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Enhancing Library Service Through Technology in Nigerian Universities: Challenges and Opportunities

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Abstract

This paper examines the role of technology in enhancing library services in Nigerian universities, highlighting the challenges, opportunities, and recommendations for sustainable adoption. University libraries are central to academic growth and research, yet traditional systems have faced limitations in meeting the evolving needs of students and researchers. With the rise of digital technologies, Nigerian university libraries are transitioning from print-based services to technology-driven platforms such as digital repositories, e-journals, mobile access systems, virtual reference services, and data analytics for personalised experiences. The paper explores multiple dimensions of technology-enhanced services, including remote access, resource digitisation, collaborative networks, open access initiatives, and mobile learning support. Despite these advancements, challenges such as inadequate funding, poor internet infrastructure, lack of skilled staff, and resistance to change remain significant barriers. However, opportunities exist for global integration, inclusive education, increased research visibility, cost-effective dissemination, and improved student engagement. The paper further outlines critical factors to consider in implementing technology-driven services, such as sustainable funding models, strong policies, professional development for librarians, and continuous monitoring and evaluation. The study recommended that clear policies should be established and enforced to guide the implementation, regulation, and long-term sustainability of digital library initiatives in our universities.

Keywords: Technology-enhanced, library services, Nigerian universities, digital repositories, ICT in libraries

Introduction

A Library is systematically arranged collection of information resources in print, non-print, and electronic formats, administered by qualified information professionals who support users in accessing, retrieving, and effectively utilising knowledge. From a modern scholarly perspective, libraries perform a vital role in fostering information literacy by equipping users with the skills required to identify, assess, and apply information responsibly for academic and professional activities. This role is especially crucial within higher education and research settings, where the standard of scholarly output largely depends on the availability, quality, and ease of access to reliable and authoritative information resources. The COVID-19 pandemic functioned as an unmistakable inflection point, since it forced libraries to migrate instruction, reference, and access services to online channels at short notice. Studies from 2020 onward shows that the pandemic did not create the pressure for digital transformation, rather it amplified pre-existing trends and revealed the unevenness of technological readiness within the sector. In this context, enhancing library services through technology is best understood as a blended project: a pursuit of new capabilities and user-centered value on one side, and a sustained effort to address funding, infrastructure, workforce, and policy gaps on the other (Ifijeh, 2020; Hudson, 2024).

Since 2020, studies have shown that academic libraries in Nigeria have progressively integrated electronic resources, virtual reference services, learning management systems, and remote authentication tools. This development has significantly improved the accessibility and visibility of locally produced research through institutional repositories. Research conducted from 2023 to 2025 emphasizes that these repositories serve as crucial mechanisms for knowledge discovery, institutional ranking, and long-term preservation, though their implementation differs across institutions. Empirical evidence indicates that repository performance and coverage have advanced; however, challenges such as inadequate policies, inconsistent metadata quality, and limited submission practices continue to constrain their full potential, often reflecting broader

institutional incentive structures. National surveys align with these findings, highlighting the importance of Open DOAR registrations and advocating for coordinated initiatives to promote open access, enhance research visibility, and meet funder requirements. In essence, institutional repositories demonstrate the potential of technology to strengthen library services while underscoring the necessity of formalized governance, standardisation, and the development of librarian expertise to achieve sustainable impact (Ezema et al., 2024; Idiedo, 2024; Farouk, 2025).

Digitisation programmes and digital library initiatives further demonstrate the promise and complexity of technological enhancement. Studies between 2022 and 2025 describe steady, sometimes cautious, progress: libraries are converting theses, rare local materials, and university publications, then surfacing them through discovery layers and scholar profiles. Authors also emphasise that digitisation projects require sustainable funding models, preservation-grade workflows, and clear selection policies, otherwise projects stall after pilot phases. The documented barriers include inconsistent electricity supply, insufficient bandwidth, aging hardware, and limited technical support, all of which raise lifecycle costs for digital collections. These constraints are not merely operational inconveniences, they shape equity of access and the reliability of services that students and faculty increasingly assume to be always on. Consequently, the digitisation agenda is intertwined with institutional planning for ICT infrastructure, facilities, and staff development (Obiozor-Ekeze, 2022).

The human capital dimension is at least as decisive as the hardware. Research on technology adoption by library personnel in Nigeria underscores how organisational culture, leadership, and innovation attributes influence staff uptake of new systems. Librarians require continuous upskilling in areas such as digital curation, data literacy, user analytics, cybersecurity, and interoperable metadata, especially as platforms become more automated and data-intensive. Post-pandemic analyses of user education also suggest that librarians have assumed broader instructional roles, from designing online orientations to embedding information literacy into hybrid courses, activities that demand pedagogical, technical, and assessment capabilities. Emerging

work in 2025 on artificial intelligence introduces another frontier, since AI affects both back-end workflows, for example metadata generation and recommendation, and front-end experiences, such as chat-based reference and personalised search, thereby raising questions about ethics, transparency, and staff preparedness. These studies argue for deliberate capacity building, sandboxes for experimentation, and policy frameworks that protect user privacy while enabling innovation (Awoyemi, 2023; Adetayo et al., 2023; Nkomo, 2025).

If the opportunities are significant, the challenges are equally well documented. Funding remains the recurring bottleneck that ripples across licensing, maintenance, staffing, and energy costs. Studies focused on Nigerian academic libraries identify chronic underfunding and inconsistent policy support as root causes that limit the scalability of promising pilots. Infrastructure deficits, especially unstable power and limited campus connectivity, degrade user experience and raise the total cost of ownership for every digital system. Governance issues, including the absence of clear institutional repository policies, data protection protocols, and preservation strategies, hinder trust and adoption. Finally, the user side presents its own hurdles, since variations in digital literacy and device access affect the uptake of e-services and can reinforce inequalities between students from urban and rural backgrounds. Addressing these challenges requires multi-level responses: national policies that prioritize knowledge infrastructure, university strategies that align library technology with research and teaching goals, and library-level roadmaps that sequence investments, measure outcomes, and foreground accessibility (Ojobor, 2025; Ifijeh, 2020).

Theoretical Framework

The theoretical framework for this study is anchored on Davis 1989 Technology Acceptance Model and related models that explain how technology is adopted, diffused, and utilized within organisational and educational contexts. Since university libraries in Nigeria are service-oriented institutions that depend heavily on user interaction, resource management, and organisational support, it is essential to ground this discussion on theories that highlight innovation adoption, information access, and technology-mediated learning. The following theories

provide a foundation for understanding both the opportunities and challenges associated with enhancing library services through technology.

1. Technology Acceptance Model (TAM) (Davis, 1989, applied in current studies)

The Technology Acceptance Model emphasises two key factors: perceived usefulness and perceived ease of use, which determine whether individuals will accept and adopt a given technology. Within Nigerian university libraries, TAM helps to explain why librarians, students, and faculties adopt or resist platforms such as online catalogs, virtual reference systems, and digital repositories.

2. Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology expands **Technology Acceptance Model** by including factors such as social influence, facilitating conditions, performance expectancy, and effort expectancy. In Nigerian universities, this framework highlights how institutional culture, leadership support, peer influence, and infrastructure availability shape the extent to which library staff and users adopt digital platforms and it is especially relevant for services like online learