AI) tools for sustainable library services in Nasarawa State university libraries. This study anchored on a survey research design. The study employed a structured questionnaire to collect data from 50 professional librarians selected from the four (4) university libraries in Nasarawa State. Census sampling technique was adopted. The study examined awareness and extent of AI tools use among librarians, alongside the institutional factors influencing their adoption. Descriptive statistics were used to analyse the data. The findings of the study revealed that majority of respondents' demonstrated moderate awareness of AI applications such as chatbots, expert systems, and virtual reference services, while only a small percentage reported practical competency in using these tools. However, infrastructural challenges, limited training opportunities, and inadequate funding were identified as major barriers for integrating AI tools for sustainable library services. The study recommended targeted capacity-building programmes and increased investment in AI infrastructure to promote the sustainable adoption of AI technologies in Nigerian university libraries.

Keywords: *Artificial Intelligence, Knowledge Competency, Librarians, Sustainable Library Service.*

Introduction

The use of Artificial Intelligence (AI) tools in library services is an emerging trend that holds great potential for enhancing sustainable library services. As libraries transition toward digital services, librarians' ability to harness AI tools becomes crucial for efficient information retrieval, resources management and user engagement (Gupta, 2021). Preliminary investigation and ample literature reported that there are issues and challenges regarding librarians' AI knowledge and information-searching skills for sustainable library services in developing nations (Mallikarjuna, 2024). These challenges include among others, the fact that many librarians lack sufficient understanding of AI tools and that there are limited training opportunities available, affecting their ability to apply AI effectively in library services. Some librarians resist adopting AI due to job security concerns or unfamiliarity with the technology, slowing the modernization process; AI adoption bridge data privacy and ethical issues, requiring careful management to ensure user trust and fair, unbiased service delivery (Davis, 2022).

Thus, this research aims to contribute to the existing body of knowledge by investigating the level of knowledge and skills in using AI tools among librarians in Nigeria. It also seeks to explore the impact of these tools on the sustainability of library services. Through a comprehensive and meticulous investigation,

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this study will offer valuable insights into the current state of AI tools knowledge and information searching skills among librarians, in libraries, as well as establishing the correlation between AI knowledge and the sustainability of library services.

Statement of the Research Problem

Libraries generally play a pivotal role in supporting education, research, and lifelong learning by providing wealth of information services. The information services include selective dissemination of information, current awareness services, mailing, reference services, circulation services among others. However, the evolving digital landscape, shifts in user expectations, and constraints on funding and resources seem to have posed significant challenges for libraries in providing sustainable library services. Traditional library services, which often prioritize physical collections and in-person support, are now insufficient in addressing the expectations of digital-native users who demand instant access to online resources, personalized services, and self-service technologies (Andersdotter, 2023). It is based on this backdrop that this study investigate how knowledge and usage of AI tools among librarians and their information searching skills can help to promote sustainable library services in Nigeria.

Aim and Objectives of the Study

This research aims to address a critical gap in understanding the relationship between the knowledge of librarians in using artificial intelligence (AI) tools and their information searching skills for sustainability of library services in federal university libraries in Nigeria. The specific objectives are to:

1. Assess the level of awareness and knowledge of artificial intelligence (AI) tools among professional librarians in university libraries across Nasarawa State.
2. Determine the competency and use of AI tools in delivering library services among librarians in Nasarawa State university libraries;
3. Identify and analyse the institutional and infrastructural factors affecting the integration and sustainable use of AI technologies in university libraries within Nasarawa State.

Literature Review

The integration of AI in library services has become a key driver for sustainability and innovation in libraries and information center globally. In Nigeria, librarians are increasingly required to possess advanced knowledge, skills in information retrieval, and familiarity with artificial intelligence tools to meet the dynamic needs of 21st-century users. This work review explores the current discourse on artificial intelligence applications in library services, the competencies required by librarians, and the implications for sustainable library practices.

AI Tools in Library Services

AI tools have revolutionized how libraries manage, retrieve, and disseminate information, it has ignited the staff zeal to further seek skills that won't make them loss their job in the 21st century as artificial intelligence pros the trait of making a lot loss their job. According to Asogwa and Ezema (2020), artificial intelligence applications such as machine learning algorithms, natural language processing, and intelligent search engines enhance cataloging, classification, user personalization, and predictive analytics. Tools like chatbots (Libby or Dewey bots), automated indexing systems, and virtual reference assistants help libraries deliver round-the-clock services.

Nnadozie et al. (2021) observe that many Nigerian academic libraries are beginning to adopt artificial intelligence-based discovery tools and library management systems, such as KOHA integrated with artificial intelligence plugins, albeit at a slower rate due to infrastructural limitations. Despite this, the potential of artificial intelligence to improve

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efficiency, user satisfaction, and sustainability are substantial.

Librarians' Knowledge and Competency Requirements

In this era and years to come, for librarians to effectively use artificial intelligence tools, they must possess foundational knowledge in Information Communication Tools, digital literacy, and data management. Ezeani and Igwesi (2012) assert that continuous professional development is crucial for Nigerian librarians, especially in Federal Universities, to stay updated with artificial intelligence technologies.

Moreover, Ozioko et al. (2023) highlight that librarians need training in data analytics, metadata creation, and artificial intelligence ethics. In Nigeria, a gap exists between artificial intelligence tool availability and librarian readiness, as a result of limited training opportunities and inadequate policy frameworks supporting digital skills acquisition.

Sustainable Library Services

Sustainable library service entails long-term adaptability, inclusiveness, and innovation. Artificial intelligence plays a central role in achieving sustainability by reducing repetitive tasks, enabling energy-efficient systems, and supporting inclusive access for users with disabilities (Abubakar & Lawal, 2021).

Libraries generally in Nigeria face challenges like budget constraints, lack of artificial intelligence infrastructure, and inconsistent ICT policies. Nevertheless, strategic investment in artificial intelligence and capacity-building for librarians could enhance their role as facilitators of sustainable development goals (SDGs), particularly SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure).

Research Methodology

This study employed a survey research design to explore librarians' knowledge and competency in integration of artificial intelligence tools for sustainable library services in Nasarawa State. This is because it serves as a fast way of collecting data on librarians' knowledge and competency in integration of artificial intelligence tools for sustainable library services. The population of this study is 50 which comprised professional librarians and library and information science educators working in the four university libraries in Nasarawa State. The study adopted total enumeration sampling technique, since the population size is manageable and not large. Therefore, the sample size is 50. Structured questionnaire was used to collect data from respondents. Data collected was analysed using descriptive statistics. The statistical software used was Statistical Package for Social Science (SPSS) version 27.

Results and Discussion

Table 1: Return Rate

Institution	Shared	Retrieved (%)
Nasarawa State University	21	15(71)
Federal University Lafia	16	14(88)
Phonix University	2	2(100)
Birmingham University	16	12(75)

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Total	**50**	**43(86)**

Table 1 showed the distribution and retrieval rates of the respondents. A total of 50 items were distributed across the four institutions, 43 items were successfully retrieved, giving an overall retrieval rate of 86%, Nasarawa State University received 21 items (42% of total distribution) with a 71% retrieval rate, Federal University Lafia received 16 items (32% of total) with the highest retrieval rate at 88%, Phoenix University received only 2 items (4% of total) but achieved a perfect 100% retrieval rate, Birmingham University received 16 items (32% of total) with a 75% retrieval rate. The result imply that the smaller institutions (Phoenix University) achieved perfect retrieval, while the larger distributions had varying success rates. Federal University Lafia performed best among the institutions with substantial distributions. Nasarawa State University, despite receiving the largest share of items, had the lowest retrieval rate at 71%.

Table 2: Awareness and Knowledge of AI tools

Awareness and Knowledge of AI Tools	**N**	**Mean**	**Std. Deviation**	**Decision Mean>=2.97**
I am aware of the concept of Artificial Intelligence (AI).	43	2.98	0.89	Aware
I can define AI in the context of library services.	43	3.21	1.06	Aware
I am familiar with common AI tools such as chatbots, expert systems, and virtual assistants.	43	3.19	1.03	Aware
I have read or heard about AI use in libraries globally.	43	2.70	0.91	N.Aware
I understand how AI tools can enhance library operations.	43	3.09	0.70	Aware
I can differentiate between AI tools and other ICT tools used in libraries.	43	2.81	1.03	N.Aware
I am aware of the impact of AI on user services in libraries.	43	3.03	0.84	Aware
I have come across scholarly articles or training materials on AI in libraries.	43	3.07	0.72	Aware
I follow developments or trends in AI technologies relevant to librarianship.	43	2.63	1.18	N.Aware
I believe awareness of AI is essential for modern librarianship.	43	3.01	0.67	Aware
Average Weighted Mean		**2.97**	**0.90**	

Table 2 presents survey results measuring librarians' awareness and knowledge of AI tools, using a scale where 2.97 appears to be the threshold for determining "awareness." The overall findings average weighted mean of 2.97 indicates that respondents are right at the boundary between aware and not aware, suggesting moderate overall awareness of AI tools among the 43 surveyed academic librarians. Areas of strong awareness (Mean ≥ 2.97): Defining AI in library contexts (3.21) with highest awareness level, Familiarity with

common AI tools (3.19) such as chatbots, expert systems, virtual assistants, Understanding AI's operational benefits (3.09) such as how AI enhances library operations, Exposure to AI literature/training (3.07) such as scholarly articles and training materials, Impact awareness (3.03) such as understanding AI's effect on user services, Professional importance (3.01) such as believing AI awareness is essential for modern librarianship, and Basic AI concept (2.98) such as general awareness of AI. The following were lower than threshold mean value. Following AI developments (2.63) with the lowest score, indicating limited engagement with current trends, Differentiating AI from other ICT tools (2.81) such as having difficulty distinguishing AI from general technology, and Global AI library usage (2.70) such as limited knowledge of international AI implementations. The result implies that librarians show good conceptual understanding and recognize AI's importance, however they struggle with staying current on developments and distinguishing AI from traditional ICT tools. The relatively high standard deviations (0.67-1.18) suggest varied levels of knowledge across respondents, indicating some librarians are quite knowledgeable while others lag behind.

Table 3: Competency and Usage of AI tools

Competency and Usage of AI Tools	N	MEAN	STD	Decision Mean>=2.63
I can operate AI-powered applications used in library services.	43	2.65	0.97	agreed
I have used AI-based tools (e.g., chatbots, recommender systems) in library tasks.	43	3.23	1.07	agreed
I am competent in evaluating AI tools for library use.	43	2.16	0.87	disagreed
I have received formal or informal training on AI tools.	43	3.14	0.91	agreed
I know how to implement AI tools to automate routine library tasks.	43	2.40	0.98	Disagreed
I can guide library users in interacting with AI-based services.	43	2.16	0.75	Disagreed
I actively participate in workshops or webinars on AI in libraries.	43	2.70	1.34	Agreed
I am confident in using AI tools without supervision.	43	2.63	0.87	Disagreed
I have integrated AI tools into at least one library service I manage.	43	2.61	0.99	Disagreed
I consider myself skilled in the use of AI technologies in the library context.	43	2.60	1.16	Disagreed
Average Weighted Mean		2.63	0.99	

Table 3 reveals a significant gap between AI awareness and actual competency among the 43 surveyed librarians, using 2.63 as the threshold for agreement. The average

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weighted mean of 2.63 sits exactly at the threshold, indicating librarians are just barely at the competency level, with considerable room for improvement in practical AI skills. Areas of Competency (Mean ≥ 2.63) are Hands-on experience (3.23) with the highest score, indicating actual use of AI tools like chatbots and recommender systems, Training exposure (3.14) such as good access to formal/informal AI training, Workshop participation (2.70) with moderate engagement in AI-focused professional development, Basic operation (2.65) meaning the ability to operate AI-powered library applications, and Independent usage confidence (2.63) which barely meeting threshold for unsupervised use. Items lower than the threshold mean value are; Evaluation skills (2.16) with major weakness in assessing AI tools for library use, User guidance (2.16) such as inability to help patrons interact with AI services, Implementation knowledge (2.40) with limited understanding of automating routine tasks, Self-perceived skill level (2.60) with low confidence in overall AI competency, and Service integration (2.61) such as minimal success of integrating AI into library services. The result implies that there is a paradox here: librarians have used AI tools and received training, yet they lack confidence in evaluation, implementation, and user support. This suggests training may be more theoretical than practical, or that exposure has not translated into deep competency. The high standard deviations (0.75-1.34) indicate significant variation in skill levels across respondents. Therefore, librarians need more comprehensive, hands-on training focused on practical implementation and user support skills.

Table 4: Institutional and Infrastructure Challenges

Institutional and Infrastructural Challenges	N	MEAN	STD	Decision Mean >= 2.88
My library lacks the infrastructure needed to deploy AI tools.	43	3.44	0.50	agreed
There is inadequate funding for AI-based innovations in my library.	43	3.35	1.12	agreed
Librarians in my institution have limited access to AI training programs.	43	2.44	1.10	disagreed
The library management has not prioritized AI adoption.	43	3.09	0.78	agreed
Poor internet connectivity affects AI tool usage in my library.	43	2.98	1.01	agreed
Power supply limitations hinder the implementation of digital tools including AI.	43	2.49	1.12	disagreed
There is resistance to change among staff regarding AI integration.	43	2.44	0.81	disagreed
There are no internal policies guiding the adoption of AI in my library.	43	2.91	1.02	agreed
Collaboration with tech organizations for AI development is lacking in my library.	43	2.49	1.30	disagreed

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Bureaucratic procedures delay the adoption of new technologies like AI.	43	3.21	0.74	agreed
Average Weighted Mean		**2.88**	**0.95**	

Table 4 reveals the institutional barriers preventing effective AI adoption in libraries, with an overall weighted mean of 2.88 indicating significant challenges across multiple areas. Major institutional challenges (Mean ≥ 2.88): Inadequate infrastructure (3.44) with the highest concern, with low standard deviation (0.50) showing strong consensus, Insufficient funding (3.35) as the second major barrier to AI innovation, Bureaucratic delays (3.21) as administrative procedures significantly slow technology adoption, Lack of management prioritization (3.09) as leadership has not made AI adoption a priority, Poor internet connectivity (2.98) as basic connectivity issues hampering AI implementation, and Absence of AI policies (2.91) with no formal guidelines for AI adoption. Items that are lower than the threshold mean value are: Limited training access (2.44), Power supply issues (2.49), Staff resistance (2.44), and Technological collaboration gaps (2.49) as partnerships with technological organizations are not seen as critical barriers.

Summary of Findings

1. The findings showed that academic librarians are aware and knowledgeable on the use of artificial intelligence tools
2. The findings indicated that academic librarians have basic exposure to AI, and they need more comprehensive, hands-on training focused on practical implementation and user support skills.
3. The findings showed that academic librarians appear willing and somewhat trained, but institutional readiness lags significantly, creating a bottleneck that prevents effective AI deployment despite individual competency development efforts.

Conclusion and Recommendations

The study underscores the transformative potential of AI in streamlining administrative tasks, optimizing information retrieval, and improving user engagement, ultimately supporting the sustainability of library services in Nigeria. While progress has been made in deploying basic artificial intelligence tools, significant gaps exist in librarian competencies and infrastructure. Building artificial intelligence knowledge and information searching skills through targeted training and institutional support is essential to leverage the full benefits of artificial intelligence for sustainable library services.

The study recommended that there should be targeted capacity-building initiatives, collaborative partnerships, and phased implementation strategies to bridge knowledge gaps and foster a culture of innovation among librarians. The research concludes that empowering librarians with AI knowledge and advanced information searching skills is essential for positioning Nigerian libraries as dynamic knowledge hubs capable of meeting evolving user needs and advancing sustainable development goals.

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FUTURE ROLES AND SKILLS SET OF REFERENCE LIBRARIANS: LEVERAGING INNOVATIVE TECHNOLOGY FOR EFFECTIVE REFERENCE SERVICE IN LIBRARIES

BY

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Abstract

The role of the reference librarian is evolving rapidly in the information and communication technology (ICT) era. With the emergence of digital libraries, the reference librarian must be prepared not only to provide traditional reference services but also virtual reference services which needs a wide range of digital skills. The role of a reference librarian in the future cannot be overemphasized which is ranging from subject expert, global information provider, resource manager and a creator. An interview guide was developed to elicit responses on this topic from reference librarians from Kenneth Dike Library, and Lead City University. Questions such as the future roles and skill set of reference librarians, the importance of the future roles and skill set of reference librarians, how new roles and skill set can be acquired and their challenges were freely responded to. At the Kenneth Dike Library, and Lead City University, the reference librarians contended that the future roles and skill set of reference librarians are connected to emerging ICT trends such as Robotics, ChatGPT as well as the internet and different databases. They equally noted that the future roles of reference librarians will be in guiding users toward the use of the aforementioned tools and trends. Funding, epileptic power supply, internet connectivity is some of barriers facing acquiring new skill set of reference librarians. In conclusion, for a reference librarian to be able to carry out her future role she must possess skills such as information technology skills, personal entrepreneur skills, technical skills. All these skills will assist reference librarians in discharging their various responsibilities.

Keyword: Future skills, roles, reference librarian, ICT

Introduction

Library is an indispensable organisation in an academic setting. It plays a vital role in the collection of information resources with the specific purpose of acquiring, preserving and making available recorded and online information and knowledge. With the advent of Information and Communication Technology (ICT), services provided by reference librarians have been affected and there is need for the reference librarians to reevaluate how they render information services in this digital age. Regardless, the ICTs are the power of communication and every library is going to adopt its tools into their library for the speedy and quick response to library users. Besides these facts, all the libraries need highly qualified, trained and competent staff to make library fruitful for the user. Ahmad, Ameen & Ullah, (2017) in Anwar & Zhiwei (2019) have investigated and come into conclusion that every second, library as an organisation needs fully competent and skillful library personnel who can handle the library properly. Likewise, library and information professionals are seeking skills, competencies, and knowledge regarding the library management, library services, library works and overall administration of the Library. Anwar &

Zhiwei (2019) suggested that skills are the key factors to run any organization as per the requirement of the digital age. ICTs are playing a vital role in reshaping the library structure and its overall services.

The reference department of the library projects the image of the library and whatever is done can either leads to satisfaction or dissatisfaction of services provided to the user. Though, ICT has not relegated reference librarians because without their assistance accurate information cannot be gotten. Therefore, there is need for the reference librarians to equip themselves with relevant skills in relation to ICTs so that they can still perform their roles as reference librarians. Librarians have the power to change lives, to this extent, the librarian of the 21st century no longer sits in a corner they have to leave their desks, leave their building and delivers packaged current information sources and deliver on point than one that sits behind the reference desk answering mere reference questions. Today, every individual or group in the society needs information without wasting time, so all these are possible when the library staff learns the latest technologies, techniques, skills, competencies, and knowledge to make the library easy for library user's use. Modern information society needs every kind of information that can increase awareness of new developments (Egunjobi, Ogunniyi & Ajakaye, 2022). The present technological era needs a flexible environment to get information or learn skills to make information valuable and sharable. The roles and responsibilities of library professionals are changing day by day with the invention of new technologies and their related aid. Hence, the need to carry out a study on the future roles and set skills of reference librarians becomes fundamental. There is the need of time for future library professionals to learn, pursue and seek new skills and roles to run the library smoothly

Literature Review

Reference services are important services in the library that add to the overall image or functionality of the library. The reference section of the library holds and cares for valuable Information resources that cannot be loaned to users like encyclopedia, biographies, gazetteers, Dictionaries, maps, almanacs, periodicals, newspapers, journals among others (Egunjobi, Ogunniyi & Ajakaye, 2022). Apart from provision of resources, the section provides one-on-one services to users to meet their ever-dynamic information needs. Zemengue (2021) explained that the reference librarian helps in assisting misinformed users who are unfamiliar with appropriate library search. They are responsible for assisting the users in researching relevant topics as well as selecting recreational reading items. In other words, they provide reference services in various ways. With the invention of ICT users do not need to come into the library again as they can consult the reference librarian by telephone, email, and other means to get their reference queries answered. Then, the advent of social media and the application of artificial intelligence tools have made it much easier to provide reference services. According to Janes (2002), reference services were adopted in the late 19th and early 20th centuries in response to forces and trends occasioned by proliferation of information resources within and outside the library, complexities in various information resources; difficulties for users to locate the resources they need within the collection and an increase in the number and diversities of user using the library leading to a wider range of information needs, enquiries, and sophistication in the search for information.

Reference services literarily mean an assistance given to individuals in search of information that is easy to define. Some view reference service strictly as the reference section of the library, while others see it as the services or functions performed by providing information either within or outside the library. Still, others regard it as a personal perception of using reference materials beyond the library. Idhalama (2019) opined that Reference and Information Service (RIS) is an aspect of library service that connects readers with library materials. It is provided through staff assistance by matching users' information needs with available library resources, whether in print or electronic form. The roles of reference libraries have thus evolved in response to new societal and technological developments. They now use the new technologies to search for information and communicate the reference service users.

Idhalama (2019) further explains that although the traditional reference service of using the printed reference sources is still being practiced, most libraries around the world are now attending to users' information needs via the use of information communication technologies (ICTs). The traditional desk-bound reference services are now being complemented by remote reference services. The evolution of the use of information in reference services has made it possible for librarians to communicate with the users through e-mails, telephone cells, chats and other instant messaging software that help clients get their questions answered and information needs satisfied from remote places without face to face interaction with the reference librarians seated behind the Reference desk. The author was of the opinion that the application of ICT to library services has generally

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been accepted by academic libraries as the most means of providing timely, accurate and efficient information services. Thus it has been established that its application in libraries and specifically in reference services is of enormous advantage. Anyim (2018) opined that reference and information services however, involve direct and personal assistance within the library environment to persons in search of specific educational, social, cultural, economical, political and other kinds of information. Therefore, for a reference librarian to perform reference services accurately he/she must assume some roles. Alabi and Omoike (2020) stated that aside the traditional role of selecting, acquiring, organizing and dissemination of information services, librarians provide electronic information services to their clientele through electronic tools such as the internet, electronic databases, email and OPAC. Siddiqua, Ansari & Ansari, (2021) analyzed and compressed the following role of librarians in present digital environment as: "subject expert, global information provider, resource manager, creator, preserver, navigational guide, communicator, financial manager, time managers, legal advisor, personnel manager, tech savvy, mentor, and leader." Furthermore, Momoh & Folorunso (2019) in their study listed the new roles of librarians to include lobbying and advocacy, consortia manager, consultant, content manager, facilitator, knowledge manager as well as web designer. They further explained that the role of the librarian has shifted from being merely a custodian, that is, concerned with selecting and preserving physical materials, to providing access to both electronic and physical resources, maintaining knowledge of specialized digital databases, evaluating electronic materials, and acquiring licenses. In the aspect of guide it has shifted from assisting users in finding relevant materials to educating patrons generalized digital library services and about use of digital literacy, providing virtual services to users, often through library websites. In the aspect of public relation officer, it has shifted from maintaining connections with community, institutions and other libraries to developing relationships with database managers, hosting community events and partnering with increase access to other libraries to use their materials.

Momoh and Folorunso (2019) therefore concluded that for librarians to perform these roles, they must have skills like information technology skills, managerial skills, personal entrepreneurial skills, technical skills, information literacy skills. Anwar and Zhiwei (2019) defined skills as the ability to do something well, expertise, the ability to use one's knowledge effectively and readily in execution or performance. A skill is a type of work or activity that requires special training and knowledge. Ofodu (2019) opined that for librarians to be involved in promotion of library resources and services there is utmost need for training of such specialized skills for effective handling of the information for its dissemination to users. Such skills that can assist a librarian in promoting library information resources/services are thus: interpersonal skills, ability to sell ideas/ library services, ability to package/repackage needed information for patrons in advance, ability to assist in research writing for patrons, ability to answer users query, information technology skills, good communication skills, ability to question and evaluate library services, ability to possess and showcase a good attitude and moral to users. Mohammed & Tang (2019) asserts that for a librarian to be efficient in the digital age they must possess traditional skills, assessment added skills, technical librarian's skills, exchangeable and soft skills, personal skills, professional skills.

Kumar (2018) classified skills for librarian intothree broad categories which include generic, managerial and professional skills. Generic Skills: Under the generic skills different skills such as adaptability skills, relationship skills, decision making skills, flexibility skills, innovation skills, interpersonal skills, presentation skills, problem solving skills, self-confidence skills, and service analytical skills, assertiveness skills, creativity skills, communications skills, customer attitude skills.

Managerial Skills: Under the managerial skills different skills such as consumer service orientation skills; stress management skills; team building skills; time managing change skills; marketing skills; negotiation skills; people management skills; accounting and auditing skills); leadership skills; local and global thinking skills; management skills (user need analysis, Information seeking, and behavior analysis); planning and organization skills; project management skills; resource management skills; finance management skills (fund raising, skillful use of financial resources, and management skills); training skills, and understanding of cultural diversity skills.

Professionals Skills: Under the professional skills, different skills such as Information Technology skills (hardware/ software and networking skills, MS-Office suite, presentation software's e.g. power point, library automation, database creation, Z39.50, and system development); knowledge management; knowledge mapping skills; technical professional skills (Information resources management, E serial

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management), Metadata standards (Dublin core, MARC, TEI, XML, Standards e.g. development, digitization, web-based services, and virtual learning); information literacy, intranet managing skill, scanning techniques, networking skills (on-line search engine, and on-line database search), desktop publishing, content knowledge auditing skills; technology acquisition skills, and traditional skills.

Bajpai & Margam (2019) conducted a survey to identify the skills and competencies needed by a reference librarian in Croatian academic libraries. The result indicates that under general skills searching skills (82.9 per cent), followed by IT skills (34.1 per cent) and Traditional reference interview (14.6 per cent) were the most important general competencies and skills considered by the librarian. However, the finding established as less important skills such as technology skills, web design, software and hardware troubleshooting, chat and instant messaging (5 per cent or less). The author, through the content analysis of literature on skills and competencies that are required for LIS professionals in the digital era, found that library professionals in the digital era were required to be analytical, creative and flexible, and have general skills such as communication and teamwork, critical thinking and other technical skills such as knowledge of collection development, digital library software, and Metadata. It is imperative to note that once a reference librarian possesses these skills, he/ she will be able to perform virtual reference services. According to Yatin, Kanan, Kamarudin & Zainuddin (2018), virtual reference service allows the users - students, researchers, academicians to do research and assignments from outside the library building and the university. This opportunity will give benefits to university and college, to begin to offer more courses and opportunities for them to choose as a distance learner and flexible learning programme. This will lead to a new position as distance librarianship, that will function as a library content developer, and there are more users who actively used library service outside the library

It is important to also note that reference librarians have not being able to assume some roles and acquire some future set skills due to some constraints. Zemengue (2021) in his study discovered that reference services in libraries in Cameroon are lagging in their development. Constraints to their efficient organisation and functioning include insufficient financial resources and a shortage of qualified librarian staff; all these prevent the development of librarianship in the country. Hussaini (2020) submitted that budget shortage is the first major challenge facing the implantation of reference services delivery in Nigerian libraries. Libraries are the hardest hit when the parent institution's budget is reduced, which affects every section of the library. Another issue is a lack of or insufficient skilled personnel. Managing the reference section without enough skilled personnel is a difficult task for librarians. To keep up with global trends, the library staff requires various types of training. Because technology is changing so quickly, staff training is an ongoing process. If the library staff is unfamiliar with the available technological tools, they may not be in the best position to assist the users and answer their reference queries properly. It is a waste of money and space not to have enough skilled workers while having a standard reference section and tools.

Zemengue (2021) stated that on a regular basis, users present reference queries -questions that require complex information that cannot be obtained from a single source. Libraries are expected to respond to these reference queries or questions posed by users. They are also expected to anticipate user queries in order to quickly provide the information resources required to answer such queries. Another challenge is the absence of qualified library personnel. It is commonly stated that the quality of reference service provided is usually reflected in the quality of staff. Most librarians working in the reference services lack professional training and do not have access to refresher courses and retraining. Poor information and communication technologies do not facilitate inter-library cooperation at the national, regional, and international levels. According to Adebayo, Ahmed & Adeniran, (2018), the challenges facing libraries use of ICT are enormous, prominent among which include inadequate funding; high cost of ICT software and/or operation; poor maintenance culture of ICT equipment in libraries; unstable power supply; dearth of ICT policies; lack of technical ICT skills and competencies among library personnel; technophobia; insufficient bandwidth and copyright and intellectual property management problems.

Methodology

Interview method of data collection of key informant type was used for the study, which involves the collection of data from a particular group of people or expert in a particular field that can provide answers to your question which is different from general opinion. A structured question was used for data collection, the study comprises of reference librarians from Lead city library and University of Ibadan and responses was collected and analysed.

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Findings

Responses obtained from the Lead City Reference Department indicate that a reference librarian should be able to show users how to navigate the internet in order to get information they seek and also train them on how to use emerging technology in ICTs like ChatGPT, robotics and artificial intelligence. The reference librarians should assume the role of instructors, telling users how and where to get information. It is important to note that reference librarians will definitely continue their traditional role but they have to tailor it to meet the need of digital age. The reference librarians will assume the role of navigating internet, making use of technology and how to authenticate information received. The reference librarians should possess new skill because of the emergent of new technology in order to remain relevant and meet the information needs of users. Some of the skills they should have include pro-activeness, self-directed skills, ICT enthusiastic, knowledge of reference sources.

Our findings further show that the best way to acquire these skills are through personal development that is the reference librarian must be a veracious reader, a book worm who is an information enthusiast and always willing to learn in order to be of assistant to the user. A reference librarian should be able to learn ahead of the user in order to be effective. Furthermore, the reference librarian should actively be engaged with library association where other reference librarians come together to share their knowledge and latest threads in the profession. Also, the parent body where the librarian belongs should also send the reference librarian for training as well as attending conference both local and international.

The reference librarian from the Kenneth Dike Library also emphasize on the roles that a future reference librarian should have which include the provision of accurate reference service to clienteles through effective communication in order to meet the need of users. They should also assume the roles of providing, selecting and dissemination of information, current awareness services, answering users queries, consultation services, giving direction / links of relevant information sources to target users as well as friendliness. In order to perform these roles the reference librarian should have interpersonal skills, technical skills and ICT skills.

Kenneth Dike Reference Librarian was also of the opinion that one should have these skills in order to perform hitch-free reference services and ensure maximum provision and dissemination of library service to users and also to provide consultation service to user having queries. It was stated that reference librarians can acquire the future skill set in this profession through online assistive training, seminar and training for library professional. It is important to note that there are some factors hindering Reference Librarian from acquiring these skills which include inconsistency in power supply, lack of technical know-how in operating computerized machine in reference section, unconducive work environment, inadequate training on relating issues, poor internet connectivity, insufficient finance from parent body

Conclusion

As we all know that reference librarians perform important roles in the library which cannot be neglected, such as answering users' queries, disseminating information, guiding the user in getting information, assisting library users with the appropriate use of information resources and also keeping most valuable resources. In order to make these vital roles keep functioning, a reference librarian must be skillful in modern technology's use of telephone, email and other means to provide answers to user queries. In a nutshell, for reference librarians to be able to carry out their future role they must have skills like information technology skills, personal entrepreneur skills, technical skills and information literacy skills. All these skills will assist reference librarians and make them achieve their future role. The best way for reference librarian to acquire new knowledge is to develop him/her personally. He must be a veracious leader, a book warmer who is always willing to learn so as to acquire new knowledge that will be of assistance to Users so that users will not render him useless. He must be curious and inquisitive with new tools and resources. He must be familiar with new development because in many cases patrons already have access to the information through the internet they only need the assistant of the reference librarian to shed more light on their previous knowledge. If a reference librarian able to provide answer to user on new skills that user has already been searching for but need more knowledge for clarification, they will be able to retain their status as expert and this will make user keep visiting the library.

Finally, a reference librarian should assume the role of navigating internet, making use of Technology and how to authenticate information received. They should be able to possess new skills because of the emergency of new technology in order to remain relevant and meet the information need of user.

Recommendation

The invention of technology in one way or another other has affected the proper functioning of library activities. In other to let the library keep functioning effectively

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and to ensure that reference roles keep functioning in the nearest future, the following are recommended

1. Acquisition of generic, managerial and professional skill
    a. The generic skills include: adaptability skills, relationship skills, decisions making skills, flexibility skills, innovation skills, innovation skills, interpersonal skills, flexibility skills, Presentation skill, self-confidence skill and service analytical skills, assertiveness skills creativity skills, communication skills and customer attitude skills
    b. Professional Skills: This includes: information technology skills hardware, software, networking skills, Ms - office, suite, Presentation, software PowerPoint, database creator, project management skills, resources management, metadata etc
    c. Management skills: These include consumer service orientation skills, stress management skills, team building skills, time management change skills, marketing skills, negotiation skills, team building skills, local and global thinking skills etc
2. Competent and skilled personnel should be employed at the reference section to be able to carry out the task effectively using different approaches
3. A reference librarian must be trained on the proper way of using new technology to be able to assist the user to be able to search for information using technology.

d. 4.They should engage in Library Association activities where other reference librarians come together to share their knowledge and latest threads in the profession

e. The parent body where the reference librarian belongs should also send the reference librarian for upskilling attending conferences both local and international.

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HARNESSING SOCIAL MEDIA TO STRENGTHEN MARKETING STRATEGIES AND LIBRARY SERVICE DELIVERY: EVIDENCE FROM KOGI STATE UNIVERSITY LIBRARY, KABBA, NIGERIA

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Abstract

This study investigates the utilization of social media as a tool for marketing library services in academic institutions, with a focus on Kogi State University, Kabba, Nigeria. The research was necessitated by the growing importance of digital platforms in extending the reach, visibility, and relevance of libraries within the information age. A descriptive survey design was adopted, targeting 24 librarians in the institution, to assess the types of social media tools employed, the extent of their usage, and their perceived impact on service delivery. Findings reveal that although platforms such as Facebook, WhatsApp, Twitter, and YouTube are widely recognized as valuable for marketing, their actual use in the studied library is minimal. The underutilization is largely attributed to challenges including inadequate funding, limited ICT competence, poor internet connectivity, erratic power supply, and low institutional awareness of the benefits of social media. Nevertheless, the study highlights the potential advantages of social media for academic libraries, including improved communication with users, cost-effective outreach, professional networking, rapid dissemination of information, and enhanced user engagement. The results underscore the need for academic libraries to embrace digital platforms strategically, supported by capacity-building initiatives, infrastructural development, and sustainable funding. The study concludes that for libraries to remain relevant in today's dynamic information environment, deliberate adoption of social media and integration of emerging technologies such as artificial intelligence are imperative. It recommends that library managers and policymakers prioritize social media marketing as a core component of service delivery in academic libraries.

Keywords: Academic Libraries, ICT adoption, Library Marketing, Social Media, and Service

Introduction

Social media is increasingly becoming the preferred medium for librarians to establish social and professional networks, extend information services, and connect with both local and remote users, particularly in academic environments. Its role in replacing traditional service delivery methods is evident, as users now create and disseminate information through highly accessible and scalable publishing technologies (Rogers, 2015). Quadri and Idowu (2016) argued that social media has transformed how people locate, consume, and share information, shifting communication from one-way monologues to dynamic conversations. Defined as internet-based platforms that enable the creation and sharing of content (O'Dell, 2020), social media also operates as collaborative spaces built on Web 2.0 technologies (Chu & Du, 2023). These tools such as wikis, blogs, and online maps foster interaction, collaboration, and knowledge sharing among professionals, with academic libraries adopting platforms like WhatsApp, Facebook, YouTube, Twitter, LinkedIn, and Skype for effective service delivery (Sahu, 2023). However, Akobe (2019) emphasized that the real challenge for librarians is not managing collections or technology but transforming these resources into services that respond to modern demands.

The evolution of library services reflects broader changes in information practices. Libraries have

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shifted from basic to value-added services, from in-house to outreach, and from reactive to proactive delivery models. In this context, social media plays a crucial role in marketing information to users and branding libraries as community hubs (Akobe, 2019). Web 2.0 applications are increasingly being recognized for their ability to enhance service promotion and access, reinforcing social media as a powerful communication tool. These applications facilitate collaborative learning, online networking, and rapid dissemination of information, positioning libraries to compete effectively in the digital age. Gupta (2014) further noted that social networking sites provide opportunities and challenges for transforming education, particularly by enabling libraries to meet evolving user needs.

In today's competitive information environment, academic libraries must adopt marketing strategies to remain viable and relevant. College libraries, regarded as the "nerve centers" of academic institutions, face increased competition from emerging technologies that extend information access beyond physical collections. For libraries, survival now depends on their ability to project a positive image, attract non-users, and highlight the value of their services (Gupta & Savard, 2020). Marketing, therefore, is not a peripheral activity but a core function embedded in the entire operations of libraries. Effective promotional approaches ensure that users are persuaded, informed, and motivated to act, thereby reducing barriers to access (Helinsky & Alman, 2016). As Gupta (2014) asserted, marketing involves understanding user needs and aligning services to meet them. By adopting marketing as a managerial tool, libraries can raise awareness of resources, foster user engagement, and ultimately contribute significantly to institutional goals.

Statement of the Problem

Many of the library services in university libraries in Nigeria are delivered manually and the delivery of these services through traditional means has been cumbersome and time-wasting. Traditional library services restrict users to the available resources available within the library collections only. Moreover, access to information is limited to print resources and these places the patrons at disadvantage with limited information resources. There is no doubt that the traditional library and information services need improvement as a result of its limitations and inadequacies. There is need for re-designing the services to meet the demands of their users and remain relevant and retain their place as information providers in this technology age. The inadequacies of traditional library services prompted university libraries to adopt information and communication technologies in library services. This study, therefore, investigated the impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria.

Research Objectives

The purpose of the study is to investigate into the Assessment of Social Media in Marketing Library Services for effective Service Delivery in Kogi State University Library Kabba, Nigeria. However, the specific purpose of the study include to:

1. Identify social media tools used in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria.

2. Investigate the level of usage of social media in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria.

3. Assess the perceived impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria.

Research Questions

1. What social media tools are used in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria?

2. What is the level of usage of social media in marketing library services for effective service delivering in Kogi State University Library Kabba, Nigeria?

3. What are the perceived impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria?

Significance of the Study

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This study is significant as the findings would help librarians to develop strategies that would guide them in the use of social media for library services. Library management in academic libraries especially Kogi State University Library Kabba, Nigeria would see the findings helpful in deciding on the kinds of social media to utilize. Moreover, the findings could be used by library administrators to organize regular training programmes to train librarians with the latest development in web technologies. This research study would be of great important to the research undergraduate/students, the academic institution and the staff. To the research students, it would serve as a source of references for the future research or study among undergraduates. To the academic institution, the research institution gives adequate training and funding in learning library courses. To the staff, to encourage them acquire more qualification and knowledge from information communication technology in the organization of information Resources.

Scope of the Study

The study focused on the Impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba. The scope of the study will estimate the number of questionnaires which are to be distributed to library officers and students to examines and suggest for the developmental framework which would catalyze the usage of social media in marketing library services for effective service delivery in Kogi State University Library Kabba, Nigeria.

Literature Review

Concept of Social Media

The emergence of social media in the 21st century has transformed human communication, becoming an integral aspect of everyday life. This shift has been facilitated by technological advancements such as computers, digital devices, telecommunication facilities, and the internet. Ayiah and Kumah (2017) defined social networking as web-based services that enable individuals to create public or semi-public profiles and interact with others within defined systems. In this sense, social media encompasses individuals or organizations linked through professional, academic, and social networks. Buettner (2016) further described social networking as computer-based tools that allow people to create, share, and exchange information, ideas, and media in virtual environments. These interactive platforms support collaboration and knowledge exchange, which have become increasingly valuable in both professional and academic contexts. Within librarianship, social media has emerged as a preferred method for building professional networks, connecting with users, and expanding service delivery beyond traditional boundaries. Rogers (2015) noted that accessible publishing technologies enable users to generate and share content on social media, while Quadri and Idowu (2016) argued that it has transformed one-way communication into interactive conversations. Similarly, O'Dell (2020) characterized social media as internet-based platforms for content creation, and Chu and Du (2023) situated it within Web 2.0 technologies, which emphasize collaboration and information sharing through tools such as blogs and wikis. In light of these developments, Akobe (2019) stressed that libraries must evolve from merely managing collections and technology to offering responsive services, a goal increasingly achieved through platforms such as WhatsApp, Facebook, YouTube, Twitter, LinkedIn, and Skype (Sahu, 2014). The integration of social media into academic libraries has created opportunities for engagement, marketing, and innovation. These tools enable libraries to build stronger relationships with users, facilitate information access, and enhance the visibility of resources. Edewo and Omosor (2024) observed that social networking platforms allow libraries to reach broader communities, target specific user groups, and provide interactive engagement spaces. For example, Facebook and WhatsApp are widely used to promote resources, YouTube supports the dissemination of recordings from academic events, and Flickr allows sharing of photographs from library activities. Similarly, blogs provide avenues for engaging distance learners, while Twitter facilitates the marketing of reference and research services. Khan and Bhatti (2014) also noted that these platforms help libraries advertise services, publicize new acquisitions, and issue service alerts, thereby improving user engagement. Ultimately, the adoption of social media in academic libraries is not simply a response to technological change but a deliberate strategy to sustain relevance, strengthen user relationships, and enhance service delivery in the evolving digital

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information landscape. The most widely Used Social Media Tools are as follows:

1. Facebook: This is the most popular social networking tool for creating library awareness and marketing library services. By using Facebook, library users can access all types of virtual technical information and disseminate their findings. Users can also use this platform to share academic information in a decreased effort and time.

2. Twitter: This is another tool used frequently to update collections, new arrivals, current content service of the library and market or advertise library services. The ease of posting and sharing information on twitter makes it an essential tool for libraries to reach their users. networking tool that enables academic libraries to market and promote their activities and services. Blogs are very helpful in promoting library services like new acquisitions, opening hours of the library, library events and programmes, online discussions etc. Library staff can post news about the library as well as events occurring in the library. This implies that there is need for consistent updating of the blogs in order to keep the library staff as well as users abreast of available library resources and services.

4. WhatsApp: This is another Social Media platform or tool that allows interaction between library staff and their users. WhatsApp features include one-on-one chat, group chat, push notifications, sending and receiving both video and audio links.

5. Instant Massaging: This is one of the real time electronic consulting and reference services offered by academic libraries via specific software running on the internet platform. Academic libraries use instant massaging to enhance their reference service delivery processes because it allow them to respond instantly to queries from their clients.

Some of the Impact of Social Media in Marketing Library are:

1. Better Communication: Social media enables everyone to communicate with their friends and families worldwide, and it fosters better communication and makes it easier to make new friends. Before the rise of social media platforms, communication was linked to short distances and took a long time to reach far places. Now, you can contact your relatives, long lost friends who are miles away in another part of the world within a click. Isn't that amazing? Being connected with old friends and people and families has helped many people feel connected and stay closer than ever. Also, you can have hundreds of friends with whom you can interact and create friendships. Social media enables people to share their posts, content, ideas, experiences, and many other things that can lead to a more significant number of connections worldwide.

2. Building relationships and communities: Social media is a crucial means to boost our communities and build relationships. With the use of social media platforms, you can find vital connections and build new relationships as you desire. In the recent times of the coronavirus pandemic, people found themselves isolated, far from social reach and communication, developing several mental health issues. And in these times of hardships, social media platforms have brought that level of connection through various virtual communities, and online desk helps. Through social media, you can make new connections and start building relationships with like-minded people to easily communicate and share content, ideas, experiences, and knowledge. This level of connectedness helps develop a sense of community that is only possible through social media platforms (Soria, 2017).

3. Sharing a common interest: We all have a hobby or a subject we are interested in. And you may be active on social groups such as book clubs, movie/TV series, fashion, and science groups on Facebook, Reddit, Instagram, etc., where you find like-minded people like you, looking for the same thing. Social media enables us to find and connect with thousands of people who share a common ground as you from across the world. You can find like-minded people, groups, and communities with shared interests and ambitions. Even for those living in remote areas, it brings a sense of community through the connectedness of social media communities. Social media can help teenagers and youths feel accepted, and groups of like-minded people can use its positivity to develop their personalities and share their journeys.

4. Offers kindness and empathy: Have you ever posted or commented about how you felt, and people have showered their care and affection, fully supporting you? This is one of the positive impacts of social media. People often share their stories, how they struggle, the ups and downs, and their journey. And let me tell you, they do care. There are tons of positive comments and messages that encourage and allow

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people to do better in life through social media. People can offer kindness and empathize by sharing their part of stories on social media. With engagement in different support groups such as anxiety, and depression support groups, and many others, people can help each other when they need it most. The kindness and support that people get on social media are positive impacts of social media on their mental health and offer a way to see the world from a whole new perspective (Soria, Fransen, & Nackerud, 2017).

5. Source of knowledge and learning: Social media is one of the major platforms where people can gain a multitude of knowledge. And not only do young people and students benefit from it, but people of all ages are learning something new every day. The multiple posts, tweets, videos, and articles shared on social media serve as valuable information sources to learn new skills every day. From learning how to make a flipbook to figuring out how to change a tire, social media can teach you a lot. Also, the times of COVID pandemic have undoubtedly proved that through the means of social media, you don't have to halt physical learning. Students and professors can enhance their learning and knowledge skills effectively through social media. Students can find different free educational websites, mentors, and online seminars, which help them learn new skills to move ahead in their careers. They can find valuable tutorials to upgrade their skills from YouTube.

6. Raise your voice on important issues: Social media helps people join causes and raise their voices and awareness on important topics and issues. Many of us have seen global movements such as Black lives matter, Me Too, and Climate Change that has made an enormous impact worldwide, unlike traditional media. It has raised awareness and exposed the whole world to contribute to such sensitive topics.

Enhancing Library Marketing and Service Delivery through Social Media: Strategies for Supporting Distance Higher Education

Distance higher education is becoming increasingly competitive, necessitating strong learner support services to ensure student success. Such services are essential in helping students overcome socioeconomic and academic challenges while reducing attrition rates and improving outcomes (Simui et al., 2017; Soria et al., 2017). Arhin et al. (2017) identified tutorial counselling and academic advising as effective tools to sustain distance learning, while Simui et al. (2017) emphasized that course modules and lecture notes alone are insufficient for advanced learning. Academic libraries play a central role as support agents, offering equitable access to information resources that supplement instruction. However, distance learners often face limited access and inadequate information literacy skills, leading to low patronage and negative learning experiences (Larson & Owusu-Acheaw, 2016). Increased library use has been positively correlated with retention, achievement, and higher grade point averages (Soria et al., 2017). To address these gaps, Hagel et al. (2022) stressed the need for collaboration among stakeholders, including libraries, to reduce dropouts and build research skills. Thus, libraries must move beyond traditional resource provision to marketing their services using strategies such as blogs, webpages, and social media platforms like Facebook, Twitter, and YouTube (Adekunmisi, 2016; Aderibigbe & Farouk, 2017).

Despite the presence of innovative technologies, many African academic libraries continue to rely heavily on traditional approaches. Edewor et al. (2024) found that flyers, newsletters, and bulletins remain common strategies, while Ofori et al. (2020) observed that orientation programs are the most widely used tool in Ghana. Though valuable, these methods limit wider engagement and reflect slow adoption of digital techniques. Additionally, challenges such as irregular updates, weak policy frameworks (Garoufallou et al., 2016), poor funding, copyright restrictions, and inadequate marketing skills (Mohammed & Ibrahim, 2021) continue to undermine effective service delivery. Combined with students' lack of experience in using retrieval tools, databases, and advanced search strategies (Owusu-Ansah et al., 2018) these issues perpetuate misconceptions about library roles and restrict usage. To overcome these challenges, libraries need comprehensive strategies involving policy reforms, investment in digital literacy, and the adoption of dynamic marketing techniques to maximize visibility and impact.

Social media has become a powerful tool for effective service delivery, allowing institutions and brands to connect with users, respond to inquiries, and build trust and engagement. When used strategically, it enables organizations to address complaints, provide resources, and foster customer loyalty (Ayiah &

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Kumah, 2017). Effective practices include timely responses to feedback and questions, choosing whether to resolve issues publicly or privately, and monitoring streams to track sentiments and perceptions in real time. Establishing personal relationships through greetings, adopting conversational tones, and setting clear brand guidelines further strengthen user engagement. Dedicated social media handles for customer service also help distinguish support from marketing functions, ensuring better responsiveness and consistency across platforms. Moreover, proactive strategies such as sharing FAQs, how-to guides, and updates on service challenges can reduce support requests and empower users with self-service solutions (Rogers, 2022). Ultimately, leveraging the right channels where target audiences are most active enhances service delivery, improves satisfaction, and sustains institutional or brand reputation.

Benefits of using Social Media tools in Marketing Library Services.

The use of Social Media tools in marketing library services by library staff has a lot of benefits to both the academic libraries and their users. Ayiah and Kumah (2017) opined that libraries (including academic libraries) can benefit in social networking through collaboration, promotion and meaningful engagement with their patrons. It can also help as avenue in receiving and responding to users' queries. Some specialized social websites like Research gate, among others are also available for librarians to use in rendering library services to professionals in all fields of human endeavors. Ayiah and Kumah (2017) stated that the use of social networking tools is easier and does not require high technological equipment except computer, internet, connectivity and a trained professional. It is sometimes expensive to utilize other means of communication like phone calls, SMS, Radio, Newspapers and Television to inform library users about services that they render.

Some of the Benefits of Social Media Marketing Libraries include:

1. Allows Libraries to promote themselves to large, diverse audiences that could not be reached through traditional marketing such as phone and email-based advertising.
2. Marketing on most Social Media platforms comes at little to no cost- making it accessible to virtually any size Libraries.
3. Accommodates personalized and direct marketing that targets specific demographics and markets.
4. Libraries can engage with patrons directly, allowing them to obtain feedback and resolve issues almost immediately.
5. Ideal environment for a Library to conduct market research.
6. Can be used as a means of obtaining information about competitors and boost competitive advantage.
7. Social platforms can be used to promote brand events, deals, and news.
8. Social platforms can also be used to offer incentives in the form of loyalty points and discounts.
9. Allows Libraries to build an online platform to promote and sell their product.
10. Can be useful for gaining potential customers and gives them access to become involved with the Libraries (Simpson, 2018).
11. Builds a community that enhances a Library's reach in their selected target market.

Strategies of Adopting Social Media in Marketing Library

Social media's popularity is soaring just as rapidly as it's changing, with new apps and trends reshaping the digital landscape every week. This rapid evolution makes it challenging for marketers and businesses to remain current. To address this, we have created a list of five strategies to construct a robust social media presence. Quadri and Idowu (2016) stated some of these Strategies. These include:

1. **Set specific objectives:** Your objectives should be clear in terms of financial or non-financial result you expect from SMM campaign.
2. **Allocate sufficient resources:** in terms of time, money and man power. There should be a separate social media marketing department and budget allocated to it.
3. Conduct a research to identify the areas required to be focused during the campaign.
4. **Make a Social Media Marketing Plan:** What, When, Where and How of SMM campaign i.e. what kind of Information will you share with the audience? (Suggestion: Information should be real and the quality of content should be good, content and themes can be according to days and events).
5. **Make Internal Collaboration:** All the employees of the organization should be part of SMM plan. They

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are the real advocates for the company and for the SMM campaign.

6. Integrate and synchronize the social media marketing with other marketing communication messages across the channels, online as well as offline.

7. **Build Relationships:** Suggested Do's: Start-interaction, participate, be true, listen to your customers, make them feel special, provide customer services, give timely response/information, involve and engage your customers in co-creating the marketing events and content, make your customers a part of your organization, provide proper feedback and rewards to your customers, and value their interest and privacy. (Suggested Don'ts: Do not disturb your customers without their permission or interest, do not irritate your customers by passing unnecessary comments, videos, pop-ups and advertisements, do not share customer information and data without their permission, and do not interfere in their other social activities on social networking sites.

8. **Manage the SMM Campaign:** Appoint technically expert people to keep checks on the SMM content, have control over negative word of mouth, keep check on competitors SMM activities, and present your stuff

Research Design

Descriptive survey research design was used for the study. According to Ali (2016), Descriptive survey research design is concerned with the documentation and description of what exists or the present status of existence or absence of what is being investigated without any manipulation of what caused the event. It develops a profile on what is and not why it is so. It is considered appropriate for the study because it is based on the views, opinions of respondents as well as resources available in the area of study. Descriptive research aims to accurately and systematically describe a population, situation or phenomenon. It can answer what, where, when and how questions, but not why questions. A descriptive research design can use a wide variety of research methods to investigate one or more variables. Unlike experimental research, the researcher does not control or manipulate any of the variables, but only observes and measures them (McCombes, 2023). The area of study was centered on a tertiary institution in Nigeria. Kogi State University, Kabba is a public higher institution of Kogi State. It is situated in Kabba, a major town in the west of Kogi State. The population of the study comprises of 24 Librarians in Kogi State University Library. The study employs a total enumeration sampling technique.

Research Question 1: What social media tools are used in Marketing Library Services for Effective Service delivery in Kogi State University Library Kabba?

Table 1: Social media tools used in marketing Library services for effective service delivery in Kogi State University Library Kabba.

S/N	Items	U	%	NU	%	Total	Decision
1.	Facebook	5	20.9%	19	79.1%	24	Not Utilized
2.	Twitter	2	8.4%	22	91.6%	24	Not Utilized
3.	Pinterest	-	0%	24	100%	24	Not Utilized
4.	Whatsapp	4	16.7%	20	83.3%	24	Not Utilized
5.	Tiktok	-	0%	24	100%	24	Not Utilized
6.	Instagram	-	0%	24	100%	24	Not Utilized
7.	YouTube	-	0%	19	100%	24	Not Utilized
8.	LinkedIn	2	8.4%	22	91.6%	24	Not Utilized
9.	Skype	-	0%	24	100%	24	Not Utilized
10.	Blog	-	0%	24	100%	24	Not Utilized

Key: U= Utilized, NU= Not Utilized

Table 1 indicates the respondents accepted to all the ten (10) items on the platforms and social media in marketing library services for effective service delivery in Kogi State University Library Kabba thus; Facebook: not utilized 79.1% and 0% not utilized, Twitter not utilized 91.6% not utilized, Pinterest: not utilized 100%, WhatsApp not utilized 83.3% and 0% not utilized, TikTok : not utilized 100% and 16.6% not utilized, Instagram: not utilized 100% and among others are 0% not utilized.

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Research Question 2: What is the extent of utilization of social media in marketing library services for effective service delivery in Kogi State University Library Kabba?

Table 2: Responses on the extent of utilization of social media in marketing library services for effective service delivery in Kogi State University Library Kabba.

S/N	Items	VHE	HE	LE	VLE	∑fx	X	Decision
1.	Facebook	0	0	9 18	10 10	28	1.16	Rejected
2.	Twitter	0	0	9 18	15 18	33	1.37	Rejected
3.	Pinterest	0	0	10 20	14 14	34	1.41	Rejected
4	Whatsapp	0	4 12	8 16	12 12	40	1.66	Rejected
5.	TikTok	0	0	8 16	20 20	36	1.16	Rejected
6.	Instagram	0	0	10 20	14 14	34	1.41	Rejected
7.	YouTube	0	0	6 12	13 13	25	1.04	Rejected
8.	LinkedIn	0	2 6	0	22 22	28	1.16	Rejected
9.	Skype	0	0	4 8	20 8	28	1.16	Rejected
10.	Blog	0	0	11 22	13 13	35	1.4	Rejected

Key: VHE = Very High Extent, HE = High Extent, LE = Low Extent, VLE = Very Low Extent

Table 2 above shows that the respondents agree to ten (10) items on the extent of utilization of social media in marketing library services for effective service delivery in Kogi State University Library Kabba.

The findings shows that none of these listed social media in marketing library services for effective service delivery in Kogi State University Library Kabba are being utilized.

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Research question 3: What are the perceived impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba?

Table 3: Responses on the impact of social media in marketing library services for effective service delivery in Kogi State University Library Kabba.

S/N	Items	SA	A	D	SD	∑fx	x	Decisions
1	Promotes better communication	20 80	4 12	0	0	92	3.8	Accepted
2	Helps users discover library resources services and events	15 60	8 24	1 2	0	86	3.5	Accepted
3	Provides cost-effective channels	18 72	6 18	0	0	90	3.7	Accepted
4	Facilitates professional networking among librarians	19 76	5 15	0	0	91	3.7	Accepted
5	Increases source of knowledge	15 60	8 24	1 2	0	86	3.5	Accepted
6	Helps in raising voice on important issues	12 48	11 33	1 2	0	83	3.4	Accepted
7	Enables rapid sharing of information news and best practice	18 72	6 18	0	0	90	3.7	Accepted

Discussion of Findings

The study was designed to examine the impact of social media in marketing library services for effective service delivery in Kogi State University Library, Kabba, Nigeria.

Social Media Tools in Marketing Library Services for Effective Service Delivery in Kogi State University Library, Kabba, Nigeria

Table 1 reveals social media tools used in marketing library services for effective service delivery in Kogi State Univeristy Library, Kabba. It was revealed that Facebook, Twitter, Pinterest, Whatsapp, TikTok, Instagram, YouTube, LinkedIn, Skype, and Blogs are not utilized. This assertion is in line with the study of (Sahu, 2015), describing social media include: Facebook, Twitter, Pinterest, Whatsapp, TikTok, Instagram, YouTube, LinkedIn, Skype, and Blogs etc.

The findings is also in collaboration with, Quadri and Idowu (2016) supported the aforementioned assertion by claiming that social media has fundamentally changed how people find, consume, and share news, information, and materials.

Extent of Utilization of Social Media in Marketing Library Services for Effective Service Delivery in Kogi State University Library, Kabba, Nigeria

Table 2 shows that the extent of utilization of social media in marketing library services for effective service delivery in Kogi State University Library, Kabba are Twitter, Pinterest, Whatsapp , TikTok, Instagram are not utilized by librarians in Kogi State University Library, Kabba. The findings are in line with (Gupta, 2014) who noted that Twitter, Pinterest, Whatsapp, TikTok, Instagram are not widely utilized social media platforms by the librarians.

Impact of Social Media in Marketing Library Services for Effective Service Delivery in Kogi State University Library, Kabba, Nigeria

Table 3 shows impact of social media in marketing library services for effective service delivery in Kogi State University Library, Kabba, which include the

promotion of better communication, helps users discover library resources, services and events, Promotes cost-effective channels, facilitates professional networking among librarians, increases source of knowledge, helps in raising voice on important issues, enables rapid sharing of information news and best practice.

Assessment of Social Media Strategy Effectiveness

The effectiveness of social media strategies was primarily assessed using a descriptive survey design, incorporating quantitative data collection through structured questionnaires administered to 24 librarians at the Kogi State University Library, Kabba, Nigeria The study relied on user feedback and engagement metrics to evaluate specific outcome areas:

1. Improved Communication

- As shown in Table 3 of the research, 83.3% of participants (20 out of 24) strongly concurred that social media enhances communication between the library and its users.
- The average score for this item was 3.8 out of 4, reflecting strong consensus and confirming that participants considered social media an essential resource for improving user-library engagement.

2. Heightened Awareness and Discovery of Resources

- 75% of those surveyed concurred or strongly concurred that social media aids users in finding library resources, services, and events.
- This was evident in an average score of 3.5, indicating a favorable view of social media's impact on enhancing user awareness and resource visibility.

3. Cost-Effective Marketing and Broader Reach

1 The research revealed that 90% of participants thought social media offers affordable platforms for promoting library services, with a considerable average score of 3.7.

2 This indicates that social media is seen as an economical substitute for conventional marketing methods.

4. Professional Networking and Knowledge Sharing

- 79% of librarians reported that social media enhances professional networking with colleagues and peers.
- The platforms were also recognized for enhancing access to knowledge and learning opportunities (mean score = 3.5), which indirectly links to better service delivery via professional growth.

Recommendations

Based on the findings of this study, the following recommendations are made to impact of social media in marketing library services for effective service delivery in Kogi State University Library, Kabba.

1. Academic libraries should endeavour to embrace other forms of social networking tools including Facebook, WhatsApp and twitter to market their products and services to their users.
2. Having known the benefits of using social networking platforms in marketing academic library services, the managements should see it as a point of duty to create an enabling environment to enhance social networking activities in the library. This can be realized if there are connectivity as well as trained professionals in the library.

funded by the authorities concerned to enable them acquire more internet facilities, train their staff on how to use the facilities to market library products and services and install solar energy in order to tackle the issue of erratic power supply in the library.

Conclusion

In this time and age, for academic libraries all over the globe to survive the current demand for information by their clients, social networking and mobile technologies must be incorporated into their activities and services. Academic libraries cannot continue to remain in their traditional methods of providing information resources and services forever. In other words, they should try to become awake to new circumstances, needs and opportunities.

Based on the findings of this study, it could be seen that despite the low level of use of social networking tools by academic libraries in Kogi State University Library Kabba, the place of social media in promoting library products and services cannot be overemphasized. This implies that for academic libraries to reach out to the 21st century library users better, communicate effectively with feedbacks, enhanced research, scholarly publications in this era of information explosion; embracing social networking has become inevitable.

However, challenges such as poor funding, network problem, lack of ICT skills, erratic power supply, lack of training opportunities, technophobia etc. are critical issues that must be addressed in order to maximize the benefits derived from the use of social media tools in

academic libraries in Kogi State and by extension the entire country, Nigeria.

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INFRASTRUCTURE READINESS FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE AND INTEGRATED LIBRARY MANAGEMENT SYSTEMS IN ACADEMIC LIBRARIES IN NIGERIA: A SYSTEMATIC REVIEW

BY

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Abstract

The effective implementation of Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS) has transformed library services globally, enhancing efficiency, accessibility, and user satisfaction. However, in developing countries such as Nigeria, infrastructural deficiencies pose significant barriers to adopting these technologies. This study systematically reviews existing literature on the infrastructural readiness of academic libraries in Nigeria to implement Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS). Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses *(PRISMA) guidelines, 11 relevant studies published between 2015–2025 were identified through searches of databases including Google Scholar, Scopus, and African Journals Online (AJOL). Findings reveal that Nigerian academic libraries face persistent infrastructural challenges, notably unreliable electricity, inadequate internet bandwidth, obsolete Information and Communication Technology equipment, and insufficient funding, which undermine their readiness for technological adoption. To address these challenges, the study recommends investments in reliable power supply, improved broadband internet access, modernization of ICT infrastructure, increased funding allocations, capacity-building programs for library staff, and the development of supportive policies and institutional roadmaps to guide technology adoption. While AI and ILMS have the potential to transform library services by enhancing efficiency, accessibility, and user satisfaction, the infrastructural deficiencies in Nigerian academic libraries remain a critical barrier. Addressing these gaps through strategic investments and coordinated interventions is essential to preparing Nigerian academic libraries to fully harness the benefits of AI and ILMS in the digital era.*

Keywords: Academic libraries; Artificial Intelligence (AI); Integrated Library Management Systems (ILMS); Nigeria, Systematic reviews.

Introduction

Academic libraries play a central role in higher education by supporting teaching, learning, and research. In today's digital era, Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS) are transforming libraries through automation, personalisation, and improved access to information (Joshi, 2025). The emergence of these new technologies offers promising avenues for automating repetitive tasks, streamlining services, and improving user engagement. These technologies are being explored to make library services more accessible, responsive, and user-friendly.

In developed countries, AL and ILMS are been used in academic libraries to make the library perform more effectively and effectively. While developed countries have embraced these technologies, academic libraries in Nigeria face infrastructural constraints such as unstable electricity, poor internet services, and inadequate ICT facilities. This study examines the infrastructural readiness of Nigerian academic libraries for AI and ILMS adoption, focusing on electricity, internet connectivity, ICT hardware, funding, and staff capacity.

Statement of the Problem

Although AI and ILMS can enhance library operations by reducing workload, improving information retrieval,

and supporting digital services, Nigerian academic libraries remain dependent on manual and semi-automated systems. Persistent challenges include slow information access, inadequate cataloguing systems, poor digital resource management, and limited staff skills. These gaps highlight the urgent need to evaluate the infrastructural readiness of Nigerian academic libraries for AI and ILMS adoption. As noted by Ajani et al. (2022), the successful adoption of AI in Nigerian libraries is often constrained by inadequate infrastructure, limited digital skills among library staff, and resistance to change, making it essential to assess both the opportunities and challenges of integrating such technologies. As such this study intends to show Infrastructure Readiness for Implementing Artificial Intelligence and Integrated Library Management Systems in Academic Libraries in Nigeria.

Objectives of the Study

The study aims to:

1. Examine the current state of infrastructure in Nigerian academic libraries.
2. Identify challenges hindering AI and ILMS adoption.
3. Recommend strategies to improve infrastructural readiness.

Research Questions

1. What is the current state of infrastructure in Nigerian academic libraries?
2. What challenges hinder infrastructural readiness for AI and ILMS?
3. What strategies can improve infrastructural readiness for AI and ILMS?

Literature Review

Studies on Nigerian academic libraries consistently report infrastructural challenges affecting technology adoption. Key issues include unreliable electricity (Ogbomo, 2019), poor internet connectivity (Chigbu and Dim, 2012), outdated ICT hardware (Nwachukwu et al., 2018), limited funding (Ishola, 2014), and inadequate staff training (Annune and Annune, 2023). Globally, AI and ILMS have been shown to improve cataloguing, user engagement, and data management (Lawless & Foster, 2020). However, Nigerian libraries lag behind due to weak policies and inconsistent government support (Ajani et al., 2022). The literature indicates that while awareness of AI and ILMS benefits exists, infrastructural readiness remains limited.

Current State of Infrasturcture in Nigeria Academic Libraries

The review reveals that the availability and functionality of these infrastructures in Nigerian academic libraries remain poor:

Electricity Supply: Despite some institutions installing generators or solar panels, most libraries still suffer from long periods of power outages. In Nigeria, the persistent challenges of unstable power supply, frequent blackouts, and inadequate electricity infrastructure have continued to hamper the operations of universities (Olanrele, et al. 2020). The educational sector, especially university libraries, is significantly affected by this erratic power situation, resulting in interrupted access to digital resources, limited use of e-learning platforms, and poor ICT service delivery. Electricity challenges impede library automation, disrupt internet connectivity, and affect climate-controlled storage of sensitive materials such as archives and rare books. With the increasing reliance on digital tools for teaching, learning, and research, the absence of a stable power supply undermines the competitiveness and quality assurance capacity of Nigerian universities (Ebekozien, et al, 2022)

Internet Connectivity: Internet bandwidth in many universities remains limited and shared among multiple departments. This slows down access to web-based ILMS and AI tools. Studies noted that the average internet speed in Nigerian academic libraries was less than 2Mbp which is well below global benchmarks.

ICT Equipment: Outdated or insufficient hardware remains widespread. According to Nwachukwu et al. (2018), many institutions still use computers running unsupported operating systems (e.g., Windows 7 or XP), which limits compatibility with modern software.

Software Readiness: Some libraries use integrated systems like KOHA or Libsys, but the implementation is often partial. Features like circulation automation and user analytics are underutilized due to lack of staff capacity and funding

Data Security Infrastructure: Few libraries have invested in advanced data protection measures. (Echezona & Ugwu, 2010) stated that inadequate facilities and fund allocation to libraries are one of the major problems that militates against disaster management. The government pays little or no attention to disaster management finance to the public libraries as a whole. In 2003 a survey was launched world-wide among National Libraries in order to know which ones did have a disaster plan. The results were alarming. Out of 177 libraries, only 39 (22%) had a disaster plan (IFLA-PAC, 2006). These findings probably may be a general reflection of what is obtainable in most academic libraries in Nigeria today.

Theoretical Framework

This study adopts Technological Determinism Theory, which argues that technology shapes social

development and organisational change. Applied to academic libraries, the theory suggests that adopting AI and ILMS can transform library operations from manual to automated systems, provided the necessary infrastructure is in place.

Methodology

This study uses a systematic literature review method following a narrative synthesis approach guided by the PRISMA framework, to assess the infrastructural readiness of academic libraries in Nigeria for implementing Artificial Intelligence (AI) and integrated library Management System (ILMS). The methodology involves careful selection, screening, and analysis of relevant literature published between 2015 and 2025. Systematic literature reviews (SRs) are a method for synthesising scientific data to address a specific research question in a transparent and repeatable manner, while attempting to include all published data on the subject and evaluating the quality of this data (Lame, 2019).

Data Sources

The review draws on data from academic databases including Google Scholar, and African Journals Online (AJOL). These platforms provide access to peer-reviewed journal articles, conference papers, and empirical research within the specified time frame.

Search Strategy

A combination of keywords and Boolean operators were used during the search process, including:

"Artificial Intelligence in Nigerian Libraries"
"Integrated Library Management Systems in Nigeria"
"Library ICT infrastructure in Nigeria"
"Digital readiness of academic libraries"

Inclusion Criteria

Studies published between 2015 and 2025
Research focused on Nigerian academic libraries
Peer-reviewed empirical or systematic review papers
Articles addressing infrastructural or technological readiness

Exclusion Criteria

Non-academic libraries or international contexts outside Nigeria
Articles not available in full text
Opinion pieces or editorial content lacking empirical data

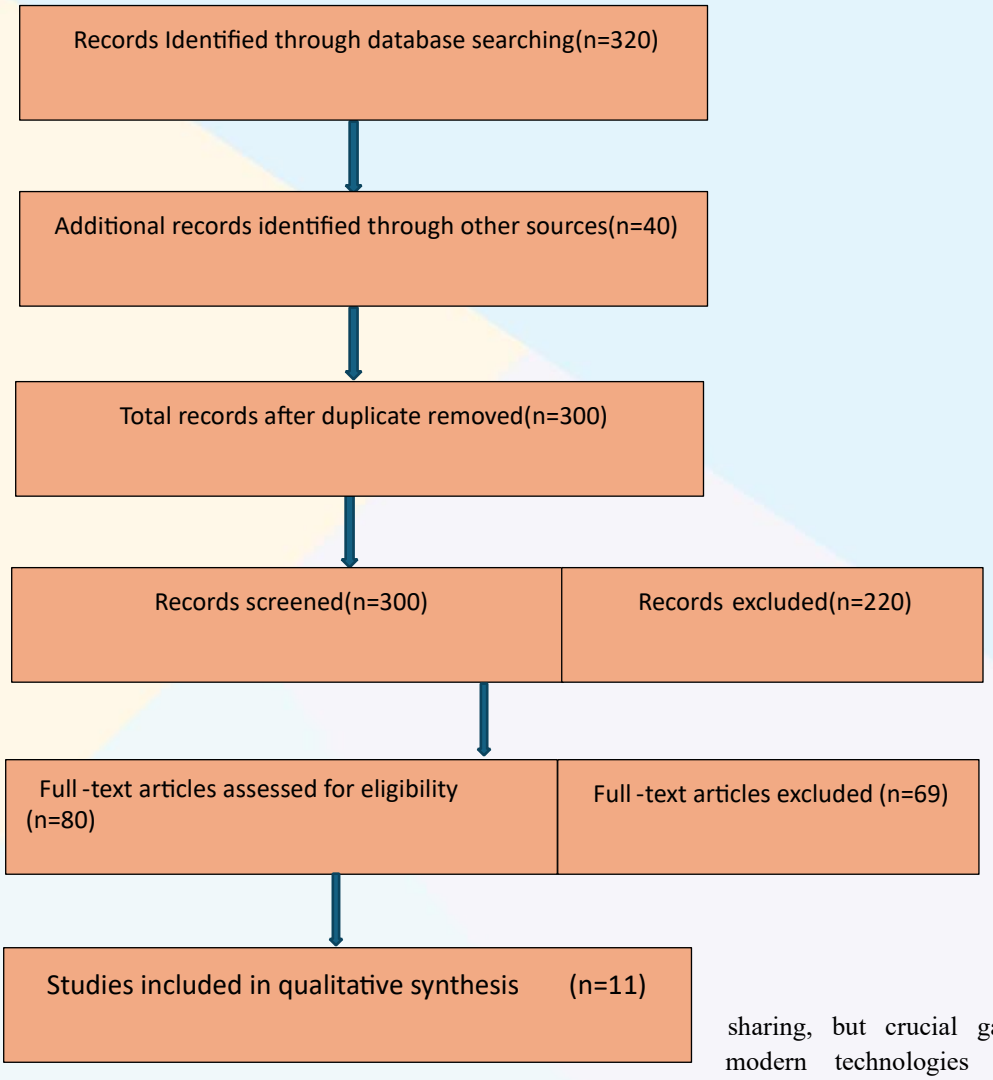

Figure 1: PRISMA Flow Diagram for the systematic review

Findings and Discussions

The findings are synthesised below across four themes: Availability of ICT Infrastructure; Power Supply & Connectivity; Digital Literacy & Technical Capacity; and Institutional

Availability of ICT Infrastructure

Many Nigerian academic libraries now have some ICT infrastructure, but it is often inadequate for demanding tasks such as AI adoption. In South-South universities, librarians were found to have basic access to digital applications, yet hardware and server systems were either obsolete or insufficient for advanced use (Okon et al., 2024). Studies indicated that many Nigerian libraries still operate on legacy systems with obsolete hardware and unsupported operating systems. (Ifijeh, 2020). Similarly, in Southeast Nigeria, a large majority of librarians reported that ICT tools supported resource sharing, but crucial gadgets and modern technologies were still lacking (Nwafor et al., 2023). These findings indicate that while a foundation exists, much of the infrastructure only supports basic automation rather than the sophisticated requirements of AI and modern ILMS

Power Supply and Connectivity

Unreliable electricity and unstable internet connectivity continue to undermine technological adoption in Nigerian academic libraries. Studies highlight that frequent power outages disrupt library services and damage equipment, while poor connectivity limits access to cloud-based systems (Iroaganachi et al., 2024). In a model for ICT-based resource sharing in Southeast Nigeria, poor electrification and inadequate internet access were ranked among the most serious challenges (Nwafor et al., 2023). Without stable power and reliable internet, attempts to implement AI and ILMS will remain unsustainable. Many libraries in Nigeria rely on public electricity supply, which is often

unstable and prone to outages. This instability hinders the consistent operation of AIdriven tools and ILMS platforms, which require uninterrupted power to function optimally (Bangani, 2024).

Multiple studies have documented the recurrent nature of power outages in Nigerian federal universities. (Aregbesola, et al. 2023), (Olatokun & Ayanbode ,2020) found that over 85% of university libraries in southern Nigeria experienced daily power outages, each lasting between 2 to 8 hours. Similarly, Ogbomo (2019) noted that many libraries operate without backup power, rendering digital systems non-functional during blackouts.

Digital and Technical Capacity

Even where infrastructure exists, many librarians lack the advanced skills needed to optimise it. A 2024 study in Kwara State found that while librarians demonstrated high levels of basic digital literacy, they were less confident with advanced competencies such as big data management or AI-driven tools (Fatile and Adebayo, 2024). Similarly, research on Nigerian university libraries and the Fourth Industrial Revolution observed that training programmes emphasise only basic ICT skills, leaving significant gaps in areas such as machine learning and data ethics (Owolabi, 2023).

Institutional Readiness and Policy Framework

Policy frameworks and institutional readiness remain uneven across Nigerian universities. Encouragingly, the Association of University Librarians of Nigerian Universities (AULNU) recently developed a roadmap for responsible AI adoption in academic libraries, signalling growing institutional awareness (Vanguard News, 2025). However, many institutions still lack robust digital strategies or data governance policies to support sustainable AI use (Ajani et al., 2022). A study of North-Central Nigerian universities also found that policies for electronic information resources were inconsistently applied, leading to fragmented implementation (Omotayo & Irechukwu, 2023).

Strategies for Improving Infrastructural Readiness

The literature recommends several strategies to address these challenges:

Government and Institutional Funding Initiatives: Increased funding from government agencies like TET Fund and private-public partnerships is necessary for infrastructural upgrades (Omotayo& Irechukwu, 2023).

Capacity Building and Training: Regular workshops, certifications, and ICT training for librarians are essential. Collaborative efforts between universities and international agencies can facilitate staff development (Annune & Annune, 2023).

Investing in Renewable Energy: To combat electricity issues, institutions should explore solar power or hybrid solutions. These provide sustainable alternatives to diesel generators

(Chukwusa, 2018)

Policy Development: Institutions should formulate clear digital transformation strategies, with specific guidelines for AI and ILMS implementation. These policies must address data privacy, system evaluation, and maintenance cycles.

Centralized IT Support: Establishing university-wide IT units to support library automation and AI integration can help streamline resource use and ensure professional system management.

Conclusion

Nigerian academic libraries remain underprepared for AI and ILMS adoption. Major gaps include unreliable electricity, inadequate internet, obsolete ICT equipment, poor funding, and limited technical expertise. Bridging these gaps is essential for libraries to provide competitive, technology-driven services.

Recommendations

1. Increase funding for ICT infrastructure through government, TETFund, and private partnerships.
2. Invest in renewable energy sources to ensure stable power supply for libraries.
3. Expand broadband internet connectivity across campuses.
4. Regularly upgrade ICT hardware and software to meet AI/ILMS requirements.
5. Establish continuous training programs on AI, ILMS, and data management for librarians.
6. Develop institutional and national digital strategies to guide AI adoption in libraries.

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INFORMATION COMMUNICATION TECHNOLOGY SKILLS ON ACADEMIC ACTIVITIES OF OFFICER CADETS IN UNIVERSITIES IN NORTH-WEST, NIGERIA

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Abstract

This study investigated information communication technology skills on academic activities of officer cadets in universities North-west, Nigeria. Three research questions guided the study in line with the research objectives. The study adopted descriptive survey research design. The study population comprised of four thousand and twenty-seven (4,027) officer cadets in universities in North-west, Nigeria with sample size of 351. A structured questionnaire was the instrument for data collection. Data were analysed using frequency counts, percentages, mean and standard deviation with criterion mean of 2.50 benchmark. Findings revealed that the extent to which officer cadets engaged in academic activities was high, the perceived influence of possession of ICT skills was positive and factors hindering their academic activities was high. Based on the findings, the study concluded that officer cadets in universities in North-west, Nigeria need to change their attitudes towards the use of ICT facilities to enhance academic activities. The study recommended that the management of universities in North-west, Nigeria should regularly engage the officer cadets in field work and physical training as these would help them to acquire practical knowledge of the profession, organise periodic ICT training for officer cadets especially in the areas where possession of ICT skills were low and provide more ICT facilities and alternative to electricity power supply, as these would help to enhance the academic activities of officer cadets.

Keywords: Academic Activities, Information Communication Technology Skills, Officer Cadets, North-west, Nigeria, Universities

Introduction

In educational institutions of all levels, the teachers encourage participation in activities that would contribute in a significant manner in honing their knowledge, competencies and abilities. In some cases, the participation in these activities is manageable, whereas, in other cases, there are occurrence of various types of problems and challenges. The problems and challenges are required to be overcome and prevented from assuming a major form. In other words, they need to be curbed from giving rise to barriers. In higher educational institutions, within the course of pursuance of Bachelors, Masters and Doctoral degrees programmes, the students are required to work on research projects or thesis (Johnson & Johnson, 2019). Students need to be versed in terms of academic activities. Through implementation of academic activities, they are able to collect the data, that is necessary for their research projects or thesis. When the students are participating in academic activities. They need to be well-versed in terms of job duties, methods and procedures.

Furthermore, they need to inculcate the traits of diligence, conscientiousness, morality and ethics. The students should form positive viewpoints and develop motivation towards acquisition of education. Hence, when they are participating in various types of academic activities, they need to develop wholehearted enthusiasm. Therefore, it can be stated that, the significance of academic activities is acknowledged in the acquisition of education (Davis, 2021).

The academic activities are formulated in a manner that would facilitate understanding of academic subjects, achieving educational goals and leading to up-graduation of the overall system of education. The various aspects that need to be taken into account in organising academic activities are, grade levels of students, academic subjects and lesson plans, learning

abilities of students, academic needs and requirements, educational goals and the overall system of education. Furthermore, there is need to ensure that the academic activities are pleasurable and students develop motivation towards it. Within the course of participation in various academic activities, there are occurrences of different kinds of problems as well. But there is also need to make sure the solutions are provided to the problems in an adequate manner. Furthermore, they need to be prevented from giving rise to barriers within the course of implementation of tasks and activities. Therefore, it can be stated that, the academic activities are critical to the university life and overall development of undergraduate students (Davis, 2021).

Officer Cadets in universities like Nigeria Defence Academy, Kaduna typically participate in a range of academic activities in addition to their military training. These activities are designed to provide them with a well-rounded education and prepare them for leadership roles in the service. Also, undergraduate education is a transformative journey, extending beyond simply attending lectures and taking exams. A rich tapestry of academic activities contributes to a well-rounded educational experience, fostering critical thinking, research skills and personal growth. The academic activities are; Coursework and lectures, this foundational element involves attending lectures, participating in discussions, completing assignments and taking examinations. It provides the core knowledge base in a chosen field. While seemingly passive, active engagement in lectures, including note-taking and asking questions, significantly enhances learning. Research is also one of the academic activities, students may participate in faculty-led research project, conduct independent research under faculty supervision. Research activities cultivate critical thinking, analytical skills and the ability to synthesize information. Also, Group discussion; students learn to work effectively in diverse teams, negotiate ideas and contribute to a shared goal. These activities mirror real-world work environments and prepare students for collaborative professional roles. Lastly, during physical trainings; officer cadets will participate in field exercises to apply their classroom learning to real-world scenarios. These exercises will help them develop their leadership, teamwork and decision–making skills. Engaging in a variety of academic activities is essential for fulfilling and having successful undergraduate experience. These activities not only enhance academic performance but also foster personal growth, develop valuable skills and prepare students for future careers. By actively exploring the diverse opportunities available, undergraduate students can maximise their learning potential and make the most of their university education. (Kuh *et al*., 2014)

Information and Communication Technology (ICT) is an ordering of special equipment used to share ideas and information among everyone. It may be used to store, process, and organise information. This all-encompassing definition of ICT includes a variety of technologies like recordings, DVDs, phones, satellites, radios, TV, PCs, gear and programming framework, advancement, hardware, specific managements and practical services. Also, Information and communication technologies (ICT) encompass a broad range of technology tools and resources used to create, store, manage and disseminate information. This includes not only computer hardware and software but also telecommunication technologies, networks and various media for recording and transmitting information (Hashmi *et al.*, 2019). Information and Communication Technologies (ICTs) has become a substantial part of people, communities and societies all over the world. The centrality of these technologies is due to the change it has instigated by influencing the mode of completing daily tasks in the universities. With this development, the behaviours of students towards their academic activities have been greatly influenced. Today, students are increasingly considering ways of reading, researching and interacting that are not facilitated by ICT as unwelcoming, outlandish and outmoded (Tor *et al.,* 2019).

Consequently, Ukaegbu and Wegwu (2019) defined ICT skills as the abilities for the collection, effective processing, storing, transmitting and the dissemination of information which enables the use of computers and related technologies to meet personal academic and labour market objectives. ICT skills of a student is a relative measure of the students' capacity to make appropriate use of ICT for educational and learning purposes, this is because, ICT skills are required to critically evaluate information content and explore it effectively, as well as understanding the technological infrastructure on which information transmission is based. Moreover, ICT has eased the stress associated with the conventional method of executing tasks, by initiating technology-driven means of performing statutory roles with improved speed, accuracy and efficiency. The fact that ICTs are identified as sources for improving productivity, this has informed the decision of many institutions in Nigeria to adopt them (Olatokun and Opesade, 2020). The increase in popularity of these technologies in universities and its

attendant impact on academic works pressured most faculty staff and students in Nigerian universities to develop skills or abilities for integrating them into their academic activities.

Statement of the Problem

Officer Cadets in military universities in North-west, Nigeria are struggling to effectively utilise the library's information resources, both in print and digital formats. Despite the library's efforts to provide comprehensive resources, the cadets' lack of ICT skills hinders their ability to access and use these resources efficiently. This limitation increasingly by rigorous nature of their training which leaves them with the little time to develop these skills. As a result, the cadets rely heavily on traditional methods of information gathering, missing out on the benefits of digital resources that could enhance their academic performance and learning outcomes.

Information and Communication Technology skills encompass the ability to understand and utilise various technology software, aiding in tasks like operating computers, accessing information online and using devices like smart phones for communication and information retrieval. In this 21st century, library users (Officer Cadets) inclusive are expected to be familiar and fully skilled in ICT manipulation to utilise library information resources both format (print and non-print) resources which will positively influence their academic activities. However, extant literature has revealed that many students in academic institution particularly those attached to military institution are not making effective use of ICT facilities to access information resources available in the university libraries to enhance academic activities. Could these challenges be due to inadequate possession of ICT skills or proficiency, inadequate ICT facilities (Ifidon and Okorafor (2012); Ogbomo and Ogbomo (2015) and Ifeanyieze and Agauola (2018). To address this research concern, the researchers investigated Information Communication Technology skills on academic activities of officer cadets in universities in North-west, Nigeria.

Objectives of the Study

The objectives are to:

1. ascertain the extent to which officer cadets engage in academic activities in universities in North-west, Nigeria;
2. determine the perceived influence of possession of ICT skills of officer cadets on academic activities in universities in North-west, Nigeria;
3. identify the factors hindering the academic activities of officer cadets in universities in North-west, Nigeria.

Research Questions

The following research questions guided the study:

1. What is the extent to which officer cadets engage in academic activities in universities in North-west, Nigeria?
2. What is the perceived influence of possession of ICT skills of officer cadets on academic activities in universities in North-west, Nigeria?
3. What are the factors hindering the academic activities of officer cadets in universities in North-west, Nigeria?

Literature Review

The academic activities are formulated in a manner that would facilitate the understanding of academic subjects, achieving educational goals and leading to up-graduation of the overall system of education (Davis, 2021). The various aspects that need to be taken into account in organising academic activities are, grade levels of students, academic subjects and lesson plans, learning abilities of students, academic needs and requirements, educational goals and the overall system of education. Tor and Malgwi (2020) asserted that these academic activities are fundamental to the survival of universities in the modern world. It is more so because the quality of programmes of instruction and output of universities in terms of graduates and research are all dependent on the effectiveness and efficiency of academic activities. Hashim *et al.* (2019) posited that the development of new broadband communication services and convergence of telecommunication with computers have created numerous possibilities to use a variety of new technology tools for teaching and learning system. Information and communication technology (ICT) are extensively occupying all the fields of workplaces. Application of information technology (IT) knowledge, skills and understanding has become a reality for employees. Information and Communication Technology (ICT) has been identified as one possible means of leapfrogging poor economies from peasant to modern information societies according to (UNECA, 2020). Mkumbo *et al.* (2023) averred that home sickness, poor time management skills, difficulty in understanding academic work, inadequate finance are some of the challenges faced by first year university students in adjusting to university life and academic activities. Consequently, Martinez *et al.* (2023) postulated that institutional, socio cultural and socio-

economic factors are barriers to academic success of first year students. Similarly, Suleiman (2023) and Husain *et al*. (2022) reported in their studies in Delta State that funding patterns and financial management in secondary schools create foundational challenges that carry into higher education. Nkedishu and Onyekwe, (2024) equally reported that inadequate finance, institutional and student factors are inhibitors to academic success in public universities in Nigeria.

Onyebinama (2021) in his study stated that students primarily acquired basic ICT skills from cybercafés, facing challenges such as poor funding and inadequate facilities. The study recommended adequate enhancement of university funding to poster the acquisition of appropriate ICT resources for optimal use by the students in their learning activities which will make the students more knowledgeable in the usage of the facilities and consequently possess the requisite skills to use them. Bako and Odigie (2021), stated that while students had basic ICT skills, these were insufficient for effective library resource utilisation. Therfore, implementing computer literacy programs within user education to enhance students' ICT competencies, thereby improving their access to library resources. In this study, the content and methodology are similar to the current study, while the scope differs in which the previous study covered South-West, Nigeria, while the current study will cover North-West, Nigeria.

Idowu *et al.* (2021), stated that many students are proficient users of various devices, including desktops, laptops, and mobile devices, so also laptops are the preferred device for academic work, and the combination of laptops and smartphones is the most popular choice. Students demonstrate the highest proficiency in email (159%), web browsing (53%), e-banking (49%), and e-commerce (44%). Although the student's express interest in learning additional skills, they believe that the university's ICT unit will contribute the most to their skills improvement during their studies. The researchers made recommendations based on these findings to enhance the ICT skills of university freshmen and support their projections for improvement upon graduation. The gap intends to cover in terms of content is similar, while difference in scope, which the study under review covered Nigerian private universities while the current study will cover two universities in North-West, Nigeria. Ariful and Samzida (2021) revealed several key positive and negative factors influencing academic performance. The study recommended that a broader discourse on improving educational outcomes in Bangladesh, reinforcing the notion that quality education is fundamental for national development. The study also emphasized the need for a supportive learning environment and the importance of student's engagement in their academic pursuits to foster a culture of excellence in higher education. The gap intent to cover in this current study the content is similar with the previous study under review, but difference in methodology and scope in which the previous study was carried out in Bangladesh, while the current study will be carried in

Methodology

This study adopted descriptive survey research design. The descriptive survey research design was used because it is a survey type of research that is characterised by population and sample as well as the use of data collection instrument. The study population comprised of four thousand and twenty-seven (4,027) Officer Cadets in military universities in North-west, Nigeria. The study adopted multi-stage sampling technique to determine the size of the study with sample size of 351 officer cadets in military universities in North-west, Nigeria. A close-ended structured questionnaire was the instrument for data collection. Data were analysed using frequency counts, percentage, mean and standard deviation with criterion mean of 2.50 benchmark. A total of 351 copies of questionnaire were administered to officer cadets and the response rate showed the returned of 323 copies of the questionnaire representing 92% response rate.

Result And Discussions

Research Question One: What is the extent to which officer cadets engage in academic activities in universities in North-west, Nigeria?

Table 1: Extent to which officer cadets engage in academic activities in universities in North-west, Nigeria

S/N	STATEMENTS	VHE 4	HE 3	LE 2	VLE 1	N	FX	X	SD	Decision
1.	I attend lectures regularly based on the time table in the university.	185 (57.3%)	110 (34.1%)	22 (6.8%)	6 (1.9%)	323	1112	3.44	0.67	High
2.	I always do my assignment any time it is given to us in the university.	160 (49.5%)	123 (38.1%)	28 (8.7%)	12 (3.7%)	323	1070	3.31	0.73	High
3.	I sat for the mid-term test any time it is scheduled in the university.	105 (32.5%)	116 (35.9%)	65 (20.1%)	37 (11.5%)	323	934	2.89	0.91	High
4.	I sat for the both semesters examinations at the end of every semester in the university.	92 (28.5%)	114 (35.3%)	74 (22.9%)	43 (13.3%)	323	889	2.75	0.96	Low
5.	I participate in group discussion with my course mates to understand what is been taught in the class better.	65 (20.1%)	104 (32.2%)	90 (27.9%)	64 (19.8%)	323	803	2.49	1.00	Low
6.	I participate in the field-work activities to acquire practical knowledge in the university.	55 (17.0%)	98 (30.3%)	100 (31.0%)	70 (21.7%)	323	769	2.38	1.03	Low
7.	I present my seminar paper at the end of every semester and final project at the end of my final year.	72 (22.3%)	108 (33.4%)	91 (28.2%)	52 (16.1%)	323	843	2.61	0.94	Low
8.	I participate fully in the physical training and examination in the university. **Weighted Mean**	64 (19.8%)	102 (31.6%)	90 (27.9%)	67 (20.7%)	323	800	2.48 **2.79**	1.02	Low

Decision: Average Weighted Mean =2.79

The results presented in Table 1 shows the extent to which officer cadets engage in academic activities in universities in North-west, Nigeria. The results revealed that majority of the respondents indicated that statements with mean scores equal and above the average weighted mean of 2.79 were high. On the other hand, majority of the respondents indicated that statements with mean scores lower than the average weighted mean of 2.79 were low. Specifically, the Table above revealed that I attend lectures regularly based on

the time table in the university with a mean score of ($\bar{X}$=3.44; SD=0.67) was the highest rated statement that officer cadets engaged on. While I participate in the field-work activities to acquire practical knowledge in the university with a mean score of ($\bar{X}$=2.38; SD=1.03) was the lowest rated statement that officer cadets engaged on in universities in North-west, Nigeria. Thus, with a weighted mean score of 2.79 which is above the criterion mean of 2.50, it can be deduced that the extent of academic activities of officer cadets in universities in North-west, Nigeria was high.

Research Question Two: What is the perceived influence of possession of ICT skills on academic activities of officer cadets in universities in North-west, Nigeria?

Table 2: Perceived influence of possession of ICT skills on academic activities of officer cadets

S/N	Items	SA 4	A 3	D 2	SD 1	N	FX	$\bar{X}$	SD	Decision
1.	Ability to use scanner to scan and upload documents efficiently enhance my academic activities in the university.	118 (36.5%)	137 (42.4%)	53 (16.4%)	15 (4.6%)	323	1035	3.21	0.83	High
2.	My knowledge of ICT enables me to use keyboard to type and this enhance academic activities in the university.	120 (37.2%)	132 (40.9%)	55 (17.0%)	16 (5.0%)	323	1027	3.18	0.84	High
3.	My ability to use printer to print and retrieve document from storage devices efficiently enhance academic activities in the university.	113 (35.0%)	141 (43.7%)	51 (15.8%)	18 (5.6%)	323	1028	3.18	0.82	High
4.	My ability to type on Microsoft word efficiently thus enhancing academic activities in the university.	110 (34.1%)	140 (43.3%)	57 (17.6%)	16 (5.0%)	323	1017	3.15	0.83	High
5.	Ability to edit and copy document from Microsoft word efficiently enhance my academic activities in the university.	108 (33.4%)	138 (42.7%)	60 (18.6%)	17 (5.3%)	323	1006	3.11	0.84	High
6.	Ability to save and retrieve document from Microsoft word efficiently enhance my academic activities in the university.	104 (32.2%)	135 (41.8%)	63 (19.5%)	21 (6.5%)	323	991	3.07	0.85	High
7.	Ability to use spreadsheet to enter numerical value into cells enhance my	87 (26.9%)	146 (45.2%)	66 (20.4%)	24 (7.4%)	323	951	2.95	0.88	High

	academic activities in the university.									
8.	My ability to use spreadsheet to perform statistical work enhance academic activities in the university.	83 (25.7%)	144 (44.6%)	72 (22.3%)	24 (7.4%)	323	939	2.91	0.88	Low
9.	My knowledge of ICT enables me to use spreadsheet to code data for SPSS analysis thus enhancing academic activities in the university.	76 (23.5%)	135 (41.8%)	81 (25.1%)	31 (9.6%)	323	912	2.82	0.89	Low
10.	My knowledge of ICT enables me to navigate web links and use OPAC/Web OPAC to retrieve bibliographic information thus enhancing academic activities in the university.	85 (26.3%)	128 (39.6%)	81 (25.1%)	29 (9.0%)	323	916	2.84	0.89	Low
11.	Ability to use Internet to navigate search Engines such as Yahoo, Google, Mamma, AOL in searching for information enhance my academic activities in the university.	92 (28.5%)	130 (40.2%)	74 (22.9%)	27 (8.4%)	323	933	2.89	0.88	Low
12.	My knowledge of ICT enables me collect research data using Google forms or Survey monkey and this enhance academic activities in the university.	80 (24.8%)	126 (39.0%)	84 (26.0%)	33 (10.2%)	323	894	2.77	0.90	Low
13.	Ability to perform Presentation using PowerPoint efficiently enhance my academic activities in the university.	83 (25.7%)	125 (38.7%)	85 (26.3%)	30 (9.3%)	323	893	2.77	0.89	Low
14.	My ability to use ZOOM and present paper in conferences, seminars and workshops enhance	79 (24.5%)	123 (38.1%)	88 (27.2%)	33 (10.2%)	323	879	2.72	0.90	Low

	academic activities in the university.									
15.	My knowledge of ICT enables me to use GOOGLE-MEET to hold meetings and present paper in seminars and workshops and this enhance academic activities in the university.	75 (23.2%)	120 (37.2%)	91 (28.2%)	37 (11.5%)	323	864	2.67	0.91	Low
16.	Ability to share my research work with my course mates on social media such as WhatsApp, Instagram, Twitter enhance my academic activities in the university.	77 (23.8%)	118 (36.5%)	93 (28.8%)	35 (10.8%)	323	866	2.68	0.91	Low
17.	Ability to search and retrieve research papers on Google Scholar, ResearchGate, Academia.edu enhance my academic activities in the university.	84 (26.0%)	134 (41.5%)	77 (23.8%)	28 (8.7%)	323	911	2.82	0.88	Low
18.	My knowledge of ICT enables me to search full-text databases such as Proquest, ebscohost, Research4life for e-books and e-journals and this enhance academic activities in the university.	86 (26.6%)	132 (40.9%)	77 (23.8%)	28 (8.7%)	323	917	2.84	0.88	Low
	Weighted Mean							**2.92**		

Decision: Average Weighted Mean = 2.92

The results presented in Table 2 shows the perceived influence of possession of ICT skills on academic activities of officer cadets in universities in North-west, Nigeria. The results revealed that majority of the respondents perceived that statements with mean scores equal and above the weighted mean of 2.92 were high. On the other hand, majority of the respondents indicated that statements with mean scores lower than the weighted mean of 2.92 were low. Specifically, the Table above revealed that ability to use scanner to scan and upload documents efficiently enhance my academic activities in the university with a mean score of ($\bar{X}$=3.21; SD=0.83) was the highest rated statement that influence the academic activities of officer cadets. While my knowledge of ICT enables me to use GOOGLE-MEET to hold meetings and present paper in seminars and workshops and this enhance academic activities in the university with a mean score of ($\bar{X}$=2.67; SD=0.91) was the lowest rated statement that influence the academic activities of officer cadets in universities in North-west, Nigeria. Thus, with a weighted mean score of 2.92 which is above the criterion mean of 2.50, it can be deduced that the perceived influence of possession of ICT skills on academic activities of officer cadets in universities in North-west, Nigeria was positive.

Research Question Three: What are the factors hindering the academic activities of officer cadets in universities in North-west, Nigeria?

Table 3: Factors hindering the academic activities of officer cadets in universities in North-west, Nigeria

S/N	STATEMENTS	SA 4	A 3	D 2	SD 1	N	FX	$\bar{X}$	SD	Decision
1.	Insufficient possession of ICT skills and knowledge of officer cadets to efficiently use ICT facilities in the university library hinder the academic activities.	90 (27.9%)	110 (34.1%)	80 (24.8%)	43 (13.3%)	323	943	2.92	0.94	Low
2.	Inadequate ICT facilities in the university library hinder my academic activities.	105 (32.5%)	130 (40.2%)	55 (17.0%)	33 (10.2%)	323	1036	3.21	0.86	High
3.	Erratic power supply in the university library for operation of ICT facilities hinder my academic activities.	100 (31.0%)	122 (37.8%)	70 (21.7%)	31 (9.6%)	323	1007	3.12	0.87	High
4.	Officer cadets' individual attitudes of unwillingness to use ICT facilities in the university library hinder the academic activities.	95 (29.4%)	120 (37.2%)	75 (23.2%)	33 (10.2%)	323	981	3.04	0.89	High
5.	Inadequate information resources in the university library hinder my academic activities.	108 (33.4%)	118 (36.5%)	65 (20.1%)	32 (9.9%)	323	1017	3.15	0.86	High
6.	Inadequate current and up-to-date information resources in the university library hinder my academic activities.	92 (28.5%)	116 (35.9%)	73 (22.6%)	42 (13.0%)	323	968	3.00	0.93	High
7.	Lack of cordial relationship between the course mates hinder my academic activities.	110 (34.1%)	125 (38.7%)	60 (18.6%)	28 (8.7%)	323	1046	3.24	0.84	High
8.	Poor conducive university library environment hinders my academic activities.	91 (28.2%)	109 (33.7%)	81 (25.1%)	42 (13.0%)	323	946	2.93	0.93	Low
9.	Poor attitude of university library personnel towards users hinder my academic activities.	89 (27.6%)	108 (33.4%)	85 (26.3%)	41 (12.7%)	323	937	2.90	0.94	Low
10.	Poor Internet network service within the university environment hinder my academic activities.	87 (26.9%)	107 (33.1%)	88 (27.2%)	41 (12.7%)	323	931	2.88	0.94	Low
	Average Weighted Mean							**3.04**		

Decision: Average Weighted Mean = 3.04

The results presented in Table 3 shows the factors hindering academic activities of officer cadets in

universities in North-west, Nigeria. The results revealed that majority of the respondents indicated that statements with mean scores equal and above the weighted mean of 3.04 were high. On the other hand, majority of the respondents indicated that statements with mean scores lower than the weighted mean of 3.04 were low. Specifically, Table 3 revealed that Lack of cordial relationship between the course mates hinder my academic activities with a mean score of ($\bar{X}$=3.24; SD=0.84) was the highest rated factor that hindered the academic activities of officer cadets. While Poor Internet network service within the university environment hinder my academic activities with a mean score of ($\bar{X}$=2.88; SD=0.94) was the lowest rated factor that hindered the academic activities of officer cadets in universities in North-west, Nigeria. Thus, with a weighted mean score of 3.04 which is above the criterion mean of 2.50, it can be deduced that the hindering of these factors on academic activities of officer cadets in universities in North-west, Nigeria was high.

Discussion of the Findings

Research question one sought to find out the extent to which officer cadets engaged in academic activities in universities in North-west, Nigeria. The findings revealed the extent of academic activities engaged in by officer cadets. These academic activities include: I attend lectures regularly based on the time table in the university, I always do my assignments anytime is being given to us, I sat for mid-term test anytime it is scheduled in the university. It can be deduced that the extent of academic activities of officer cadets in universities in North-west, Nigeria was high. This corroborates with the findings of Tor and Malgwi (2020) that these academic activities are fundamental to the survival of universities in the modern world. It is more so because the quality of programmes of instruction and output of universities in terms of graduates and research are all dependent on the effectiveness and efficiency of academic activities

Research question two sought to find out the perceived influence of possession of ICT skills on academic activities of officer cadets in universities in North-west, Nigeria. The findings revealed that the perceived influence of ICT skills on academic activities of officer cadets' universities was positive with the following statements: Ability to use scanner to scan and upload documents efficiently enhance my academic activities in the university, ICT enables me to use keyboard to type and this enhance academic activities in the university, ability to use printer to print and retrieve document from storage devices efficiently enhance academic activities in the university, ability to type on Microsoft word efficiently enhance academic activities in the university, ICT enables me to navigate web links and use OPAC/Web OPAC to retrieve bibliographic information thus enhancing academic activities in the university, use Internet to navigate search Engines such as Yahoo, Google, Mamma, AOL in searching for information enhance academic activities in the university etc. However, this finding corroborates the findings of Hashim *et al.* (2019) that ICT opens up opportunities for learning because it enables learners to access, extend, transform and share ideas and information in multi-modal communication styles and format. It helps the learners to share learning resources and spaces, promote learner centred and collaborative learning principles and enhance critical thinking, creative thinking and problem-solving skills. Similarly, Otolo *et al.,* (2018) in their study on "impact of ICT skills on the use of electronic resources by undergraduate students in Nigerian university libraries" observed that ICT skills of undergraduates enable them to effectively utilise information resources. Also, for undergraduate students to get information to support their learning and research activities, they should have the requisite ability which is alluded to as an ICT literacy skill.

Research question three sought to find out the factors hindering the academic activities of officer cadets in universities in North-west, Nigeria. The finding revealed that the hindering was high with following factors: insufficient possession of ICT skills and knowledge of officer cadets to efficiently use ICT facilities in the university library hinder the academic activities, Inadequate ICT facilities in the university library, Erratic power supply in the university library for operation of ICT facilities, unwillingness to use ICT facilities in the university library, Inadequate information resources in the university library, Inadequate current and up-to-date information resources in the university library, Lack of cordial relationship between the course mates, Poor Internet network service within the university environment and Poor conducive university library environment. However, this finding corroborates the findings of Mkumbo *et al.* (2023) that home sickness, poor time management skills, difficulty in understanding academic work, inadequate finance are some of the challenges faced by first year university students in adjusting to university life and academic activities. Similarly, Ajayi and Olaniyi (2022) reported that poor access to Internet facilities, incessant strike, closure of school, lack of well-equipped departmental and central library, overcrowded examination timetable

was seen as institutional factors influencing students' academic performance.

Conclusion

Based on the findings, the extent to which officer cadets are engaged in academic activities is high, the perceived influence of possession of ICT skills on academic activities of officer cadets is positive and the factors hindering the academic activities is high. Thus, the study therefore, concluded that officer cadets in universities in North-west, Nigeria need to change their attitudes towards the use of ICT facilities to enhance academic activities.

Recommendations

Based on the findings, the following recommendations were made:

1. Management of Universities in North-west, Nigeria should regularly engage the officer cadets in field work and physical training as these would help them to acquire practical knowledge of the profession.
2. Management of Universities in North-west, Nigeria should organise periodic ICT training for officer cadets especially in the areas where possession of ICT skills was low.
3. Management of Universities in North-west, Nigeria should provide more ICT facilities, information resources and alternative to electricity power supply, as these would help to enhance the academic activities of officer cadets.

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INNOVATIVE TECHNOLOGIES FOR DIGITAL PRESERVATION IN NIGERIA DIGITAL RESEARCH LIBRARIES

BY

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Abstract

This paper describes different approaches and practical methods underlying digital preservation of resources that are either digitally converted or digital born resources in some Nigeria Digital Research Libraries (NDRL). It reviews terminologies, definitions, and conceptual frameworks on different models in preserving digital resources in research libraries. The challenges, goals, and strategies of objects and resources that drive preservation in research libraries were discussed. The areas underlying the need to understand the risks associated with preserving digital information and the approaches adopted by various Nigeria Digital Research Libraries (NDRL) to mitigate the major threats were also discussed. Furthermore, this paper discusses the state of digital preservation practice in some Nigeria Digital Research Libraries (NDRL) and provides a set of practical guidelines for preserving digital library assets. Finally, it reviews selected standards and technical solutions to preserving digital content.

Keywords: digital preservation, digital resources, digital preservation practices

Introduction

A change to the digital era is compelling research libraries to rethink their structures, operations and services to remain relevant in this digital era. As noted by Raju (2014), the proliferation of the explosive growth of digital devices and related applications has collectively altered the traditional research libraries beyond recognition. The main rationale behind digital preservation is to ensure access to information by present and future generations (Das, Sharma & Gurey 2009). Therefore, managing digital content, the desire to promote library services, increased application and interest in digital technologies, pressure from other institutions in the developed countries, competition amongst research institutions, pressure from researchers and pressure from other libraries are regarded as the major reasons for preserving digital materials in research libraries (Masenya 2018).

Research Library

A research library is a library that collects, organizes, preserves, and provides access to specialized academic, scientific, technical, or cultural resources to support research and advanced study.

In Nigeria, research libraries are mainly found in:

- Universities and research institutes
- Government and national research agencies
- Specialized centers (medical, agricultural, industrial, etc.)

Digital Preservation in Research Library Context

Digital preservation refers to the planned, managed activities in research libraries that ensure long-term access to digital information in authentic, reliable and usable form. Idoko and Onwudinjo (2021) described digital preservation as the totality of steps necessary to ensure the permanent accessibility of any particular material forever. Friday and Eze (2022) expressed that Digital preservation can be explained as the act of securing digitized and born-digital information resources for a long time so that they can be accessed and used again.

Digital Preservation In research libraries it entails:

- Capturing and storing born-digital and digitized content
- Managing formats, metadata, and rights information
- Preventing loss through migration, replication, and monitoring
- Providing continued access for scholarship and innovation

Importance of Digital Preservation for Nigeria's Digital Research Libraries

Digital preservation is an essential element of digital library management due to the increasingly important role digital information resources play in an academic environment. People have become increasingly dependent on digital information and the Internet for their research work in this information age where time

is precious and where there is increased access to up-to-date information, in print and electronic format (Agbodeji & Akporhonor, 2021).

Digital preservation is essential for:

- **Safeguarding national scholarly heritage** — theses, dissertations, local research data, manuscripts, oral traditions, newspapers
- **Supporting open science and education** — reliable long-term access improves citation and reuse
- **Protecting against disasters** — power outages, humidity, floods, and security breaches
- **Promoting global visibility** — Nigerian research output becomes more discoverable and citable

Advantages of Digitalization Preservation in Research Libraries

Some of the advantages of Digital Preservation in Research Libraries are as follows:

1. It makes possible for future generation to use the data
2. It ensures an unbroken chain of evidence in research data
3. It helps to reuse the library materials
4. It is a long term view
5. It helps in legal obligations of record retention
6. It helps to improve the possibilities for developing competence and reduces the human factor.

General Overview of the Current Situation of Research Libraries in Nigeria

- Most research libraries operate **hybrid collections** (print + electronic materials).
- There is a growing adoption of **institutional repositories** to host theses, dissertations, and locally produced research.
- A few well-resourced institutions subscribe to **international databases** (e.g., JSTOR, EBSCOhost, ScienceDirect).
- The COVID-19 pandemic accelerated **interest in digital access** and highlighted the need for remote research support.
- The **National Library of Nigeria** and some universities (like University of Ibadan, University of Lagos, Ahmadu Bello University, Covenant University) serve as **leading examples** with relatively advanced e-library services.
- The **National Library of Nigeria (NLN)** runs the **National Repository of Nigeria (NRN)** as the country's legal-deposit and preservation platform.
- Many **university and research libraries have institutional repositories** (often based on DSpace) but few have fully-fledged preservation policies or workflows.
- Digitization of fragile cultural and research materials is increasing, but sustainability of access is still a challenge.
- Cloud-based and collaborative preservation networks (LOCKSS/CLOCKSS) are not yet widely deployed.
- Gaps remain in staff skills, funding, storage infrastructure, and format-migration planning.

Key Challenges of Digital Preservation in Nigeria Research Libraries include

Category	Examples
Infrastructure	Limited bandwidth, unstable power supply, insufficient storage
Policy & Governance	Few institutions have formal digital preservation policies
Funding	Limited, often project-based, no long-term sustainability plans
Human Capacity	Shortage of trained digital archivists and preservation experts
Technology & Obsolescence	Rapid software/hardware changes, lack of format migration planning
Legal & Rights Issues	Copyright, licensing, unclear mandates for deposit

Key Gaps / What Needs to Be Done

From what I saw, key areas for improvement include:

- Stable policy frameworks and consistent implementation (national & institutional) that support digital libraries: including legal, copyright, budget, preservation standards.
- Improved ICT infrastructure: reliable internet, stable power, up-to-date hardware, sufficient servers, digitization equipment.
- More funding (both initial capital and ongoing maintenance) and sustainable financial models.

- Training and professional development: formal curricula, skills for librarians; also training for end users (students, public) in how to use digital resources.
- Awareness raising: ensuring that digital resources are known, accessible, user-friendly; user experience improvements.
- Resource sharing & consortium models: so institutions can share costs, access more diverse collections and avoid duplication.

Conclusion

Digital Research libraries should focus more and more on digital preservation so that users take most benefits from it. Digital preservation is very much essential in research libraries because it is impossible to keep all documents or recorded materials in their original format so in order to store those materials should convert to the electronic format. The need for digitization has been fundamental to ensure the durability, usability, intellectual integrity of the data / information contained in the materials to be preserved for the current and future generations. Additionally, Digital preservation is crucial for ensuring that Nigeria's scholarly and cultural digital resources remain accessible for future generations. Progress is being made through NRN, institutional repositories, and various digitization projects but **sustained** investment in infrastructure, policy, skills, and collaborative technology adoption is required to secure long-term preservation and access.

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INNOVATIVE TECHNOLOGIES FOR RECORDS MANAGEMENT IN MINISTRIES, DEPARTMENTS AND AGENCY LIBRARIES IN NIGERIA.

BY

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Abstract

In the era of digital governance, effective records management is essential for transparency, accountability and efficient service delivery in public sector. With the increasing demand for open government and e-governance, Ministries, Departments and Agencies (MDAs) are under pressure to enhance their records management capabilities through the integration of digital innovations. To this effect MDAs, libraries are adopting technology driven systems to manage their records. This paper explained the different innovative technologies used by libraries in MDAs to be; Cloud computing technologies, Artificial intelligence, Electronic document and records management systems (EDRMS), Blockchain technologies, Mobile technologies, Optical character recognition and scanning technology (OCR), Radio frequency identification technology (RFID), Institutional repositories and digital archives. The paper also highlighted the key challenges facing the adoption of innovative technologies to records management in the libraries to be infrastructure and technical issues, inadequate funding and slow policy implementation. However, the way forward to this challenge is to provide adequate funds through budget allocation to the library, there should be provision of more infrastructures and regulatory bodies on records management should endeavor to implement policies that will encourage effective records management using modern technology.

Keyword: Agency, Departments, Innovative Technologies, Libraries, Ministries, Records Management

Introduction

Technological advancement has transformed how organisations carry out their activities, one of which is the records management practices. It is believed that efficient records management is critical to attaining transparency, accountability and effective service delivery in any organisation. However, in today's digital environment, the transformation from paper-based record keeping system to electronic-based record keeping system is very important. According to Duke library (2025), records management is a field of management that governs how organisations create, receive, store, use, access and dispose all records regardless of its format. The society of American archivists (2025) sees records management as the systematic and administrative control to records throughout their life cycle to ensure efficiency and economy in their creation, use, handling, control, maintenance and disposition. Ukunegbu (2013) stated that records managements helps organisations to be efficient, effective, accountable and transparent. Organisations that develop and maintain a sound and well-planned records management programme are efficient and they work at peak performance, very effective and they operate in an atmosphere of openness and inclusiveness. The adoption of modern technologies has changed the management of records in organisations including libraries. According to Oseni (2022), when technologies are applied to records management in offices, it ensures a quick accessibility and usability of records. Read and Grinn (2017) believed that more businesses are investing in new technologies in order to deal with the increasing number of records which is as a result of the current explosion in information creation. Records management in the public sector plays a vital role in supporting decision-making, preserving

institutional memory and complying with legal and regulatory requirements (International Records Management Trust [IRMT], 2009). However, many government agencies still face challenges such as poor infrastructure, lack of skilled personnel and resistance to change, which hinders the effective deployment of technology-driven solutions (Ngulube, 2012). With the increasing demand for open governance and e-governance, MDAs are under pressure to enhance their records management capabilities through the integration of digital innovations. (Mutula & Wamukoya, 2009).

Innovative Technologies used for Records Management in Libraries

According to Haupert (2024) the records management industry is experiencing significant changes due to rapid pace in technological advancement. This means that organisations are using innovative technologies like; cloud computing, artificial intelligence, data analytics, mobile devices, blockchain technology to manage their records. Also, Innovation in technology have led to an increase in library records which are available in multiple format. When they are not properly managed, it can lead to delay or no access to the records. Therefore, the more efficient the management of library records, the more effective access is provided to them. According to Nwosu (2017), the challenges faced by libraries and other information centers in organising and managing their hybrid resources which include both print and electronic resources have led to the adoption of modern technologies. In the same vein, the integration of innovative technologies into records management is transforming how libraries within ministries, agencies and departments operates because as data volumes continue to increase there is need for effective data governance, risk management and compliance.

Innovative technologies such as Electronic Document and Records Management Systems (EDRMS), cloud-based platforms or cloud computing technologies, artificial intelligence (AI) and blockchain now offer government agencies more secure, accessible and reliable ways to manage information. In addition, these technologies enable digitisation, secure storage, automated classification and efficient retrieval of records, which improves service delivery and operational transparency. (Mwangi 2020 & Katuu, 2015).

1. **Cloud Computing Technologies**

One of the most significant information technology mode, that revolutionised the way records management is conducted is the cloud computing technology. According to Eneh (2024), libraries are increasingly turning to cloud computing to modernise their operations and services. Also, many organisations use cloud computing to store records in central location that is accessible from anywhere with Internet connection. Cloud computing in records management has improved collaboration, increased productivity and reduced costs associated with traditional document storage methods. Cloud computing has made it easier for records managers to ensure compliance with regulatory requirements, as records can be easily audited and tracked. According to Chigada and Madzinga (2017), cloud computing technology services offer scalability, remote access and disaster recovery for records and archives. (UNESCO 2021). Examples of cloud computing technologies used in records management are google cloud, Microsoft azure and amazon web services (Bello & Nwachikwu, 2021). Libraries in agencies, departments and ministries are using cloud computing technology to support hybrid record keeping, digital repository management and long-term preservation. According to NITDA (2022), agencies like national assembly libraries can use AWS Govcloud to manage legislative records which is a type of cloud computing technology. Govcloud are designed to prevent sensitive data leaks, and also helps one to handle huge numbers of users. Eneh (2024) revealed that cloud computing technologies helps libraries to maintain record data, private and delicate data. One advantage of using cloud computing is that it empowers libraries to adopt innovative technologies and services.

2. **Artificial Intelligence**

The records management industry is experiencing transformation through the use of artificial intelligence. Schreur (2020) explained that the advent of AI has brought transformative changes in domain, offering tools and solutions that enhances the efficiency and accuracy of records management. According to Osagie and Oladokun (2024), the integration of artificial intelligence tools in to the library systems represents a pioneering approach to enhancing the management and protection of records. Artificial Intelligence tools can analyse large amounts of data, identify patterns and provide insights that help organisations make informed decisions. AI powered software can help record managers identify duplicate records, classify documents and automate record retention and disposition

schedules. Katuu (2020) opined that artificial intelligence enhances record classification, metadata tagging, search optimisation and predictive archiving. Libraries in ministries and agencies use artificial intelligence and machine learning technologies to supports automation in information retrieval and records lifecycle management. According to Modiba (2021), artificial intelligence technologies like natural language processing (NLP), computer vision, and predictive analytics offer unprecedented capabilities in automating routine tasks, detecting anomalies and ensuring integrity of both physical and digital records in libraries. One of the most significant contribution of AI to library records management is the automation of cataloguing and classification services . (Omigie & Anthony, 2023). The National library of Norway has implemented AI-driven digitisation projects to preserve its extensive collection of historical documents, also the New York public library uses AI to enhance its digital archives and improve search functionality (Osagie & Oladokun, 2024). Artificial intelligence further enhances records management by automating tagging, predicting retention schedules and improving information discovery through natural language processing. (IRMT, 2016)

3. Electronic Document and Records Management Systems (EDRMS)

With the proliferation of computers, organisation develop a lot of electronic records. The EDRMS is a technology that automate the creation, storage, retrieval, and disposal of records. The application of electronics into records management is overwhelming because it helps records to be preserved and reduced in sizes. They support compliance, security and workflow management in public institutions. Examples of EDRMS used for records management are SharePoint, Laserfiche, alfresco, open text. According to Iwhiwhu B (2010) ministries, departments and agencies use EDRMS to streamline process and audit records with centralized access. Ogundipe (2024) revealed that many MDAs adopted electronic records management systems to automate workflows and manage their born-digital records. According to Okonedo (2020) federal agencies like corporate affairs commission and federal inland revenue service use EDRMS to digitize paper records, automate workflows, and enhance retrieval process. Also, EDRMS facilitates centralized access to records, version control and audit trails, which are crucial for maintaining the integrity and authenticity of official information. (ISOd, 2016)

4. Blockchain Technology

Blockchain technology is a decentralised digital ledger that is used to secure records transactions. Records managers use it to ensure the authenticity and integrity of records. According to Jha (2023), blockchain technology is a fresh and dependable technology that aids in security, reliability and preservation of information, which can be used to safeguard library records, retrieve library documents and improve collection management. Block chain technology can be used to track the chain of custody for records and ensure that records have not been tampered with. Lemiuex (2016) opined that blockchain technology ensures immutability, transparency, and traceability of records, especially for auditing and security. Libraries and archives use blockchain technology to promote trust and integrity in public records handling, by improving security, transparency and efficiency. Libraries can create auditable trails for all activities, by preventing unauthorised data modification and ensuring data integrity. Some libraries use blockchain technology as a tool for securing and tamper-proof records, particularly in areas like land registration and procurement documentation. (Kshetri, 2018). However, Owubiko (2025) is of the view that blockchain technology has the potential of revolutionising management practices in libraries, this because the integration of blockchain technology in to library operations improves the state of security, enhances transparency and accessibility of library collections and thereby transforming the bounders of digital preservation and intellectual property management.

5. Mobile Technologies

Libraries in MDAs use mobile technologies to manage library records through mobile application like SMS notification, web-based interfaces that are optimised for mobile devices. Mobile platforms enable easy access to records, especially in remote locations or field offices. For example, federal ministry of agriculture library use USSD/SMS-based retrieval for agricultural records (World Bank, 2020). According to Ojedokun and Moahi (2014), agricultural libraries in ministries use mobile technologies to facilitate mobile cataloguing, scanning and digital lending as part of their records management, retrievals, due dates for files or required action on sensitive documents. Ekong (2021) further explained that, libraries used SMS alerts to notify staff about records. Examples of mobile technologies used for records management in MDAs libraries are smartphones, tablets, mobile applications, cameras.

These technologies allows staff to capture high quality images or PDFs of physical documents, forms directly from the field or at a point of receipt(NARA, 2022).

6. **Optical Character Recognition and Scanning Technology**

Optical character recognition (OCR) is a technology that enables libraries to digitise paper records into editable and searchable digital formats. According to Mnjama (2011), OCR supports digital transformation and legacy records conversion. The National archives of Nigeria (2021) explained that, national war museum library use OCR to digitise colonial records. Other MDAs libraries use OCR and scanning technology to digitise and manage their records by converting physical documents into searchable and editable digital formats. This helps in enhancing accessibility, preservation and easy searching of library collections.

7. **Radio frequency identification technology**

This is a cutting-edge technology that utilises electromagnetic fields to automatically identify and track tags attached to objects. (Comport communications, 2025). Radio frequency identification technology can be used to track and manage physical records using radio waves, thereby offering advantages in efficiency and accuracy over manual records. According to Mamdapur (2011)radio frequency identification technology is an innovative automated library system for automatic identification and tracking of library material. It is predicted that this technology will replace the barcode systems used in the library. According to Viji (2024) the use of radio frequency identification technology (RFID) in intelligent library management is a cutting-edge strategy that leverages RFID power to improve many aspects of library operations one of which is records management. This innovative technology introduces a more automated and simplified approach to managing library resources like records by seamlessly integrating RFID tags, readers and software solutions. Libraries in MDAs use radio frequency identification technology to identify and track library materials and records. The RFID technology is used to ensure security of records, real time inventory and easy location of classified or circulating records. (Oyewole & Adetimirin,2015).

8. **Institutional repositories and digital archive**

One of the innovative approaches to records management within MDAs libraries is the use of institutional repository and digital archives. These technologies provide improved access to records, efficient preservation of records and effective management of records. According to Ezema (2013), library repositories preserve and provide access to institutional records and publications. Libraries in MDAs use repositories and digital archives to manage grey literature, policy documents and internal reports emanating from the parent organisation where the library is established. Examples of the repositories are DSpace and EPrints.

Challenges faced by libraries in MDAs in using innovative technologies for records management

With Innovation in technologies revolutionising how operations are carried out in different organisations, libraries are not left behind. However, libraries are facing some challenges when integrating innovative technologies for records management. (Ngoepe & Saurombe, 2016). These challenges are as follows:

1. Infrastructure and technical issues

According to WorldBank (2023) many libraries in MDAs lack infrastructures, such as reliable power supply and limited broadband Internet connectivity, lack of proper storage facilities for digital resources as such, it hinders the adoption of the various technology for records management. Also, some lack skilled staff with technical expertise to manage and troubleshoot new technologies.

2. Inadequate funding

Another key challenge faced by the libraries is on the lack of adequate funds. Most of the libraries in the MDAs are not adequately funded, but rather some of them rely on donor projects from World Bank and UNESCO. The lack of funds hinders them from purchasing and maintaining new technologies.

3. Policy Implementation

Another challenge faced by libraries in adopting innovative technology for records management is on the slow implementation of policies from government regulatory bodies. (National policy on records management, 2017).

The Way forward

Based on the challenges faced by the libraries while adopting innovative technologies in managing records, the following suggestions were made.

1. There should be adequate funding from the parent organisation where the library is established through the provision of more funds in their annual budgetory allocations.
2. There should be provision of more infrastructures in the libraries so as to enable them to use the new technologies and also provide more training for the staff.
3. Regulatory bodies should endeavor to implement policies on effective records management practices using modern technologies.

Conclusion

In concession, the use of innovative technologies in managing records in MDAs libraries, significantly enhances access, security, transparency and preservation of government information. These technologies aligned with the digital transformation agenda and global practices in public records management.

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INNOVATIVE TECHNOLOGIES FOR DIGITAL PRESERVATION IN ACADEMIC LIBRARIES: STRENGTHENING USER CONFIDENCE IN KNOWLEDGE SUSTAINABILITY

BY

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Abstract

Academic libraries in Nigeria are witnessing rapid growth in the creation and acquisition of digital resources, including e-journals, e-books, theses, dissertations, and institutional repositories. However, sustaining the long-term preservation and accessibility of these resources remains a major challenge due to technological obsolescence, inadequate infrastructure, limited funding, and insufficient technical expertise. This paper adopts a qualitative, descriptive approach, drawing on literature review, examine how innovative technologies such as institutional repositories, cloud-based platforms, LOCKSS/CLOCKSS, blockchain, and artificial intelligence can enhance digital preservation strategies. The discussion integrates global best practices with Nigerian experiences, emphasizing the need to balance preservation challenges with uninterrupted access as the foundation of user confidence in digital scholarship. The paper argues that the effective adoption of innovative technologies, supported by robust institutional policies, collaborative frameworks, and continuous capacity building, is essential for positioning Nigerian academic libraries as trusted custodians of knowledge. Ultimately, strengthening digital preservation practices is not only a technical necessity but also a strategic requirement for ensuring the sustainability, reliability, and credibility of academic libraries in the 21st century.

Keywords: Digital Preservation, Innovative Technologies, Academic Libraries, User Confidence, Institutional Repositories, Nigeria

Introduction

Digital libraries now encompass a wide range of resources, from e-books and journals to datasets, multimedia collections, and even representations of three-dimensional artifacts. These resources are either "born-digital" or digitized from analog sources through structured digitization efforts (Digital Preservation Coalition [DPC], 2015). Over the past decades, the expansion of digital collections has transformed academic libraries worldwide, and Nigerian institutions are no exception. Many Nigerian academic libraries have developed institutional repositories, digitized local content, and subscribed to extensive collections of e-journals, e-books, and research data (Ubogu, 2020, 2021). Increasingly, born-digital theses, dissertations, grey literature, and institutional records are routinely collected and managed on library platforms.

While digital resources provide immense opportunities for research, innovation, and lifelong learning, they are also inherently fragile. Their longevity is threatened by rapid technological changes, media decay, bit rot, and dependence on complex interlinked systems (DPC, 2015). When content or its context disappears, the usefulness of the material diminishes. Yet, when effectively preserved, these resources maintain their scholarly and cultural value for future generations. Users also increasingly expect uninterrupted, authentic, and reliable access to these resources, making digital preservation not only a technical task but also a strategic

responsibility that directly impacts trust in academic libraries (NASIG, 2024; Olubiyo, 2023).

Libraries worldwide are responding to these challenges by adopting sustainable preservation strategies guided by frameworks such as the Open Archival Information System (OAIS) reference model**, the** Preservation Metadata: Implementation Strategies (PREMIS) data model**, and the** National Digital Stewardship Alliance (NDSA) Levels of Digital Preservation**,** which ensure the authenticity and long-term usability of digital assets (Digital Library Federation [DLF], 2025). Shared infrastructures like Lots of Copies Keep Stuff Safe (LOCKSS), Controlled LOCKSS (CLOCKSS), and Portico provide resilience through redundancy, replication, and reliable access (Bonnie, Helen, & Charles, 2024). New technologies, including cloud-based services, Archivematica, artificial intelligence (AI)-driven metadata enhancement, and optical character recognition (OCR), are expanding preservation practices, while blockchain is being tested for secure provenance and rights management despite cost barriers (Patel & Sutar, 2025; Rao & Prasad, 2025). Policy frameworks such as the **UNESCO/PERSIST Programme** further guide institutions by linking strategies with appraisal and risk management practices (UNESCO, 2016).

In Nigerian university libraries, digital preservation is still at an early stage, with emphasis on basic practices such as backups, replication, and fixity checks. Migration and normalization are also used to address file obsolescence, in line with global practices (Bonnie, Helen, & Charles, 2024). However, advanced methods such as emulation and encapsulation are rare due to limited resources, though some libraries are turning to cloud storage and policy frameworks (Omoju & Omotayo, 2024). Progress is visible, but stronger capacity, infrastructure, and policy support are needed to meet international standards. Despite this development, nothing is known about digital preservation practice in government-owned universities in Kano State.

Against this background, this study examined government-owned university libraries in Kano State, Nigeria, with particular focus on the digital resources available, the strategies used for their preservation, and the challenges encountered. The study also proposed workable solutions aimed at strengthening preservation practices and ensuring sustainable access to knowledge for users.

Statement of the Problem

Academic libraries in Nigeria have greatly expanded their digital and electronic holdings, including e-books, e-journals, institutional repositories, digitized theses, and research data. These resources are now central to teaching, research, and knowledge dissemination. However, ensuring their long-term accessibility and authenticity is a major challenge. Problems such as unstable electricity, weak internet connectivity, irregular funding, technological obsolescence, and inadequate staff expertise continue to threaten digital preservation. While some libraries have policies and digital repositories in place, the strategies and methods they adopt for preservation are not always well-defined or consistently applied. Moreover, little is known about how government-owned universities in Kano State are preserving their digital and electronic resources, what challenges they face, and what practical solutions can strengthen sustainability.

Therefore, the problem this study addresses is the need to investigate the digital and electronic resources available in government-owned university libraries in Kano State, the strategies and methods used for their preservation, and the challenges faced, with a view to proposing workable solutions.

Objectives of the Study

The study aims to:

1. Identify the available digital and electronic resources in government-owned university libraries in Kano State, Nigeria.
2. Examine the strategies (institutional policies) and methods (technical practices) used for preserving these resources.
3. Identify the challenges faced in preserving digital and electronic resources and propose possible solutions.

Literature Review

Theoretical Framework and Conceptual Framework

This study is guided by the Open Archival Information System (OAIS) Reference Model, which provides an internationally recognized framework for digital preservation The OAIS model was originally developed by the Consultative Committee for Space Data Systems (Consultative Committee for Space Data Systems [CCSDS], 2024; Lavoie, 2004, 2014), and has since become the most widely used conceptual standard for organizing, preserving, and providing access to digital information.

The OAIS framework identifies six functional components that work together to ensure that digital resources remain authentic, usable, and accessible over the long term (Consultative Committee for Space Data Systems [CCSDS], 2024; Lavoie, 2004, 2014):

1. Ingest – the process of receiving, validating, and preparing digital resources for long-term storage.
2. Archival Storage – the secure storage and maintenance of resources to protect against data loss and corruption.
3. Data Management – the creation and maintenance of metadata and indexes that ensure resources are discoverable and manageable.
4. Preservation Planning – the development of strategies to address technological obsolescence, including format migration and risk assessment.
5. Administration – the policies, governance structures, and institutional support needed to sustain digital preservation.
6. Access – the mechanisms that allow users to retrieve and interact with preserved digital resources.

Applying the OAIS model to the Nigerian academic library context provides a structured lens for achieving the objectives of this study. Specifically:

Objective 1, Identify available resources:

Guided by the *Ingest* and *Access* functions, which deal with acquiring digital/electronic resources and making them available to users.

Objective 2, Strategies and methods of preservation:

Informed by *Archival Storage, Data Management, and Preservation Planning*, which ensure the integrity and sustainability of resources.

Objective 3, Challenges and solutions:

Connected to Administration, which highlights the institutional, financial, and policy-related issues that influence preservation outcomes.

OAIS encompasses institutional, policy, and governance elements (via administration and preservation planning), which are necessary for sustainable digital preservation practices. It aligns with the aims of the research, particularly strengthening user confidence and knowledge sustainability, by emphasizing long-term preservation, intelligibility of preserved content, and accessibility. By adopting the OAIS model, this study ensures that both the technical and organizational dimensions of digital preservation are captured, thereby aligning the analysis with internationally accepted standards while addressing local realities in government-owned universities in Kano State.

Digital Preservation and Its Importance

Digital resources encompass digitized and born-digital materials such as text, images, audio, video, datasets, and software. According to Dukare (2020), a digital resource refers to any material that requires a computer or electronic device for access. Such resources may include full-text databases, e-journals, image repositories, multimedia content, or products containing numerical, graphical, or temporal data. Typically, these resources are created for commercial distribution and can be accessed through CD-ROMs, tapes, the Internet, or similar formats. These resources are distinct from traditional print collections and exist in various formats that support diverse user communities. Their intangible and technology-dependent nature, however, makes them highly vulnerable to media failure, format obsolescence, and rapid technological change. This has positioned digital preservation as an indispensable component in sustaining their accessibility and usability over time (Patel & Sutar, 2025;
Dukare, 2020).

Digital preservation involves "the series of managed activities necessary to ensure continued access to digital materials for as long as necessary" (Digital Preservation Coalition [DPC], 2015). It is the set of planned activities that ensures long-term access, authenticity, and usability of digital materials. It is not only about keeping files alive but also about maintaining their intellectual and cultural value over time (DPC, 2015). Patel and Sutar (2025) emphasize that such preservation extends beyond merely storing files; it requires proactive strategies such as migrating resources into sustainable formats, maintaining backups, monitoring integrity, and adapting to evolving technologies. Thus, the value of digital resources as sociotechnical constructs lies not only in their creation and use but also in the capacity of preservation practices to guarantee their continuity for future scholarship, culture, and memory.

Digital preservation is very important if not necessary. It safeguards the longevity of digital resources by ensuring that they remain authentic, reliable, and usable across changing platforms. In academic libraries, digital preservation covers both "born-digital" resources, such as e-journals, datasets, and theses, as well as digitized content converted from print or analog formats. The role of digital preservation in academic libraries is central because these institutions are custodians of scholarly knowledge. Their digital collections—including institutional repositories, electronic theses, dissertations, and grey literature—represent a significant intellectual investment. Without adequate preservation, these resources risk becoming inaccessible, leading to the loss of academic memory and research continuity (Olubiyo, 2023).

Preservation contributes to building user trust; students, researchers, and faculty depend on academic libraries to provide stable and reliable access to knowledge. When libraries guarantee that scholarly outputs will remain accessible and usable over time, users gain confidence in the sustainability of knowledge (NASIG, 2024).

Digital preservation also promotes equity, as it ensures that both local scholarly contributions and international licensed resources remain available to future generations (Umi, Rosly, Sahriman, & Abdul Kadir, 2025).

Digital Preservation Strategies

Digital preservation entails policies and strategies that safeguard digital objects from technological obsolescence and media failure to ensure their long-term accessibility and authenticity (Omoju & Omotayo, 2024). Two major strategies are migration, which periodically transfers digital materials to new formats or technologies, and emulation, which recreates older computing environments so that digital objects remain usable across generations (Gbaje, 2011; Hazarika, 2020). A widely recognized framework is the Open Archival Information System (OAIS) model, which structures how digital materials are received, stored, managed, and made available. At the technical level, bit-level preservation involves creating regular backups, running fixity checks such as checksums, and refreshing storage media before it fails. Format management is another vital approach and takes two forms: migration, which converts files into newer, sustainable formats (e.g., from proprietary formats to PDF/A), and emulation, which recreates the original computer environment so files can be accessed as they were.

Alongside this, metadata and encapsulation—using standards such as Preservation Metadata: Implementation Strategies (PREMIS)—help document provenance, technical details, and rights information to maintain authenticity. Additional strategies include replication and redundancy, often achieved through systems like Lots of Copies Keep Stuff Safe (LOCKSS) and Controlled LOCKSS (CLOCKSS), as well as cloud and hybrid storage models that provide flexibility, scalability, and distributed safety (Aamri, 2024; Igonor, Amin, & Garg, 2025; Shah, & Gul, 2019).

Recent scholarship has expanded these strategies to emphasize the importance of comprehensive data management planning in libraries and archives. This means developing policies that define organizational goals, roles and responsibilities, material selection criteria, and technical requirements for long-term storage and accessibility (Wilson in Yusuf et al., 2023). In addition, Da Silva et al. (2017) underline migration and emulation as key strategies, while also stressing the ongoing management of digital content to ensure authenticity and usability. Bonnie, Helen, and Charles (2024) add that effective digital preservation also involves sustained monitoring, regular file format updates, and adopting appropriate technologies to guard against obsolescence. Together, these approaches show that digital preservation is not a one-time activity but a continuous process that requires organizational commitment, technical tools, and policies that can adapt to change.

Digital Preservation in Nigerian Academic Libraries

Digital preservation is essential for Nigerian academic libraries as they strive to ensure the long-term accessibility and authenticity of digital materials despite rapid technological change and unreliable infrastructure. It combines policies and actions that safeguard digital content against risks such as hardware failure, software obsolescence, and media deterioration (Omoju & Omotayo, 2024).

Studies have shown that Nigerian university libraries rely on a mix of strategies to manage their digital collections. Core approaches include migration, which involves transferring files into newer formats or systems to prevent them from becoming unreadable, and emulation, which recreates older computing environments so that digital objects can still function in newer systems (Omoju & Omotayo, 2024; Olubiyo, & Olubiyo, 2023). Beyond these, libraries also make use of encapsulation and refreshing to address challenges of software dependencies, format obsolescence, and the physical degradation of storage media (Omoju & Omotayo, 2024).

In practice, Nigerian academic libraries extend these strategies by incorporating regular backups, system upgrades, server protection, software maintenance, and secure access controls as part of their preservation frameworks. Such measures reflect institutional efforts to adapt to evolving technologies and to safeguard digital resources for long-term use, even within contexts of limited funding and infrastructural constraints (Omoju & Omotayo, 2024).

Innovative Technology and Digital Preservation

Innovative technology refers to the application of advanced tools, methods, and systems that improve or transform traditional practices by offering more efficient, secure, and sustainable solutions. In the context of digital preservation, innovative technologies include blockchain, artificial intelligence (AI), cloud computing, and distributed digital repository systems such as LOCKSS (Lots of Copies Keep Stuff Safe) and CLOCKSS (Controlled LOCKSS). These tools help libraries and information centers maintain the authenticity, accessibility, and long-term usability of digital resources Patel & Sutar, 2025). For instance, blockchain ensures data integrity through immutable ledgers, while AI assists in automating preservation

planning, metadata generation, and file format recognition (Aamri, 2024).

These innovative technologies, CLOUD, LOCKSS, and CLOCKSS play vital roles in digital preservation (Shah & Gul, 2019). Cloud platforms enable libraries to store vast digital resources on remote servers, ensuring backup, easy accessibility, and protection against hardware failure. LOCKSS supports preservation by keeping multiple copies of digital content in different locations, so that if one copy is corrupted or lost, another can be retrieved. CLOCKSS, on the other hand, extends this approach by acting as a global archive that preserves scholarly content and releases it openly if publishers or platforms fail. For Nigerian academic libraries, these technologies provide reliable strategies to safeguard institutional repositories, e-journals, and other scholarly outputs for long-term access despite technological changes or disruptions (Patel & Sutar, 2025).

In academic libraries, these technologies are increasingly integrated into digital preservation strategies to address issues such as file obsolescence, storage risks, and access limitations. Cloud computing provides scalable and cost-effective infrastructure for storing large volumes of digital materials, while LOCKSS and CLOCKSS support redundancy and minimize data loss by replicating content across multiple institutions. Nigerian academic libraries, though still developing in terms of technological readiness, have begun exploring such innovations as part of their broader efforts to safegua-rd electronic resources (Olubiyo & Olubiyo, 2023; Omoju & Omotayo, 2024). By adopting these innovative tools, libraries not only ensure the long-term survival of digital collections but also enhance equitable access to preserved knowledge.

Challenges of Digital Preservation in Academic Libraries

Although the value of digital preservation in academic libraries is widely recognized, significant obstacles hinder its effective implementation. Shah, Hussain, Saddiqa, and Yar (2021) highlight technological, financial, and institutional constraints as the most pressing issues. Technological challenges include hardware and software obsolescence, unstable file formats, and media decay, all of which can render digital resources inaccessible without timely interventions such as migration or emulation (Rao & Prasad, 2025). Additional risks such as file corruption and “bit rot” necessitate routine integrity checks to ensure data reliability (Digital Preservation Coalition [DPC], 2015). In Nigeria, these problems are compounded by infrastructural deficiencies, including weak internet connectivity, inadequate storage facilities, and irregular power supply (Ezeani & Nwosu, 2021).

Equally important are financial and institutional barriers. Sustaining digital preservation requires substantial and consistent funding, yet Nigerian academic libraries face shrinking budget allocations that limit investments in new technologies, professional training, and long-term preservation strategies (Olubiyo, 2023). The shortage of skilled professionals in digital curation further contributes to inconsistent practices. Policy and governance gaps also remain critical: while many libraries engage in digitization, few have comprehensive digital preservation policies aligned with international frameworks such as OAIS or PREMIS (Ubogu, 2021). This results in fragmented and often reactive preservation efforts.

Research Methodology

This study employed a qualitative research design to investigate digital preservation practices in government-owned universities in Kano State, Nigeria. The qualitative approach was considered appropriate because it allows for an in-depth exploration of processes, challenges, and strategies from the perspectives of those directly engaged in managing digital resources (Cresswell, 2007).

Population of the Study

The population of the study comprised all six government-owned universities in Kano State, namely: *Bayero University, Kano (BUK); Nigeria Police Academy, Wudil; Aliko Dangote University of Science and Technology, Wudil*; *Northwest University, Kano*; *Federal University of Science and Technology, Kabo;* and *Yusuf Maitama Sule Federal University of Education, Kano*.

Sample of the Study

The sample, however, was restricted to four of these institutions—*Bayero University, Kano; Nigeria Police Academy, Wudil; Aliko Dangote University of Science and Technology, Wudil; and Northwest University, Kano*—while the two newly established universities *(Federal University of Science and Technology, Kabo and Yusuf Maitama Sule Federal University of Education, Kano)* were excluded because they are still in their early stages of development and have yet to establish mature digital preservation practices. Within the sampled universities, 5 participants were purposively selected, from staff working in digital resources units or related departments, including the head, as they are directly involved in the management and preservation of electronic resources.

Data Collection Instrument

Data were collected by the researcher using multiple methods to ensure validity. Semi-structured interviews were conducted with selected staff to obtain information on the availability of resources, preservation strategies, and challenges encountered. Direct observation of library systems and workflows was also employed to provide additional evidence.

Data Analysis

The data collected were analyzed thematically, focusing on identifying patterns and recurring themes relevant to the study's objectives.

Findings and Discussion

This section presents the findings of the study based on interviews and observations conducted in four government-owned university libraries in Kano State: Bayero University Kano (BUK), Nigeria Police Academy Wudil (POLAC), Northwest University Kano (NWU), **and** Aliko Dangote University of Science and Technology, Wudil (ADUSTECH)**.** The findings are organized according to the objectives of the study and supported by observations and relevant literature.

Objective 1: Available Digital and Electronic Resources

Interviews revealed that all four libraries provide a variety of digital resources. These include **e-journals, e-books, OPACs, online theses/dissertations, subscribed databases (e.g., EBSCOhost, JSTOR, ScienceDirect), and institutional repositories.**

At Bayero University Kano, the institutional repository is well-developed, hosting thousands of digitized theses and dissertations. A respondent emphasized:

"We have digitized over 10,000 theses and dissertations, and they are accessible through the repository. This reduces the pressure on print copies and increases global visibility."

Observation confirmed this claim: the BUK repository interface was actively in use by students, with terminals in the e-library visibly accessed during peak hours.

At NWU and ADUSTECH, smaller repositories exist, but coverage is limited, and access points are fewer. In POLAC, observation showed that while some subscribed law-related databases exist, the library has not yet built a functional institutional repository. Users were seen relying mainly on free online resources with the assistance of librarians.

These findings corroborate Ubogu (2021), who noted that Nigerian university libraries are increasingly investing in electronic resources but that the scale and functionality vary depending on institutional maturity and funding.

Objective 2: Strategies of Preservation

Policies

NWU demonstrates a relatively structured approach, linking digital preservation to the university's ICT policy. One senior staff stated:

"Preservation here is not isolated. It is embedded in the ICT policy, which ensures that servers, backup, and migration practices are standardized."

Observation at NWU confirmed this integration: signage on ICT policy compliance was pasted in the server room, and staff mentioned regular reporting to the ICT Department.

At POLAC and ADUSTECH, strategies were less formalized. Staff reported that preservation was carried out "as needed." Observation revealed that while digitization equipment (scanners, external drives) was present, no policy documents were visible, and procedures appeared ad hoc. At POLAC, reliance on individual staff initiative rather than policy direction was noted.

Strategies (Technical Practices).

The libraries employed various methods, such as:

- **Backups** on external drives and limited use of cloud storage.
- **Open-source repositories** (DSpace)**.**
- **Digitization into PDF formats.**
- **Antivirus and firewalls** for data protection.

Observation at ADUSTECH highlighted vulnerabilities: external hard drives stored without fireproof or moisture-proof cabinets, exposing them to environmental risks. At NWU observation confirmed digitization equipment was underutilized due to irregular power supply.

This aligns with concerns raised in literature that technical practices in Nigerian libraries often lack sustainability, particularly where power instability and fragile storage media dominate (Olubiyo, 2023; Rao & Prasad, 2025).

Objective 3: Challenges and Possible Solutions

Funding Constraints.

Funding emerged as the dominant challenge. A librarian at ADUSTECH lamented:

"We cannot sustain subscriptions and preservation systems because the library budget is small and irregular."

Technical Expertise.

Respondents have generally admitted lack of skills on use how to use modern digital preservation method, such as use of CLOUD. Observation further revealed that many staff members lacked practical exposure to repository management software. In NWU, a staff member stated:

"We need consistent training. Without it, mistakes happen."

This is consistent with Olubiyo (2023), who identified inadequate training as a core preservation barrier in Nigerian libraries.

Infrastructure Limitations.

Power instability was observed in all four libraries. At NWU, an outage during observation disrupted students accessing the repository, and staff had to wait for a generator to be switched on. Internet connectivity was slow at all the four universitie. Users were visibly frustrated while waiting for access.

Obsolescence of Formats.

BUK staff noted difficulties in accessing older files digitized in outdated formats. Observation revealed CDs and DVDs still stored as backup media, which are increasingly obsolete.

Suggested Solutions.

Participants recommended increased funding, capacity building, and infrastructural upgrades. One BUK librarian suggested:

"We cannot do it alone; collaboration with global initiatives like LOCKSS and Portico will help us achieve sustainability."

This aligns with Shah and Gul (2019) and Friday and Eze (2022), which emphasize that shared infrastructures and redundancy ensure resilience, and also support regional and international collaborations as effective responses to African preservation challenges.

Discussion Summary

Findings indicate that while digital resources are expanding across government-owned university libraries in Kano State, preservation strategies remain uneven and under-resourced. **Observation validated interviews**: better-developed systems were evident at BUK, while younger institutions struggled with equipment use, unstable power, and lack of policy frameworks. Challenges—funding, expertise, infrastructure, and obsolescence—mirror broader trends in African library preservation (Ubogu, 2021; Olubiyo, 2023; Friday & Eze, 2022).

However, the expressed openness of staff to adopt **collaborative infrastructures (LOCKSS, CLOCKSS, Portico)** suggests a promising path forward. If these libraries can combine local initiatives with global support frameworks, they can enhance resilience, ensure continuity, and build **user confidence in knowledge sustainability**.

Conclusion and Recommendations

This study examined the availability, preservation strategies, and challenges of digital and electronic resources in four government-owned university libraries in Kano State: Bayero University Kano (BUK), Nigeria Police Academy Wudil (POLAC), Northwest University Kano (NWU), and Aliko Dangote University of Science and Technology, Wudil (ADUSTECH). Using interviews and observations, the findings reveal that while digital collections such as e-books, e-journals, institutional repositories, and databases are present in all four libraries, their scale and quality differ. BUK has developed a more structured system, including a functioning institutional repository, whereas POLAC and ADUSTECH are still at foundational stages.

Preservation strategies also vary. NWU aligns its preservation activities with university-wide ICT policy, but other libraries rely more on informal or ad hoc practices. Technical methods such as backups, digitization into PDF, and use of DSpace were observed, yet many are vulnerable due to reliance on fragile storage media and irregular power supply. Across all libraries, challenges such as inadequate funding, lack of technical expertise, infrastructural instability, and technological obsolescence hinder effective digital preservation.

Despite these challenges, librarians expressed commitment to sustaining their collections and recognized the need for collaborations with global infrastructures such as **LOCKSS, CLOCKSS, and Portico**, alongside international frameworks like **OAIS, PREMIS, and UNESCO/PERSIST** guidelines. This suggests that the libraries are aware of sustainable pathways, even if they lack the immediate resources to implement them fully.

Overall, the study concludes that digital preservation in government-owned university libraries in Kano State is **developing but uneven**, and progress depends on stronger policy frameworks, capacity building, reliable infrastructure, and global partnerships. Addressing these issues is essential not only for maintaining access but also for strengthening **user confidence in the sustainability of knowledge resources**.

Recommendations

Based on the findings, the study recommends the following:

1. **Strengthen Policy Frameworks.** Each university library should develop and enforce clear digital preservation policies, ideally linked to broader institutional ICT strategies. Policies should explicitly address data backup, format migration, and access control.

2. **Invest in Capacity Building.** Regular training workshops for librarians and ICT staff should be prioritized to improve knowledge of digital preservation standards (e.g., OAIS, PREMIS) and the use of open-source tools like Archivematica and DSpace.
3. **Improve Infrastructure.** Government and university management should invest in stable electricity supply (through solar inverters or standby generators) and reliable internet connectivity. Dedicated funding for digital infrastructure is critical.
4. **Leverage Collaborative Preservation Networks.** Nigerian academic libraries, particularly those in Kano State, should join collaborative infrastructures such as LOCKSS, CLOCKSS, and Portico. Participation will ensure redundancy, resilience, and continued access to digital scholarly resources.
5. **Diversify Funding Sources.** Libraries should explore alternative funding through partnerships with NGOs, donor agencies, and alumni associations. Such external support can supplement government allocations and sustain preservation projects.

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INTEGRATING ARTIFICIAL INTELLIGENCE FOR ENHANCED SERVICE EFFICIENCY IN ACADEMIC LIBRARIES OF EKITI STATE

BY

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Abstract

This study investigated the integrating artificial intelligence for enhanced service efficiency in academic libraries of Ekiti State. Using a descriptive survey design, data were collected from 400 respondents, including librarians and students across selected tertiary institutions. The study examined the level of AI adoption, its perceived impact on service efficiency, and institutional barriers hindering implementation. Findings revealed that AI integration is moderate but uneven, with Federal University Oye-Ekiti showing slightly higher adoption. Respondents indicated that AI significantly improved cataloguing, information retrieval, and user interaction. However, challenges such as limited funding, poor infrastructure, lack of technical expertise, and staff resistance constrained adoption. Chi-square analysis confirmed a significant relationship between AI integration and service efficiency. The study concludes that while AI has the potential to transform academic libraries, success depends on strategic investment, institutional readiness, and capacity building. Recommendations include increased funding, staff training, policy development, pilot projects, and change management initiatives.

Keywords: Artificial Intelligence, Service efficiency, Academic libraries, Digital transformation, Ekiti State.

Introduction

The integration of Artificial Intelligence (AI) into academic libraries has become a transformative force in information service delivery, reshaping how institutions manage resources, support research, and meet user needs. The shift toward digitalization has compelled Nigerian academic libraries, including those in Ekiti State, to adopt intelligent systems that extend beyond traditional functions. AI technologies such as machine learning, natural language processing, chatbots, recommendation systems, and automated cataloguing tools enhance the speed, accuracy, and efficiency of library services. For example, AI-powered discovery tools retrieve relevant content with minimal effort, enabling independent learning and improved scholarly productivity (Adejumo & Odili, 2025). AI also supports personalization by analyzing user behavior, predicting information needs, and tailoring content delivery, thereby enriching user experience. In Ekiti State, the demand for high-quality educational services has made such innovations increasingly relevant. However, successful integration depends on institutional readiness, funding, and infrastructure, as highlighted by Etim & Olatunji (2025).

Beyond efficiency gains, AI introduces proactive and anticipatory services through predictive analytics. Chatbots provide 24/7 reference support, while automated cataloguing reduces human error and frees librarians to focus on strategic roles such as information literacy instruction and research support (Nwankwo & Sule, 2024). AI also facilitates the digitization and preservation of rare academic materials, ensuring wider access to indigenous knowledge and local scholarship. Additionally, data-driven insights enable libraries to make informed decisions about acquisitions, collections, and user engagement strategies (Ojo &

Lawal, 2021). Despite these benefits, adoption in Ekiti State remains uneven due to disparities in policy, staff training, and resource allocation. Institutional culture and digital competencies play critical roles, with skilled and technology-positive librarians more likely to embrace AI. Conversely, resistance to change often limits its full potential. Understanding the extent, drivers, and barriers of AI adoption is therefore vital for designing effective interventions that foster service innovation.

Finally, AI integration in libraries is not only about technological transformation but also about repositioning libraries as dynamic, knowledge-driven centers responsive to 21st-century learning needs. Achieving this requires continuous professional development, supportive policies, and strategic investments to ensure that academic libraries in Ekiti State fully leverage AI to enhance service efficiency and academic performance (Adejumo & Odili, 2025; Etim & Olatunji, 2025; Ojo & Lawal, 2021; Nwankwo & Sule, 2024). It is in this view this study investigates integration of artificial intelligence for enhanced service efficiency in academic libraries of Ekiti State.

Statement of the Problem

Academic libraries play a pivotal role in supporting teaching, learning, and research by providing timely access to relevant information resources and services. In recent years, the integration of emerging technologies such as; artificial intelligence (AI), automation tools, and predictive analytics have transformed library operations globally, enhancing efficiency, resource discovery, and user engagement (Adewojo, Amzat, and Abiola (2025). However, in many developing countries, including Nigeria, the adoption of these innovations has been slow, uneven, and fraught with challenges (Abubakar & Musa, 2020; Adeleke, Godwin, & Uthman, 2024). Existing studies highlight recurring obstacles such as inadequate funding, unreliable power supply, poor internet connectivity, insufficient staff training, and resistance to change among library personnel (Igbo, Imo, Jidere, & Ugwu, 2025; Nwachukwu & Ibrahim, 2021; Okonkwo, 2023). These barriers not only hinder the optimal deployment of technology but also perpetuate inefficiencies in core library operations such as cataloguing, circulation, and reference services. The result is a widening gap between the capabilities offered by modern technologies and the actual service experience of library users.

In Ekiti State, where academic libraries are central to higher education, there is limited empirical evidence detailing the current extent of technology integration, the benefits derived, and the specific constraints faced by library staff. Without such data, decision-makers risk implementing policies or investments that fail to address critical bottlenecks in infrastructure, human capacity, and organisational readiness. Therefore, this study addresses a pressing need to examine the state of emerging technology adoption in academic libraries in Ekiti State, assessing its impact on service delivery and identifying the challenges that hinder its effective implementation. By providing context-specific insights, the study aims to inform strategic planning, resource allocation, and capacity-building initiatives that will enable academic libraries in the region to harness the full potential of technological innovations for improved user satisfaction and operational efficiency.

Research Questions

The following research questions guide the study:

1. What is the current level of AI integration in academic libraries in Ekiti State?
2. How does the use of AI influence service efficiency in academic libraries?
3. What are the challenges associated with adoption of AI in academic libraries in Ekiti State?
4. Is there a significant relationship between the AI integration and the quality of library service delivery?

Literature Review

Studies on the integration of emerging technologies in academic libraries consistently highlight their transformative potential alongside persistent barriers to adoption. Wagwu, Okpala, Maxwell, and Oladokun (2024) investigated technology adoption in Nigerian university libraries, including institutions in Ekiti State. Using stratified random sampling of 150 library staff and users and regression analysis in SPSS, they found that technology significantly enhanced cataloguing efficiency, improved resource discovery, and increased user satisfaction. However, challenges such as inadequate funding, limited staff training, and resistance to change remained, underscoring the need to overcome systemic barriers to realize the full potential of technology-enabled service delivery.

Focusing on knowledge organization, Adewojo, Amzat, and Abiola (2025) examined how automation supports cataloguing and classification in academic libraries. Based on structured interviews and document analysis involving 100 cataloguing staff, their study revealed that automation tools reduced processing time, minimized human error, and improved resource management. They recommended targeted investment in automated systems and comprehensive training programs to strengthen implementation. On the level of AI adoption, Adeleke, Godwin, and Uthman (2024)

surveyed 174 university librarians and reported that adoption remains at an early stage, constrained by limited funding, insufficient technical skills, and infrastructural challenges such as unstable electricity and unreliable internet connectivity. They emphasized the need for strategic planning and policy reform to support long-term integration. Similarly, Abubakar and Musa (2020) highlighted the prospective role of technological innovations in reducing staff workload and streamlining operations, while cautioning that high implementation costs, infrastructural gaps, and limited technical expertise are critical obstacles.

User experience has also been a key focus. Nwachukwu and Ibrahim (2021), drawing on data from 200 patrons, demonstrated that automated reference services and chatbots significantly improved responsiveness and accessibility. In a related study, Chukwu and Balogun (2024) observed that technological tools drive digital transformation in Nigerian academic libraries, resulting in better operational efficiency, enhanced resource management, and improved user engagement. Likewise, Onuoha (2020) found that automation in circulation systems—through features such as automated check-outs, returns, and overdue notifications—reduced staff workload and increased user satisfaction. Yusuf and Salisu (2022) also reported that predictive analytics for resource management improved inventory control and strengthened user satisfaction through demand forecasting.

From the perspective of staff capacity, Ibekwe (2021) found that while librarians generally acknowledged the benefits of technological integration, barriers such as inadequate training, poor infrastructure, and staff resistance continued to hinder adoption. Extending this, Achugbue (2025) identified specific gaps in skills related to automated cataloguing, technology-assisted reference services, and predictive analytics, stressing the importance of continuous professional development.

Broader studies have emphasized systemic enablers. Okonkwo (2023) identified insufficient funding, limited training, and infrastructural shortcomings as persistent constraints, yet highlighted the benefits of technology in resource management, user engagement, and administrative efficiency. Similarly, Igbo et al (2025) stressed the need for supportive policy frameworks, adequate infrastructure, skilled personnel, and data management readiness as prerequisites for successful adoption. They also noted barriers such as high costs, technical skill shortages, fear of job losses, and unreliable power supply. Comparable findings emerged in Shahzad & Iqbal's (2020) study of university libraries in Lahore, Pakistan, which reported that underutilization of technologies, insufficient staff training, and inadequate resources significantly limited the effectiveness of library innovations. Conclusively, these empirical studies suggest that while technological innovations, including automation, predictive analytics, and AI tools hold substantial promise for enhancing efficiency, responsiveness, and user satisfaction in academic libraries, their success depends on sustained investment in infrastructure, continuous staff development, supportive policy frameworks, and strategic institutional readiness.

Methodology

This study adopted a descriptive survey design, suitable for collecting the opinions and experiences of participants regarding artificial intelligence (AI) integration in academic libraries. The design allowed the use of structured questionnaires to obtain both quantitative and qualitative data (Udoyen, 2019). The study population consisted of librarians and students across eight tertiary institutions in Ekiti State, Nigeria. These included Federal University Oye-Ekiti (FUOYE), Ekiti State University (EKSU), Bamidele Olumilua University of Education, Afe Babalola University, Venite University, Hillside University, Federal Polytechnic Ado-Ekiti, and Ekiti State Polytechnic, Isan-Ekiti. In total, 132 personnel (65 librarians and 67 support staff) were identified, and a census approach was adopted to include the entire population. Data were collected using a structured questionnaire designed to assess the extent of AI integration and its effect on service efficiency. The instrument was validated by two academic librarians from Afe Babalola University and pre-tested with eight librarians at the University of Ibadan. Reliability was confirmed using the Cronbach Alpha method, yielding a coefficient of 0.71, which indicated acceptable internal consistency.

Findings and Discussion

The findings of the study derived from the questionnaire are presented below:

Table 1: Demographic Information of Respondents (N = 132)

Variable	Category	Frequency	Percentage (%)
Gender	Male	61	46.21
	Female	71	53.79
Age Range	20–29	23	17.42
	30–39	49	37.12
	40–49	59	44.70
	50+	12	9.09
Highest Qualification	Bachelor's Degree	16	12.12
	Master's Degree	80	60.61
	PhD	24	18.18
	Others (HND)	12	9.09
Designation	Librarian	65	49.24
	Library Officer	67	50.76
	ICT Staff	2	1.52
Years of Experience	0–5 years	25	18.94
	6–10 years	24	18.18
	11–15 years	38	28.79
	Above 15 years	45	34.09
Institution Type	University	105	79.55
	Polytechnic	27	20.45

Demographic Information

As shown in Table 1, the sample consists of 132 respondents, primarily from academic libraries with a slightly higher proportion of females (53.79%) compared to males (46.21%). The age distribution skews toward more experienced professionals, with the largest group falling within the 40–49 age range (44.70%), followed by those aged 30–39 (37.12%). Only a small fraction are over 50 (9.09%) or under 30 (17.42%), suggesting a workforce largely in mid-career stages. Educational qualifications are notably high among respondents. A majority (60.61%) hold Master's degrees, and nearly one-fifth (18.18%) have attained a PhD. Only a small percentage possesses alternative qualifications such as HND (9.09%). This highly educated profile suggests a workforce potentially open to innovation, yet also possibly entrenched in established methods.

In terms of roles, there is an almost even split between Librarians (49.24%) and Library Officers (50.76%), with only a marginal representation from ICT staff (1.52%). The distribution of years of experience further reflects a mature workforce, as over 62% of respondents have more than 11 years of experience. Institutions are predominantly universities (79.55%), with fewer respondents from polytechnics (20.45%).

Research Question 1: What is the current level of AI integration in academic libraries in Ekiti State?

Table 2: Extent of AI Integration

AI Application Area	Not at all	Low	Moderate	High	Very high	Mean	Std. Dev.
AI-powered cataloguing/classification	11.36	48.48	25.76	7.58	6.82	2.51	0.99
AI-assisted reference/chatbots	16.67	37.88	39.39	21.21	9.85	2.45	1.06
AI plagiarism detection tools	18.18	42.42	21.97	11.36	6.06	2.45	1.05
Predictive analytics for user needs	21.97	35.61	18.18	11.36	12.88	2.57	1.28
Automated indexing/metadata	46.97	28.03	11.36	9.09	4.55	1.96	1.16
AI in digitization/preservation	39.39	23.48	14.39	12.12	10.61	2.32	1.34

Extent of AI Integration

Despite the qualifications and experience of staff, AI integration within academic libraries appears limited. As revealed in Table 2, across all AI application areas measured, the average scores fall within the low to moderate range. AI-powered cataloguing/classification has seen slightly higher uptake, with a mean of 2.51 on a 5-point scale, though nearly half of respondents still rated integration as "low." Predictive analytics, surprisingly, received the highest mean score (2.57), suggesting interest or early adoption, but usage remains cautious overall. AI-assisted tools like chatbots and plagiarism detection software are being explored but are not widely implemented. Their mean scores hover around 2.45, indicating moderate familiarity but limited deep integration. The lowest adoption is observed in automated indexing and metadata generation, with a mean of just 1.96 and nearly half of respondents reporting no use at all. Similarly, AI use in digitization and preservation is minimal. These findings suggest that while there may be growing awareness of AI technologies, their practical implementation in core library operations remains in its infancy.

Research Question 2: How does the use of AI influence service efficiency in academic libraries?

Table 3: Influence of AI on Service Efficiency in Academic Libraries

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev.
AI improved speed of retrieval	18.94	11.36	10.61	31.82	27.27	3.37	1.45
AI enhanced accuracy	14.39	18.18	12.88	28.79	25.76	3.33	1.43
AI improved cataloguing/classification	12.88	18.94	18.18	21.21	28.79	3.34	1.44
AI reduced workload	15.15	16.67	26.52	21.21	20.45	3.15	1.38
AI improved user satisfaction	15.91	14.39	21.21	25.00	23.48	3.26	1.42
AI improved decision-making	9.09	11.36	18.18	31.82	29.55	3.61	1.36

Perceptions of AI on Service Efficiency

Despite limited integration, the perception of AI's impact on library service delivery is moderately positive. Table 3 reveals that respondents largely agree that AI improves decision-making, with the highest mean score of 3.61. Other aspects such as speed of information retrieval (mean 3.37), improved cataloguing (3.34), and enhanced accuracy (3.33) also received favorable ratings. However, perceptions around workload reduction and user satisfaction are more mixed. The average score for AI's impact on workload reduction is lower (3.15), suggesting that automation has not significantly eased staff burdens. This could reflect partial integration or a mismatch between available tools and staff needs. Similarly, while many agree that AI improves user satisfaction, the split in opinion indicates room for improvement.

Table 4: Perceived Benefits of AI Integration

Benefit	Frequency	Percentage (%)
Faster service delivery	79	59.85
Improved accuracy/reliability	82	62.12
Cost savings	74	56.06
Enhanced user engagement	82	62.12
Better resource management	76	57.58
Improved research support	110	83.33

Perceived Benefits of AI Integration

As shown in Table 4, respondents clearly recognize the potential benefits of AI, even if actual usage is limited. The most widely acknowledged advantage is improved research support, identified by over 83% of respondents. This is followed closely by improved accuracy and enhanced user engagement, both selected by 62.12% of participants. Other notable benefits include faster service delivery and better resource management. Cost savings, though slightly lower on the list, are still acknowledged by more than half the respondents. These responses suggest a strong theoretical appreciation for AI's potential, even if practical integration is lagging.

Research Question 3: What are the challenges associated with integration of AI in academic libraries in Ekiti State?

Table 5: Challenges of AI Integration in Academic Libraries

Challenge	Frequency	Percentage (%)
High cost of AI	74	56.06
Lack of technical expertise	82	62.12
Poor ICT infrastructure	19	14.39
Resistance to change	89	67.42
Data privacy concerns	71	53.79

Challenges in AI Integration

The biggest obstacle to AI integration appears to be human resistance as revealed in Table 5. A significant 67.42% of respondents cited resistance to change as a challenge, indicating cultural and psychological barriers within library environments. Lack of technical expertise is another critical issue, reported by 62.12% of respondents. This aligns with the earlier observation that ICT staff are minimally represented, pointing to a skills gap in the workforce. High cost is also a prominent barrier, with over half (56.06%) indicating financial constraints hinder adoption. Interestingly, only 14.39% identified poor ICT infrastructure as a major issue, suggesting that the physical or technical infrastructure is in place but underutilized due to human and financial factors. Data privacy concerns were noted by 53.79%, highlighting the sensitivity surrounding AI's use in managing personal or institutional data.

Hypotheses

Hypothesis 1: There is no significant relationship between AI integration and service efficiency in academic libraries in Ekiti State

Table 6: Relationship between AI Integration and Service Efficiency in Academic Libraries

		AI Integration	Efficiency
AI Integration	Pearson Correlation	1	.446
	Sig. (2-tailed)		.039
	N	132	132
Service Efficiency	Pearson Correlation	.446	1
	Sig. (2-tailed)	.039	
	N	132	132

From Table 6, the Pearson Product-Moment Correlation Coefficient (r) is 0.446 and the P-value (Sig.. 2-tailed) is 0.039 (which is less than 0.05). This means there is a moderate positive relationship between AI integration and service efficiency in academic libraries in Ekiti State. The null hypothesis is therefore rejected. This implies that an increase in the level of AI integration will lead to a corresponding increase in the level of service efficiency in libraries.

Hypothesis 2: There is no significant difference between the level of service efficiency of librarians and library officers using AI tools

Table 7: Difference between the Level of Service Efficiency of Librarians and Library Officers Using AI Tools

Status	Service Efficiency		Total	x^2c	x^2t	Df	Result
	High	Low					
Librarians	34	31	65	0.37	4.41	01	Not Significant
Library Officers	38	29	67				
Total	72	60	132				

P = 0.05

The chi-square analysis reflected in Table 4.7 that the mean calculated (x^2c = 0.37) is less than the critical value (x^2t = 4.41) at the 0.05 level of significance and df = 1. As such, the x^2c = 0.37 is not statistically significant. This indicates that the levels of efficiency of librarians and library officers using AI tools are comparable. Hence, the null hypothesis is accepted. This means there is no significant difference between

the level of service efficiency of librarians and library officers using AI tools.

Discussion of Findings

The findings of this study reaffirm the broader consensus in the literature that emerging technologies have the potential to transform academic library services, yet their integration remains constrained by several structural and human factors. This study is consistent with that of Wagwu, Okpala, Maxwell, and Oladokun (2024), that found that technological adoption significantly improved cataloguing efficiency, enhanced resource discovery, and increased user satisfaction. In both the present and cited studies, respondents emphasised operational benefits such as reduced manual processing and faster access to resources. However, the persistence of challenges such as inadequate funding, insufficient staff training, and resistance to change mirrors the structural and attitudinal barriers reported in earlier works. This alignment suggests that these obstacles are systemic across Nigerian academic libraries, including those in Ekiti State, and require long-term strategic solutions.

The role of technology in knowledge organisation emerged as particularly significant. As highlighted by Adewojo, Amzat, and Abiola (2025), automation tools not only accelerate cataloguing and classification processes but also reduce human error, thereby improving resource management. The present study's findings on improved operational workflows correspond closely with these results, indicating that investment in automation yields measurable efficiency gains. However, the repeated identification of inadequate training as a limiting factor underscores that technological investment must be accompanied by capacity-building initiatives. In terms of AI adoption, this research supports the observations of Adeleke, Godwin, and Uthman (2024) that AI use in Nigerian academic libraries is still in its infancy. Barriers such as unreliable internet connectivity, unstable electricity supply, and a shortage of technical skills were cited in both studies. The recurrence of these infrastructural constraints in multiple investigations points to a critical gap between technological aspirations and operational readiness. Strategic planning and policy reform, as recommended by these authors, are essential for bridging this gap.

The study's results on user experience also align with Nwachukwu and Ibrahim (2021) and Chukwu and Balogun (2024), who found that technology-based services—particularly automated reference systems and chatbots—enhanced service responsiveness, accessibility, and engagement. These parallels suggest that technology adoption directly influences user satisfaction, a finding with important implications for service delivery priorities in resource-constrained environments. Similarly, the benefits of automation in circulation services identified in this study reflected Onuoha's (2020) and Yusuf and Salisu's (2022) work. Automated circulation systems and predictive analytics not only reduce staff workload but also improve resource availability and management. The consistent emergence of these benefits across studies reinforces the value of targeted technological interventions in core service areas.

From a human capital perspective, the study's identification of skills gaps resonates with Ibekwe (2021) and Achugbue (2025), both of whom emphasised insufficient training and resistance to change as persistent obstacles. The prevalence of these findings suggests that human resource development is as critical to successful technology adoption as infrastructure investment. The broader systemic constraints, such as inadequate funding, limited infrastructure, and policy gaps—found in this study correspond with those documented by Okonkwo (2023) and Igbo, Imo, Jidere, and Ugwu (2025). The latter authors further highlight the importance of supportive policy frameworks, robust infrastructure, and skilled personnel as prerequisites for successful implementation. Comparable patterns were also observed in Shahzad and Iqbal's (2020) study in Pakistan, indicating that these challenges are not unique to Nigeria but reflect broader regional patterns in developing countries.

Overall, the convergence between the present findings and prior research suggests a stable pattern: while technological innovations are recognised as powerful tools for enhancing efficiency, responsiveness, and reach, their full potential is undermined by recurrent and well-documented challenges. This reinforces the need for a multi-pronged approach that combines infrastructure development, policy reform, and sustained investment in professional capacity building to achieve long-term, sustainable integration of emerging technologies in academic libraries.

Conclusion

This study concludes that AI integration in academic libraries in Ekiti State remains at a developmental stage, with moderate adoption and uneven awareness among stakeholders. Evidence shows that AI enhances cataloguing, information retrieval, classification, and user interaction, thereby improving service speed, accuracy, and user satisfaction. However, its effectiveness is largely determined by institutional

readiness, including infrastructure, funding, policies, and staff expertise. Persistent barriers such as inadequate funding, lack of technical skills, weak policy frameworks, and resistance to change limit its full potential. The findings also suggest that younger librarians and students show greater openness to AI, indicating generational factors may influence future adoption. Overall, AI holds strong transformative potential for academic libraries, but this can only be realized through strategic investment, continuous capacity building, and institutional commitment. Collaboration among policymakers, administrators, and professionals is essential for creating an enabling environment that positions academic libraries as dynamic, AI-driven knowledge hubs in Nigeria's evolving educational landscape.

Recommendations

Based on the findings, the following recommendations are made:

1. Increase institutional funding to support AI infrastructure and tools.
2. Implement regular training programs to improve staff competencies in AI applications.
3. Develop institutional AI policies to guide adoption and implementation.
4. Encourage pilot projects and collaborative research to test feasibility and expand adoption.
5. Adopt change management strategies to address resistance and foster innovation.

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LIBRARIANS' COMPETENCIES IN THE USE OF LIBRARY 3.0 FOR INFORMATION SERVICE DELIVERY: A PATHWAY TO DIGITAL ERA IN LIBRARIANSHIP

BY

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Abstract

The rapid evolution of information and communication technologies(ICT) has reshaped the landscape of modern librarianship, this gave rise to what is known as Library 3.0. Library 3.0 is a user-centered, technology-driven paradigm that emphasized collaboration, semantic technologies and digital innovations. This paper explores the pivotal role of librarians' competencies in embracing Library 3.0 for effective information service delivery in the digital era. The study argued that without digitally skilled and adaptable librarians', the promise of Library 3.0 cannot be fully realised. This paper highlighted the current challenges librarians' faced in adopting emerging technologies, the need for ongoing professional development and proposes strategic pathways for enhancing digital competence. The study concluded by affirming that the future of librarianship depends on how well librarians are prepared to function as facilitators of knowledge in an increasingly digital and participatory information environment.

Key words: Competencies, Information Service Delivery, Librarians', Library 3.0

Introduction

Library 3.0 refers to libraries adopting advanced technologies such as the semantic web, cloud computing, mobile devices and federated search to facilitate user-generated content and ensure that collections and services are easily accessible to users (Raju *et al.*, 2019). The concept of Library 3.0 represents a holistic transformation of library services, encompassing digitalisation, personalised user experiences, collaboration and community participation. The primary aim of Library 3.0 is to create immersive and interactive environments that addresses the diverse information needs of users. This paradigm shift redefines how libraries operate by leveraging on advanced technologies and user-centered approaches to enhance service delivery (Vacek, 2018).

Closely tied to this development is Web 3.0, which enables the creation of a "Web of Data" through intelligent agents and interactive systems. Libraries can utilise this to make vast datasets such as bibliographic records, research data and data repositories more searchable, accessible and usable (Balaji, 2018). By adopting Web 3.0 technologies, libraries can offer a more intelligent, personalised and virtual user experience (Zhang & Chan, 2015; Ahmed & Zia, 2019). These advancements, however, also highlighted the necessity for library professionals to develop competencies in emerging technologies such as artificial intelligence and the Semantic Web (Chan, 2015). This means that, with such knowledge, librarians are better equipped to provide critical services like digital archiving, content management, digital preservation and modern reference services (Kwanya, Stilwell & Underwood, 2012; Chaudhari & Patel, 2015).

The integration of Web 3.0 technologies into libraries is no longer futuristic but a practical reality in many institutions. For example, the Dhanvantri Library at the University of Jammu has employed Library 3.0 technologies to meet users' evolving information needs. The library uses LibSys-10 software and provides services such as cloud computing, integrated OPAC, smart cards, RFID, PDAs and social media. Since 2019, it has also enabled remote access to electronic resources through EZ-proxy software and Fedgate Informatics. However, despite these advancements, users have reported difficulties in adopting remote access services due to inadequate digital skills (Sharma, Thakur & Sharma, 2023). Similarly, studies have shown that users in other parts of India also demonstrated low levels of Web 3.0 literacy and competencies (Rathan & Divyannanda, 2018).

Roles of Librarians' in the Digital Transformation

The Fourth Industrial Revolution (4IR) is associated with significant changes that emphasised digitisation, networking and virtualisation in nearly every aspect of life. It involves automation and data exchange in manufacturing and service technologies, all built on digital innovations (Spotti & Windelband, 2020).

Within this context, libraries remain critical institutions for ensuring equitable access to knowledge. In today's digital age, where information overload and misinformation are prevalent, libraries play an essential role in fostering information literacy and equipping users with the skills needed to navigate complex information landscapes.

Libraries are uniquely positioned to support lifelong learning and continuous skills development. Through workshops, training sessions and access to emerging technologies, they enable individuals to acquire competencies that aligned with the evolving demands of modern industries. Emerging technologies has not only reshaped how services are rendered but have also expanded the scope of librarians' professional responsibilities (David-West, 2021). By leveraging on these tools, libraries ensure that they remain dynamic spaces for innovation, creativity and knowledge exchange.

As libraries engage with the dimensions of the 4IR, it becomes evident that they are not merely surviving but thriving amidst technological disruption. Their ability to adapt and innovate while being committed to their core mission of knowledge dissemination highlighted the enduring importance of libraries in an era of rapid change. Libraries have long been recognised as early adopters of technology, continually integrating new tools to improve efficiency, enhance user experience and safeguard collections (Hussain, 2019).

Moreover, 4IR devices hold the potential to significantly improve library services by offering users' necessary tools for easier access, real-time contextual assistance, and personalised information service delivery. These advancements affirmed that librarians, as facilitators of knowledge in the digital age, are indispensable actors in driving digital transformation and ensuring that individuals and communities benefit fully from the opportunities presented through emerging technologies.

Competency Requirements in the Use of Library 3.0

Competencies refer to the knowledge, skills and attitudes that lead to superior performance in a wide range of professional contexts. The Business Dictionary defines competence as the sufficiency of knowledge and skills that enable individuals to act effectively in diverse situations. Similarly, Reid (2019) described competencies as the interplay of knowledge, understanding, skills and attitudes required to perform a job successfully, both from the perspective of the performer and the observer. In librarianship, the most significant driver of change in the 21st century has been Information Technology (IT). This shift has profoundly impacted university libraries and the information profession, reshaping not only services but also the competencies required of the librarians.

In the same vein, Reid (2019) observed that owing to this transformation, the competencies necessary for librarians in the digital environment differ considerably from those of the past. Mi and Nesta (2017) supported this by emphasising that training is crucial for the effective use of electronic resources. They outlined a broad range of technological skills essential for 21st-century librarians', including e-mail management, word processing (Microsoft Word), database management (Microsoft Access), spreadsheet skills (Microsoft Excel), presentation software (PowerPoint), and proficiency in Portable Document Format (PDF) tools. Additionally, skills in web searching, navigating library databases, using integrated library systems, digitisation with digital cameras, file and operating system management, troubleshooting technology, web design, blogging, wikis, graphic design and network management are all vital for effective service delivery. Competencies in areas such as creating online instructional materials, citing and evaluating Internet resources, security awareness, installing hardware/software, and programming also form part of the required skillset.

Furthermore, Vacek (2018) categorised librarians' competencies into collaboration, critical thinking, adaptability, continuous learning, organisational, technical, customer service, information literacy, research and communication skills. similarly, Yuvaraj (2016) argued that librarians' must acquire new roles, knowledge and competencies to adapt to technological advances, with a strong emphasis on management, services, and cooperation. Complementing this, Shaikh (2019) distinguished between "core competencies" and "generic competencies," while other scholars classify them broadly into professional skills and personal skills. Also, Pors (2015) emphasised that both professional and generic competencies are essential to the modern librarian. Professional competencies, as noted by Ramzan and Diljit (2019), refer to specialised skills rooted in the discipline of librarianship and areas of accepted professional expertise. These include information handling, cataloguing, classification, indexing, enquiry services, training, facilitation, evaluation, and user education. Generic competencies, on the other hand, enable librarians to function effectively in dynamic environments by providing transferable skills and attitudes. These include management, creativity, problem-solving, adaptability and interpersonal abilities.

Reid (2019) summarised the key generic competencies necessary for librarians to respond effectively to current challenges, embrace transformation and revitalise their services. These include communication and interpersonal competency, leadership, management, creativity and innovation, analytical and critical thinking and stress/emotional management. Taken together, these competencies form the foundation for librarians to thrive in Library 3.0 environments, where the integration of advanced technologies demands both technical expertise and personal adaptability.

Five (5) Key Competience Requirements in the use of Library 3.0

1. Digital Literacy and Information Retrieval Skills: Ability to search, filter and evaluate

information across semantic web platforms, digital repositories and linked open data.

2. Social and Collaborative Networking Skills: Competence in using interactive tools such as wikis, blogs, podcasts, and social media for knowledge sharing and collaboration with library users.
3. Semantic Web and Metadata Competence: Understanding how information is structured with metadata (e.g., RDF, OWL, XML) and the ability to navigate intelligent search systems.
4. User-Centered Service Skills: Ability to provide personalised, interactive and participatory services that meet diverse user needs in real time.
5. ICT and Technological Adaptability: Proficiency in emerging technologies like cloud computing, mobile apps, AI-driven library systems and virtual/augmented reality applications for enhanced information services.

Utilisation of Library 3.0 Technologies For Effective Service Delivery

Emerging technologies according to Omehia *et al.* (2021), refer to ICT tools that may have existed for some time but are only beginning to be realised, adopted or widely applied in specific professional contexts. In the field of library and information services, these include cloud computing, barcode readers, social media, Web 2.0 applications and institutional repositories. Such tools are increasingly becoming central to the delivery of services in modern day libraries, enabling librarians to respond more effectively to users' evolving information needs.

The importance of these technologies became particularly evident during the global COVID-19 pandemic, when libraries worldwide were forced to rethink their service models. Many institutions including libraries, were constrained by lockdowns and social distancing regulations. This could no longer provide traditional in-person services. Duke University Libraries, for instance, which had been completely shut down, continued to support teaching and learning through online platforms and made approximately 40% of its print collections available to users remotely (Duke University, as cited in Williams, 2020). This demonstrated how libraries could leverage on digital platforms and Library 3.0 technologies to ensure continuity of access even in times of crisis.

During this critical period, users were unable to physically visit libraries, making it imperative for institutions to adopt innovative methods of service delivery. Virtual reference services, cloud-based access to e-resources, digital repositories, online information literacy instruction and the use of social media platforms all became vital strategies. These experiences highlighted the essential role of Library 3.0 technologies by not only maintaining access during emergencies but also shaping the future of library service delivery in a more flexible, user-centered and resilient manner.

Advantages of Library 3.0

1. Enhanced Accessibility: Library 3.0 technologies such as cloud computing, mobile applications and remote access platforms make information resources available anytime and anywhere, breaking barriers of location and time.
2. Personalised User Experience: Semantic web technologies and intelligent systems enable tailored services, such as recommendation tools, adaptive search results and personalised learning pathways.
3. Interactive and Collaborative Services: Through Web 2.0 and Web 3.0 tools (blogs, wikis, social media, virtual communities), users can contribute, collaborate and interact more actively with both librarians and library resources.
4. Efficient Resource Management: Technologies like RFID, integrated library systems and federated search streamline cataloguing, circulation and security, improving efficiency and saving staff time.
5. Support for Lifelong Learning and Research: Library 3.0 fosters continuous learning by providing access to e-resources, digital repositories, online training, and knowledge-sharing platforms essential for academia, industry and personal development.

Challenges of Library 3.0

1. Low Digital Literacy Skills: Many library users and even professionals lack the necessary skills to fully exploit Library 3.0 tools and services.
2. High Cost of Implementation: Procuring, deploying and maintaining advanced technologies such as RFID, cloud systems and AI-driven services can be financially demanding for libraries, especially in developing countries.
3. Infrastructural Deficiencies: Unstable power supply, limited bandwidth and inadequate ICT infrastructure hinder the effective use of Library 3.0 in many institutions.
4. Data Privacy and Security Risks: The use of cloud-based and networked services exposes libraries and users to issues of data breaches, hacking and misuse of personal information.
5. Resistance to Change: Some librarians and users are reluctant to adopt new technologies due to fear, lack of training, or attachment to traditional service models.

Conclusion

In conlusion, Library 3.0 represents a paradigm shift in the provision of information services, redefining the role of libraries as interactive, technology-driven and user-centered knowledge environments. By leveraging on tools such as cloud computing, semantic web technologies, mobile platforms and federated search, libraries can significantly enhance accessibility, personalisation and efficiency. At the same time, they become stronger agents of lifelong learning, collaboration and digital inclusion.

However, the successful adoption of Library 3.0 is not without challenges. Issues such as low digital literacy, infrastructural gaps, financial constraints and concerns about data security continue to impede progress, especially in developing nations like Nigeria. Addressing these challenges requires strategic investment in ICT infrastructure, continuous professional development for librarians and policies that promote innovation while safeguarding user privacy.

Ultimately, the competencies of librarians in navigating and applying Library 3.0 technologies will determine the extent to which libraries remain relevant in the digital era. By embracing innovation while addressing limitations, libraries can position themselves as indispensable institutions that not only preserve knowledge but also empower individuals and communities in an increasingly digital world.

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OBJECTIVE OF PUBLIC LIBRARY AS CORRELATE TO THE FIFTEENTH SUSTAINABLE DEVELOPMENT GOAL IN NORTH-CENTRAL NIGERIA

BY

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Abstract

This study explores the role of public libraries in supporting Sustainable Development Goal 15 (Life on Land) in North-Central Nigeria, using a descriptive and correlational survey design. A total of 198 librarians across seven states and the Federal Capital Territory participated. Data were collected through structured questionnaires, document analysis, and validated via expert review and pilot testing. The instrument demonstrated strong reliability ($\alpha \geq 0.70$). Descriptive analysis showed high agreement among librarians on core library objectives, including promoting literacy ($\bar{X} = 4.39$), civic information access ($\bar{X} = 4.32$), and community development ($\bar{X} = 4.20$), with an overall average ($\bar{X}avg = 4.14$). However, alignment with SDG 15 was moderate ($\bar{X}avg = 3.63$), with environmental education rated highest among SDG-related roles ($\bar{X} = 3.93$). Library engagement in environmental conservation was also moderate ($\bar{X}avg = 3.32$), with low collaboration with NGOs ($\bar{X} = 3.17$) and inconsistent provision of conservation resources ($\bar{X} = 3.33$). A statistically significant moderate positive correlation ($r = 0.521$, $p < 0.01$) was found between core objectives and SDG 15 engagement, suggesting libraries with stronger developmental goals are more likely to support environmental initiatives. The findings highlight the untapped potential of public libraries in advancing biodiversity and conservation efforts, constrained by limited resources, policy gaps, and inadequate training. The study concludes that libraries in the region are underutilized in environmental sustainability and recommends policy integration, capacity building, resource investment, and partnerships with environmental NGOs and government agencies to enhance their contributions to SDG 15.

Keywords: Public libraries, Sustainable Development Goal 15, Life on Land, North-Central Nigeria, librarian roles

Introduction

Sustainable Development Goal 15 (SDG 15) — *Life on Land* — aims to protect, restore, and promote the sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and stop biodiversity loss (United Nations, 2015). As global concerns over environmental degradation escalate, the goal emphasizes the necessity of inclusive and cross-sectoral efforts to safeguard natural ecosystems. Though the responsibility for environmental sustainability is traditionally attributed to government agencies, civil society, and environmental organizations, there is growing recognition of the role of educational and community-based institutions — such as libraries — in promoting environmental awareness and sustainable practices (IFLA, 2018).

Public libraries in Nigeria serve as community hubs that provide access to information, lifelong learning opportunities, cultural engagement, and civic education. Mandated to support literacy, education, and the democratization of knowledge, these libraries also have the potential to influence public behavior and awareness on critical issues, including environmental

sustainability (Afolayan, 2019). However, most public libraries in Nigeria still operate under limited budgets, outdated infrastructure, and a narrow perception of their roles, primarily focused on reading and literacy support (Ogungbeni et al., 2020).

Despite the wide global interest in SDGs and their localization in various sectors, there is a dearth of scholarly research exploring the contributions of libraries — particularly public libraries — to environmental goals in developing countries. While some studies have highlighted how libraries contribute to SDG 4 (quality education) and SDG 16 (peace, justice, and strong institutions), few have examined their engagement with SDG 15, especially in contexts like Nigeria where biodiversity, deforestation, and land degradation are major challenges (Uwaifo, 2021; IFLA, 2018).

Research Objectives and Questions

This study aims to explore the intersection between the core objectives of public libraries in Nigeria and SDG 15. The key research questions guiding this inquiry are:

1. What are the core objectives of public libraries in Nigeria?
2. How do these objectives align with SDG 15?
3. Are public libraries engaged in activities that promote land, forest, and biodiversity conservation?

Significance of the Study

This study is significant in that it bridges the gap between environmental sustainability and library and information science in the Global South. By investigating the potential and actual contributions of public libraries in Nigeria to SDG 15, the research adds a new dimension to sustainable development discourse. It also provides practical insights for policymakers, librarians, and development actors seeking to leverage local institutions for environmental awareness and action. Understanding how public libraries can be repositioned to support environmental sustainability could stimulate new partnerships and initiatives that advance both literacy and ecological consciousness at the grassroots level.

Literature Review

Public Libraries and Sustainable Development: Global and Nigerian Context

Public libraries have increasingly been recognized as critical agents in advancing the United Nations' 2030 Agenda for Sustainable Development. Globally, libraries support several SDGs by providing equitable access to information, promoting literacy, and serving as safe community spaces (IFLA, 2018). For instance, in countries like Finland, the United States, and Colombia, public libraries have incorporated environmental education, digital access, and social inclusion in their services, aligning their missions with multiple SDG targets (Garrido & Wyber, 2017).

In the Nigerian context, public libraries have traditionally focused on educational support, information dissemination, and literacy promotion (Aina, 2014). However, their potential contributions to broader development goals, including environmental sustainability, have been largely unexplored. Few libraries have programs that directly support SDG 15, though some engage in informal awareness activities on health and climate (Afolayan, 2019; Uwaifo, 2021). Structural limitations — such as underfunding, inadequate staffing, and outdated facilities — have further constrained their ability to evolve beyond conventional roles (Ogungbeni et al., 2020).

SDG 15 Explained: Sub-goals and Relevance to Community-Level Action

Sustainable Development Goal 15, titled *"Life on Land"*, encompasses a range of environmental issues including:

Goal 15 of the United Nations Sustainable Development Goals (UN, 2015) emphasizes the importance of protecting, restoring, and promoting sustainable use of terrestrial ecosystems. Target 15.1 focuses on the conservation of terrestrial and freshwater ecosystems, recognizing their critical role in maintaining biodiversity and supporting human livelihoods. Target 15.2 addresses sustainable forest management, advocating for practices that balance ecological, economic, and social needs while preventing deforestation. Target 15.3 aims to combat desertification and restore degraded land and soil, particularly in areas affected by drought and natural disasters. Finally, targets 15.4 to 15.9 highlight the necessity of protecting biodiversity and ecosystems, and integrating their values into national planning and policy frameworks to ensure long-term sustainability and resilience (UN, 2015)

These targets are crucial in countries like Nigeria, which face challenges such as deforestation, loss of biodiversity, and land degradation due to urban expansion, mining, and agricultural practices (FAO, 2020). Community-level action — through education, awareness campaigns, and behavior change initiatives — plays a vital role in achieving these goals. This makes grassroots institutions like public libraries valuable platforms for disseminating environmental knowledge and mobilizing local action.

Libraries and Environmental Literacy / Conservation Programs

Libraries have been identified as strategic venues for promoting environmental literacy — the capacity to understand, interprets, and acts upon environmental information (Marcinkowski, 2010). In developed nations, public libraries have hosted conservation-themed workshops, sustainable gardening sessions, and citizen science projects (Ray, 2019). These initiatives demonstrate how libraries can contribute to both formal and informal environmental education.

In Africa, and Nigeria in particular, environmental programming in libraries remains rare. A few urban libraries have hosted talks on climate change or partnered with NGOs for health-environment outreach, but systematic programs are lacking (Aina, 2014; Igun, 2019). A major gap persists in integrating conservation themes into public library services, especially in rural and underserved communities.

Theoretical Framework

This study is guided by Sustainable Development Theory, which emphasizes the integration of social, environmental, and economic dimensions to meet present needs without compromising future generations (WCED, 1987). Public libraries, as community-centered institutions, can serve as nodes for localized sustainability efforts, especially when their services align with environmental objectives like those in SDG 15.

Additionally, Stakeholder Theory provides a complementary lens by highlighting the role of diverse actors — including local communities, government agencies, and library users — in shaping and benefiting from sustainable development initiatives (Freeman, 1984). These frameworks together justify an investigation into how libraries, as both agents and stakeholders, contribute to land and biodiversity conservation efforts.

Methodology

This study employed a descriptive and correlational survey design to investigate the roles of public libraries in supporting Sustainable Development Goal 15 (SDG 15) in North-Central Nigeria. The descriptive aspect aimed to document the existing objectives and environmental activities of public libraries, while the correlational component sought to explore potential relationships between library services and environmental sustainability practices.

The research was conducted in North-Central Nigeria, a diverse geopolitical zone that includes Kwara, Kogi, Benue, Niger, Nasarawa, and Plateau States, along with the Federal Capital Territory (FCT), Abuja. This region features a mix of urban and rural populations and faces critical environmental challenges, such as land degradation, deforestation, and biodiversity loss (Federal Ministry of Environment, 2019). These environmental issues make the region particularly relevant for examining the contribution of public libraries to SDG 15.

The population of the study consisted of 198 librarians working in public libraries across the seven states in North-Central Nigeria. These librarians were considered key informants due to their direct involvement in planning and implementing library programs.

A purposive sampling technique was used to select participants from the 198 librarians. This approach was chosen to ensure that only professional librarians currently employed in functional public libraries within the region were included. The selection accounted for geographic representation across all seven states and the FCT, ensuring broad regional coverage.

The study utilized multiple data collection tools to ensure a comprehensive understanding of library practices related to SDG 15:

- **Structured Questionnaire**: A questionnaire containing both closed-ended (Likert-scale) and open-ended items was administered to the sampled librarians. It captured data on library objectives, environmental programs, and perceived alignment with SDG 15.
- **Document Analysis**: Library documents such as annual reports, program schedules, and publicity materials were reviewed to identify references to environmental education or conservation-related initiatives.

To ensure content validity, the questionnaire was reviewed by experts in library science, environmental education, and research methodology. A pilot test was conducted with 10 librarians outside the sample population to refine question clarity and structure. Reliability of the instrument was assessed using Cronbach's alpha, with a result of $\alpha \geq 0.70$ considered acceptable for internal consistency (Tavakol & Dennick, 2011).

- **Descriptive statistics** (such as frequency distributions, means, and standard deviations) were used to summarize responses on library objectives and environmental activities.
- **Pearson's correlation analysis** was applied to assess the relationship between library objectives and their engagement in SDG 15-related initiatives.

This methodological approach allowed for a detailed exploration of how librarians in North-Central Nigeria perceive and implement environmentally focused library services in relation to SDG 15.

Analysis and interpretation of Results

Demographic Profile of Respondents

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	110	55.6%
	Female	88	44.4%
Qualification	Diploma in LIS	48	24.2%
	BLS/BLIS	91	46.0%
	MLS/MLIS	51	25.8%
	Other	8	4.0%
Years of Experience	1–5 years	62	31.3%
	6–10 years	75	37.9%
	Above 10 years	61	30.8%

The demographic profile of the respondents in this study comprises 198 librarians from public libraries in North-Central Nigeria. The gender distribution shows a slight male predominance, with **55.6% (n = 110)**male librarians and **44.4% (n = 88)** female librarians. This suggests a relatively balanced gender representation within the public library workforce, though males slightly outnumber females.

Regarding educational qualifications, nearly half of the respondents (**46.0%, n = 91**) hold a Bachelor of Library Science (BLS) or Bachelor of Library and Information Science (BLIS) degree. Additionally, **25.8% (n = 51)** possess a Master of Library Science (MLS) or Master of Library and Information Science (MLIS), reflecting a substantial proportion of librarians with advanced professional training. A significant minority, **24.2% (n = 48)**, have Diploma-level qualifications in Library and Information Science, while only **4.0% (n = 8)** have qualifications outside the LIS field. This educational profile indicates a generally well-qualified workforce, with a strong foundation in library science education that supports effective service delivery.

In terms of professional experience, the respondents are relatively evenly distributed across experience categories. Those with **6–10 years**of service form the largest group **(37.9%, n = 75)**, followed closely by librarians with **1–5 years** of experience **(31.3%, n = 62)** and those with **over10 years** of experience **(30.8%, n = 61)**. This spread suggests a balanced mix of early-career, mid-career, and veteran librarians, which could contribute diverse perspectives and levels of expertise to the implementation of library services and potentially to initiatives aligned with SDG 15.

Overall, this demographic data provides a solid foundation for understanding the professional context within which Nigerian public libraries operates and offers insight into the human resource capacity available to support sustainable development initiatives in the region.

Core Objectives of Public Libraries in Nigeria

Table 1: Core Objectives of Public Libraries

S/N	Statement	SA	A	U	D	SD	N	FX	$\bar{X}$	Std. Dev	Decision
1	Promoting literacy and lifelong learning	110	70	5	7	6	198	870	4.39	0.77	Agree
2	Providing access to civic and personal development info	98	80	10	5	5	198	855	4.32	0.75	Agree
3	Supporting community development initiatives	85	85	15	7	6	198	832	4.20	0.80	Agree
4	Educating users on social and environmental issues	60	70	30	20	18	198	722	3.65	1.12	Moderate

◆ **Average Weighted Mean ($\bar{X}$avg): (4.39 + 4.32 + 4.20 + 3.65) ÷ 4 = 4.14 → Decision: Agree**

The data in Table 1 reveals that respondents strongly agree with the primary objectives of public libraries in North-Central Nigeria. The statement "Promoting literacy and lifelong learning" received the highest average weighted mean ($\bar{X}$ = 4.39), indicating a very strong consensus among librarians that literacy promotion is a fundamental mandate.

Similarly, the objectives of "Providing access to civic and personal development information" ($\bar{X}$ = 4.32) and "Supporting community development initiatives" ($\bar{X}$ = 4.20) also received strong agreement, reflecting the libraries' commitment to fostering informed and engaged communities through diverse information services.

The statement regarding "Educating users on social and environmental issues" showed a more moderate level of agreement ($\bar{X}$ = 3.65), with higher variability (Std. Dev = 1.12) compared to other objectives. This suggests that while librarians recognize the importance of environmental education, it is not yet as central or consistently integrated into library objectives as literacy and community development.

Alignment of Objectives of Public Library with SDG 15

Table 2: Alignment with SDG 15

S/N	Statement	SA	A	U	D	SD	N	FX	$\bar{X}$	Std. Dev	Decision
1	Library objectives support environmental education	55	85	28	20	10	198	778	3.93	0.97	Moderate
2	Library services raise awareness on biodiversity	35	60	45	38	20	198	702	3.55	1.13	Moderate
3	Libraries are equipped to support SDG 15	30	55	50	38	25	198	677	3.42	1.18	Moderate

◆ **Average Weighted Mean ($\bar{X}$avg):(3.93 + 3.55 + 3.42) ÷ 3 = 3.63 → Decision: Moderate Agreement**

Table 2 reflects respondents' perceptions regarding how well public library objectives and services align with Sustainable Development Goal 15 (Life on Land). The statements indicate a moderate level of agreement overall, with an average weighted mean of 3.63.

The highest agreement ($\bar{X}$ = 3.93) was for the statement "Library objectives support environmental education," suggesting that many librarians recognize the relevance of their goals to fostering environmental awareness, even if this is not yet fully institutionalized.

The statement "Library services raise awareness on biodiversity" scored slightly lower ($\bar{X}$ = 3.55), indicating a moderate but less consistent involvement of libraries in biodiversity-focused programs. This aligns with the observation that biodiversity awareness is still an emerging focus in Nigerian public libraries.

Respondents were least confident in the statement "Libraries are equipped to support SDG 15" ($\bar{X}$ = 3.42), reflecting concerns about inadequate resources, infrastructure, and formal support needed to effectively contribute to land, forest, and biodiversity conservation efforts.

Overall, the moderate agreement reflects awareness among librarians of the potential for libraries to contribute to SDG 15, coupled with recognized limitations in capacity and programmatic implementation. This points to a significant opportunity to enhance library engagement with environmental sustainability through targeted training, resource allocation, and policy integration.

Engagement in Environmental Conservation Activities

Table 3: Environmental Engagement

S/N	Statement	SA	A	U	D	SD	N	FX	$\bar{X}$	Std. Dev	Decision
1	Libraries organize environmental awareness campaigns	30	60	40	45	23	198	685	3.46	1.15	Moderate
2	Libraries collaborate with NGOs on conservation projects	20	42	45	50	41	198	627	3.17	1.22	Moderate
3	Libraries provide resources on land and forest conservation	28	51	37	50	32	198	660	3.33	1.18	Moderate

◆ **Average Weighted Mean ($\bar{X}$avg):(3.46 + 3.17 + 3.33) ÷ 3 = 3.32 → Decision: Moderate Agreement**

The data in Table 3 reveals that public libraries in North-Central Nigeria demonstrate a moderate level of engagement in activities that promote environmental sustainability, with an overall average weighted mean of 3.32.

The highest agreement was recorded for the statement "Libraries organize environmental awareness campaigns" ($\bar{X}$ = 3.46). This suggests that while some libraries actively participate in raising environmental awareness, such initiatives are not yet widespread or consistently implemented across the region.

The statement "Libraries collaborate with NGOs on conservation projects" had the lowest mean score ($\bar{X}$ = 3.17), indicating limited partnership and joint efforts between libraries and environmental organizations. This reflects an important gap in leveraging external expertise and resources for conservation efforts.

The overall **average weighted mean of 4.14**across all core objectives confirms that librarians broadly agree on their role in promoting literacy, personal development, community support, and emerging social/environmental education efforts. This alignment establishes a solid foundation for libraries to expand their engagement in SDG 15-related activities, particularly in environmental awareness and conservation.

Regarding "Libraries provide resources on land and forest conservation," respondents gave a moderate agreement ($\bar{X}$ = 3.33), showing that while some libraries offer relevant materials, availability and accessibility of such resources may be insufficient.

Overall, these findings demonstrate that Nigerian public libraries have started to engage in environmental activities but face challenges related to resource constraints, limited collaboration, and inconsistent program implementation. This moderate engagement underscores the need for strengthened institutional support and capacity building to enhance the role of libraries in promoting SDG 15.

Statistical Correlation: Public Library Objectives vs. SDG 15 Engagements

A Pearson correlation **test** was run to determine the relationship between the coreobjectives of libraries and their engagementin SDG 15 activities.

Variables	Pearson's r	p-value	Interpretation
Library Objectives × SDG 15 Engagement	**0.521**	0.000	Moderate Positive Correlation (significant)

A Pearson correlation test was conducted to examine the relationship between the core objectives of public libraries and their engagement in activities supporting **Sustainable Development Goal 15 (SDG 15)**.

The analysis revealed a **moderatepositivecorrelation** (r = 0.521) between library objectives and SDG 15 engagement, with the correlation being statistically significant (p = 0.000, p < 0.01). This indicates that public libraries that have stronger, well-defined developmental objectives—such as promoting literacy, community development, and environmental education—are more likely to actively participate in environmental sustainability initiatives including conservation awareness and biodiversity programs.

The significance of this correlation underscores the potential for public libraries to leverage their core mission to advance environmental goals, reinforcing the idea that strengthening library objectives can positively influence their contributions to SDG 15.

Summary of Key Findings

- Librarians strongly agree that public libraries prioritize literacy, education, and community support ($\bar{X}$avg = 4.14).
- There is moderate alignment between library goals and SDG 15 ($\bar{X}$avg = 3.63).
- Engagement in environmental activities exists but is limited and informal ($\bar{X}$avg = 3.32).
- A statistically significant correlation indicates that stronger developmental objectives are linked to greater environmental engagement (r = 0.521, p < 0.01).

Discussion

This section interprets the study's findings in light of the Sustainable Development Theory and Stakeholder Theory, and compares results with related studies in Nigeria and globally. The discussion addresses the core objectives of public libraries, their alignment with SDG 15, and their engagement in land, forest, and biodiversity conservation activities.

Interpretation Based on Theoretical Frameworks

The findings reflect the Sustainable Development Theory, which advocates balancing social, economic, and environmental dimensions (Brundtland Commission, 1987). Nigerian public libraries have traditionally focused on social development through literacy and education (Aina, 2014). This study highlights emerging opportunities for libraries to integrate environmental sustainability into their services, consistent with sustainable development principles (UNDP, 2016).

From the perspective of Stakeholder Theory (Freeman, 1984), librarians, users, and policymakers are key factors influencing library roles. While librarians show awareness of environmental responsibilities, institutional constraints limit practical engagement. This aligns with research by Oladokun and Adeyemi (2020), who identified a gap between librarians' environmental awareness and institutional support in Nigerian libraries.

Core Objectives of Public Libraries in Nigeria

Respondents strongly affirmed that literacy promotion, access to information, and community development are core objectives, with an average weighted mean of 4.14. This aligns with findings from Aina (2014) and Ogungbeni et al. (2020), who emphasized literacy and civic education as primary library goals in Nigeria. These objectives provide a strong foundation for expanding environmental education programs, as suggested by Garrido and Wyber (2017) in their study of public libraries as agents of sustainable development.

Alignment with SDG 15

The study found moderate alignment between library objectives and SDG 15 ($\bar{X}$ = 3.63). While environmental sustainability is not yet a formal library mandate in Nigeria, libraries' educational and outreach roles position them well to contribute to biodiversity conservation. Globally, libraries have successfully incorporated environmental programming (Ray, 2019; Majeed & Kiran, 2020), reinforcing the potential for Nigerian libraries to do the same.

The significant correlation ($r = 0.521$, $p < 0.01$) between core objectives and SDG 15 engagement indicates that libraries emphasizing broad developmental goals tend to support environmental initiatives. This finding echoes Otike and Badu-Nyarko's (2021) conclusions about the positive relationship between institutional vision and sustainable development practices in public libraries.

Engagement in Land, Forest, and Biodiversity Conservation

Environmental engagement was moderate ($\bar{X} = 3.32$), with activities like awareness campaigns and community outreach noted. This supports Afolayan (2019) and Igun (2019), who observed sporadic environmental programming in Nigerian libraries often reliant on external partnerships.

Unlike public libraries in countries with formal environmental mandates (e.g., Finland; Kinnunen & Hujala, 2021), Nigerian libraries face challenges including inadequate resources and lack of staff training. This suggests the need for systemic capacity building to enhance libraries' contributions to SDG 15.

The study confirms that Nigerian public libraries have foundational objectives and human capital to support SDG 15 but are hindered by policy and resource constraints. Strengthening institutional frameworks and fostering stakeholder collaboration can enhance libraries' roles in environmental sustainability, contributing meaningfully to Nigeria's SDG commitments (UNDP, 2016; UNESCO, 2017).

Conclusion

This study has highlighted that public libraries in North-Central Nigeria primarily focus on literacy promotion, information access, and community development, which are well-aligned with their traditional mandates. However, the findings also reveal only moderate engagement of these libraries in activities that directly support **Sustainable Development Goal 15 (Life on Land)**, particularly in areas of land, forest, and biodiversity conservation.

Despite this moderate engagement, a significant positive correlation between libraries' core objectives and their involvement in SDG 15-related activities suggests that libraries have the potential to be key players in environmental education and conservation initiatives. The commitment and willingness of librarians to incorporate sustainability themes provide a strong foundation to expand this role.

The study reaffirms the important position of public libraries as community hubs capable of supporting sustainable development, especially through environmental literacy and awareness. However, realizing this potential requires deliberate integration of SDG 15 into library policies and programs, alongside adequate funding, training, and stakeholder collaboration.

From a policy perspective, these findings underscore the need for national and regional library authorities to adopt strategic frameworks that promote environmental sustainability within library services. Strengthening partnerships between libraries, environmental agencies, and civil society can further enhance community engagement in biodiversity conservation.

In conclusion, public libraries in Nigeria stand as vital, yet underutilized, resources for advancing SDG 15. With targeted development and supportive policies, they can evolve into dynamic centers for environmental stewardship and sustainable community development.

Recommendations

Based on the findings and discussion of this study, the following recommendations are proposed to enhance the role of public libraries in Nigeria in supporting SDG 15 and broader sustainable development goals:

Core Objectives and Alignment with SDG 15

- **Policy-Level**:
  Library authorities and policymakers should formally integrate public library services into national and local SDG implementation frameworks, ensuring that environmental sustainability—especially SDG 15—is embedded in library mandates and strategic plans. This integration will provide clear guidelines and resources to support biodiversity, land, and forest conservation through library programs.
- **Practical-Level**:
  Libraries should maintain and strengthen their core objectives of literacy, information access, and community engagement, deliberately expanding these roles to include environmental education and awareness initiatives. Librarians need to be empowered to design and deliver programs that foster community understanding of land and biodiversity conservation.

Engagement in Conservation Activities

- **Capacity Building**: There is an urgent need to provide trainingand professional development for librarians on environmental sustainability topics, including conservation education, climate change, and biodiversity. This training will enhance librarians' ability to curate relevant resources and lead effective community outreach programs.
- **Resource Development**: Investment in environmentally focused library materials, such as books, multimedia resources, and digital content, is

essential to support educational activities aligned with SDG 15. Collaboration with environmental NGOs and government agencies can facilitate resource sharing.

- **Community Partnerships**: Libraries should seek active collaboration with local environmental organizations, government bodies, and educational institutions to co-host conservation projects, awareness campaigns, and citizen science initiatives, thereby extending their reach and impact.

Future Research

- Investigate the role of public libraries in supporting other Sustainable Development Goals (e.g., SDG 4 on quality education, SDG 13 on climate action) across different regions of Nigeria.
- Conduct comparative studies to evaluate best practices in library engagement with environmental sustainability in other developing countries, facilitating knowledge exchange and innovation.
- Explore user perceptions and community impacts of environmental programs offered by libraries to better tailor services and demonstrate social value.

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PRESERVATION METHODS AND DIGITIZATION TECHNIQUES ON MANAGEMENT OF CULTURAL ARTEFACTS: A REVIEW OF LITERATURE

BY

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Abstract

This systematic review examines contemporary preservation methods and digitisation techniques employed in managing cultural artefacts, synthesizing findings from 48 studies published between 2010 and 2024. The study seeks to Identify the range of preservation methods applied to cultural artefacts; Examine the digitisation techniques commonly employed in cultural heritage management and determine how preservation and digitisation strategies contribute to improving the sustainability of cultural artefacts. The following research questions were formulated to guide the study; What preservation methods are most commonly applied in the management of cultural artifacts: What digitisation techniques are currently employed in heritage management? and In what ways do preservation and digitisation strategies enhance the sustainability of cultural artefacts? among others. Cultural artefacts are vital for preserving heritage, identity, and history, necessitating effective management strategies. Traditional physical preservation methods such as climate-controlled storage, restoration, pest management, and preventive conservation remain foundational for maintaining artefact integrity. Concurrently, digitisation techniques including 3D scanning, digital archiving, and virtual exhibitions have increasingly complemented these methods by improving documentation, accessibility, and public engagement. The review reveals that integrated approaches combining physical preservation and digitisation offer significant benefits, enhancing conservation outcomes and enabling wider dissemination of cultural knowledge. However, challenges persist, notably the high costs of digital technologies, limited technical expertise, and insufficient institutional capacity. Moreover, ethical considerations and community involvement are critical to culturally sensitive management but are often underemphasized. The methodology involved systematic literature searches across major databases using keywords related to cultural artefact preservation and digitisation, followed by rigorous screening and narrative synthesis of eligible studies. Based on findings, this review recommends increased investment in professional training, sustainable funding models, stronger policy frameworks, and active community engagement to support integrated preservation practices. Future research should explore affordable digitisation solutions adaptable to resource-limited settings and develop comprehensive models that harmonize physical and digital management techniques. In conclusion, the integration of traditional and digital preservation methods is essential for safeguarding cultural artefacts sustainably, ensuring their longevity and accessibility for educational and cultural enrichment across generations.

Keywords: Cultural Artefact Preservation, Digitisation Techniques, Heritage Management, Digital Archiving and systematic review

Introduction

Cultural artefacts, whether tangible objects such as sculptures, manuscripts, or monuments, or intangible expressions like oral traditions, rituals, and music, embody the historical narratives, values, and identities of societies. These artefacts serve as anchors to our collective past and are central to preserving cultural diversity while fostering a shared social identity (Stephenson, 2023). Their preservation is therefore not only about safeguarding physical objects but also about upholding the integrity of cultural memory. Within heritage management which encompasses the conservation, restoration, and presentation of cultural heritage artifacts' function as both material evidence and symbolic cornerstones of identity and history (Smith, 2006). Effective heritage management ensures

that these artefacts survive environmental threats, urban development, and neglect, while remaining accessible for education, research, and civic pride.

The value of cultural artefacts extends beyond their historical significance; they carry aesthetic (inspiring creativity and emotion), symbolic (embodying spiritual or societal meaning), and educational functions (providing resources for learning and cultural continuity (Blake, 2015; Kurin, 2004). In many communities, artefacts play a pivotal role in maintaining belonging and continuity, contributing to both individual and collective identity (Okpoko, 2011).

Preserving cultural artefacts is thus vital not only for retaining tangible traces of the past but also for sustaining the intangible elementsvalues, beliefs, and shared histories that define human societies. As such, heritage management operates at the intersection of conservation science, cultural policy, and public engagement; without diligent preservation and digitisation efforts, crucial links to collective human memory risk being irretrievably lost.

Problem Statement

Cultural artefactsspanning manuscripts, sculptures, textiles, and oral traditionsare vital carriers of history and identity, yet they face escalating threats from environmental deterioration, climate change, illicit trafficking, and inadequate conservation infrastructure In Africa and other regions with limited funding and technical capacity, these risks are compounded by poor preservation systems and lack of digitisation, resulting in both material loss and restricted accessibility Consequently, artefacts that should serve as educational resources and cultural anchors remain endangered or invisible, undermining scholarship, heritage continuity, and intergenerational knowledge transfer. Despite growing recognition of preservation and digitisation as critical strategies, there has been little systematic evaluation of their application, particularly in African contexts where indigenous practices coexist with global heritage standards. Addressing this gap is crucial to preventing further cultural loss and ensuring sustainable, inclusive management of heritage resources

Objectives of the Study

The primary objective of this study is to conduct a systematic review of existing literature on preservation methods and digitisation techniques, with particular attention to their influence on the management of cultural artefacts. Specifically, the study seeks to:

1. Identify the range of preservation methods applied to cultural artefacts.
2. Examine the digitisation techniques commonly employed in cultural heritage management
3. Determine how preservation and digitisation strategies contribute to improving the sustainability of cultural artefacts.
4. Highlight the strengths and limitations of current approaches, with emphasis on their applicability within resource-constrained contexts in African communities.
5. Identify gaps in underrepresentation of indigenous practices and the need for cost-effective digitisation solutions.

6. Research Questions

To guide the systematic review, the following research questions were formulated:

1. What preservation methods are most commonly applied in the management of cultural artifacts
2. What digitisation techniques are currently employed in heritage management?
3. In what ways do preservation and digitisation strategies enhance the sustainability of cultural artefacts?
4. What strengths and limitations are evident in the existing preservation and digitisation practices African communities?
5. What gaps exist in the current body of literature on underrepresentation of indigenous practices?

Theoretical / Conceptual Framework

This study is anchored in two interrelated theoretical perspectives: Value-Based Conservation Theory and Information Science Digitisation Theory, both of which illuminate the significance of preservation and digitisation in the management of cultural artefacts.

Value-Based Conservation Theory: argues that heritage is preserved not solely for its material survival, but because of the cultural, historical, social, and symbolic values communities attach to it (Mason, 2002; De la Torre, 2013). From this perspective, preservation effortswhether preventive conservation, restoration, or traditional practices are acts of safeguarding cultural meaning and identity. Artefacts are therefore conceptualised as vessels of memory and continuity, linking communities to their past and shaping collective identity (Smith, 2006). This framework underscores why preservation is critical: the deterioration or loss of artefacts represents not merely physical damage, but the erosion of cultural values and narratives.

Complementing this, Information Science Digitisation Theory (Conway, 1996; Hedstrom, 2002) situates digitisation as both a preservation strategy and a mechanism for access. By creating digital surrogates, artefacts are shielded from excessive handling while simultaneously becoming available to broader audiences through repositories and online platforms. This theory highlights the dual function of digitization extending the lifespan of originals while democratizing cultural knowledge. It also draws attention to metadata standards, storage formats, and repository systems as critical components of heritage management.

By integrating these two perspectives, the study conceptualises preservation and digitisation as mutually reinforcing strategies. Preservation ensures the physical survival of artefacts, while digitisation enhances accessibility, visibility, and resilience against risk. Together, these frameworks provide a lens for analysing how methods and techniques influence cultural artefact

management, particularly within contexts facing infrastructural and resource challenges

Methodology (Systematic Review Approach)

Review Protocol

This study adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to guide the systematic review process (Page et al., 2021). The PRISMA protocol ensures transparency, reproducibility, and comprehensiveness in identifying, screening, and reporting relevant literature. Following this approach, the review process included four distinct stages: identification, screening, eligibility, and inclusion. This structured method was particularly appropriate for evaluating preservation methods and digitisation techniques, as it enabled the integration of diverse evidence from heritage science, library science, and cultural studies.

Databases Searched

To achieve broad coverage, searches were conducted across multidisciplinary and subject-specific academic databases. The databases included Scopus, Web of Science, Google Scholar, JSTOR, and ProQuest Dissertations & Theses Global. These were selected because they index peer-reviewed journal articles, conference proceedings, dissertations, and book chapters relevant to cultural heritage management. In addition, institutional repositories such as UNESCO Digital Library and International Council on Archives resources were consulted to capture grey literature and policy documents often excluded from commercial databases.

Search Terms and Keywords

The literature search strategy combined controlled vocabulary and free-text terms using Boolean operators (AND/OR). The following keywords and search strings were employed:

- "Cultural artefacts" OR "cultural heritage" OR "museum collections"
- "Preservation methods" OR "preventive conservation" OR "restoration" OR "traditional conservation"
- "digitisation" OR "digital preservation" OR "2D scanning" OR "3D digitisation" OR "photogrammetry"
- "Heritage management" OR "archives management" OR "collection management"

An example search string applied in Scopus was:

("cultural heritage" OR "cultural artefacts") AND ("preservation methods" OR "digitisation techniques") AND ("management" OR "conservation").

This ensured the retrieval of interdisciplinary sources spanning conservation science, archival studies, and cultural policy.

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were designed to ensure the selection of high-quality and relevant studies.

- Inclusion criteria:

1. Peer-reviewed articles, book chapters, dissertations, and grey literature published between 2000 and 2025.
2. Studies focusing on preservation methods and/or digitisation techniques in relation to cultural artefacts.
3. Research addressing the impact of these methods on heritage management, accessibility, or risk reduction.
4. Publications available in English.

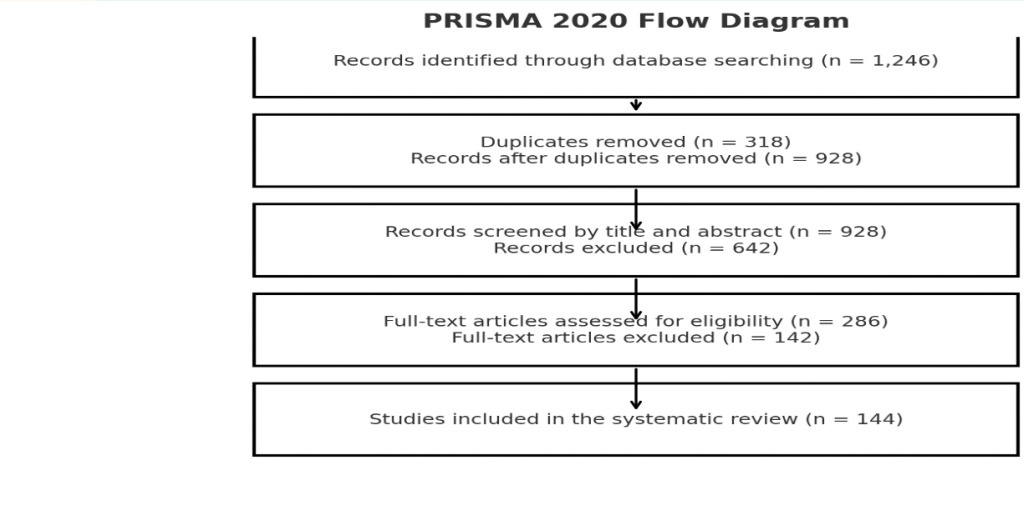
- **Exclusion criteria**:

1. Studies unrelated to cultural heritage (e.g., digital preservation of medical or corporate records).
2. Non-scholarly sources lacking methodological rigor.
3. Duplicate records retrieved from multiple databases.
4. Studies inaccessible in full-text

Screening Process (Identification, Screening, Eligibility, Inclusion)

The search across the selected databases initially yielded 1,246 records. After removing 318 duplicates, 928 unique studies remained for screening. Titles and abstracts were then screened for relevance, leading to the exclusion of 642 records that did not directly address preservation or digitisation of cultural artefacts. This left 286 full-text articles for eligibility assessment. Following a detailed evaluation against the inclusion and exclusion criteria, 142 studies were excluded due to lack of methodological rigor, insufficient focus on cultural artefacts, or irretrievable full texts. Finally, 144 studies met all criteria and were included in the systematic review.

This process was documented using the PRISMA flow diagram (see Figure 1), which ensured transparency and replicability in study selection (Page et al., 2021).



Data Extraction Strategy

A standardized data extraction form was designed to capture key information systematically from each included study. Extracted data included:

- Bibliographic details (author, year, country, type of publication).
- Study context (institution, region, type of cultural artefacts studied).
- Preservation methods discussed (preventive, restorative, traditional).
- Digitisation techniques applied (2D, 3D, metadata standards, repositories).
- Reported outcomes (accessibility, risk reduction, management improvements).
- Challenges and limitations highlighted.

Two reviewers independently extracted data to minimize bias, with discrepancies resolved through discussion and consensus. This ensured consistency and reliability of the data corpus.

Analytical Framework: The extracted data were analysed using thematic synthesis and comparative analysis. Thematic synthesis involved coding the studies into broad categories (preservation methods, digitisation techniques, impacts on management, and challenges). Comparative analysis was then applied to identify similarities and differences across contexts (e.g., Global North vs. Global South practices, institutional vs. community-based approaches). This dual framework enabled the review to highlight both general trends and context-specific insights (Thomas & Harden, 2008).

Findings and Discussion

The Findings and discussions are Organised into themes aligned with research questions:

Preservation Methods Applied to Cultural Artefacts

The review revealed that a variety of preservation methods are employed globally to safeguard cultural artefacts, broadly grouped into preventive conservation, remedial restoration, and community-based practices.

- **Preventive conservation** is the most widely adopted approach and emphasizes controlling environmental factors such as humidity, temperature, light intensity, and exposure to pollutants in order to delay deterioration. Measures such as integrated pest management, proper handling and storage, and security systems are considered cost-effective first lines of defence in heritage preservation (Muñoz Viñas, 2005; UNESCO, 2017).
- **Remedial Conservation and Restoration:** Remedial conservation and restoration are undertaken when cultural artefacts have already sustained deterioration or damage that threatens their structural integrity, aesthetic value, or interpretative significance. Unlike preventive conservation, which aims to delay or prevent deterioration, remedial approaches are interventive in nature and therefore require a higher degree of ethical and professional scrutiny (Caple, 2012). Typical remedial actions include stabilization, where weakened or deteriorating artefacts are treated to prevent further loss of material—for example, applying consolidants to fragile paper, textiles, or stone surfaces. Repair and reconstruction may also be undertaken to reattach broken fragments, restore missing elements, or reconstruct collapsed structures, always with the goal of maintaining both structural stability and historical authenticity (Muñoz Viñas, 2005).
- **Innovative bio cleaning techniques** using microorganisms and nanomaterials have recently emerged as eco-friendly alternatives for removing stains, salts, and surface crusts from cultural materials, though they are still experimental and require further validation (Ranalli *et al*., 2021; Baglioni *et al*., 2021).
- **Community-based preservation practices**including oral traditions, ritual safeguarding, indigenous knowledge systems, and local custodianshipplay a crucial role, especially in African contexts. However, these are often underrepresented in the literature despite their effectiveness in maintaining continuity and cultural meaning across generations (Akpan, 2018). these findings underscore that while scientific conservation methods dominate scholarly

discourse, indigenous and community-led practices remain vital but insufficiently documented.

Digitisation Techniques in Cultural Heritage Management

Digitisation has emerged as a critical pillar of cultural heritage management, offering new ways of safeguarding and disseminating artefacts.

- **2D digitisation** (scanning, digital photography) is the most commonly used technique for documents, manuscripts, and flat artworks. Its low cost and ease of use make it a preferred entry-level method for many institutions (Ross, 2012).
- **3D digitisation** techniques such as laser scanning, photogrammetry, and structured-light imaging are increasingly employed for sculptures, monuments, and architectural heritage. They create highly detailed replicas that allow for analysis, restoration planning, and public engagement through virtual or augmented reality experiences (Apollonio *et al*., 2020).
- **Metadata standards** are crucial for making digital collections useful and interoperable. Widely adopted frameworks include Dublin Core, CIDOC-CRM (ISO 21127:2023), LIDO, MARC, and OAI-ORE. CIDOC-CRM, in particular, has been praised for enabling semantic interoperability between museums, libraries, and archives (Doerr, 2021).
- **Knowledge graphs and linked data** are being explored to enhance metadata richness. For example, CHAD-KG demonstrates how RDF, CIDOC-CRM, and CRMdig can model exhibitions' digitisation processes for long-term interoperability (Yang *et al*., 2025).
- **Digital repository systems**, ranging from institutional archives to cloud-based solutions and open-access platforms, enable long-term storage and wide dissemination. Provenance and authenticity of digital surrogates are increasingly maintained through RDF-based models such as PROV-O and Dublin Core (Mendes *et al*., 2023).The findings highlight that digitisation is not merely a technical process but also requires strong information management frameworks to ensure cultural artefacts remain discoverable and meaningful.

Contributions of Preservation and Digitisation to Accessibility, Risk Reduction, and Sustainability:

A consistent theme in the literature is that preservation and digitisation are complementary strategies in the long-term management of cultural heritage. While preservation ensures the physical safeguarding of artefacts through preventive and remedial measures, digitisation creates digital surrogates that extend the life and reach of collections. Together, these approaches reduce the risks of permanent loss, provide alternative means of access, and support the sustainability of cultural resources in both local and global contexts (UNESCO, 2017; Terras, 2015).

- **Accessibility** is enhanced by digital platforms that allow heritage institutions to democratize access. For example, digitised archives make rare manuscripts and artefacts available globally, breaking geographical and socio-economic barriers (Smith, 2019).
- **Risk reduction** is achieved through digital surrogates that act as insurance against theft, natural disasters, and physical deterioration. Preventive conservation strategies further reduce risks by minimizing the need for frequent intervention (UNESCO, 2017).
- **Sustainability** is reinforced by hybrid approaches—where digitisation reduces handling of physical artefacts and preventive conservation lowers long-term costs. This synergy helps preserve artefacts for future generations while also providing rich digital records for scholarship (Caple, 2012).

Strengths and Limitations of Current Approaches

One of the most widely acknowledged strengths of current approaches is the emphasis on preventive conservation, which is both cost-effective and sustainable. By addressing environmental conditions such as humidity, temperature, light, and pests, preventive measures reduce the likelihood of deterioration and minimize the need for expensive remedial interventions in the future (Caple, 2012; Muñoz Viñas, 2005). This proactive approach has been particularly beneficial in resource-constrained contexts, where financial and technical resources for restoration are limited.

Another key strength lies in the role of digitisation, which has transformed cultural heritage management by enabling global collaboration, public engagement, and educational outreach. Through digital repositories, online exhibitions, and open-access databases, researchers across borders can engage with collections, while the general public gains new opportunities for interaction and learning (Terras, 2015; Kalay et al., 2008). Digitisation thus expands the audience for heritage materials, enhancing inclusivity and ensuring broader cultural participation.

Finally, the adoption of metadata standards such as the CIDOC Conceptual Reference Model (CIDOC-CRM) represents a significant strength in improving interoperability across cultural institutions. By providing a common framework for describing artefacts and their contexts, these standards make it possible to integrate data from museums, archives, and libraries into unified platforms (Doerr, 2021; Richards, 2017). This not only supports information sharing but also strengthens the long-term sustainability of digital heritage initiatives

Limitations:

- High financial and technical requirements restrict large-scale digitisation projects in low-resource contexts (Ross, 2012).

- Biocleaning and nanomaterial-based preservation, though innovative, remain experimental and lack scalability (Ranalli *et al*., 2021).
- Infrastructure gaps such as unstable electricity, poor internet, and limited digital storage capacity constrain African communities and other developing regions (Akpan, 2018).

Gaps in the Literature and Areas for Further Research

The review reveals important gaps that require scholarly and practical attention:

- **Indigenous practices remain underexplored.** Most literature focuses on Western scientific methods, with insufficient study of traditional African, Asian, and Indigenous community-based approaches that have proven effective for centuries (Akpan, 2018).
- **Cost-effective digitisation solutions are lacking.** Current tools and repositories often demand expensive hardware, software, and connectivity. There is limited innovation around affordable, scalable methods that can work in rural or underfunded settings.
- **Sustainability models for digital heritage are underdeveloped.** Questions remain about long-term digital preservation, obsolescence of formats, and the energy cost of large-scale repositories (Mendes *et al*., 2023).
- **Integration of traditional and modern approaches** has not been sufficiently tested. Future research could explore hybrid models where indigenous safeguarding practices are complemented by digital techniques for holistic and culturally grounded heritage management.

Summary of Findings

This systematic review examined the intersection of preservation methods and digitisation techniques in the management of cultural artefacts. Findings reveal that preventive conservation remains central to safeguarding collections, with measures such as environmental controls, integrated pest management, secure storage, and handling protocols serving as cost-effective first lines of defence (Caple, 2019). When deterioration has already occurred, remedial conservation and restoration practicesincluding surface cleaning, varnish removal, and material consolidationare employed to stabilize and extend the life of artefacts. These approaches are underpinned by ethical considerations such as reversibility, minimal intervention, and proper documentation to ensure long-term integrity (Staniforth, 2013).

The review also highlights the transformative role of digitisation in cultural heritage management. Techniques such as 2D scanning, digital photography, and 3D photogrammetry have expanded the accessibility of artefacts for research, education, and public engagement (Terras, 2011). Metadata standards like CIDOC-CRM and the establishment of digital repositories enable interoperability and the preservation of digital surrogates, while also reducing the risks associated with frequent physical handling. In this way, digitisation not only enhances accessibility but also contributes significantly to risk reduction and sustainability.

However, findings point to persistent challenges, particularly in resource-constrained settings such as Africa. Limitations include inadequate funding, infrastructural deficits, lack of skilled personnel, and limited access to advanced digitisation equipment (Ngulube, 2012). Furthermore, ethical challengesranging from intellectual property rights to the cultural sensitivity of open-access platformscomplicate the long-term sustainability of digitisation initiatives (Khir, 2019). These gaps emphasize the need for more inclusive frameworks that integrate indigenous preservation practices with modern technologies while prioritizing affordable and scalable solutions.

Conclusion

This study systematically reviewed literature on preservation methods and digitisation techniques in the management of cultural artefacts, with a focus on their application in resource-constrained contexts such as Africa. Digitisation has emerged as a transformative tool in cultural heritage management. Ultimately, the review underscores that while preservation and digitisation strategies significantly enhance accessibility, risk reduction, and sustainability, their effectiveness in African contexts remains constrained by systemic challenges. There is, therefore, a pressing need for integrative, context-sensitive solutions that combine modern conservation science with indigenous knowledge systems.

Recommendations

It is recommended that:

1. There should be heavy Investment in affordable environmental monitoring tools, pest management, and storage solutions suitable for resource-limited settings.
2. Expand professional training and capacity-building initiatives for conservators, with emphasis on practical, locally adaptable skills should be enhanced.
3. Adoption of open-source digitisation tools and software to reduce costs should be Encouraged.
4. Promote community-based heritage programs to ensure local participation and sustainability.
5. The findings of this review highlight several areas where further research is required to strengthen the preservation and digitisation of cultural artefacts, particularly in resource-constrained contexts.

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PREDICTIVE ANALYTICS FOR USER BEHAVIOUR: A STEP TOWARDS SMART LIBRARY SYSTEMS IN NIGERIA

BY

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Abstract

Predictive analysis has become an essential tool for improving user-centred services and operational efficiency as libraries embrace digital transformation. With an emphasis on the Nigerian context, this study examines the types of user data currently collected such as borrowing histories, search queries, demographic profiles, and foot traffic—and explores how these can be analysed to enhance collection development, optimise resource allocation, and improve user engagement. Using a systematic review and narrative synthesis approach, the study identifies key applications of predictive analytics in smart library systems, including personalised recommendations, budget optimisation, and digital resource management. It also outlines significant benefits, such as improved operational efficiency, strategic alignment with institutional goals, and enhanced patron satisfaction. However, challenges persist in the form of limited infrastructure, inadequate staff training, privacy concerns, and potential algorithmic biases. Drawing on the Technology Acceptance Model (TAM), the study highlights how perceptions of usefulness and ease of use influence adoption readiness. A seven-step implementation framework is proposed, covering objective setting, data assessment, capacity building, model selection, piloting, ethical safeguards, and scaling. The study recommends that Nigerian libraries begin with small-scale predictive analytics pilots, invest in staff training and technological infrastructure, establish strong data privacy and ethical protocols, foster interdisciplinary collaborations, and advocate for institutional and government support. These steps will enable libraries to harness predictive analytics effectively, strengthen user trust, and secure their relevance in the rapidly evolving digital information landscape.

Keywords: Library Innovation, Nigerian Libraries, Predictive Analytics, Smart Libraries, User Behavior.

Introduction

In recent years, the landscape of library management has witnessed remarkable changes, driven by the integration of sophisticated technologies, one of which, predictive analytics, shines especially bright in terms of its transformative potential. A specialized domain under the umbrella of advanced data analytics is predictive analytics, which again employs historical data to predict future trends and behaviours; the application of predictive analytics that underlines the predictions opens many horizons for efficient library resource management (Adewojo, Akanbiemu & Onuoha, 2024). Utilising datadriven insights enables libraries to adapt to changing user information needs, improve resource allocation and streamline decision-making. Globally, libraries are embracing digital transformation to stay relevant and responsive to evolving user expectations (Isiaka, 2024). Central to this transformation is the adoption of data-driven approaches, particularly predictive analytics, which enables institutions to move beyond reactive practices toward proactive, user-focused decision-making. Predictive analytics, an emerging tool in library science, offers transformative potential for addressing collection development challenges. By leveraging data on user behavior, borrowing patterns, and emerging trends, predictive models enable libraries to make informed decisions about resource acquisitions (Hamad, Fakhuri & Abdel, 2022). For example, predictive analytics can identify high-demand materials, allowing libraries to prioritise acquisitions that are likely to see significant use.

In library settings, this technology can be used to personalise user experiences, forecast demand for resources, and enhance operational planning. While developed countries have begun integrating such technologies into their library systems, Nigerian libraries are still at the nascent stage of this digital evolution. Given the unique infrastructural, educational, and socio-cultural challenges in Nigeria, it is critical to explore how predictive analytics can be contextualised to meet local library needs. This study investigates the potential applications, benefits, and challenges of implementing predictive analytics in Nigerian libraries, with the goal of enhancing their relevance, efficiency, and user satisfaction in the digital era.

Statement of the Problem

Despite the increasing digitisation of library services, many libraries in Nigeria continue to operate within traditional frameworks that rely on reactive and manual approaches to service delivery. This limits their ability to anticipate user needs, efficiently manage resources, and align with broader institutional objectives. Most Nigerian libraries collect valuable user data such as borrowing histories, search queries, and visit patterns but lack the analytical capabilities to derive actionable insights from this information. The absence of predictive systems means that Nigerian libraries struggle to optimise staffing, manage space effectively, recommend relevant resources, or forecast demand for services. Additionally, there is limited awareness and training among library staff on how to leverage predictive analytics tools. These issues hinder the ability of libraries to deliver modern, user-centric services and threaten their relevance in a fast-changing digital information landscape.

Objectives of the Study

The main aim of this study is to explore the role of predictive analytics in transforming traditional Nigerian libraries into smart, user-centred institutions. Specifically, the study seeks to:

1. Investigate the types of user data currently collected by Nigerian libraries;
2. Examine how predictive analytics can be applied to improve service delivery in libraries;
3. Identify the benefits of integrating predictive analytics into library systems;
4. Assess the challenges and limitations facing Nigerian libraries in adopting predictive analytics.
5. Recommend actionable strategies for the implementation of predictive analytics in Nigerian library contexts.

Research Questions

To guide the study, the following research questions are posed:

1. What categories of user data are currently collected and managed by Nigerian libraries?
2. In what ways can predictive analytics be utilised to enhance library services and operational efficiency?
3. What are the benefits of integrating predictive analytics in Nigerian libraries?
4. What are the challenges affecting Nigeria libraries in adopting predictive analytics?
5. What practical steps can Nigerian libraries take to implement predictive analytics technologies?

Theoretical Framework

Technology Acceptance Model (TAM)

The technology acceptance theory commonly known as Technology Acceptance Model (TAM) was propounded by Davis, F. D. in 1989. The theory was used to explain user acceptance of technology and how it is used in various environments. TAM is a model that shows how users accept and use technology. The Technology Acceptance Model (TAM) posits that a user's intention to adopt a technology depends mainly on two beliefs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). TAM affects Attitude towards Use and Behavioral Intention.

Perceived usefulness is "the prospective user's subjective probability that using [a system] will enhance his or her job or life performance," while perceived ease of use is "the degree to which the prospective user expects the target system to be free of effort" (Odunewu, Oyedipe & Oyedokun, 2022).TAM is applied in this study to understand the behavioural factors influencing the adoption of predictive analytics in Nigerian academic libraries. Predictive analytics is an emerging technology in the library context, and TAM's two core constructs Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) offer a clear framework for assessing readiness. PU refers to the extent to which librarians and users believe predictive analytics can improve decision-making, personalise services, and enhance resource allocation, while PEOU concerns how effortless they perceive its adoption and daily use to be. In the Nigerian setting, where issues such as limited ICT infrastructure, skill gaps, and policy constraints persist, these perceptions are crucial for explaining whether libraries move from readiness to actual implementation. By mapping enablers and barriers identified in the systematic review to PU and PEOU, TAM helps identify targeted strategies for improving adoption. For instance, if librarians see predictive analytics as valuable but

technically challenging, capacity building and simplified tools should be prioritised. Conversely, if the technology is easy to use but its benefits are unclear, awareness campaigns could increase PU. This human-centred approach ensures the study goes beyond technical feasibility, addressing the organisational and behavioural dimensions essential for the sustainable integration of predictive analytics into smart library systems in Nigeria.

Methodology

This study adopts a systematic review and narrative synthesis approach to gather evidence on predictive analytics for user behaviour in Nigerian academic libraries. Search queries included key terms such as "predictive analytics," "user behaviour," "smart library systems" and "Nigeria," combined with Boolean operators was applied to major academic databases including Scopus, Web of Science and Google Scholar. The search was limited to recent publications from January 2018 to May 2025 to ensure the inclusion of current insights. After retrieving the results, the researchers removed duplicates and screened titles and abstracts to exclude irrelevant papers, focusing on studies concerned with academic libraries and user-behaviour analytics in Nigeria. Eligible studies were required to meet predefined inclusion criteria, such as being peer-reviewed, addressing predictive analytics or library technology, and focusing on Nigeria or similar contexts. We collated and synthesised data narratively to identify trends in readiness, training and ethical considerations for AI-driven user-behaviour analysis in library systems. This rigorous approach ensured transparency and reduced bias by systematically selecting and evaluating all relevant literature on smart library systems in Nigeria.

Findings and Discussions

The Findings and discussions are Organised into themes aligned with research questions:

Types of User Data Collected by Libraries

The following are types of user data collected by libraries according to Ashikuzzaman (2024):

i. Circulation Data:

Borrowing Patterns: By tracking which books and materials are checked out most frequently, libraries can identify popular genres, authors, and subjects. This information helps make informed decisions about future acquisitions and ensure that high-demand items are readily available. For example, if data shows a high demand for science fiction novels, the library can prioritise acquiring more titles in that genre. **Renewals and Returns**: Understanding how often materials are renewed or returned late can reveal user engagement levels and potential issues with borrowing policies. It can also help in optimizing loan periods and fine structures to better suit user needs. For instance, frequent renewals of certain materials might indicate that the initial loan period is too short.

ii. User Demographics:

Age, Gender, and Education Levels: Analysing demographic data helps libraries tailor their services to specific user groups. For instance, a library with a large number of young adult users might focus on expanding its young adult literature collection and related programs. Demographic data can also help in designing targeted marketing campaigns and outreach efforts.

Membership Trends: Observing changes in membership over time can indicate the effectiveness of outreach efforts and highlight areas where additional promotion may be needed. A decline in memberships could signal a need for new services or programs to attract users.

iii. Usage Statistics:

Foot Traffic: Counting the number of visitors provides insight into the library's popularity and usage patterns. High foot traffic during certain times can signal the need for more staff or extended hours. For example, if data shows a peak in visitors during the afternoon, the library might consider increasing staff during those hours.

Program Attendance: Monitoring participation in events and programs helps evaluate their success and popularity. Libraries can use this data to refine existing programs or develop new ones that better meet community interests. For instance, if a particular workshop consistently attracts a large audience, the library might offer it.

Digital Resource Access: Tracking the use of e-books, databases, and other online resources reveals which digital services are most valued by users. This data can guide investments in digital collections and technology infrastructure. For example, high usage of a specific database could justify renewing its subscription.

iv. Feedback and Surveys:

User Satisfaction Surveys: Collecting feedback on library services and facilities provides direct input from users about what's working well and what needs improvement. Surveys can cover various aspects, including staff helpfulness, facility cleanliness, and overall satisfaction. This feedback is invaluable for making user-centric improvements.

v. Catalogue Searches:

Search Queries: Analysing what users search for in the library catalogue can identify popular topics and areas of interest. It also helps understand user search behavior and improve catalog usability. For example, frequent

searches for a particular author might prompt the library to acquire more of their works.

Unfulfilled Searches: Identifying gaps in the collection based on unfulfilled search queries helps libraries understand what materials users are looking for but unable to find. This can guide collection development efforts to better meet user needs.

vi. Interlibrary Loan (ILL) Requests:

ILL Requests: Tracking the number and type of items requested through interlibrary loans indicates which materials are in demand but not available locally. This helps identify gaps in the collection. For example, if many patrons request a specific book through ILL, the library might consider purchasing it for their collection.

Fulfillment Rates: Monitoring how often ILL requests are successfully fulfilled provides insight into the efficiency of interlibrary loan processes and partnerships

Applications of Predictive Analytics in Smart Libraries

The concept of libraries has undergone significant evolution throughout history. From ancient in repositories of manuscripts to digital hubs of information, libraries have consistently adapted to meet the needs of their users (Jagadeesha, 2024; Schopfel, 2018). In the 21st century, the rise of technology has transformed how information is created, stored, and accessed. Smart libraries, integrating advanced technologies like artificial intelligence (AI), the Internet of Things (IoT), big data, and virtual reality (VR), represent the next frontier in this evolution. One of the fundamental roles of smart libraries will be to provide seamless access to information (Meesad & Mingkhwan, 2024). The exponential growth of digital content demands systems capable of managing vast amounts of data efficiently. Smart libraries will leverage AI to organise and retrieve information with precision, tailoring results to the specific needs of each user. Personalized recommendations, akin to those offered by streaming platforms, will become commonplace, allowing users to discover relevant books, articles, and resources effortlessly (Meesad and Mingkhwan, 2024). Through the use of natural language processing and voice recognition, patrons will interact with library systems conversationally, breaking down barriers for those less familiar with traditional search methods (Nepali & Tamang, 2022). According to Mojjada (2025), predictive analytics in managing library resources has a broad focus, including several key areas:

Predictive analytics helps librarians understand future consumption trends, noting deserts and overages in their original collections. It assists in making data-driven collection decisions regarding what books, journals, electronic databases to purchase or discontinue, based not only on retrospect evaluation but also on the anticipated demand from users. Research by Jones & Green (2018) emphasises the role of predictive analytics in optimising collection management. By analysing historical circulation data, libraries can forecast demand, identify underutilised resources, and strategically curate collections to meet the evolving needs of their communities.

User Behaviour Analysis: Predictive models follow borrowing patterns, how often to use it, and even seasonal trends can allow for tailored recommendations or targeted promotions. Libraries can use this knowledge to refine their offerings and meet user needs. By analysing patterns in user preferences and borrowing histories, libraries can tailor their services, recommend personalized content, and anticipate the needs of their patrons.

Optimisation of Budget and Resource Allocation: Budgeting, resource allocations and predictive analytics aid librarians in efficient fund flows. Accurate predictions on resource usage can help libraries avoid wasteful spending and ensure they are allocating resources to where they will be genuinely needed by users.

libraries and electronic resources continue to gain importance, predictive analytics is essential in optimizing licenses and subscriptions in the digital arena. This enables libraries to determine the access levels needed and not pay for unnecessary subscriptions, making the management of digital resources more efficient.

4.3 Benefits and Opportunities

Predictive analytics and types of modeling allow library professionals to move from reactive to proactive decision-makers (Ikwuanusi, Adepoju, & Odionu, 2023). Such data-informed patterns can then be used to make decisions about collection development, service design, and user engagement strategies libraries and closely tied to established patterns about when, how and by whom resources are used, borrowed, etc. It makes library services increasingly responsive, targeted and effective. Predictive analytics helps libraries better allocate human and material resources. It also better distributes physical or digital resources, enables staff to address in-person visits and challenges as necessary, and continue keeping collections up-to-date. This leads to more efficient processes and enhanced user experience.

according to Nannapaneni, (2019) is that predictive

analytics reduces resource redundancy, increasing users traffic, users satisfaction, thereby transfiguring library systems into intelligent and fast responding hubs. It utilises machine learning to augment lending prediction and availability optimization of the books. By searching historical data, they can accurately determine what books will be in demand, estimated return dates, and decrease the waiting time for the users. User preference analysis is part of the model, helping to personalise recommendations and improve engagement.

Predictive analytics offers several advantages for library collection management, ensuring that resources align with user needs while optimizing operational efficiency. By predicting demand for specific resources, libraries can allocate budgets and shelf space more effectively (Yeh, Arthaud-Day & Turvey-Welch, 2021). This reduces wasteful spending on low-demand items and ensures that high-demand resources are readily available. Anticipating user needs through predictive analytics allows libraries to provide timely access to relevant materials. Personalized recommendations derived from predictive models can enhance user engagement and satisfaction. Predictive analytics provides librarians with evidence-based insights, enabling faster and more accurate decision-making. This reduces the reliance on intuition or trial-and-error approaches, particularly in complex scenarios such as managing digital subscriptions or transitioning to new formats. Libraries can use predictive tools to monitor and respond to trends in research, education, and technology. For instance, anticipating a surge in interest in a particular subject area allows libraries to curate relevant collections proactively.

Challenges and Ethical Considerations

Protecting privacy is a long-standing commitment for libraries. Predictive analytics (particularly when evaluating personalised utilisation data) raises ethical dilemmas regarding consent, data protection, and transparency. To preserve user trust and meet legal and ethical standards, libraries need to establish strong privacy policies, anonymize user data, and practice sound data stewardship. Several studies, including those by Brown (2019) and Garcia & Rodriguez (2022), highlight the critical importance of addressing privacy and security concerns associated with the implementation of predictive analytics and AI in libraries. Protecting user data and ensuring compliance with privacy regulations emerge as paramount considerations. The potential for bias in AI algorithms is examined in the work of Kim & Park (2020). The study emphasises the need for libraries to critically assess and mitigate biases in algorithmic decision-making processes, ensuring fair and equitable access to library resources for all patrons.

Steps to Implementing Predictive Analytics

1. Define Clear Objectives

The first step is to establish what the library aims to predict. Objectives could range from forecasting user demand in specific disciplines, identifying declining use of certain resources, to projecting digital content needs. Clear goals ensure that predictive models remain focused and actionable.

2. Assess Data Availability and Quality

Libraries must assess the types of data they already collect and determine if it is structured, clean, and sufficient for analysis. Useful data includes circulation logs, OPAC search histories, e-resource usage, and acquisition records. Many Nigerian libraries still rely on manual data entry or outdated systems, which limits the ability to apply predictive tools effectively.

3. Build Technical Capacity

Training librarians to use basic data analysis tools is critical. Staff should be introduced to tools like Microsoft Excel, SPSS, Power BI, or open-source platforms such as Orange and Weka. Collaborations with ICT units or university data science departments can also provide much-needed support.

4. Choose Suitable Predictive Models

Depending on the objectives and data available, libraries can begin with basic models such as linear regression for trend prediction or decision trees for classification tasks. Advanced institutions may integrate machine learning algorithms for tasks like automated acquisition or recommendation systems.

5. Pilot the Process

Rather than implementing analytics at full scale, libraries should first test the approach in a single department or on a specific resource type. For instance, predicting STEM textbook demand in the Faculty of Science over one semester can provide measurable outcomes to refine future efforts.

6. Address Ethical and Privacy Concerns

Libraries must anonymise user data, seek ethical clearance where applicable, and communicate transparently with users. Ethical practices foster trust and ensure compliance with data protection policies.

7. Monitor, Evaluate, and Scale

Monitoring the impact of predictive models is essential. Key indicators might include improved acquisition accuracy, increased resource usage, or enhanced user satisfaction. Regular evaluation ensures that systems remain relevant and responsive.

Discussion of Summary of Findings

The findings from this study reveal that Nigerian libraries currently collect a wide range of user data, including circulation records, demographic information, usage statistics, catalogue search histories, and interlibrary loan requests. These datasets are crucial for understanding borrowing trends, measuring user engagement, and guiding acquisitions (Ashikuzzaman, 2024). However, unlike libraries in developed countries where such data is integrated into advanced analytics platforms for automated recommendations and real-time decision-making, Nigerian libraries often lack the technological infrastructure and trained personnel to fully exploit these resources. This aligns with Isiaka, (2024), who emphasise that while data is routinely gathered, its strategic use for predictive modelling remains minimal due to infrastructural and skills deficits.

The application of predictive analytics offers multiple opportunities for enhancing library operations in Nigeria. It supports proactive collection development, user behaviour analysis, budget optimisation, and digital resource management. For instance, Mojjada (2025) highlights how predictive modelling can help anticipate demand for resources and tailor recommendations to user preferences. These capabilities are already commonplace in developed contexts, where libraries employ AI-driven models and real-time analytics to deliver personalised experiences (Meesad and Mingkhwan, 2024). This echoes Yeh *et al*. (2021), who note that predictive analytics enables budget allocations and resource decisions based on evidence rather than intuition. For Nigerian libraries, beginning with small-scale predictive projects such as forecasting STEM resource needs can builds the evidence base for wider adoption.

The benefits and opportunities identified in this study confirm earlier observations by Nannapaneni (2019), who noted that predictive analytics transforms library services from reactive to proactive, increasing efficiency, reducing redundancy, and enhancing user satisfaction. Globally, libraries have leveraged predictive tools to align collections more closely with demand and to improve engagement. In Nigeria, however, capitalising on these benefits will require investment in predictive tools, training programmes, and institutional strategies that embed data-driven decision-making into everyday operations.

Nevertheless, challenges remain. Privacy concerns, potential algorithmic bias, and the absence of robust policies emerged as critical issues in this study, corroborating the concerns raised by Brown (2019) and Garcia & Rodriguez (2022) regarding ethical dilemmas in AI-driven environments. Developed countries have sought to address these challenges through strong data protection frameworks and algorithm audits but such measures are underdeveloped in the Nigerian context. Without the establishment of clear privacy policies, anonymisation protocols, and staff training in AI ethics, adoption risks eroding user trust and exacerbating inequalities in access. To operationalise predictive analytics, the study proposes a seven-step implementation framework defining objectives, assessing data quality, building technical capacity, choosing suitable models, piloting projects, addressing ethical issues, and scaling initiatives. This incremental, evidence-based approach mirrors structured AI adoption roadmaps already in use in many global library systems (Huang et al., 2023). Following such a phased model, with measurable indicators for success, will allow Nigerian libraries to minimise risks while maximising the benefits of predictive analytics integration.

5. Conclusion

1. Predictive analytics holds transformative potential for library collection development, enabling libraries to make datadriven decisions that enhance resource management, user engagement, and operational efficiency. By leveraging data from usage patterns, user behavior, and external trends, libraries can optimize acquisitions, identify emerging research areas, and proactively manage underutilised resources. The ability to forecast demand for books, journals, and digital resources ensures that libraries align their collections with the evolving needs of their user base, ultimately improving the accessibility and relevance of library services. However, the integration of predictive analytics into library workflows requires continued innovation and research. As libraries embrace increasingly sophisticated tools such as machine learning, natural language processing, and open source predictive platforms, it is crucial to refine these models and adapt them to specific institutional contexts. Research into new methodologies, collaboration across libraries, and the development of more accurate predictive models will further enhance the effectiveness of predictive analytics in libraries. The study recommends:

1. Initiating targeted pilot projects in selected departments or resource areas to build confidence, refine models, and provide measurable outcomes before scaling to the whole library.

2. Investing in continuous staff capacity building through workshops, collaborations with ICT/data science unit and hands-on training in analytics tools like Power BI, SPSS, and open-source platforms.
3. Upgrading library infrastructure by deploying modern integrated library systems (ILS) that support real-time data collection, processing, and analytics integration.
4. Establishing robust privacy and ethical frameworks to ensure user trust, including anonymisation of personal data, clear consent processes, and bias mitigation in algorithms.
5. Fostering interdisciplinary partnerships with technologists, academic researchers, and policy stakeholders to share expertise and accelerate adoption.
6. Securing institutional and governmental policy support for funding, strategic planning, and long-term sustainability of predictive analytics initiatives.

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ROLES OF LIBRARIANS IN DIGITAL LITERACY TRANSFORMATION IN THE 21ST CENTURY: A REVIEW.

BY

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Abstract

As digital technologies increasingly permeate all aspects of modern life, digital literacy has emerged as an essential competency for education, employment, and civic engagement. Libraries and librarians, traditionally seen as custodians of information, are now at the forefront of this transformation, serving as educators, digital mentors, and ethical stewards in a rapidly evolving information landscape. This study examines the evolving role of librarians in promoting digital literacy in the 21st century, as well as the strategies, tools, and institutional frameworks that support their efforts. A secondary research methodology was used whereby the study synthesises existing scholarly literature, policy documents, and case studies to examine the roles librarians play to promote digital literacy across academic, public, and school settings. The review of prior studies and professional reports indicates that librarians employ a variety of approaches, including instructional design, one-on-one support, outreach programs, and integration of emerging technologies such as AI and learning management systems. Despite their progress, librarians continue to face persistent challenges, including institutional barriers, digital inequity, and the need for ongoing professional development. Based on these insights, the study offers five key recommendations: enhancing librarian training, embedding librarians in strategic planning, expanding inclusive outreach, adopting technologies thoughtfully, and developing impact evaluation frameworks. These actions are critical to sustaining a human-centred and equitable digital transformation in information services.

Keywords: Librarians, Digital Literacy, Advanced Technology

Introduction

In the 21st century, digital technologies have reshaped how information is created, accessed, and shared, bringing significant changes to education, work, and civic life. Within this transformation, digital literacy has emerged as a critical competency, encompassing not only technical skills but also the ability to evaluate information, engage responsibly in online environments, and participate meaningfully in society. Closely connected are the concepts of digital citizenship and digital inclusion, which highlight the importance of equitable access to digital resources and opportunities for all individuals.

Libraries, once viewed mainly as physical repositories of books, have evolved into hybrid learning and community hubs. They now play a vital role in bridging digital divides, supporting technology access, and fostering the skills required for lifelong learning. In this evolving context, librarians are taking on new responsibilities that extend beyond resource management. Their work increasingly includes instructional design, mentorship, outreach initiatives, and the integration of emerging technologies such as artificial intelligence and learning management systems.

This paper, written as an opinion piece, explores the transformative role of librarians in advancing digital literacy and supporting inclusive participation in a digital society. By synthesizing insights from existing scholarship, professional reports, and documented practices, it positions librarians as proactive leaders in ensuring equitable and ethical engagement with digital technologies. The background establishes the variables of digital literacy, librarianship, and digital inclusion as the conceptual foundation for the discussion that follows.

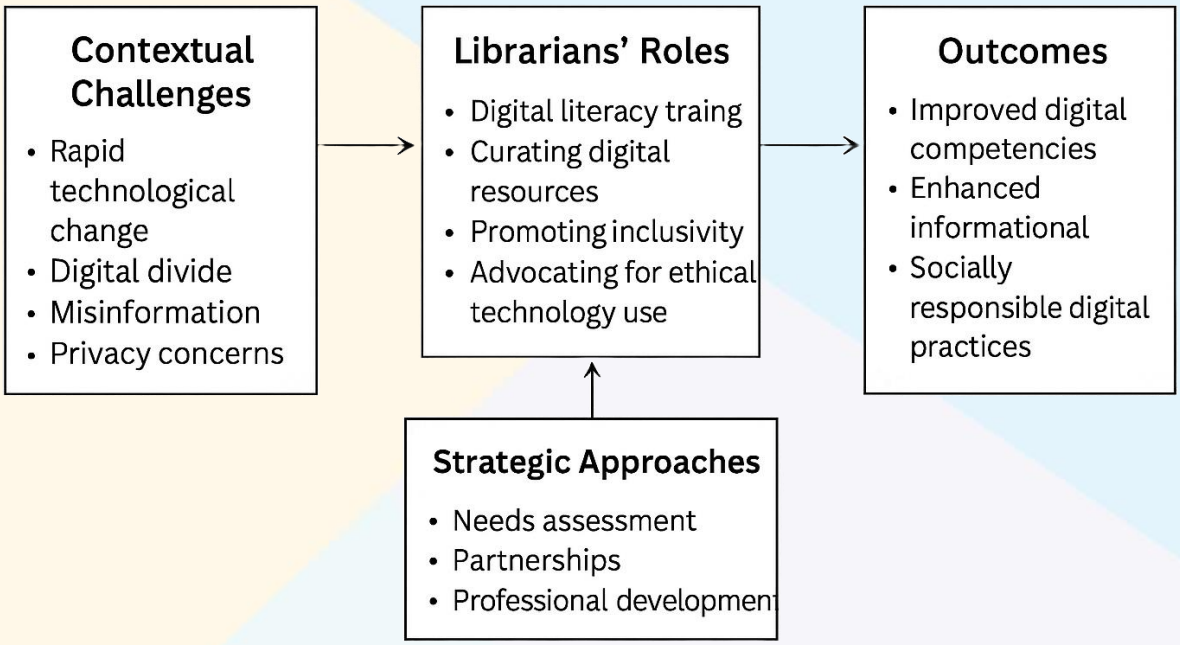
Literature Review

Conceptual Framework

The rapid shift toward digital-first societies has redefined the meaning of literacy in the 21st century. Beyond technical proficiency, digital literacy now encompasses critical evaluation of information, ethical participation in online spaces, and the ability to adapt to emerging technologies. Libraries, as dynamic knowledge hubs, are uniquely positioned to address these evolving needs. Through instructional design, digital

mentorship, outreach initiatives, and technology integration, librarians are helping to shape inclusive and resilient communities. This framework draws on the literature to establish digital literacy, librarianship, and digital inclusion as interconnected variables that provide the foundation for understanding how librarians actively drive change in a digital age.

Digital Literacy in the 21st Century: How Librarians Help Drive the Change Framework



The conceptual framework titled "Digital Literacy in the 21st Century: How Librarians Help Drive the Change" outlines the dynamic relationship between contextual challenges, the evolving roles of librarians, strategic interventions, and the expected outcomes of their efforts. On the left side of the framework, it identifies key contextual challenges, including rapid technological change, the digital divide, misinformation, and privacy concerns, which necessitate urgent and strategic responses within information environments. These challenges serve as the driving forces prompting libraries to reposition themselves as active agents in fostering digital competency and ethical digital engagement.

At the centre of the framework, the diagram highlights librarians' transformative roles, including delivering digital literacy training, curating credible digital resources, promoting inclusivity, and advocating for the ethical use of technology. These roles are supported by strategic approaches, such as needs assessments, partnerships, and continuous professional development, which empower librarians to respond effectively to evolving user demands. Ultimately, these interventions lead to measurable outcomes, such as enhanced digital competencies, improved informational awareness, and more socially responsible digital practices. The diagram emphasises that librarians, supported by targeted strategies, are not just adapting to digital transformation; they are actively shaping it to ensure equitable, ethical, and informed participation in the digital world.

Conceptualising Digital Literacy

Digital literacy has evolved markedly from its initial conception, which primarily emphasised basic computer skills and internet navigation. Today, it is understood as a multifaceted competency that includes not only technical fluency but also the ability to locate, critically evaluate, ethically produce, and responsibly communicate digital information, as noted by Iordache et al. (2017). Eshet-Alkalai (2004) underscores this evolution by highlighting the need to incorporate critical thinking, ethical reasoning, and data literacy into digital literacy models, reflecting the growing complexity of online engagement. As digital technologies become embedded in everyday practices such as education, civic participation, and governance, scholars have observed a shift in how literacy is framed. For instance, Martínez-Bravo et al. (2022) emphasise that the digital era necessitates not just skills but meaningful, ethical engagement with information. Frameworks like the European Commission's DigComp and the American Library Association's digital literacy standards illustrate this transition by focusing on the development of reflective and accountable digital citizens, a shift that Lee and

Fanea-Ivanovici (2023) describe as central to navigating digital environments. Increasingly, digital literacy is defined as "being shaped by contextual shifts in digital use," indicating that it is not static but continuously redefined by emerging technologies and societal needs.

In parallel, the scope of digital literacy in the 21st century includes not only platform navigation but also a sophisticated understanding of algorithms, data privacy, and digital identity management, as emphasised by Bawden (2001). These expanded competencies closely intersect with the domain of information literacy, which focuses on the ability to identify information needs, access, evaluate, and apply information judiciously. While Arp et al. (2007) argue that both literacies are underpinned by ethical use and critical thinking, they contend that the two differ in their scope and application. Information literacy is primarily grounded in academic and research contexts. In contrast, digital literacy has broader societal relevance, shaping how individuals engage in political, social, and professional spheres. The pivotal role of libraries in bridging these literacies is highlighted by McNaught (2008), who notes that librarians are strategically positioned to support integrated learning approaches that develop both digital and informational fluency. This convergence of literacies is fundamental to designing inclusive educational frameworks that promote lifelong learning and empower individuals to participate meaningfully in digital environments. Ultimately, such an integrated perspective supports not only technical competence but also cultivates a more reflective, ethical orientation toward digital engagement.

The Role of Librarians in Digital Society

The role of librarians has been significantly redefined in response to the rapid digitisation of the information landscape in the 21st century. Once primarily seen as custodians of printed materials, librarians have emerged as digital mentors, a shift that reflects the broader transformation of their responsibilities from gatekeeping to guidance (Makwana & Gadhavi, 2023). Croud et al. (2000) describe this evolution as essential in enabling users to navigate increasingly complex digital environments. Librarians now support users not just in locating information, but also in interpreting, evaluating, and engaging with it ethically. This instructional and advisory role addresses the challenges of information overload and promotes digital literacy as a lifelong competency. According to Nur (2023), the modern librarian functions as a facilitator of access and a partner in education and research, helping learners become critical and informed contributors within a data-saturated society. In this expanded capacity, librarians are also key agents in fostering ethical engagement with digital tools and content (Owoeye et al., 2025).

At the core of this reimagined role is embedded librarianship, a model in which librarians are positioned directly within academic, organisational, or community contexts to provide hands-on support for digital learning and citizenship (Kesselman & Watstein, 2009). Rather than remaining confined to traditional library spaces, embedded librarians collaborate closely with faculty, students, and professionals to co-design curricula, co-create digital resources, and address subject-specific information needs (Schulte, 2012). This proximity enhances their ability to tailor support to the specific demands of different environments. Bharati and Majhi (2019) note that librarians are increasingly involved in interdepartmental and cross-sectoral initiatives, contributing their expertise to programs addressing media literacy, privacy concerns, data ethics, and equitable digital access. Dewey (2004) reinforces this view by framing librarians as essential partners in cultivating inclusive and informed digital practices. Ultimately, the evolving role of librarians underscores their increasing impact as strategic allies in fostering a more ethically engaged and digitally competent society.

Strategies for Advanced Digital Literacy

Instructional Design and Digital Pedagogy

Librarians are increasingly embracing instructional design principles and digital pedagogy, as Bergstrom-Lynch (2019) explains, to craft structured and learner-centred educational experiences that actively promote digital literacy. By incorporating clear learning outcomes, thoughtful assessment strategies, and technology-driven content delivery methods, librarians, according to Booth (2011), can create workshops, modules, and tutorials specifically tailored to meet the diverse needs of their user communities. These resources often address essential topics, such as digital source evaluation, ethical information use, citation management tools, and navigating academic databases, as described in the work of Lannon, Holder, and Colosimo (2012). Through the deliberate alignment of teaching methods with digital platforms, Hines and Campbell (2025) emphasise that librarians ensure learning experiences remain both accessible and adaptable,

solidifying their role as educators across a wide range of formal and informal educational environments.

Information Literacy Instruction in Virtual and Hybrid Classrooms

With the expansion of online and hybrid education, librarians have strategically adapted by embedding information literacy instruction into virtual learning environments, a shift that Mune et. al (2015) describe as central to reaching digitally dispersed learners. This integration often includes live instruction delivered through webinars, alongside asynchronous video tutorials and modular learning components embedded within platforms like Moodle, Blackboard, or Google Classroom, as outlined by Xiao (2012). By collaborating closely with faculty and librarians, according to Easter, Jackson, and Frank (2014), assignments can be co-developed, instruction on research strategies, plagiarism awareness, and source evaluation provided, and students offered digital tools to support scholarly engagement. Kelley (2012) highlights how these initiatives help students acquire essential digital competencies directly within the context of their academic tasks, regardless of physical classroom presence or instructional modality.

One-on-One User Engagement and Reference Models

Personalised assistance remains a foundational strategy in digital literacy development, with librarians, according to Khan and Zainab (2015), continuing to provide one-on-one support through both in-person consultations and virtual reference platforms. In response to evolving user expectations, modern reference service models now incorporate tools like live chat, video conferencing, and asynchronous email support, a development detailed by Chowdhury (2002), which enhances the flexibility and immediacy of librarian-user interactions. Miller (2018) points out that this tailored engagement is particularly effective for learners who may feel less confident in group settings, as it helps reinforce critical digital skills while fostering user confidence and autonomy in digital environments.

Outreach and Programming in Underserved Communities

Librarians play a vital role in mitigating digital inequities by designing outreach initiatives that specifically serve underserved and marginalised populations, as Grimes and Porter (2023) highlight in their work on inclusive digital access. These efforts often take the form of mobile digital literacy labs, local tech fairs, hands-on workshops focused on internet safety, and the distribution of affordable digital tools. Strategies such as these, identified by Jutras (2023) as essential for reaching communities with limited infrastructure, are also employed. To amplify their reach and effectiveness, librarians, according to Prasastiningtyas et al. (2024), frequently collaborate with schools, local organisations, and government entities to deliver skill-building programs to individuals with low digital exposure or literacy barriers.

Tools and Technologies Empowering Librarians

Learning Management Systems (LMS) and Instructional Platforms

Learning Management Systems (LMS) like Moodle, Canvas, and Blackboard have become central to how librarians deliver digital literacy instruction at scale, as noted by Mune et al. (2015), who emphasise their role in extending reach and accessibility. These platforms enable librarians to embed key instructional materials, such as research tutorials, citation guides, and modules on information evaluation, directly within academic courses or community learning programs, a method Khailova et al. (2023) describe as effective in streamlining instructional access. By collaborating with educators through LMS environments, librarians can co-design course content, monitor student engagement, and offer timely feedback throughout the learning process, as described by Tumbleson (2016). Idleman (2022) further highlights that these systems facilitate asynchronous learning, allowing users to access and engage with digital literacy resources at their convenience, thereby advancing more inclusive and flexible educational experiences.

Digital Curation Tools and Open Educational Resources (OER)

Digital curation tools such as LibGuides, Wakelet, and Padlet have become essential in helping librarians organise, personalise, and disseminate curated digital content in ways that are both structured and user-friendly, as Antonio and Tuffley (2015) explain in their discussion of digital pedagogy. These platforms support the development of thematic learning hubs, where users can efficiently access curated databases, assigned readings, multimedia content, and research tools in one accessible location. This practice, highlighted by Ungerer (2016), is particularly beneficial for self-guided learning. When integrated with Open Educational Resources (OER), these tools allow librarians to deliver

adaptable, cost-effective, and high-quality instructional materials tailored to diverse learning needs, as demonstrated by Sharma and Deschaine (2016). Flintoff et al. (2014) emphasise that the ability to openly curate and share these digital resources not only strengthens collaboration across learning communities but also expands access to knowledge and promotes a more inclusive and equitable educational experience.

Use of Artificial Intelligence and Data Literacy Platforms

The integration of artificial intelligence (AI) and data literacy platforms is reshaping the librarian's toolkit for digital engagement, as Ridley and Pawlick-Potts (2021) point out in their exploration of evolving library services. AI-powered tools, including chatbots, recommendation systems, and plagiarism detection software, are being used to enhance reference services, improve search efficiency, and reinforce ethical research behaviours, a shift detailed by Ekka (2025) as crucial to modern information environments. In parallel, librarians are leveraging platforms like DataBasic, Tableau Public, and Google Data Studio to teach users essential skills in data interpretation, visualisation, and responsible data management. These technologies, as Chakala (2024) observes, position librarians as essential guides in fostering both data literacy and algorithmic awareness capacities that are increasingly vital for navigating the complexity of contemporary digital information ecosystems.

Challenges in Promoting Digital Literacy

Institutional Barriers and Budget Constraints

One of the central challenges librarians face in advancing digital literacy is navigating institutional constraints that often restrict innovation and adaptability. Conners (2024) emphasises that limited funding, rigid administrative hierarchies, and the marginalisation of digital initiatives within organisational priorities pose significant obstacles to progress. Julien et al. (2021) note that many libraries operate under financial constraints that hinder investment in current technologies, comprehensive digital infrastructures, and ongoing staff development resources essential for effective digital programming. These limitations, as Kenton and Blummer (2010) explain, directly affect the scalability and responsiveness of digital literacy efforts, leaving librarians with fewer tools to meet the evolving demands of their communities. Hallam et al. (2018) argue that without consistent institutional support and strategic financial commitment, even the most innovative approaches risk stagnation, reducing their long-term impact and reach.

Digital Divide and Inequity in Access

The digital divide remains a significant barrier to digital literacy, particularly for marginalised and underserved populations, as Jutras (2023) highlights in discussions of equitable digital access. Grimes and Porter (2023) explain that issues such as inadequate internet infrastructure, limited access to digital devices, and low foundational digital skills inhibit full participation in the digital realm for many communities. In response, librarians often confront not just individual skill deficiencies but broader systemic inequities that restrict access to digital tools and resources, a reality McCloskey (2000) illustrates in her early work on outreach in underserved areas. This challenge is especially acute in rural regions, low-income urban areas, and ageing communities, where digital infrastructure and training opportunities are scarce. Allmann et al. (2021) argue that bridging this persistent divide demands a proactive strategy: one that includes inclusive programming, community-based outreach, and partnerships that allow libraries to extend their services well beyond traditional institutional boundaries.

Algorithmic Bias and Information Ethics

As digital platforms increasingly depend on algorithms to sort, recommend, and prioritise content, librarians are confronting new challenges tied to algorithmic bias, misinformation, and pervasive digital surveillance concerns that Ridley and Pawlick-Potts (2021) identify as central to the evolving landscape of digital literacy. Archambault et al. (2024) explain that such technologies can inadvertently reinforce existing social inequities or expose users to manipulative and misleading information, thereby complicating users' ability to engage with content critically. In response to these dynamics, O'Hara (2021) emphasises that promoting digital literacy must now include educating users about how algorithms influence their online experiences and fostering critical awareness of the digital tools they interact with daily. Beyond instructional content, librarians are also expected to navigate complex ethical questions related to data privacy, informed consent, and the responsible deployment of technology. Archambault (2023) notes that institutional policies in these areas are often underdeveloped or inconsistent, leaving librarians

to make judgment calls in ethically ambiguous situations while still ensuring user trust and safety.

Professional Development and Technological Fluency

Keeping pace with the rapid evolution of digital tools and emerging technologies remains a persistent challenge for librarians, as Stranack (2012) notes in his exploration of professional adaptability in the digital age. Blakiston (2011) points out that while continuous professional development is crucial, many librarians encounter barriers such as limited time, insufficient access to quality training resources, or minimal institutional encouragement for skill enhancement. Achieving technological fluency, according to Martzoukou and Elliott (2016), involves more than mastering digital applications; it requires the ability to integrate these tools into pedagogical frameworks and community outreach in ways that are relevant and effective. When structured opportunities for ongoing learning and digital upskilling are lacking, Martzoukou (2013) warns that librarians risk falling behind technological trends, which can undermine the impact of digital literacy programs and diminish users' trust in library services as reliable sources of digital guidance.

Case Studies and Best Practices

Academic Library Initiatives

Academic libraries have progressively evolved into critical agents of digital literacy within higher education, reflecting a shift in paradigm from being mere custodians of information to active collaborators in instructional design. As Lindstrom and Shonrock (2006) argue, librarians are no longer confined to support roles. However, they are increasingly engaging with faculty in structured pedagogical partnerships, where digital literacy is embedded directly into course content through joint consultations and integrated classroom support. At institutions such as the University of Michigan and the University of Cape Town, this collaborative ethos has led to the co-development of curricular materials aimed at cultivating advanced digital competencies; Brasley (2008) documents these efforts as pivotal in enhancing student proficiency in navigating scholarly databases, managing data, and adhering to citation standards. The integration of such skills into academic programs is further exemplified by Watts and Hubbard, who identify credit-bearing courses, digital learning labs, and subject-specific instruction as common strategies employed by academic libraries (Watts & Hubbard, 2021). These instructional models are not implemented in isolation; instead, they are often purposefully aligned with departmental and institutional goals, thereby reinforcing digital literacy as an essential academic outcome. Kenton and Blummer (2010) report that embedded instruction models have demonstrably improved student academic performance, particularly when digital fluency is framed as a core curricular competency. It has been widely acknowledged that the integration of librarians into teaching and learning frameworks significantly contributes to institutional teaching capacity, with librarians increasingly regarded as pedagogical co-creators. This recognition highlights the growing role of academic libraries in cultivating digitally literate graduates and promoting long-term academic success.

Public Library Outreach Models

Public libraries have increasingly assumed a proactive role in expanding digital literacy, particularly through outreach strategies aimed at bridging the digital divide for marginalised and underserved communities. This transformation is thoroughly analysed by Bertot (2016), who underscores the sector's shift toward innovative, equity-focused service models. One prominent example is the Brooklyn Public Library's "TechConnect" program, alongside Toronto Public Library's "Digital Literacy Week"; both illustrate how libraries are reimagining their community engagement by offering no-cost instruction on core competencies such as computer basics, internet safety, and digital job readiness. As noted by Whiteside et al. (2022), such initiatives are particularly effective in urban environments, where disparities in digital access are often more pronounced. Accessibility is a defining characteristic of these programs, often achieved through adaptive delivery models. Bertot et al. (2016) describe how libraries implement mobile learning labs, multilingual instruction, and flexible drop-in sessions to engage users across various socio-economic and linguistic contexts. These approaches are not merely logistical solutions but reflect a broader philosophical commitment to digital equity. In discussing this shift, Adeyemon (2009) contends that public libraries now serve as essential access points for inclusive digital empowerment, enabling community resilience and lifelong learning through hands-on, practical engagement with technology. This evolving role positions public libraries not only as educators but as transformative civic institutions dedicated to fostering technological agency across diverse populations.

School Librarians and Early Digital Literacy

School librarians play a pivotal role in cultivating digital literacy from the early stages of education, laying the groundwork for responsible digital citizenship among young learners. This foundational contribution is underscored by Wine (2016), who emphasises that librarians are uniquely positioned to guide students' initial encounters with digital content and tools. Within K–12 environments, effective digital literacy practices are often embedded into project-based learning; as Rogers-Whitehead et al. (2022) explain, such integration enables students to develop evaluative skills for assessing the credibility of online information while also fostering ethical and safe participation in digital spaces. Programs such as Common-Sense Education and initiatives aligned with the International Society for Technology in Education (ISTE) standards are frequently facilitated by school librarians, positioning them as both instructional collaborators and digital mentors (Phillips & Lee, 2019). The instructional presence of librarians in these contexts is not incidental but is part of a broader pedagogical strategy that embeds digital fluency into the core learning experience. As Ortlieb (2018) observes, these practices contribute meaningfully to students' readiness to navigate complex digital landscapes with discernment and confidence. Through this multifaceted engagement, school librarians not only enhance technological competence but also shape the critical thinking capacities essential for lifelong digital engagement.

Impact Assessment and User Outcomes

Evaluating Digital Literacy Programs

Evaluating the effectiveness of digital literacy programs remains a critical component in ensuring their relevance, impact, and sustainability. As Meena (2024) emphasises, continuous assessment not only provides insight into a program's success but also informs iterative improvements that respond to learner needs and evolving technological contexts. In practice, librarians adopt a combination of formative and summative assessment techniques to measure both immediate and long-term outcomes. Julien et al. (2022) report that methods such as pre- and post-assessments, reflective journals, and participant feedback surveys are frequently utilised to gauge skill acquisition, track learner progress, and assess user satisfaction. These strategies are particularly valuable in revealing whether participants have developed practical digital competencies, demonstrated ethical behaviour online, and gained confidence in using technology dimensions of learning underscored by Sieberhagen and Cloete (2012) as essential for meaningful digital engagement. Moreover, as Jun et al. (2024) observe, rigorous evaluation supports strategic alignment with institutional goals, enabling librarians to justify program investments or policy recommendations through transparent, evidence-based reporting. By embedding such evaluation frameworks, digital literacy programs not only maintain accountability but also enhance their capacity to serve diverse learning communities effectively.

User Engagement Metrics and Learning Outcomes

Tracking user engagement provides essential insight into both the scope and effectiveness of digital literacy initiatives. As Lalmas et al. (2014) demonstrate, understanding how users interact with digital instruction is vital for assessing program impact and guiding instructional refinement. Quantitative metrics, such as attendance figures, session duration, module completion rates, and patterns of repeat participation, are frequently used to capture engagement levels. These indicators, identified by Balasooriya et al. (2018), serve as benchmarks for user interaction with digital content and services. However, meaningful engagement extends beyond numerical data. McGuinness and Fulton (2019) argue that qualitative evidence, such as the emergence of more complex research inquiries, heightened curiosity, and an increased openness to experimenting with new technologies, offers more profound insight into users' evolving digital behaviours and cognitive development. These qualitative dimensions not only suggest increased digital confidence but also point to transformative learning outcomes. Taken together, both quantitative and qualitative indicators play a vital role in shaping instructional strategies. They help educators identify areas where learners struggle conceptually, enabling the adaptation of program design to accommodate varying levels of digital fluency and diverse user needs. As a result, tracking engagement becomes a dynamic tool for sustaining program relevance and enhancing learner impact.

Longitudinal Effects on Research Skills and Digital Empowerment

Long-term assessment of digital literacy initiatives is crucial for evaluating their sustained impact on users' research capabilities, critical thinking, and

digital self-efficacy. As Tomar (2023) emphasises, such evaluations provide deeper insights into how learners internalise and apply digital skills beyond the immediate instructional context. Longitudinal evidence supports this view; Hallam et al. (2018) found that consistent engagement with librarian-led digital literacy programs significantly enhances users' abilities to locate reliable sources, manage digital tools, cite materials appropriately, and make informed, ethical decisions in online environments. These outcomes are not limited to academic performance but also extend into broader digital empowerment. According to Prasastiningtyas et al. (2024), sustained participation in these programs equips individuals to navigate academic, professional, and civic digital landscapes with increased competence and assurance. Over time, this empowerment fosters habits of independent inquiry and adaptive learning. Described by Susanty (2024) as a driver of self-directed learning and academic resilience, the long-term effects of digital literacy extend beyond skill acquisition to reinforce ethical behaviour and lifelong learning values. Moreover, such enduring outcomes reaffirm the librarian's evolving role as a central architect of inclusive and forward-thinking digital societies.

Policy, Advocacy, and the Librarian's Voice

Shaping Institutional Digital Literacy Frameworks

Librarians play a central role in shaping institutional frameworks and policies that foster the integration of digital literacy across higher education. As Brasley (2008) asserts, their contributions extend beyond instructional spaces to institutional governance, where they actively participate in curriculum committees, academic senate discussions, and cross-disciplinary planning efforts. Through these engagements, librarians help embed digital competencies into formal learning outcomes, accreditation standards, and strategic planning documents. This institutional alignment is further examined by Hallam and Smeaton (2017), who describe the process by which library-led initiatives are systematically linked to broader academic missions, thereby elevating digital literacy from a peripheral skill to a recognised academic and civic imperative. The strategic value of this integration lies in the librarian's unique blend of pedagogical expertise, commitment to equitable access, and grounding in information ethics. According to Dupuis (2009), it is precisely this interdisciplinary knowledge that positions librarians as key architects in the conceptualisation, execution, and evaluation of digital literacy policies within higher education. When supported by institutional structures, these efforts not only legitimise digital fluency but also ensure its sustainable development as a core component of academic and societal engagement.

Involvement in National and Global Policy Dialogues

Librarians are increasingly extending their influence beyond institutional boundaries to play a critical role in shaping digital policy on national and international stages. Their engagement with key global organisations, including the International Federation of Library Associations and Institutions (IFLA), the American Library Association (ALA), and UNESCO, has positioned them as central contributors to policy frameworks that address digital inclusion, open access, intellectual freedom, and digital rights (IFLA, 2021; ALA, 2020; UNESCO, 2019). Through active participation in white papers, policy advisory panels, and public consultation initiatives, librarians have made meaningful contributions to the formulation of technology policies and educational standards that aim to advance equity and access. As noted by IFLA (2021), this participation ensures that foundational library principles such as privacy, intellectual freedom, and equitable access to information remain embedded within the broader global discourse on digital transformation. Moreover, it has been widely recognised that their sustained advocacy helps align emerging digital policies with the ethical and social imperatives of information justice. In this capacity, librarians not only act as institutional representatives but also as informed policy advocates committed to shaping an inclusive digital future.

Ethical Leadership and Librarians as Advocates

Librarians increasingly serve as ethical leaders and advocates within the evolving digital landscape, championing responsible technology use and the protection of users' rights. As Gorham et al. (2016) assert, this role extends beyond service delivery to encompass a broader commitment to information ethics and public interest. In the face of escalating concerns such as algorithmic bias, digital surveillance, and the proliferation of misinformation, librarians play a critical role in promoting digital justice. Jones (2010) highlights their advocacy for user autonomy, intellectual freedom, and the protection of diversity in digital spaces, principles that have become vital in today's

data-driven society. Through public education on data privacy, resistance to censorship, and the cultivation of inclusive and equitable digital environments, librarians fulfil a multidimensional role that is both instructional and activist in nature (Michalak, 2023). As Jaeger et al. (2015) explain, this positioning enables librarians to act not merely as information facilitators, but as ethical stewards of the digital age, defenders of human dignity, social equity, and justice-centred approaches to digital literacy. Their work ensures that technological advancement does not come at the expense of the foundational values that underpin an open and democratic information society.

The Future of Librarianship in a Digitally Literate World

Redefining Core Competencies

As digital literacy becomes an indispensable component of modern education, employment, and civic engagement, the profession of librarianship is undergoing a profound redefinition of its core competencies. Widén and Kronqvist-Berg (2014) argue that the future of the field depends not merely on the preservation of traditional skills such as cataloguing, reference assistance, and physical resource management, but on the expansion of librarians' expertise into digitally intensive domains. To meet the demands of contemporary information environments, librarians must now be proficient in digital pedagogy, data literacy, user experience (UX) design, and content curation across diverse digital platforms (Awogbami, 2024). This transformation has led to an increasingly hybrid professional identity. As Barton (2006) notes, librarians are no longer viewed solely as information custodians, but also as instructional designers, digital technologists, and ethical consultants within academic and public settings. Supporting this shift is an urgent need for continuous professional development. Sa'ari et al. (2024) emphasise that lifelong learning is essential for librarians to remain adaptive and responsive to technological evolution, user expectations, and the broader societal role of libraries in the digital age. As the profession continues to evolve, sustained investment in upskilling will be vital to ensuring the continued relevance and leadership of librarians in digitally mediated knowledge ecosystems.

Preparing for Emerging Technologies

The trajectory of librarianship will be increasingly shaped by the integration of emerging technologies, including artificial intelligence (AI), virtual and augmented reality (VR/AR), blockchain applications for digital rights management, and advanced data analytics. As Oyedokun (2025) observes, these innovations are poised to redefine the informational landscape and transform how libraries deliver services, engage users, and manage digital resources. Preparing for such shifts requires not only technical fluency but also critical awareness of the broader implications these technologies carry. Din and Ali (2024) emphasise the importance of interrogating issues related to access, user privacy, algorithmic accountability, and digital equity, domains in which librarians are uniquely positioned to advocate for the ethical application. In this context, Okwu et al. (2024) highlight the dual responsibility librarians bear: leveraging these tools to enhance pedagogical practice, optimise service delivery, and extend community outreach, while simultaneously ensuring that innovation aligns with core values such as inclusivity, transparency, and intellectual freedom. Future-ready librarians must therefore function as both forward-thinking adopters and principled gatekeepers, navigating technological change with a commitment to equitable access to information and ethical stewardship in the digital era.

Sustaining Human-Centred Digital Transformation

Amid the growing presence of automation and digital systems in library environments, the foundational values of librarianship must remain rooted in human-centred principles. Guzman (2024) emphasises the importance of ensuring that technological advancements serve to enhance, rather than supplant, the interpersonal, ethical, and empathetic dimensions of library service. While digital tools can expand access and efficiency, the librarian's role as a facilitator of inclusive, supportive, and responsive spaces remains indispensable. As Gorman (2015) notes, librarians continue to be essential in promoting digital well-being, supporting marginalised or vulnerable communities, and fostering environments where equitable learning can flourish. This human-centred mission demands more than technological investment; it requires a parallel commitment to the development and empowerment of library professionals. According to Levy et al. (2001), sustaining such a transformation entails equipping librarians to lead institutional change that centres on dignity, social equity, and informed democratic participation. In this evolving landscape, libraries must position themselves not merely as technology hubs but as civic spaces where ethical engagement

and human connection guide the use of digital tools.

Conclusion

In an increasingly digital world, librarians are no longer confined to traditional roles but are emerging as key facilitators of digital literacy, equity, and ethical information use. Through instructional design, personalised engagement, and strategic use of technology, they help bridge digital divides and empower users to navigate complex information environments responsibly. While challenges such as institutional constraints, technological gaps, and ethical concerns persist, librarians continue to adapt, advocate, and innovate. The future of librarianship lies in embracing a hybrid model that integrates technological tools with human-centred practices, ensuring digital transformation remains inclusive, ethical, and impactful.

Recommendations for Future Action

I. **Invest in Continuous Professional Development for Librarians:** Institutions should prioritise ongoing training programs that equip librarians with emerging digital competencies such as AI literacy, instructional design, data analysis, and digital ethics. This ensures librarians remain agile and capable of supporting diverse user needs in evolving digital environments.

II. **Integrate Librarians into Strategic Institutional Planning:** Libraries should be embedded in broader digital literacy and curriculum development frameworks at the institutional level. This involves including librarians in policy-making, cross-disciplinary committees, and decision-making processes that shape educational technology and user engagement strategies.

III. **Expand Inclusive Digital Literacy Outreach Programs:** Libraries must actively design and implement targeted outreach initiatives for underserved communities, focusing on digital access, multilingual content, and localised training. Collaborations with community groups, schools, and NGOs can amplify impact and close persistent digital gaps.

IV. **Adopt and Customise Technological Tools Thoughtfully:** Libraries should strategically integrate tools such as learning management systems, open educational resources (OERs), and AI-based platforms to support teaching, learning, and research. User needs, ethical considerations, and institutional contexts must guide the adoption of these tools.

V. **Develop Frameworks for Evaluating Impact and User Outcomes:** Establish structured models for assessing digital literacy initiatives through both quantitative metrics (e.g., participation, completion rates) and qualitative outcomes (e.g., user confidence, skill application). These assessments should inform program refinement, scalability, and funding justification.

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THE ROLE OF CLOUD COMPUTING ADOPTION IN ENHANCING DIGITAL PRESERVATION OF ACADEMIC LIBRARY RESOURCES

BY

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Abstract

The sudden shift of print to digital format has increased the need for digital preservation systems in the libraries. Knowledge has gone beyond sitting only in human memory and shelves to been stored in digital forms for the current and upcoming generations. As a result, cloud computing has become a transformative tool that offers scalability, flexibility, easier collaboration, long term accessibility, resilience and cost effectiveness in managing task, this makes it striking for digital preservation. Examining global case studies, literature analysis and professional reports. This paper explored the role of cloud computing adoption in facilitating digital preservation of library resources. Precisely, it determined the extent of use in libraries, opportunities it offered and challenges that must be met. The study reported that cloud computing significantly improved the preservation outcome of the library through enhanced storage capacity, long term accessibility, data redundancy or backup, integration with advanced technologies, collaboration and shared repositories. It also ensured that digital collections are not only tightly secured but remain accessible, sustainable and long-term viable. However, challenges such as: financial sustainability, cyber security, legal issues, reliance on Internet and infrastructure and need for technical expertise remains an issue especially in developing countries. This paper concluded that if librarians are particular about preserving information resources for the future generation, then cloud computing should not be considered as merely a technical choice but a task to be embraced thoughtfully, strategically and with care.

Keywords: cloud computing; Digital preservation; Library resources, Academic Library

Introduction

Cloud computing is the delivery of computing services such as networking, storage, software and data bases especially over the internet, allowing institutions to balance resources on demand while reducing the reliability on local infrastructure (mell&Grance,2020) . Digital preservation in academic libraries on the other hand is the set of actions, strategies, and policies that ensure the long term accessibility to digital information beyond changes in technology and user needs (Lavoie, 2014). The intersection of these two concepts is increasingly resourceful because it will bring about an improved service delivery in academic libraries.

Preservation of knowledge from time immemorial has never been reliable. Oral preservation resulted in death of knowledge holder, to ancient manuscripts which were lost to natural disasters such: as fire or flooding down to modern era which led to the presence of libraries. Librarians who have been custodians of knowledge are also charged with the preservation and conservation of cultural and intellectual heritage. With time, collections transformed increasingly from physical to digital space. Libraries are faced with a new reality; digital collections such as digital texts, institutional repositories, digital-born resources, research data and electronic records must be efficiently preserved so that patrons from the present and future can access it with ease and subsequently improve on them. Surprisingly, a study conducted recently depicted that this goal is endangered as data degradation, limited storage capacity, obsolete file formats, problem of verifying authenticity capital intensive maintenance requirements and access over time. (Mabawonku, Babatope, Anyanwu & Akintunde, 2024; Ahmad, Rafiq, & Arif, 2024). Hence without diligent management, digital formats may vanish more quickly than even paper.

Interestingly, cloud computing has the potential of overcoming these challenges by externalizing storage services, upgraded backup systems, intensive management of infrastructures, and in many cases software (Ambrust ,Fox, Griffith, Joseph, , Katz, Konwinski, Lee, Patterson, Rabkin, Stoica, & Zaharia, 2010) Libraries can also gain from shared infrastructures, built- in- redundancy and regular system updates. However, adoption requires careful planning and consideration: there are challenges of data privacy, legal issues, costs and human factors such as attitude of staff and their skills. This paper explored precisely the extent of cloud adoption in libraries, identified opportunities and benefits, highlighted major, identify basic challenges to adoption and supply evidence-based recommendation for library managers and policy makers.

Literature review

The increasing growth of digital resources has made digital preservation a vital responsibility of libraries especially academic libraries. Unlike the print collections, digital resources face the risk of technological obsolescence, hardware failures, and format incompatibility. This threatens their long term accessibility (Lavoie, 2014) to fix these challenges, many organizations are opting to cloud computing as a cost effective and scalable strategy for preservation. Cloud computing known as the delivery of on demand computing resources such as storage, applications and processing power over the internet usually on a pay-per-use format (Ambrose, et al.,2010) it diminishes the weight of maintaining expensive local infrastructure by enabling organizations to access remote, provider managed systems. furthermore, digital preservation refers to the set of managed activities aimed at ensuring the continued authenticity, integrity and usability of digital content overtime (Lavoie,2014) collectively, cloud computing presents a promising avenue for strengthening digital preservation initiatives in academic libraries.

Academic literature on cloud computing and digital preservation in libraries between 2020 to date revealed three distinct stances: to begin with, numerous studies underscored the benefits of cloud computing citing its scalability, affordability and enhanced accessibility. A research work argued that libraries capitalizing on cloud computing storage achieved greater economic efficiency and lessen the strain on internal system (Olanrewaju and Mohammed, 2023). Equally, Liu and Zhang (2023) realizes that cloud systems improved redundancy, data security, strengthen disaster preparedness and recovery through provided backup by vendors.

Secondly, numerous scholars gave emphasis on the challenge of adoption of cloud computing in their research works. For instance, Ibrahim and Musa (2022) underscored that data security, provider dependency and unstable data service as perpetual barriers. Additionally, a case study from South African institutional libraries revealed that institutions faced recurring costs and lots of dependence on external vendors despite the improved access cloud system offered (Moyo, 2022)

Thirdly, there is increase in the adoption of hybrid models by scholars and practitioners, a study by Okafor, Bello and Hassan (2024) strongly recommended the combining of local infrastructure with cloud computing systems would help n reducing risks and ensuring that organisational data remained under control while still benefiting from the scalability of the cloud system.

Findings from empirical studies showed that effective cloud adoption is strongly linked to organizational preparedness, well-defined service agreements and an extensive staff training initiatives.(Garuba & Eze,2023) while the systematic reviews further revealed that institutions using cloud computing systems experience improved interoperability and enhanced meta data governance, ensuring sustained resource visibility (Liu & Zhang, 2023)

Despite the advantages of cloud computing, the challenges are equally documented in literature, Susubashini and Kavitha (2011) noted that the data stored in the cloud is vulnerable to breaches, confidentiality threats and violation of compliance. Marston et al (2011) and Ghosh & Chatterjee (2015) draw the attention to vendor lock-in and unpredictable subscription costs, which can strain institutional budgets and limit flexibility. Most developing regions face additional obstacles; Olarenwaju et al. (2020) observe that erratic or slow internet connectivity hampers remote access and synchronization, undermining the reliability of preservation systems. In addition, Kaur and Chaturvedi (2019) stress that limited staff expertise in cloud technologies often in misconfiguration and errors in metadata management, which in turn compromise preservation quality.

From these perspective, it is glaring that while cloud computing offers academic libraries unprecedented opportunities to strengthen digital preservation. It successful adoption requires a careful governance, capacity building, and infrastructural readiness. The literature however reveals two central strands: the one that underscores cloud computing role as a transformative enabler of preservation and the other of the cautions against not relying too much on it without addressing institutional challenges. This duality provides the foundation for examining how libraries can strategically adopt cloud solutions for sustainable digital preservation especially in academic libraries

Theoretical framework

The Technology Organisation Environment (TOE) influenced the theoretical framework of this paper. It was developed by **Louis G. Tornatzky and Mitchell Fleischer in 1990** in their book *The Processes of Technological Innovation.* TOE explains adoption as a function of three interrelated domains: technological capability, organizational readiness and environmental pressures. Libraries therefore have to balance the perceived advantage of cloud systems (automation,

elasticity and redundancy, with internal capabilities (financial resources and skilled personnel) and external demands (technology policies and legal mandates).
Recent studies showed TOE's relevance for cloud computing adoption in academic libraries. For instance, a systematic review showed TOE to be the dominant framework in organizational level cloud research, most especially in evaluating managerial support, regulatory compliance and infrastructure complaints (Prakash et al., 2021)
In the library sector, Yakubu, Kassim and Husin (2024) revealed that organizational capacity, trust, and environmental pressures jointly influence the inetentions of adoption among Nigerian academic libraries. Similarly, Baalbaki, Shamieh, and Bodolica (2025) depicted that in disruptive contexts, technological factors such as relative advantage and complexity significantly shape cloud adoption decisions. In addition, it has also been confirmed through a TOE based model that technological, organizational and environmental antecedents strongly predict adoption outcomes for cloud computing in micro small and medium sized enterprises. To the present study, the TOE model provides an all-encompassing lens to explain how technological features (such as disaster recovery, backup and scalability) organizational readiness (skills, budget and readiness) and environmental conditions (broadband access, regulations and ICT policy) collectively determine whether academic libraries can successfully adopt cloud computing for a sustainable digital preservation.

Benefits of cloud computing for digital preservation in Academic library

Cloud computing has emerged as a transformative tool for academic libraries, offering scalable, flexible, and cost-efficient solutions that strengthen the long-term preservation and accessibility of digital resources. Cloud computing also presents diverse opportunities for libraries aiming to safeguard their collections. Olanrewaju and Mohammed, (2023) revealed that the consumption model enable libraries to expand or reduce their storage capacity based on their demand without any major capital investment. Cloud providers also offer automated backup services, data replication and integrity checks or validation to support reliable preservation over time. Cloud solutions also support remote connectivity, metadata exchange, joints cataloguing, and strengthens collaboration and partnerships among staff and across multiple institutions. By leveraging shared infrastructure, libraries can cut operational expenses, while maintaining consistently up to date systems. In addition, offsite cloud storage systems further enhances system resilience and disaster recovery capabilities and protecting resources from local hazards including flood, fire, or technical system failures.
Cloud computing providers also offer usage-based-pricing models allowing institutions to rate resources according to demand. Systematic reviews and synthesis work have merged proof of why libraries turn to the adopting cloud computing. For instance, a systematic study in the year 2024 concisely summarize repeated findings that cloud solutions deliver scalability, maintenance burden and help manage features such as versioning, and life cycle policies. (Asim, Arif & Rafiq, 2024). In addition, the study of Mabawonku, Babatope, Anyanwu, & Akintunde, 2024 showed that migrating to cloud storage and other cloud-based systems can reduce capital expenditure and maintenance problems. Moreover, as digital collections grow, more storage ad computing capacity are needed by libraries to scale without needing large upfront infrastructure investment. A recent report revealed that academic librarians see scalability as one of the main reasons to adopting cloud computing (Mabawonku *et al.*, 2024).
Furthermore, cloud solutions are adopted because they offer users and staff to remotely access digital resources. It also enhances collaboration, resources sharing and using consortia models. This becomes useful when staff and users are geographically spread or remote access is vital because of emergencies. In addition, cloud computing providers often duplicate data across multiple locations, which in turn offers versioning, backup and sometimes specialised preservation services such as format migration and fixity checks. However, major technical evidence is not frequently reported in local studies, case literature and theatrical studies both regionally and globally note these as key benefits (Pasqui, 2024). In addition, synthesis note that the technical advantages are necessary but insufficient: successful adoption is tied to organisational preparedness, legal safeguards and up-skilling of staff. Systematic reviews have also shown that libraries adopting cloud solutions achieved greater interoperability and meta data handling (Liu and Zhang, 2023)
The case study provides practical evidence of how cloud solutions reshape preservation practices. For instance, pillen's (2022) case study of an institution archival unit sows that certain services to the cloud make data recovery easy and enabled new automation options such as lifecycle management, scripted fixity checks. Numerous empirical studies conducted recently showed that academic libraries are increasingly adopting cloud computing especially with the purpose of addressing issues of capacity and access pressures For instance, Mabawonku *et al.*, 2024 research revealed that cloud systems improved remote access and staff collaboration. In addition, a study has shown how cloud computing can help libraries meet these prerequisites effectively and efficiently. For example, a research by Pasqui, 2024 titled "digital curation and long-term digital preservation in libraries gives emphasis on how cloud computing services reduce the stress of maintaining local hardware and enhances a more robust preservation facilities by sharing resources and using platforms managed by specialists. Correspondingly, Mabawonku *et al.* (2024) did a survey across academic libraries in Lagos and Ogun states, Nigeria. His research findings revealed that cloud computing is used for preserving

digital resources, enhancing accessibility and promoting collaboration amongst staff and user. Moreover, another study by Okuonghe & Bakare-Fatungase (2023) titled "cloud computing; a tool for effective records and Information management system in Nigerian academic libraries" highlighted the utility of cloud computing in preserving records, especially those generated by library activities such as; logs, administrative documents and metadata. Most often when the local backup or power is erratic.

Challenges in the adoption of cloud computing in academic libraries.

Despite the immense value cloud computing has on preservation in this digital age, several barriers limit its seamless adoption. Recurring subscription fees, data transfer charges and platform-switching costs can strain library finances (Adewale & Kingsley, 2023). In addition, Ibrahim and Musa (2022) research revealed that poor connectivity undermines effective cloud integration and cloud synchronization especially in low income countries where ICT infrastructures are inadequate. Furthermore, persistent worries about data breaches, privacy and regulatory compliance to data protection remains a pressing challenge in cloud adoption. Reliance on cloud providers, especially when proprietary formats and ambigious exit plans are involved disrupts libraries seeking to switch vendors or repatriate their data. Moreover, lack of skilled personnel may hinder the effective adoption of cloud computing, hence, causing errors in system setup and metadata management.

The study of Ahmad *et al.* (2024) showed that while cloud services reduce upfront cost, repeated subscription payment, outbound data costs and reconfiguration expenses can accumulate and surpasses expected budgets. In addition, he highlighted that libraries worry about reliance on single vendors or proprietary systems. Transferring large data sets from one provider to another can be very expensive and tedious. However, adoption does not only depend on technology alone but on staff skills and institutional preparedness such as: staff expertise, change management, training and management support which are equally critical (Mabawonku *et al.*, 2024). It is also worthy to note that libraries must take cognizance of copyright, intellectual property, sensitive user data, and national or institutional rules and regulations when adopting cloud computing (Pasqui, 2024). Infrastructural constraints and connectivity is also a challenge as in many developing countries, Internet bandwidth, reliability and price remains a key challenge. In the absence of a reliable, high speed Internet, remote access and cloud synchronization become compromised (Okunghae &Bakare-Fatangase, 2023; Mabawonku *et al.*,2024)

Conclusion

Cloud computing is changing the approach of digital preservation in academic libraries. With its scalable systems, improved accessibility, and collaborative capabilities, it mitigates the shortcomings of conventional preservation practice. Nevertheless, migrating to cloud-based preservation is complex and requires strategic planning, strong governance structures and sustained development for staff. So, by taking strategic approach and securing robust contractual agreements. Libraries can protect the integrity, authenticity, safety and accessibility of their digital collections for generations to come. Hence, librarians and policy makers ought to treat cloud implementation as a long term sustainable investment in knowledge preservation

Recommendations

The following recommendations are made:

1. To fully harness the benefits of cloud computing for digital preservation, particularly in academic libraries, a deliberate and carefully structured strategy must be implemented. The universities or institutions concerned should start by improving institutional readiness through specialised trainings, professional workshops formal certifications to enable staff to become competence in cloud technologies. Concurrently, libraries should establish governance frameworks that is in cognizance with global benchmarks, such as ISO 16363, to provide a clear roadmap to guide implementation.
1. The library management or administrators and institutional policy makers should negotiate with reliable vendors contracts that have comprehensive service-level agreements (SLAs) is key to safeguarding data portability, ensure service reliability and providing remedies for service disruptions. Furthermore, working jointly with broadband providers to upgrade ICT Infrastructures will guarantee dependable access and effective integration with cloud systems especially in regions facing connectivity limitations.
2. Library management, in collaboration with ICT units and policymakers should adopt a blended preservation approach. This will allow academic libraries to maintain control of sensitive collections locally while leveraging the scalability, fault tolerance and collaborative capabilities of cloud solutions.
3. Library administrators, working with finance departments and governing boards, should conduct ongoing monitoring and cost-benefit analysis. This are crucial to maintaining financial sustainability and ensuring that cloud adoption continues to deliver long-term value instead of a liability.

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THE POSITION OF ARTIFICIAL INTELLIGENCE (AI) TOOLS IN MARKETING ACADEMIC LIBRARY SERVICES: A STUDY OF GLOBAL PRACTICES

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Abstract

In the evolving digital landscape, academic libraries face growing pressure to enhance visibility, user engagement, and service delivery. This paper examines the integration of Artificial Intelligence (AI) tools in the marketing of academic library services, with a specific focus on global practices and trends. The study investigates how libraries across different regions adopt and apply AI technologies, such as chatbots, recommendation systems, predictive analytics, and virtual assistants, to promote services, tailor user experiences, and optimize outreach efforts. Employing a qualitative content analysis approach, the research synthesizes data from scholarly articles, institutional reports, and case studies from North America, Europe, Asia, and Africa. It explores key factors influencing the adoption of AI tools, including technological infrastructure, staff competence, institutional policy, and funding availability. The paper also highlights successful use cases, such as AI-driven personalized search services, automated reference support, and targeted information dissemination via social media platforms. Findings reveal a growing awareness of AI's potential to revolutionize library marketing, although disparities exist in adoption levels due to regional and institutional variations. Libraries in technologically advanced settings demonstrate higher engagement with AI tools, while institutions in developing regions often face implementation challenges linked to resource constraints and skill gaps. The study also identifies ethical concerns, including data privacy, user consent, and algorithmic bias, that must be addressed to ensure responsible use. This paper concludes by proposing strategic recommendations for academic libraries seeking to adopt AI tools for marketing, including capacity building, stakeholder collaboration, and policy development. It underscores the transformative potential of AI in repositioning academic libraries as proactive, data-informed, and user-centered knowledge hubs in the digital age.

Keywords: Artificial Intelligence (AI) Tools, Library Marketing, Academic Libraries, Global Practices, User Engagement.

1. Introduction

Artificial Intelligence (AI) is transforming how academic libraries not only deliver and manage services but also market their value to increasingly diverse and digitally oriented user communities. As academic libraries evolve into hybrid digital–physical spaces, AI tools are becoming central to marketing strategies, enabling targeted outreach, personalized communication, and enhanced user engagement (Hussain, 2023; Adetayo, 2023). This shift reflects the broader digital transformation across higher education and the knowledge sector, where visibility and relevance are crucial for sustaining user interest.

In today's competitive information environment, academic libraries are under growing pressure to promote their services effectively and demonstrate impact. Traditional marketing approaches, while still useful, are insufficient in an era defined by digital disruption, rapidly shifting user expectations, and competition from commercial information providers (Oguntoye, Olafimihan, & Ajibare, 2024).

Within this context, AI-driven tools such as chatbots, recommendation systems, predictive analytics, and automated content generation offer innovative solutions for library marketing, allowing libraries to personalize experiences, optimize communication, and leverage

data for evidence-based promotional strategies (Kyumana, 2025).

Globally, academic libraries are experimenting with AI to strengthen their marketing and outreach, yet the extent of adoption, the particular tools employed, and their effectiveness vary widely across regions and institutions. These variations are shaped by differences in resources, technological infrastructures, and institutional priorities (Cox, Pinfield, & Rutter, 2019).

Despite growing interest, scholarship on how AI tools are positioned in the marketing of academic library services remains limited, especially from a comparative international perspective.

This study investigates the current position and application of AI tools in marketing academic library services across different countries. Specifically, it explores how libraries are integrating AI into their marketing practices, the motivations driving adoption, the challenges encountered, and the emerging global trends shaping this transformation. By drawing on global practices, the study provides a comparative perspective that highlights both innovation and disparity in AI adoption, offering insights for academic libraries seeking to future-proof their marketing strategies in a digitally driven world.

Research Objectives

1. To investigate the current position of Artificial Intelligence (AI) tools in marketing academic library services across different regions.
2. To identify the types of Artificial Intelligence (AI) tools that are being integrated into marketing practices in academic libraries in different regions.
3. To examine the challenges encountered by academic libraries in integrating AI tools into their marketing practices in different regions.
4. To explore the strategies adopted by academic libraries to address the challenges for the improvement of AI-driven marketing practices.

Research Methodology

Research Design

This study adopted a documentary research design to investigate the position of Artificial Intelligence (AI) tools in marketing academic library services, with reference to global practices. Documentary research was considered appropriate because it allows for the systematic examination and interpretation of existing documents to generate knowledge (Mogalakwe, 2006; Ahmed, 2010). This approach is particularly useful when primary fieldwork is not feasible, yet sufficient secondary data exists to address the research objectives.

Data Sources

The study relied exclusively on secondary data obtained from a wide range of documents. These included scholarly journal articles, conference papers, case studies, institutional reports, and professional publications accessed through major academic databases and reputable web sources. As Bowen (2009) notes, the use of multiple sources in documentary research enhances the credibility and depth of the study by allowing triangulation of evidence. Sources were selected based on their relevance to the study's focus on AI applications in academic libraries, especially their role in promoting and marketing library services.

Data Analysis

The analysis involved a critical review and synthesis of findings reported in existing empirical studies on the implementation of AI tools in academic libraries. According to Hart (1998), literature review and synthesis help to identify patterns, evaluate trends, and reveal gaps in knowledge. By comparing global experiences and reported practices, the study identified patterns, benefits, challenges, and emerging trends in the integration of AI into library marketing.

Justification for Research Method

Primary data collection methods such as surveys, interviews, or field observations were not employed. This was because the research sought to capture a broad, global perspective of AI applications in academic libraries rather than focus on a single institutional or regional context. Furthermore, as Mouton (2001) argues, where substantial empirical evidence already exists, documentary research offers an efficient and valid means of addressing the research objectives without the constraints of fieldwork.

Limitations of the Method

Despite its strengths, relying solely on documentary research presents certain limitations. The findings are restricted to what is available in published and accessible literature, which may not fully capture recent developments, unpublished practices, or localized experiences of AI adoption in academic libraries. Additionally, the study is dependent on the interpretations and perspectives of previous authors, which may introduce bias and limit the ability to validate findings independently (Bowen, 2009).

Ethical Considerations

Although this research did not involve direct human participants, ethical standards were carefully observed in the collection and use of secondary data. All sources of information were properly acknowledged through accurate citation and referencing to avoid plagiarism and intellectual dishonesty. As Cohen, Manion, and

Morrison (2018) emphasize, ethical considerations in documentary research include transparency, accurate reporting, and respect for intellectual property. Care was taken to present existing findings objectively, without misrepresentation of authors' work, and to respect the integrity of original scholarly contributions. In addition, the study ensured that only credible and reliable sources were consulted, thereby upholding academic integrity and transparency.

Results and Discussion

This section presents and interprets the findings of the study in relation to the four stated objectives. To structure the discussion, the first objective focuses on the current position of AI tools in academic library marketing across regions. The second objective identifies the specific types of AI tools being integrated into marketing practices. The third objective examines the challenges hindering effective AI adoption, while the fourth explores the strategies libraries employ to address these challenges and improve AI-driven marketing practices.

Together, these results provide a comprehensive understanding of how AI is shaping library marketing globally, highlighting both regional variations and common trends

Objective 1: To investigate the current position of Artificial Intelligence (AI) tools in marketing academic library services across different regions.

Response to the Objective

The current position of Artificial Intelligence (AI) tools in marketing academic library services across different countries reflects a landscape of both adoption and uneven development. In advanced contexts such as North America and Europe, AI tools are increasingly embedded into library marketing strategies, particularly through personalized recommendation systems, AI-driven chatbots, predictive analytics, and automated content delivery to engage users more effectively (Cox et al., 2019; Huang, 2024). Academic libraries in these regions leverage AI to segment audiences, track user behavior, and deliver targeted marketing campaigns that enhance visibility and outreach.

In emerging economies, including parts of Africa, Asia, and Latin America, the adoption of AI for marketing academic library services remains limited, often constrained by infrastructural challenges, inadequate funding, lack of skilled personnel, and concerns over ethical use of data (Orubebe, Oloniruha & Oladokun, 2024; Kyumana, 2025). While some institutions have begun experimenting with AI-powered discovery tools and social media analytics for outreach, such practices are not yet mainstream.

Globally, there is also variation in how AI adoption aligns with institutional priorities: while some universities use AI strategically to build stronger digital presence and improve scholarly visibility, others remain focused on traditional marketing methods. Importantly, there is a growing recognition across regions that AI has the potential to transform library marketing into a more dynamic, data-driven process, but its actual position varies significantly depending on regional readiness, policy support, and technological infrastructure.

Discussion

The integration of Artificial Intelligence (AI) tools into the marketing of academic library services is gaining attention worldwide, but the degree of adoption and implementation varies considerably across regions. In developed countries such as the United States, Canada, and parts of Europe, AI applications are increasingly becoming central to library marketing strategies. For example, libraries employ AI-driven recommendation systems, predictive analytics, and automated communication platforms to personalize outreach and enhance user engagement (Cox, Pinfield, & Rutter, 2019; Asim, Arif, Rafiq, & Ahmad, 2023). Chatbots, such as those integrated into library websites, are being used to provide round-the-clock assistance while simultaneously collecting data on user needs, which feeds into targeted marketing efforts (Kaushal & Yadav, 2022; Abba, 2024; Kyumana, 2025). Such practices position AI not only as a tool for service delivery but also as a driver of strategic promotion and visibility of library resources and services.

In contrast, in developing and emerging economies, particularly across Africa, Latin America, and parts of Asia, the use of AI in marketing library services is still nascent. Several studies highlight infrastructural and financial limitations as significant barriers to adoption (Abba, 2024; Kyumana, 2025). Additionally, lack of technical expertise among library staff and insufficient policy frameworks slow down the integration of AI into marketing activities. Where AI tools have been adopted, they are often limited to social media analytics, automated alerts, or experimental chatbot services, rather than fully integrated marketing systems (Sapri, Rashid, & Tarmizi, 2024). This unevenness underscores a digital divide in how AI is positioned globally in academic library contexts.

Another important dimension is the perception and readiness of librarians themselves. While there is growing recognition of AI's potential to improve marketing by making library services more visible, discoverable, and user-centered, skepticism and ethical concerns persist. Issues of data privacy, algorithmic

transparency, and potential biases in AI-driven tools pose challenges to widespread acceptance (Fernandez, 2021). This suggests that the position of AI in library marketing is not simply a matter of technological capacity but also of cultural and ethical negotiation within academic institutions.

Overall, while the global picture reflects uneven adoption, there is a clear trend toward embracing AI in library marketing as institutions seek to remain competitive in digital environments. The current position can be characterized as advanced and innovative in developed regions, exploratory and experimental in emerging contexts, but universally recognized as a growing necessity for sustaining relevance in academic knowledge dissemination.

Objective 2: To identify the types of Artificial Intelligence (AI) tools that are being integrated into marketing practices in academic libraries in different regions.

Response to the Objective

Artificial Intelligence (AI) tools are increasingly being adopted by academic libraries worldwide to enhance their marketing strategies, improve user engagement, and extend outreach. The types of AI tools integrated into marketing practices vary across countries, but several categories are particularly prominent.

1. Chatbots and Virtual Assistants

Many libraries use AI-driven chatbots to provide real-time responses, answer frequently asked questions, and guide users to resources. For example, academic libraries in the United States and the United Kingdom have implemented chatbots such as LibChat and custom-built conversational agents to support marketing campaigns by maintaining constant communication with patrons (Huang, Cox, & Cox,(2023; Ehrenpreis & DeLooper, 2022). In India and South Africa, similar tools are used to create awareness of services and events, thus functioning as interactive marketing agents (Orubebe, Oloniruha, & Oladokun, 2024; Akinyemi,2023).

2. Recommendation Systems and Personalization Tools

AI-driven recommendation engines are used to personalize communication with library users, suggesting books, journals, and digital resources based on prior searches or borrowing history. Libraries in China and Singapore, for example, employ data mining and machine learning techniques to target marketing messages and resource promotions to specific user groups (Zhou & Hu, 2020; Zhang & Ye, 2022).

3. Social Media Analytics Tools

AI-enabled analytics platforms help libraries track engagement and sentiment on platforms such as Twitter, Facebook, and Instagram. Academic libraries in North America and Europe use tools like Hootsuite Insights and Sprout Social to optimize campaigns and reach wider audiences (Fister & Paxton, 2020). In African countries, where social media is a dominant marketing channel, AI-powered analytics are increasingly used to understand user behavior and tailor outreach strategies (Oguntoye, Olafimihan & Ajibare, 2024;Kyumana, (2025).

Natural Language Processing (NLP) Tools

NLP technologies are applied in academic libraries to analyze user queries, monitor feedback, and generate insights for service promotion. In the Middle East, some universities have adopted NLP-based sentiment analysis to refine library marketing strategies (Al-Daihani & Abrahams, 2021).

Predictive Analytics and Data Mining

Academic libraries in technologically advanced regions such as North America, Europe, and parts of Asia employ AI-powered predictive analytics to forecast user needs, identify trends, and proactively market relevant services. For instance, predictive modeling helps determine peak times for marketing campaigns or the types of resources that may gain traction among students (Cox, Pinfield & Rutter, 2019).

6. Content Generation and Automation Tools

AI-based content creation tools, including automated newsletter generators and AI-assisted writing platforms, are emerging in marketing practices. In European universities, libraries use AI tools to draft promotional blog posts, design flyers, and automate email campaigns, ensuring consistent communication with users (Sapri, Rashid, & Tarmizi, (2024).

Overall, the adoption of AI marketing tools in academic libraries is uneven across regions. While developed countries employ advanced analytics, personalization, and automation tools, developing regions are largely utilizing chatbots, social media analytics, and basic recommendation systems due to resource and infrastructure limitations. Nonetheless, a global trend indicates that AI-driven tools are becoming indispensable in strengthening marketing practices, thereby improving visibility, user experience, and the perceived value of academic libraries.

Discussion

The findings indicate that academic libraries across different regions are adopting a range of AI tools to strengthen their marketing practices, though the level of sophistication varies significantly. Academic libraries in

technologically advanced countries have moved beyond basic applications to embrace predictive analytics, personalization, and automation, enabling them to deliver highly targeted and data-driven marketing campaigns (Zhou & Hu, 2020; Sapri, Rashid, & Tarmizi, 2024). By contrast, academic libraries in developing regions are primarily leveraging chatbots and social media analytics, which are more accessible and cost-effective yet still impactful in enhancing visibility and user interaction (Adeniran & Ajayi, 2021). This uneven adoption highlights both opportunities and challenges. On one hand, AI tools are expanding the reach and efficiency of marketing strategies by offering personalized recommendations, automating routine communications, and deepening user engagement (Al-Daihani & Abrahams, 2021).

On the other hand, disparities in infrastructure, funding, and technical expertise limit the extent to which some libraries particularly in Africa and parts of Asia can harness advanced AI capabilities. These findings align with global scholarship suggesting that AI adoption in libraries reflects broader socio-technical divides while also underscoring the transformative potential of AI in redefining how libraries communicate their value to stakeholders (Adjei & Agyeman, 2024; Sapri, Rashid, & Tarmizi, 2024).

Overall, the evidence suggests that while AI is not yet uniformly integrated into academic library marketing practices, it is steadily reshaping the field by enabling more dynamic, interactive, and user-centered approaches to outreach. Bridging the gap between developed and developing contexts remains critical if academic libraries worldwide are to fully capitalize on the potential of AI for effective marketing.

Implications for Practice

The findings suggest that academic libraries should strategically align their marketing approaches with the AI tools most feasible within their contexts while gradually building capacity for more advanced applications. Libraries in developing regions can strengthen their outreach by maximizing cost-effective tools such as chatbots and social media analytics, while seeking collaborations, training, and infrastructural support to adopt predictive analytics and personalization systems in the future. Conversely, libraries in advanced economies should continue leveraging automation and data-driven tools but also ensure that ethical considerations, such as user privacy and transparency, guide their adoption. By tailoring strategies to local realities, libraries can enhance visibility, foster stronger user engagement, and position themselves more effectively in the evolving information landscape.

Objective 3: To examine the challenges encountered by academic libraries in integrating AI tools into their marketing practices in different regions.

Response to the objective

The integration of Artificial Intelligence (AI) tools into academic library marketing is not without significant challenges, which vary across countries due to infrastructural, cultural, and policy differences. A foremost challenge is the issue of funding and resource allocation. In developing regions, such as parts of Africa and South Asia, limited financial resources constrain libraries' ability to acquire, maintain, and train staff on AI-driven marketing tools (Okike & Popoola, 2021). In contrast, libraries in developed countries like the United States and Germany may face fewer financial barriers but encounter ethical concerns and user privacy issues, particularly in relation to data collection for personalized marketing (Fernández-Toro & Calzada-Prado, 2020).

Another challenge is the lack of skilled personnel. Successful implementation of AI marketing tools requires librarians with expertise in data analytics, machine learning, and digital communication. Many libraries in emerging economies report gaps in professional development opportunities, leading to resistance or slow adoption of AI tools (Abba, 2024).

Even in technologically advanced contexts such as China, staff training remains a concern, as rapid AI adoption outpaces librarians' readiness to fully utilize these tools (Zhang & Ye, 2022).

In addition, infrastructure limitations including unreliable internet connectivity, insufficient ICT facilities, and inadequate technical support pose major barriers in many countries, particularly in sub-Saharan Africa (Adeniran & Ajayi, 2021). These infrastructural constraints hinder the use of chatbots, recommendation systems, and automated outreach platforms that rely heavily on stable networks.

Cultural and policy-related issues also play a role. In some regions, skepticism toward AI tools in educational environments creates cultural resistance, with librarians and patrons expressing concerns about job displacement, loss of human touch, or overreliance on technology (Ifijeh & Yusuf, 2020). Furthermore, policy and regulatory frameworks especially concerning data protection pose challenges. For instance, the European Union's General Data Protection Regulation (GDPR) has complicated the deployment of AI-driven personalized marketing, requiring strict compliance

mechanisms that many academic libraries struggle to meet (Bradley, 2022).

The findings directly address the research objective by demonstrating that the challenges of AI integration into academic library marketing are multifaceted and context-specific. While financial and infrastructural barriers dominate in developing countries, ethical, regulatory, and skill-related issues are more prevalent in developed contexts.

Implication for Practice

Recognizing these challenges is crucial for academic libraries globally. Academic libraries should pursue capacity-building initiatives for staff, advocate for policy frameworks that balance innovation with user protection, and explore cost-effective AI solutions suitable for their local contexts. By doing so, libraries can strategically navigate these barriers and optimize the benefits of AI in enhancing user engagement and service visibility.

Objective 4: To explore the strategies adopted by academic libraries to address the challenges for the improvement of AI-driven marketing practices.

Academic libraries are increasingly adopting adaptive strategies to overcome challenges in implementing AI-driven marketing practices. These strategies include investing in staff training and digital literacy to build capacity for AI adoption (Cox, Pinfield & Rutter, 2019), forming collaborations with technology providers and other institutions to share expertise and reduce costs (Orubebe, Oloniruha, & Oladokun, 2024), and adopting open-source or low-cost AI tools to mitigate financial constraints (Huang, 2024). Libraries also emphasize ethical guidelines and user privacy frameworks to address concerns of data security and trust (Adeniran & Ajayi, 2021; Bradley, 2022). By integrating these approaches, academic libraries enhance their ability to leverage AI effectively for targeted outreach, personalized services, and improved user engagement.

Implications of the Study

The implications drawn from the research objectives of this study:

The study highlights that the integration of AI tools into marketing academic library services is no longer optional but a strategic necessity for enhancing visibility, personalization, and user engagement globally. Findings on the current position of AI demonstrate varying levels of adoption across countries, underscoring the need for context-specific approaches to implementation. Identifying the types of AI tools in use such as chatbots, recommender systems, and predictive analytics offers libraries practical guidance on selecting technologies aligned with their institutional goals and user needs.

The challenges revealed, including infrastructural limitations, staff capacity gaps, ethical concerns, and budgetary constraints, emphasize the importance of policy development, training, and sustainable investment to ensure equitable adoption, especially in developing contexts. The strategies identified such as partnerships, capacity-building programs, phased adoption, and user-centered policies provide actionable pathways for libraries to overcome barriers and optimize AI-driven marketing.

Overall, the study implies that while developed countries may continue to set the pace in innovative applications of AI in library marketing, developing countries can leverage adaptive, collaborative, and resource-conscious strategies to bridge the gap, ensuring AI adoption fosters inclusivity, sustainability, and global competitiveness in academic libraries.

Conclusion

This study demonstrates that Artificial Intelligence (AI) is increasingly shaping the marketing of academic library services globally, though adoption varies across countries. The findings reveal that libraries are integrating diverse AI tools such as chatbots, recommender systems, and data analytics platforms to enhance user engagement, personalize services, and optimize outreach. However, integration is not without challenges, as issues of funding, digital infrastructure, staff expertise, and ethical considerations differ across developed and developing contexts. To address these barriers, academic libraries are employing a range of strategies, including capacity building, partnerships, policy development, and phased implementation approaches. Collectively, these insights highlight both the transformative potential of AI in library marketing and the need for context-sensitive strategies to ensure equitable and sustainable adoption worldwide.

Limitations of the Study

This study is limited by several factors. First, in investigating the current position of AI tools across countries, the findings rely heavily on available literature and reported practices, which may not capture undocumented or emerging initiatives, particularly in under-researched regions. Second, while identifying the types of AI tools adopted, variations in terminology and inconsistent reporting across countries may have restricted the comprehensiveness of the analysis. Third, the examination of challenges faced by academic libraries is constrained by the context-specific nature of such issues, meaning the findings may not be generalizable to all countries or institutional settings.

Finally, in exploring strategies adopted to address these challenges, the study is limited by the scarcity of detailed, empirically validated accounts of AI-driven marketing practices, especially from developing countries, which narrows the scope for drawing robust comparative conclusions.

Future Research Directions

Building on these limitations, future research should prioritize empirical case studies across diverse regional and institutional contexts to better capture practical applications of AI in academic library marketing. Comparative studies between developed and developing countries could provide deeper insights into contextual differences in adoption, challenges, and strategies. Longitudinal research is also recommended to trace how AI tools evolve in marketing practices over time and to assess their long-term impact on library-user engagement. Furthermore, mixed-methods approaches that integrate surveys, interviews, and usage data could generate richer evidence, enabling more comprehensive and generalizable conclusions about AI-driven marketing practices in academic libraries.

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USING SOCIAL MEDIA PLATFORMS IN LIBRARY SERVICE DELIVERY: AVENUES FOR INFORMATION DISSEMINATION AND BUILDING USERS' CONFIDENCE IN LIBRARY

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Abstract

This research paper focused on 'Using Social Media Platforms in Library Service Delivery: Avenues for Information Dissemination and Building Users' Confidence in Library'. It is a conceptual research article which adopted systematic literature review, a method that entails critical review of relevant scholarly publications in order to collect relevant data. National and international journal articles, conference papers & proceedings, textbooks, online information sources etc. were accessed and reviewed accordingly. Findings on research objective one revealed that SMPs are known and widely used for library service delivery, especially, among the academic and national library clients. On research objective two, findings show that various types of SMPs are involved in library service delivery, which include social networking sites, media sharing networks, discussion forum, blogging and publishing networks, messaging and private community platforms and visual bookmarking & curation sites. On the third research objective, findings revealed that users build confidence in using library where SMPs are integrated to library service. However, this is more prominent among the digital native. On the fourth research objective, findings revealed that, as adoption of SMPs to library service delivery has certain challenges and consideration. For instance, inadequacies in connectivity infrastructure, issue of training librarians, issue of user privacy, cyber bullying, fraud and addiction. It is recommended that other type of libraries should adopt SMP in library service delivery. Adopting SMP relevant to peculiar need of the library is recommended. Adoption of SMP among libraries should be encouraged and sustained.

Keywords: Social Media Platforms, Library Services Delivery, Information Dissemination, Users' Confidence in Library.

Introduction

Using social media platforms have become a habitual part of everyday life in our contemporary world. Social media platforms have taken over the conventional means of communication among people and established institutions, because of their efficiency. According to Olugbenga, Zubairu, & Hamzat (2022) social media platforms are modern interactive communication channels through which persons with common interest, reach out to one another to share knowledge, experiences, messages and information. The distinctive nature of social media platforms from conventional method of communication is their interactive ability which allows users to communicate from anywhere and anytime via internet connection with smart devices. Social media platforms provide avenue to create, share or exchange message, ideas, pictures and videos in virtual communities and networks.

Social media offers libraries real-time avenues for disseminating information, promoting resources, and fostering trust among users by making services more

transparent, interactive, and user-centered. Libraries, as information hubs, are increasingly adopting social media platforms such as Facebook, Twitter (X), WhatsApp, Instagram, YouTube, and LinkedIn to engage users, promote services, and enhance visibility. By leveraging on these platforms, libraries can disseminate information faster, attain wider coverage and maintain strong connections with users. Anari (2013) stated that libraries utilize social media platforms to provide services to visitors and to create an environment of mutual interaction in order to create avenue for sharing views, experiences, ideas and opinions with users. Emergence of social media has expanded the operational status of libraries towards effective library service delivery. More importantly, consistent engagement, transparency, and responsiveness through social media can build users' confidence in library. Thus, the integration of social media into library operations not only enhances visibility but also reinforces the library's role as a trustworthy and dynamic information provider. Hence, Librarians are expected to take advantage of the technology to share knowledge and provide effective and efficient library services to meet information needs of library users, especially the digital natives.

Ilesanmi & Mabawonku (2020) stated that library services are activities carried out in library to satisfy information needs of its users. Such services include user education, reference service, current awareness and document delivery among others. Library services could be delivered to the users through the use of social media platforms. Individual, groups of people and organisations have been using social media space for different purposes such as breaking news, advertisement, send and receive Microsoft office files, portable document format and images attachments, send and receive links to mention a few on personal ground, corporate level or both.

For effective service delivery, social media platforms, according to Chakrabarti (2016) bring library closer to the users and build a collaborative platform for the users, ease users' registration. Through social media platform, Librarians can generate reading list and promote reading culture among their client. It gives room for users to update, modify and place/hold on, a material needed via their mobile phone or other smart devices, users can get answers to specific queries by using social media, it enhances reference service.

Objective of the Study

The broader objective of this research paper is to produce opinionated position on 'using social media platforms in library service delivery: avenues for information dissemination and building users' confidence in library'. However, the specific objectives of the research are to:

1. Determine Concept and Definition of Social Media Platforms in Library Service Delivery
2. Determine Types of Social Media Platforms in Library Service Delivery
3. Ascertain Using Social Media Platforms in Building User' Confidence in Library
4. Find out Challenges and Considerations in Using Social Media Platforms in Library Service Delivery

Literature Review

The practice of information dissemination and technology enhanced service delivery in organizations, have raised motivation to adopting technology platforms for improving services delivery in order to meet up with the demands of the 21st Century users. With the explosive growth in the number and use of social media in everyday communication method for individuals and organizations, there has been a corresponding increase of its incorporation in teaching and learning especially in education industry. Hence, using social media platforms for library service delivery can significantly improves user engagement, increases the visibility and accessibility of library resources, and allows for dynamic, real-time communication. This leads to greater user satisfaction, broader awareness of services, and the ability to provide information outside of physical library hours. Studies have shown that awareness and perception constitute important factors in the use of emerging technology for personal use with paucity of literature on the use of social media platforms for library service delivery (Ilesanmi & Mabawonku 2020).

The use of social media is relevant to information service delivery and knowledge sharing which could lead to enhanced effective service delivery in the library. Library/information services can be delivered to users through conventional, virtual or hybrid methods. To Ishola (2014), university libraries rendered translation, registration, abstract and indexing, documentation, and current awareness services, among others. For library service delivery, social media platforms are not too new technologies in academic libraries in Nigeria. For instance, Kenneth Dike Library - University of Ibadan operates a Facebook and Twitter handle to disseminate information to their users and so do other libraries like UNILAG, LAUTECH and the likes. Aina, (2014) identified library services rendered by librarians to include: library notices, Online Public Access Catalogue (OPAC), loans, reservation, registration,

dissemination of information, current awareness and reference service. Other library services are library orientation, information literacy programme and electronic resources. Although, pertinently put, social media platforms have shifted the idea of library services from consumption base to more interactive and collaborative one, creating opportunity for interaction between the library and users, hence, increase user convenience and confidence in sustained library service demand and utilization.

However, it is observed that social media platforms, as contemporary technologies being adopted in library practices present a lot of challenges to librarians. Librarians must be mindful of use of social media platforms. Information shared on social media platforms can be used by clients, other professionals and the public to form opinions. Some librarians are not really familiar with social media platform other than Facebook and Twitter. When they do, they use it mainly for social interaction and sharing personal information with friends instead of professional purposes. This could be attributed to factors like poor awareness, inadequate internet access, lack of ICT literacy skills and lack of computer skills.

Methodology

This paper is a conceptual research effort. Hence, the researchers adopted systematic literature review, where critical review of relevant and related literature from various scholarly publications was embarked upon. This effort is geared towards collecting relevant data to the study, especially on 'concept and definition of social media platforms in library service delivery', 'types of social media platforms in library service delivery', 'using social media platforms in building users' confidence in library' and finally, 'challenges and considerations in using social media platforms in library service delivery'. Therefore, local, national and international journal articles, conference papers & proceedings, textbooks, online information sources etc. were searched, accessed and reviewed and acknowledged in accordance with research ethics.

Result and Discussion of Findings

Concept and Definition of Social Media Platforms in Library Service Delivery

Social media platform is really a set of technology based 'Apps' that have re-engineered what the Internet could always do, which allow people to share thought, message, information, idea and knowledge. Social media platform allow people to communicate more easily, sharing ideals, video and other related materials which might be form elsewhere or their own user-generated contents. Some of the social media sites prominently used by librarians in delivering library services to users include Facebook, Twitter, Blog, WhatsApp, Flicker, LinkedIn and YouTube. In the opinion of Akagha (2021), information can be shared among people through various medium, and one important way is through social media, given the reality of our time, where questions, situations, issues and challenges are handled, addressed and solved electronically within a space of time. Generally, social media platforms can be regarded as a means or medium used to transmit and communicate ideas, views, opinions, videos and pictures from persons, groups to either or both. They are mediums used in transmitting, interacting, collaborating and sharing of information to users irrespective of their location and it usually during reference services delivery in the library.

Types of Social Media Platforms in Library Service Delivery

Akagha, (2021) stated that library service can be accomplished through various so call media platforms such as **Facebook -** most popular social media platform implored by users for interaction and sharing of information and used by libraries to create awareness and market library resources and services. **Blogs -** used to broadcast news and market library resources and services. **Twitter -** used to send messages to friends, colleagues and friends easily and fast. It can be used to create library services alert and library users can also use it to interact with librarians. **WhatsApp** – use for instant messaging, send audio messages, photos, videos, documents, images etc. Mohd and Aditya (2017) stated that WhatsApp has been found very useful in the promotion of relevant communication among library staff and between library staff and library users where it helps in getting useful feedbacks from patrons. **Pinterest -** use to organise and share resources and for marketing the library and its contents (Gallardo, 2013). Dudenhoffer (2014) reported that libraries can create their own profiles where they pin photos of the library/events or quotes encouraging the use of the library for promotional display. Pintrest can be used to pin book covers; showcasing historic archives, learning-related infographics, creating reading lists, sharing new acquisitions, craft projects, etc., promoting library activities (add fliers, etc.), collecting ideas, materials, library displays, etc. highlighting library staff and, showing off things in the local community/library pictures. **Library Thing -** enriches the library OPAC. Once an account is created, a list of books with ISBNs is sent to Library Thing which sends back a piece of code which is pasted into the footer of the Library

OPAC. Librarians can utilize this to send a list of current publications to usersm (Egbukole, 2017).

Olugbenga, Zubairu, & Hamzat (2022) highlight different types of social media platforms commonly used among people, especially in Nigeria to include: Facebook, Twitter, WhatsApp, YouTube, Blog or otherwise called web blog, Google+, LinkedIn and Instagram.

- **Facebook:** a free social networking website which gives users opportunity to create profiles, upload photos, videos and receive messages thereby remaining connected with friends, families across the world.
- **Twitter:** allows users to send, receive and read short character messages known as "Tweets". **WhatsApp:** allows people to exchange messages free of any SMS charge. This service is available and accessible via smart devices.
- **YouTube:** Use for posting videos especially in marketing library resources.
- **Blog or otherwise called web blog**: is an informational or discussion site on the web. It consists of posts (discrete entries) where the most recent appears first.
- **Google+:** It consists of group of friends/colleagues who are interested in thought leadership and technology and not purely friends or business contacts (as in Facebook or LinkedIn respectively).
- **LinkedIn:** Allows users to manage list of contact details within people in the same level of connections, especially in academic and research.
- **Instagram:** Permit users to send visual images and photos that offer stylized filters for photographs and images.

Using Social Media Platforms in Building User' Confidence in Library

Use of social media encourage greater social interaction via electronic devices providing greater access to information and information sources, encourage creativity between individuals and groups, creating a sense of belonging among users of common media tools, proving more choice to promote engagement among different individual and group. Reducing barriers to group interaction and communication such as distance and social/economic status and increasing the technological competency levels of frequent users of social media. For instance, Jain (2013) stated that Flicker is a good marketing tool use to sensitise library patrons on the resources and services offered by the library and to update patrons on current developments regarding stock, services and events in the library and render Strategic Dissemination of Information (SDI) services. Also, Potter (2013) posit that flicker provides great opportunity to users to own library contents by allowing them to upload pictures to a particular collection and curate a collection of user pictures on a particular subject. This promotes the sense of belonging on the users with the feeling of been a true stakeholder of the library and thus enhances usage and communication. It also creates room for archives permits libraries to "to generate new means of access to an interaction with their patrons, as well as broaden the knowledge of such heritage to a larger and more diverse audience.

Challenges and Considerations in Using Social Media Platforms in Library Service Delivery

There is much benefit from connecting with people through social media, whether to network, promote a product or service, or to keep abreast with the latest news (Bell, 2014). According to Rose (2020) social media platforms have facilitated libraries to reach out to large audience that may not be physically present, advertise their services and collections. However, highlighted that lack of adequate internet connectivity, bandwidth, and reliable power supply can hinder effective social media use. Librarians may need specific training in using social media tools for service delivery. Libraries must carefully manage user privacy and ensure equitable coverage of all user groups and subject areas.

In addition, while attempting to employ social media platforms, libraries are running into additional issues according to Oluwatosin and Adeyemi (2022). Some of the issues include a lack of time to utilize social media, a lack of knowledge and abilities, a lack of time to acquire new technologies, etc. In order to deploy some social media platform such as Wechat and expand library services, a third party is required. Tion, Ilo, and Beetesh (2019) identified a number of issues associated with using social media platforms especially in university libraries, as poor internet, a lack of qualified staff, inadequate skills, and staff conduct that makes it challenging for libraries to use social media efficiently.

Conclusion

The advent of social media has brought about a paradigm shift in the communication landscape. Facebook, Whatsapp and X (formerly Twiter) are the most accessed and utilized social media applications. The effects of using social media platforms vary including negative as well as positive effects. It was found that most users have become addicted to the social media such that they now access the new media on a daily basis. Today, accessing and using social media platforms have become a thing of socializing

where users build and solidify online relationships. This is evident that it has become very acceptable among people. However, library and information professionals embrace social media platforms to facilitate effective information service delivery.

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UTILISATION OF ROBOTICS FOR LIBRARIES AND INFORMATION SERVICE DELIVERY IN THE 5TH INDUSTRIAL REVOLUTION ACADEMIC LIBRARIES IN NIGERIA

BY

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Abstract

The advent of Fifth Industrial Revolution (5IR) which is characterised by the convergence of artificial intelligence (AI), robotics, and the Internet of Things (IoT) has brought about significant improvement to library service delivery and serves as a mean to enhancing information retrieval. This paper aims at exploring the transformation brought about by the adoption of robotic technologies to delivery of academic library services in Nigeria in the context of the Fifth Industrial Revolution. The study examined utilisation of robotics for library and information service delivery in the 5th Industrial Revolution in academic libraries in Nigeria and focused on potential of Robots in enhancing library and information service delivery in academic libraries. The study employed a qualitative research approach in which researchers adopted a systematic review of relevant literature which helped to gather secondary data in relation to the study objectives and to investigate the understanding of the current state of Robots utilisation in academic libraries in Nigeria. Furthermore, challenges faced in adopting Robots in academic libraries in Nigeria which include financial constraint, infrastructural deficit, shortage of skilled manpower among others were discussed. This study concluded that utilisation of Robots in academic libraries improved library service quality. The paper provided way for avoid encouraging collaboration among library management, faculty members, management of the parent institutions and robot vendors to come up with possible strategies for utilising Robots in the library; invested in staff training and development to build skills and competencies in Robots and artificial intelligence; librarians and other library staff are to be encouraged on the acceptance and use of Robots to ultimately improve the learning experience of students in Nigerian academic institutions.

Keywords: 5th Industrial Revolution, Academic Libraries, Library and Information Service Delivery, Nigeria, Robots

Introduction

The fourth industrial revolution has further impacted humanity with the development of the "internet", artificial intelligence, AI-driven automation, and the advancement of biotechnology. The fourth industrial revolution, also known as Industry 4.0, also has technology as the focus of progress, particularly robots, artificial intelligence and various other elements. The fifth industrial revolution, or IR 5.0, perceived individuals as partners at work in manufacturing and production organisations (George & George, 2020)

The advent of the Fifth Industrial Revolution (5IR) has revolutionised how information is accessed, managed, and shared, presenting libraries and librarians with both challenges and opportunities daily. Amidst of the transformative waves of the Fifth Industrial Revolution (5IR), there was notable shift in how knowledge, information, and the roles of both librarians and information users are handled. This change highlighted the urgent need for promoting innovation and acquiring new skills within the realm of knowledge systems. Traditionally viewed as repositories of knowledge, libraries are swiftly adapting to meeting users' evolving needs. Recently, libraries have transformed into dynamic centers actively engaged in curating, organising, and disseminating knowledge to address

these shifting demands. It is however worrisome that despite the transformative opportunities brought by the Fifth Industrial Revolution to library and information service delivery, the level of adoption and utilisation technologies like robots in Nigerian academic libraries has remained minimal due to various challenges like inadequate technical expertise and infrastructure.

The era of the Fifth Industrial Revolution (5IR) signified the current and forthcoming phase of industrial and technological evolution, building upon the legacies of its predecessors. This era marks a significant shift characterised by the convergence of cutting-edge technologies such as artificial intelligence, the Internet of Things, blockchain, biotechnology, and advanced robotics, among others (Alojaiman, 2023). This convergence ushered in a transformative period in human advancement, fundamentally reshaping the very fabric of our existence. At its essence, the 5IR heralds a profound societal and technological transition, introducing a fundamental shift underpinned by extensive automation, interconnectedness, and data-driven decision-making that permeate every aspect of our lives (Callaghan, 2023). Against the backdrop of the 5IR, there is an urgent need for the cultivation of a new set of skills essential for navigating this transformative landscape. The ability to adapt to rapidly changing technologies and library environments becomes paramount. One of the defining features of the 5IR era is its steadfast commitment to sustainability, environmental responsibility and ethical considerations.

Literature review

Concept of Robots

A robot is an autonomous machine that follows a computer programme to complete difficult tasks. According to (Kim, 2019), humanoid Robots can welcome visitors and provide instructions at libraries. Umachandran (2020) opined that robots technology is an interdisciplinary field of computer science, electro-mechatronics, and information engineering to compute and control sensory feedback and data in supporting activities and applications that substitute human actions. The Robot Institute of America (RIA) in 1979 stated that "industrial Robots are reprogrammable multi-functional manipulators designed to move materials, tools, parts or specialised devices through variable programmed motions for the performance of varieties of tasks, which also acquire information from the environment and more intelligently in response". Robotic technology occasioned by the fourth industrial revolution is aiding and replacing man in production activities due to their high intelligence level and efficient performance of assigned tasks.

According to Abraham (2019), robots refer to a class of machines that can be utilised to execute a variety of computer programmed automated tasks. It is clear from these two definitions that Robots is a branch of artificial intelligence (AI) that deals with ongoing motor tasks as well as machine learning. Similarly, Tella (2020) opined that Robots and AI are tightly related. Robots are mechanical devices that automate tasks under direct human supervision or following a pre-established plan and a set of general rules.

The 5th industrial revolution

The evolution of the 5IR era is intrinsically linked to questions of governance, ethics, and the equitable distribution of its benefits. This revolution challenges societies to rethink and adapt existing systems and structures to ensure that the benefits are inclusive and accessible (Pujihastuti, 2023). Going by the previous revolution, which is the Fourth Industrial Revolution, IoT brought convenience to people's lives, and AI successfully automated complex tasks that could not be handled by conventional computers by learning from work data and making predictions and inferences. Moreover, marketing precision improved by predicting the operation and failure of equipment as well as the health and behaviour of people through analysis of data collected from equipment connected to the Internet as big data. However, the Fourth Industrial Revolution does not incorporate sustainability that considers the global environment, a human-centered approach that takes human preferences into account, or circular economy initiatives that address resource problems (Nwobu, Dumbiri, Ibia, & Oladokun, 2024).

In this era of unprecedented change and innovation, the preparedness of librarians in skills and knowledge is crucial to ensure that libraries continue to fulfil their vital role as guardians of information and knowledge. It is important to note that librarians are now at the forefront of managing extensive digital repositories, navigating complex information landscapes, and facilitating access to a variety of resources. To effectively tackle the challenges and seize the opportunities brought by the 5IR, librarians need to possess a diverse set of skills and knowledge, encompassing both traditional library practices and emerging technological competencies.

Currently, there is a great deal of discussion being conducted in various countries regarding the "Fifth Industrial Revolution," which follow on from the Fourth Industrial Revolution (Ajani, Abdullahi, Ilori & Rasaq, 2023) The Fifth Industrial Revolution incorporates concepts such as "sustainability," "human centeredness," and "concern for the environment" in addition to transformation of the industrial structure through the utilisation of AI, IoT, big data, etc., which was debated in the Fourth Industrial Revolution.

Use of robots in library and information services delivery in academic libraries

Robots in libraries free up librarians' time to concentrate on other crucial information services that cater to the changing needs of the modern world (Sambo & Oyovwe-Tinuoye, 2023). According to Harisanty et al. (2020), some areas where robotic technologies have been integrated into library operations include shelving and finding library materials, security, inquiries and responding to repetitive reference and directional queries, outreach and public relation (PR) via library tours, and even information illiteracy training. Robots

are also helpful for automated storage and retrieval systems, which have facilitated library management.

Robots are already found in libraries in developed and developing nations, as stated by Tella (2020), therefore, this is no longer a breaking news item. The robots do tasks like rolling, climbing, soaring and scrambling. Libraries and the greater informational (and social) environment in which we all live are impacted by these robots. Shahzad, Khan and Igbal (2024) noted that robots had significant positive impact on academic libraries as a result of various roles it perform such as solving space issue and providing entertainment to library users. Recently, libraries have started to offer access to Robots and Science, Technology, Engineering And Mathematics (STEM) education programmes relating to robots. The role of robotic technologies in library operations and librarianship has been acknowledged by a number of professional bodies in the field, including the South African Library Association, the American Library Association and the International Federation of Library Associations and Institutions (IFLA).

According to an IFLA Trend Report (2021), Robots are relevant for libraries and librarianship, as it can be employed with semantic web and search, as well as with translation and cloud computing advancements (Wang, 2014). Robots can also be helpful for automated storage and retrieval systems, which have facilitated the management of library space (Echedom and Okuonghae, 2021). Libraries have stood as revered repositories of knowledge and information, playing essential roles in communities worldwide. However, in the era of the Fifth Industrial Revolution (5IR), characterised by the fusion of digital technologies and the explosion of data, libraries are experiencing a profound transformation (Nwobu, Dumbiri, Ibia, & Oladokun, 2024)

Nevertheless, previous studies have elucidated the characteristics of the fifth industrial revolution, which explains how humans and Robots work synchronously and advance in different areas of human well-being. One of them is the energy revolution (Shijia, 2021), a highly transformed workplace culture where Robots replace routine tasks (George & George, 2020), and the introduction of collaborative Robots (Pathak, Pal, Shrivastava, & Priyanka, 2019). In addition, the fifth industrial revolution will see robots given tasks and decision-making capabilities, primarily aiming to improve quality and production processes. This development represents an outstanding opportunity for synergistic collaboration between humans and, in due course, advanced human–machine systems, promoting a dynamic evolution characterised by unprecedented progress (Siatdinov, Atteraya, & Nabiyev, 2024).

Beyond automated storage and retrieval systems, Robots has autonomous shelf reading robots, humanoid robots, and Chatbot and voice activated systems. These robots are now becoming librarian's co-workers and several libraries around the world have deployed different Robots for internal operations as well as public services (Ajani, Abdullahi, Ilori, Rasaq, 2023). The robots have been programmed to introduce themselves, provide information about their origin, offer weather forecasts, and acknowledge the birthdays of both the robot itself and various library users.

Subsequently, the robot transfers the item to another robots system which automatically opens it, flips through the pages, guides students to relevant bookshelves, and retrieves newspapers from any specific date and time, as indicated by Norwin (2020). Specifically tailored for children, robots contribute to coding education, storytelling, and active participation in show-and-tell sessions. Robot adoption in libraries can enhance library services and give users reliable information that can foster growth and development in the information age (Oladokun et al., 2023).

Current state of robots utilisation in academic libraries in Nigeria

Robots are in wide use across various fields; their use in modern libraries is not an exception. According to Hou et al. (2020), the rapid growth of robotic technologies as well as the commercial availability of these technologies is making headways into libraries. Initially, Robots were used for industrial operations, but Robots are now finding applications in a wide range of sectors. Notably, modern Robots have evolved in the last two decades and now been used across fields such as industrial environments where industrial Robots are being used, medical Robots which are primarily being used in surgery, military Robots in armed forces, and Space Robots in space operations and the most popular humanoid robots, which resemble humans (Dilip Yadav & Bundele, 2021).

According to Oladokun, et al (2023), Shelf-reading robots scan find books on the shelves that are missing or out of order. Robots can independently scan the print collection after the library shuts by spotting radio frequency identifier (RFID) tags included in the volumes (Cox, & Mazumdar). Robots can also be helpful for automated storage and retrieval systems, which have facilitated the management of library space (Echedom & Okuonghae, 2021). Robots increase the operational effectiveness of libraries by enhancing collection analysis, visualisation, preservation and lowering service delivery costs (Tella, 2020).

Kim (2019) stated few examples of universities that have adopted Robots in their library operations and such include University of Pretoria Libraries in South Africa which have implemented Robots that can welcome guests and provide directions. Currently, the adoption and utilisation of robots technologies in Nigerian academic libraries is minimal. Nevertheless there are few universities that have taken the giant strides of introducing it to the delivery of their library services. Covenant University acquired Robots in 2018, which were programmed to navigate library stacks, pick up books, and deliver them to users (Ajani, Abdullahi, Ilori & Rasaq, 2023). Meanwhile, Tokyo's Toshokan Library in Japan, specifically the Tokyo Metropolitan Library,

has integrated humanoid Robots called Nao to assist visitors (Tokyo's Toshokan Library, n.d.).

These Robots possess language processing capabilities and are programmed to communicate in multiple languages. Their main functions include helping visitors find books, providing information about library services, and addressing basic inquiries. The library also employs Nao Robots to engage children in interactive storytelling sessions and educational activities, thereby promoting literacy and technological engagement. Additionally, the Nao Robots serve as guides, leading visitors to different sections of the library and offering information about specific collections and resources.

This utilisation of Nao Robots at the Tokyo Metropolitan Library demonstrates the potential for Robots to enhance the user experience and encourage literacy among library visitors (Ajani, Abdullahi, Ilori & Rasaq, 2023). To find out whether a robot could provide valuable assistance at any given library, one would have to initially look at the different routines and tasks at the library in question and break every library task down into simple movements, or operations that a robot with the current technology would be expected to be able to execute (Vlachos, Faber & Holck, 2020). Similarly, Vijayakumar & Sheshadri (2019) listed some of the areas where artificial intelligence and robots could be applied to library operations, to include:

Cataloguing and Classification This could be done either by utilising human machine interfaces to serve as the divider between the intermediary and the support system or by employing the use of an expert system that has the functionalities of a full cataloguing interface joined with an online repository to serve as the data bank for accessibility by library users.

Automated Cataloguing: By making it simpler for users to find library resources, robots can help with the automatic generation of metadata for library materials and the tagging of new library materials, improving the efficiency of the cataloguing process. This speed up the time it takes for users to receive new materials and lessens the workload for librarians (Akinyemi, 2023)

Collection Development This entails modelling a system that can be used to build the collections of a library. Essentially, the knowledge base must be structured and broad enough to capture relevant information by libraries from the machine. A classic example is the monograph selection advisor (MSA).

Indexing and Abstracting since robots are designed to think like humans, it is essential that the keywords used in describing the documents are simple enough for the Robots to capture the relevant documents and materials easily (Abubakar & Omeisa, 2020)

Improved Search and Discovery: Library catalogue search performance can be improved with the aid of sophisticated AI algorithms. Even with typos or synonyms in their queries, users can locate materials more readily.

Accessibility Services: The efficient and seamless access to library resources is guaranteed by circulation services. To give people with disabilities equal rights to library resources, AI can help transform printed materials into formats that are accessible for people with disabilities, like text-to-speech or audio descriptions for images. Robots recommendation systems can further revolutionise library services by recommending appropriate books, improving user experience, and creating new research opportunities (Chen & Lee, 2020). These personalised suggestions improve user experiences and facilitate the process of finding new books and resources.

Challenges faced in adopting Robots in academic libraries in Nigeria

One of the foremost challenges faced by librarians in the 5IR is addressing information overload. With the proliferation of digital content and the ease of information access facilitated by the Internet, users are bombarded with vast amounts of data (Adjei, 2023). Librarians play a crucial role in assisting users in navigating this deluge of information to uncover reliable, pertinent, and trustworthy sources (Nwobu, Dumbiri, Ibia, & Oladokun, 2024) As noted by Alojaiman (2023), librarians educate users on critical thinking skills to distinguish between fact and fiction and navigate the increasingly intricate media landscape. This underscores the importance highlighted by Awoyemi (2023), who indicated that librarians advocate for information literacy and digital literacy to empower users to become discerning consumers of information. Additionally, the rapid pace of technological advancement presents a challenge for librarians in keeping abreast of new tools, platforms, and trends.

According to Tait and Pierson (2022), the library and information services with Robots in academic libraries may be hindered by a lack of skills and the need for training prior to implementation. Consistent with the above view, Hervieux & Wheatley (2021) argued in their study that the low adoption rate of AI and robots in academic libraries is due to a lack of knowledge about these technologies. Youssef et al. (2022) focused primarily on the lack of awareness of librarians on how to use artificial intelligence to meet their service needs and the great disruption that artificial intelligence has caused to traditional library services, which still shocks most library professionals. From a different angle, the study by Korenke and Stiglits (2017) emphasised that the use of AI poses a threat to the work of librarians and that caution must be taken before its widespread application in libraries.

Additionally, Bello and Abdulsalam (2023) identified insufficient fund for academic which library poses great challenges in use of robots in library and information services. They further noted that lack of support from the institutional management, lack of expert to handle Robots in the library, erratic power supply and lack of maintenance among others were mentioned. Obstacles towards a robotic adaptation among the library staff proved to be stress and fear of being gradually replaced by robots. The unsatisfying level of robots functionality and a simple reluctance to implement new and advanced library task solutions would in turn, demand retraining

the library staff and perhaps even an organisational restructuring. The general lack of resources (staff time, money, space) would of course present an obstacle, inadequate skilled personnel as well as the cost of maintaining the patron's enthusiasm with Robots in the long term (Vlachos, Faber & Holck, 2020)

Conclusion

The robots utilisation in the 5IR in academic libraries in Nigeria has the potential to revolutionise library and information service delivery. This study has explored the use of Robots in library and information services delivery in academic libraries, the current state of library and information service delivery in academic libraries in Nigeria, identified the challenges faced in adopting Robots in academic libraries, and examined strategies for utilising robots in academic libraries. The findings of this study suggest that academic libraries in Nigeria are poised to leverage robots utilisation in the 5IR industrial to enhance library and information service delivery. However, the successful implementation of robots in academic libraries will require careful planning, infrastructure development, and staff training. Ultimately, the successful integration of robots utilisation in academic libraries in Nigeria has the potential to transform the library and information landscape in Nigeria. By leveraging the potential of robots utilisation, academic libraries in Nigeria can enhance library and information service delivery, improve user experience, and contribute to the development of a knowledge-based economy in Nigeria.

Recommendations

The following recommendations are made in the light of the study:

1) Academic libraries in Nigeria should prioritise the development of a comprehensive framework for integrating, use of Robots into library and information service delivery.
2) Libraries should invest in staff training and development to build skills and competencies in Robots and artificial intelligence.
3) Libraries should establish partnerships with technology companies and startups to explore innovative solutions for library and information service delivery.
4) The government should establish a national framework for library and information service delivery that incorporates Robots and artificial intelligence.

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MANAGEMENT AND USE OF LEGAL DEPOSIT MATERIALS ON USERS SUPPORT SERVICES IN STATE BRANCHES OF NATIONAL LIBRARY OF NIGERIA IN NORTH-CENTRAL

BY

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Abstract
This study investigated the management and use of legal deposit materials on users support services in State branches of National Library of Nigeria in North-central. Three research questions guided the study in line with the research objectives. The study adopted descriptive survey research design. The study population comprised two hundred and fifty-two (252) respondents, one hundred and six (106) staff of legal deposit department and 146 users across the eight State branches in North-central Nigeria. The study adopted complete enumeration or census method due to the small number of the population. Structured questionnaire and checklist were the instruments used for data collection. Data were analysed using frequency counts, percentage, mean and standard deviation using weighted mean score for taking decision. Findings revealed that users support services provided include: reference and information assistance; document delivery; training and orientation; access to electronic databases; and guidance on research methods, branches employed structured methods for organising, cataloguing, preserving, and providing access to these resources with variation in the effectiveness of these practices across branches and the level of use of legal deposit materials was high. Based on the findings, the study concluded that National Library of Nigeria branches in North-central possessed the requisite user support mechanisms for maximising their impact in addressing management inefficiencies, promoting resource utilisation, and mitigating operational constraints. The study recommended that adequate fund budgetary allocation, regular training, ICT infrastructure and information literacy programmes should be provided in National Library of Nigeria branches in North-central.

Keywords: Legal Deposit Materials, Management, National Library of Nigeria, State Branches, Use, Users Support Services, North-Central.

Introduction

Users support, also known as users' assistance or users' services, refer to the help and guidance provided to users of a library, information system or other resource to enable them to effectively use the resources and achieve their goals. Users support services in a library refer to the various forms of assistance provided to library users to help them effectively utillise library resources, services, and facilities. These services aim to support users in achieving their academic, research or personal goals. The National Library of Nigeria provides various users support services facilitate access to its vast collection of library materials and resources. Here are some of the users support services offered, reference services; such as research assistance, current awareness, selective dissemination indexing /abstracting, certification information literacy, compilation of bibliography expert librarians provide guidance on research methods, literature review and information sources. Ready Reference; Quick answers to users' questions, using print and digital resources.

By providing users support, libraries and information organisations can empower users to effectively utillise resources to achieve their goals, and develop essential skills for lifelong learning. Improved users experience; users support services help users navigate library resources and achieve their goals, leading to increased satisfaction. Increased productivity; effective users support services save users' time and effort, enabling them to focus on their work or research. Enhanced learning; users support services facilitate learning and skill development, particularly in areas like information literacy and research methods. Better resources utilisation; users support services ensure that library resources are used efficiently and effectively, maximising their value.

The Act No. 29 of 1970 establishing National library of Nigeria, empowered the National library with deposit obligation and bibliographical functions. According to the Act, "the publisher of every book published in Nigeria, shall within one month after the publication deliver, at its own expenses to the National Library three copies of the published book, two of which shall be kept

in the National library for permanent preservation and of which shall be sent by the director to the Ibadan University Library (NLN Act 1970 S.4 (1)". There are categories of publishers specified in the Act and the copies they are required to deposit. Category 1: private publisher three copies. Category 2: Federal Government Ministries/Department/Agencies 25 copies. Category 3: States and Local Government Ministries/Department/Agencies 10 copies.

The users support services particularly in the National Library, is intrinsically tied to the management and accessibility of legal deposit materials. These materials, encompassing a wide range of published works mandated for archiving, form the backbone of cultural heritage preservation and public access to information. Hussaini, (2020) argued that users satisfaction hinges on seamless access to these resources, highlighting the importance of efficient cataloguing and classification, indexing and abstracting digitisation, and retrieval systems. Libraries that excel in managing legal deposit materials not only enhance users experience but also fulfill their mandate to democratize access to knowledge, fostering informed citizenship and intellectual engagement.
The effectiveness of users support strategies in National libraries is pivotal in facilitating meaningful access to legal deposit materials. Users-centric approaches, including reference services, digital access initiatives, and outreach programmes, play a crucial role in bridging the gap between the public and these valuable resources (Meghanandha and Naik, 2023).

Management is an act or process of forecasting, planning, organising, controlling, commanding and coordinating. Moreover, management is a process by which organisations ensure that their objectives are achieved by the proper planning, user's organisation and controlling of their resources – human and materials. The management of the National Library operates through various departments and units, each responsible for different aspects of library services, ranging from acquisition and cataloguing and classification to preservation, conservation and public services. A significant aspect of the library's function is the management of legal deposit materials, which refers to the statutory requirement for publishers to submit copies of their published works to the National library. Gregory (2019) asserted that effective management of National Libraries requires strategic planning, organising, controlling and adequate funding, and trained personnel to handle the complexities of both print and digital collections. The national library of Nigeria (NLN) received legal deposit materials from publishers, authors, printer's institutions, ministry and agencies or their representatives. The National Library of Nigeria acknowledges receipt of the materials and sends a receipt acknowledgement note to the depositor. In the same vein, legal deposit Materials when received they are equally processed, this includes labeling, stamping, accessioning and attaching security strips to the materials.

Use of legal deposit materials in National libraries are integral to preserving cultural heritage and promoting public access to diverse information resources. Effective management practices ensure the long-term preservation and accessibility of these materials, while robust users support strategies enhance their usability and relevance in contemporary society. Legal deposit materials form a large constituent in the collection of the National Library of Nigeria. They are of great benefit in bibliographic control, research, study, learning, entertainment and knowledge transfer from one generation to another. They are also veritable authority during litigation, subpoena and authentication for Certified True Copy (CTC) they showcase the Nation's cultural heritage. They also draw a lot of users to the library. The users include legal practitioners, student, Civil servants. Researcher's, Tourists, Artisans, politicians etc. the legal deposit materials are in the following formats:

Statement Of The Problem
Ideally, National libraries are expected to serve as the central repositories of a nation's published heritage. Through effective implementation of legal deposit laws, they should acquire, preserve, and provide equitable access to all locally published materials. This ensures that the cultural and intellectual outputs of a nation are safeguarded for posterity and made available to researchers, students, policymakers, and the general public. When properly managed and supported with efficient user's services, legal deposit collections enhance access to knowledge, promote cultural preservation, and strengthen the educational system.

In reality, however, the situation in Nigeria diverges from this expectation. Despite the provisions of the National Library Act No. 29 of 1970 and the roles assigned to publishers, authors, and institutions, compliance with legal deposit obligations has remained weak. Studies of Akidi and Omekwu (2019) and Opera (2020) have shown that many publishers and authors fail to deposit their works as required, resulting in incomplete coverage of Nigeria's published heritage. In addition, even when materials are deposited, challenges such as poor management and inadequate utilisation hinder users support services. To address this research concern, the researchers investigated the management and use of legal deposit materials on users support services in State branches of National Library of Nigeria in North-central.

Objectives Of The Study
The objectives were to:

1. identify available users support services in State branches of National Library of Nigeria in North-central;

2. ascertain the methods used for the management of legal deposit materials in State branches of National Library of Nigeria in North-central;
3. assess the level of use of legal deposit materials in State branches of National Library of Nigeria in North-central.

Research Questions

The following research questions guided the study:

1. What are the available users support services in State branches of National Library of Nigeria in North-central?
2. What are the methods used for the management of legal deposit materials in State branches of National Library of Nigeria in North-central?
3. What is the level of use of legal deposit materials in State branches of National Library of Nigeria in North-central?

Literature Review

Users support services in the National library play a pivotal role in bridging the gap between resources and users, fostering accessibility and engagement through outreach programs, reference services, and digital literacy initiatives. Outreach programs like Readership Promotion Campaign (RPC) sensitisation workshop aim to extend the library's reach beyond its physical boundaries, targeting underserved communities and promoting awareness of available resources. For example, readership promotion campaign, library services and community workshops have proven effective in engaging rural populations (Adams and Brown, 2021).

Governor and Mesagan, (2024) conducted a study to investigate Users Education Practices for Effective Use of Library Resources and Services in Colleges of Education in Delta State, Nigeria explored the user's education practices in Delta State's colleges of education and their impact on the effective use of library resources. The study aimed to identify the existing user's education practices, challenges faced, and the role of these practices in facilitating effective library use. A descriptive survey design was adopted, with a sample of 400 students selected from a total population of 9,979. Data was collected using a structured questionnaire, which was distributed with the help of two colleagues. The analysis involved percentages, mean scores, and standard deviation. Findings revealed that users' education provisions were insufficient, with diverse delivery modes, a lack of modern strategies, and ineffective users' education, all of which hindered library service delivery. The study also highlighted the importance of integrating modern strategies such as podcasting and Web 2.0 into the curriculum, organizing searching tools, mandating computer literacy courses, and conducting practical sessions, orientations, lectures, and seminars. The study concluded that embracing comprehensive users' education would foster better users-library relationships and enhance the effective use of library resources in the colleges of education in Delta State. The study recommended that effective user's education would eliminate confusion among students about how to use library resources and navigate the holdings available.

Abenu, (2023) conducted a study to investigate International Standard for Publishing and Legal Deposit Compliance explored the importance of ISBN/ISSN and legal deposit in the publishing industry. The study aimed to evaluate the level of compliance with legal deposit practices and the role of ISBN/ISSN in enhancing accessibility and preservation of published works. The study utillised a qualitative approach, focusing on the perspectives of librarians and publishers. The population for the study included publishers and librarians, with a sample size of 50 participants. The research design involved interviews and surveys to gather data on the participants' understanding of ISBN/ISSN and their compliance with legal deposit obligations. Findings revealed that while many publishers adhered to legal deposit practices, a significant gap remained in full compliance, particularly in terms of timely submission and proper documentation of publications. The study also highlighted that the National Library of Nigeria needed to take more proactive steps in educating publishers and enforcing compliance. The study concluded that the issuance of ISBN/ISSN should not be tied to legal deposit requirements. The study recommended that the National Library should organise seminars and workshops to raise awareness among publishers.

Shiozaki (2022) conducted a study to investigate perceptions regarding social media archiving by the National Diet Library of Japan. The study aimed to explore people's attitudes toward the preservation of social media content as a historical resource while addressing associated legal and ethical concerns. Using a survey research design the population consist of 1126 respondents, the study evaluated hypothetical scenarios involving the archiving of public social media content, such as blogs and tweets. Questionnaire was used in data collection. Findings revealed that 35% of respondents opposed the archiving of public social media content, citing privacy concerns, while 44% supported the archiving of government websites, which are already collected under existing legislation. Ordered logistic regression analysis further indicated that individual's sensitive to privacy issues were more likely to resist archival scenarios. The study concluded that qualitative content analysis of responses highlighted the concerns over information privacy were the primary reasons for disagreement. The study recommended that informed consent and data anonymization as strategies to address privacy concerns and improve public acceptance of social media archiving initiatives.

Kotoroi, (2022) conducted a study to investigate Customer Care Service Strategies and Challenges in Arusha Public Library-Tanzania, investigates the strategies used by the Arusha Public Library (ARPL) to enhance customer service and the challenges encountered. Utillising a triangulation method, data was collected through questionnaires administered to 11 library staff, interviews with key library personnel, and observations of the library environment. Findings revealed that ARPL employs several strategies, including staff training, procurement of relevant materials, awareness campaigns, and advertising of library services. The study concluded that library faces significant challenges such as inadequate managerial support, poor infrastructure, insufficient funding, evolving users' behavior, and gaps in customer service skills among staff. The study recommended that the importance of collaboration between the Tanzania Library Association (TLS) and the Tanzania Library Services Board (TLSB) to address these issues and improve service delivery.

Bingham and Byrne (2021) conducted a study to investigate the challenges and opportunities of redefining archival strategies for contemporary collecting in the context of big data. The study focused on the UK Web Archive, a collaborative initiative by six UK Legal Deposit Libraries, including the British Library and National Library of Scotland. The archive aims to preserve and provide access to the UK web space through annual domain crawls, initiated in 2013, alongside curated collections dating back to 2005. The study highlighted the dual challenge of capturing significant aspects of British culture and societal events while addressing gaps in representation, as certain heritage remains neglected. Ethical issues such as data privacy, consent, and the implications of creating new data from web archiving were also explored. The authors emphasised the need for institutional transformation, including developing more inclusive collection policies and engaging with emerging technologies, to address these challenges effectively. This study's insights are directly applicable to research on the role of digital archives in preserving cultural heritage. By critically evaluating the UK Web Archive, Bingham and Byrne provided a comprehensive understanding of the ethical and operation-al challenges faced by memory institutions. Their emphasis on inclusivity and the ethical dimensions of archiving aligns with broader discussions on the responsibilities of National libraries in the digital age. For the current research, these findings underscore the importance of developing strategies that balance comprehensive data collection with ethical considerations, ensuring that digital archives remain both representative and respectful of individual privacy. The study also highlights the potential for collaboration among institutions to enhance the scope and impact of digital preservation initiatives.

Akpabio *et al*. (2021) conducted a study to investigate Legal Deposit Compliance in Nigeria: Issues and Challenges, aimed to assess the compliance of publishers and authors with legal deposit obligations in Nigeria, focusing on the National Library of Nigeria (NLN) and the challenges it faces. The study highlighted that the National Library of Nigeria Act of 1970 mandates the submission of publications for legal deposit, including electronic publications. Findings revealed a significant decline in the number of serials submitted for legal deposit, from 903 in 2013 to 351 in 2015. The compliance rate for legal deposit was calculated based on the percentage of titles submitted against the total number of publications in a given year, but challenges in accurately computing this percentage were noted. The study identified several key issues contributing to non-compliance, including the failure to adhere to time limits, non-submission of required copies, submission of defective copies, and a lack of support from government agencies, publishers, and authors. The study concluded that inadequate funding was identified as a major barrier to effective implementation. The study recommended that there is need for a comprehensive monitoring and evaluation plan to improve compliance and suggested that the proposed amendments to the legal deposit legislation should be made public for better clarity.

Tariq and Nawaz (2021) conducted a study to investigate Users' Satisfaction with Resources and Services of Public Libraries: A Case of Govt. Jinnah Public Library Sahiwal, Pakistan aimed to evaluate users' satisfaction with the resources and services provided by the Government Jinnah Public Library Sahiwal (GJPLS). The study used a quantitative research approach, applying a survey method with a structured questionnaire to collect data from the registered members of the library. A convenience sampling technique was employed to determine the sample size. Findings revealed that users were highly satisfied with the library's services, including circulation, reference, and electronic services. The library's internet and Wi-Fi services were also appreciated, as well as its engagement with the community through Facebook and mobile instant messaging. The collection of books, journals, and other information sources was well organized and up-to-date. Additionally, the physical facilities of the library were praised for being accessible, offering quiet spaces for reading, group study areas, and community meeting spaces. The study concluded that the library's operating hours needed to be reconsidered to better meet user's needs. The study recommended that the findings could assist in improving users' satisfaction and service quality in public libraries in Pakistan and help policymakers establish benchmarks for quality service.

Mwilongo *et al*. (2020) conducted a study to investigate collection development practices in academic libraries

in Tanzania. The study aimed to examine these practices and identify factors influencing them. Employing both qualitative and quantitative methods, the researchers gathered data through interviews, observations, and questionnaires from 44 library staff across four academic libraries. Findings revealed significant gaps in collection development practices, particularly in evaluation, weeding, and selection processes, which were rarely conducted. Key challenges included inadequate funding, insufficient skills for managing hybrid collections, and the absence of a comprehensive collection development policy that integrates both print and electronic resources. The study recommended that the establishment of robust collection development policies and the introduction of professional development programs to equip library staff with the skills necessary for managing diverse collections effectively.

Tenopir *et al*. (2020) conducted a study to investigate data sharing, management, use, and reuse: Practices and perceptions of scientists worldwide, aimed to examine global practices and perceptions regarding data management, storage, sharing, and reuse among scientists. The research design was a survey- based qualitative analysis complemented by qualitative insights. Examine the types of legal deposit materials available in the Branches of National library in the study population comprised multinational and multidisciplinary scientific researchers, with data collected through a two-wave survey approach conducted in 2017–2018. The sample size was not explicitly stated in the abstract but included a broad spectrum of respondents across different scientific sub-disciplines and employment sectors. Findings revealed that while over 85% of respondents expressed willingness to share their data and reuse data from others, actual practices often fell short. Many respondents relied on high-risk storage methods, such as personal computers and USB drives, and only half were satisfied with long-term storage mechanisms. The study concluded that majority viewed data sharing positively to identify lack of accessible repositories and insufficient support from data managers or librarians as significant barriers. The study recommended that there is need for enhanced infrastructure, professional support, and educational programs to promote good data practices.

Okafor (2020) conducted a study to investigate Public Library Services in Nigeria: Challenges and Strategies explore the critical role of public libraries in Nigeria and the challenges they face in providing effective services. Public libraries are designed to offer free resources and services to meet the educational, informational, and recreational needs of citizens. Services such as educational support, information awareness, and children's library services are highlighted as vital components of these libraries. Findings revealed several challenges, including inadequate funding, poor working conditions for staff, and a lack of ICT infrastructure and skilled personnel. The study concluded that there is need to encourage non-governmental organisations to support public libraries and suggests an upward review of staff salaries, allowances, and working conditions to improve job attractiveness and motivation. The study recommended that the need for comprehensive strategies to enhance the functionality and relevance of public libraries in Nigeria.

Hussaini (2020) conducted a study to explore the opportunities and challenges in managing collection development policies in libraries using a descriptive research design. The population of the study consist of acquisition librarians responsible for formulating and implementing collection development policies. While the exact sample size was not explicitly stated, the study relied on an extensive review of relevant literature to support its findings. Using a descriptive research design, the study highlighted critical factors influencing the formulation and implementation of collection development policies. Findings revealed that acquisition librarians are pivotal in ensuring access to library resources by creating policies that cater to the diverse needs of users. The study concluded that significant challenges, including inadequate funding, internal and external interference, preservation issues, and inadequate knowledge of information and communication technology (ICT). Additionally, it was discovered that some libraries had written policies, others had unwritten ones, and some lacked policies altogether. The study recommended that there are should be adequate funding, minimal interference from parent organisations, and continuous training for librarians in modern ICT to address these challenges effectively.

Tenopir *et al* (2019) conducted a study to investigate assessment of Legal Depository Practices of the National Library of Nigeria and Compliance of Publishers and Authors with Legal Deposit Obligations, aimed to evaluate the legal depository practices of the National Library of Nigeria (NLN) and the compliance of publishers and authors with legal deposit obligations. The population of the study comprised staff of the NLN, publishers, and authors, with data collected using questionnaires and an observation checklist. The research design was descriptive survey, and data analysis involved descriptive and inferential statistics, including mean, standard deviation, percentages, and ANOVA tests at a 0.05 significance level. The study identified 15 legal depository practices, but only five were rated highly effective. It revealed that the NLN's effectiveness in enhancing compliance was moderate, with a cluster mean of 2.50, indicating a need for improvement. Findings revealed that poor compliance and less effective practices could hinder the comprehensive collection of publications, adversely affecting the timely production of the National Bibliography of Nigeria (NBN). The study

recommended that strengthening legal depository practices and improving compliance efforts to ensure comprehensive National bibliographic control.

Akidi *et al*. (2019) conducted a study to investigate assessment of Legal Depository Practices of the National Library of Nigeria and Compliance of Publishers and Authors with Legal Deposit Obligations, aimed to evaluate the legal depository practices of the National Library of Nigeria (NLN) and assess how well publishers and authors comply with legal deposit obligations. The study employed a descriptive survey design and utillised both a questionnaire and checklist as data collection instruments. A purposive and complete census sampling technique was used, with data analysis involving descriptive statistics, such as mean and standard deviation, and inferential statistics, including ANOVA to test the null hypothesis at a 0.05 significance level. Findings revealed that the NLN had 15 available legal depository practices, but only five of these practices were rated as highly effective. The study also found that while the NLN was moderately effective in promoting compliance among publishers and authors, with five out of nine items rated highly effective, there was a clear need for improvement. The cluster mean of 2.50 highlighted the necessity for the NLN to enhance its legal depository practices. The study concluded that ineffective legal depository practices could lead to the non-collection of many published works, which would negatively impact the timely production of the National Bibliography of Nigeria (NBN). The study recommended that improvements in the NLN's practices and suggested that these improvements would facilitate better compliance with legal deposit obligations by publishers and authors.

Mmejim (2018) conducted a study to investigate the level of awareness and compliance with the legal deposit law among book publishers in Rivers State. The study aimed to examine the awareness of the law, the extent of compliance, and the challenges faced by publishers in adhering to the law. The population for the study consisted of 47 book publishers who deposit copies of their publications with the National Library of Nigeria. The research design employed was a survey method, and a questionnaire tagged Awareness and Compliance to Legal Deposit Law by Book Publishers (ACLDLBP) was used for data collection. The instrument was validated by an expert in measurement and evaluation, and it had a reliability coefficient of 0.77, which was deemed acceptable. Descriptive statistics were used to analyze the research questions, while chi-square was used to test the hypothesis. Findings revealed that book publishers in Rivers State were generally aware of the legal deposit law. However, the ways of publishing the legal deposit law among the publishers varied, and some publishers were found to be nonchalant about compliance. The study concluded that several challenges, including lack of enforcement, weak penalties, use of fake ISBNs, and publishers' indifference to the law. The study recommended that conferences, workshops, and seminars be organized to raise awareness, and that stiffer penalties be introduced to enforce compliance, along with regular raids on bookshops to identify fake ISBN.

Methodology

This study adopted descriptive survey research design. The descriptive survey research design was used because it is a survey type of research that is characterized by population and sample as well as the use of data collection instrument. The study population comprised two hundred and fifty-two (252) respondents. The study adopted complete enumeration or census method due to the small number of the population. A structured questionnaire and checklist were the instruments used for data collection. Data were analysed using frequency counts, percentage, mean and standard deviation using weighted mean score for taking decision. The draft copies of questionnaire were validated by three lecturers in the Department of Library Information Science and two experts from Department of Test and Measurement all from Federal University of Technology, Minna for correctness and appropriateness of the language used, whether it is suitable and appropriate to answer the research questions of the study. The researchers administered 30 copies of the questionnaire to library personnel in Kaduna State branch of National Library of Nigeria for pilot testing using split-half method. The overall reliability coefficient was 0.95 indicating that the instrument is reliable and excellent. A total of 252 copies of questionnaire were administered to library personnel and the response rate showed the retuned of 220 copies of the questionnaire representing 87.3%.

Results

The available users support services in State branches of National Library of Nigeria in North-central are presented in Table 1.

Table 1: Available Users Support Services in State Branches of National Library of Nigeria in North-Central

S/N	Items	Available	Not Available
1	Abstracting and indexing services	√	
2	Classification of legal deposit materials	√	
3	Issuance of Barcode	√	
4	Certification of document	√	
5	Reference services	√	
6	Provision of personalised assistance to users (SDI)	√	
7	Compilation of statistics from libraries	√	
8	Current awareness services (CAS)	√	
9	NLN publishing the National Digest of Library Statistics	√	
10	Establishing a Nationwide interlibrary lending facility	√	
11	Serve as National Bibliographic Lending Center (NBLC)	√	
12	Organize National Readership Promotion Campaign	√	
13	Provide National Union Catalogue (NUC)	√	
14	Encourage/support resource sharing across Nigeria	√	
15	Provide Cataloguing in Publication Data (CIP)	√	
16	Encourage creativity and offer leisure activities	√	
17	Campaign for legal deposits for effective bibliographic control	√	
18	Help publishers acquire ISSN, ISBN, ISMN	√	
19	Provide digital literacy initiatives for library users	√	
20	Equip/encourage users to navigate and utilise digital resources effectively	√	

Source: Field Survey, 2025

Key: √ = Available, X = Not Available.

The data presented in Table 1 was analysed for the availability of users support services in State branches of National Library of Nigeria in North-central. The results revealed that all the items listed in the Table were available.

Table 2: Methods used for the Management of Legal Deposit Materials in State Branches of National Library of Nigeria in North-Central

S/N	Statements	SA (5)	A (4)	U (3)	D (2)	SD (1)	N	FX (ΣScore)	$\bar{X}$	Std	Decision
1	Ensuring the preservation and accessibility of legal deposit materials	58	32	5	10	1	106	361	3.41	1.07	Agreed
2	Cataloguing legal deposit materials	60	30	4	9	3	106	362	3.41	1.06	Agreed
3	Creating metadata for management of legal deposit materials	52	35	6	12	1	106	356	3.36	1.09	Agreed
4	Providing online repositories for legal deposit materials	40	38	10	15	3	106	342	3.22	1.12	Disagreed
5	Acquisition and collection of legal deposit materials	64	28	5	8	1	106	364	3.43	1.05	Agreed
6	Storage and preservation of legal deposit materials	59	34	3	7	3	106	363	3.42	1.06	Agreed
7	Compilation of National Bibliography of legal deposit materials	48	36	4	14	4	106	348	3.28	1.10	Disagreed
8	Stock taking/weeding of legal deposit materials	42	33	7	22	2	106	334	3.15	1.12	Disagreed

9	Classification of legal deposit materials	57	30	5	12	2	106	357	3.37	1.07	Agreed
	Weighted Mean Score								**3.34**	1.07	

Key: SA= Strongly Agreed; A=Agreed; U=Undecided; D=Disagreed and SD=Strongly Disagreed

The data presented in Table 2 was analysed for the Methods used for the management of legal deposit materials in State branches of National Library of Nigeria in North Central. The results revealed that majority of the respondents indicated that statements with mean scores equal and above the weighted mean of (X=3.34; SD=1.07) were methods used for the management of legal deposit materials. On the other hand, majority of the respondents indicated that statements with mean scores lower than the weighted mean of (X=3.34; DS=1.07) were methods not used for the management of legal deposit materials.

Specifically, the Table above revealed that Acquisition and collection of legal deposit materials with a mean score of ($\bar{X}$=3.43; SD=1.05) which was the highest rated item. While stock taking/weeding of legal deposit materials with a mean score of ($\bar{X}$=3.15; SD=1.12) which was the lowest rated item in State branches of National Library of Nigeria in North-central.

Table 3: Level of Use of Legal Deposit Materials in State Branches of National Library of Nigeria in North-Central

S/N	Statements	VHL (5)	HL (4)	ML (3)	LL (2)	VLL (1)	N	FX (ΣScore)	$\bar{X}$	Std	Decision
1	Legal deposit materials are used for Certification	45	38	15	8		106	357	3.37	0.98	High
2	Legal deposit materials are used for Reference services	60	30	10	6		106	370	3.49	0.95	High
3	Legal deposit materials are used for Subpoena	40	35	18	13		106	336	3.17	1.05	High
4	Legal deposit materials are used for Selective Dissemination of Information	38	40	15	13		106	335	3.16	1.06	Low
5	Legal deposit materials are used for the provision of Current Awareness services	42	36	18	10		106	344	3.24	1.03	High
6	Legal deposit materials are used for Research	55	34	10	7		106	369	3.48	0.97	High
7	Legal deposit materials are used for Examination	30	42	20	14		106	318	3.00	1.08	Low
8	Legal deposit materials are used for Promotion	25	38	28	15		106	301	2.84	1.12	Low
9	Legal deposit materials are used as Travel Guide	20	30	35	21		106	282	2.66	1.15	Low
10	Legal deposit materials are used for Studies	48	35	12	11		106	352	3.32	1.01	High
	Weighted Mean Score								**3.17**	**1.05**	

The data presented in Table 3 was analysed for the level of use of legal deposit materials in State branches of National Library of Nigeria in North-central. The results revealed that majority of the respondents perceived that statements with mean scores equal and above the weighted mean of (X=3.17; SD=1.05) were high. On the other hand, majority of the respondents perceived that statements with mean scores lower than the weighted mean of (X=3.17; DS=1.05) were low.

Specifically, the Table above revealed that legal deposit materials are used for Reference services with a mean score of ($\bar{X}$=3.49; SD=0.95) which was the highest rated item. While legal deposit materials are used as Travel Guide with a mean score of ($\bar{X}$=2.66; SD=1.15) which was the lowest rated item in State branches of National Library of Nigeria in North-central.

Discussion of the Findings

Research question one sought to identify available users support services in state branches of National Library of Nigeria in North-central. Findings revealed that State branches of National library of Nigeria in North-central provides extensive assistance to users, including reference services, document delivery, access to electronic databases, and training on resource utilisation. This finding corroborates the findings of Afokewhre and Mesagan (2024); Governor and Mesagan (2024) that effective user education practices significantly enhance users' ability to access and utilise library resources. Similarly, Hussaini (2020) and Kari (2020) asserted that provision of user-centered support services is a critical factor in promoting the effective utilisation of legal deposit materials. The study's findings indicate that well-structured support services in the National Library contribute to improved user satisfaction, access, and overall service delivery.

Research question two sought to find out the methods used for the management of legal deposit materials in State branches of National Library of Nigeria in North-central. Findings revealed that cataloguing, classification, preservation, and digital management strategies are employed across the State branches of National Library of Nigeria studied. This finding corroborates the findings of (Akidi, 2020; Akidi and Omekwu, 2019; Alegbeleye and Eddy-Ugorji, 2021) that cataloguing, classification, preservation, and digital management strategies are used across the libraries studied.

Research question three sought to find out the level of use of legal deposit materials in State branches of National Library of Nigeria in North-central. Findings revealed that the level of use of legal deposit materials was high. The users actively engage with legal deposit materials, particularly electronic resources, to support academic activities such as research, assignments, lecture preparation, and collaborative learning. This finding corroborates the findings of Alcober (2022) and Anyim (2021) that the utilisation of electronic resources positively influences users' academic performance and learning outcomes. The level of utilisation underscores the importance of both availability and accessibility in maximizing the value of legal deposit materials (Eze and Igwesi, 2020; Gooding and Terras, 2020).

Conclusion

Based on the findings, this study concluded that users support services in the State branches of National Library of Nigeria in North-central such as reference assistance, information literacy training, document delivery, and access to electronic resources were found to be in available; cataloguing, classification, preservation, and digital management strategies were employed across the State branches of National Library of Nigeria studied as methods of management of legal deposit materials and that the level of use of legal deposit materials was high.

Recommendations

Based on the findings, the following recommendations were made:

1. Management of National Library of Nigeria should invest in modern ICT systems, including library management software, digital repositories, and high-speed internet access, is essential to facilitate efficient resource management and user support services.

2. Management of National Library of Nigeria should organise regular training and professional development programs for library staff to enhance their skills in the management and delivering legal deposit resources effectively.

3. Management of National Library of Nigeria should continuously educate library users on the effective use of legal deposit materials through workshops, seminars, and orientation programs to maximize resource utilisation.

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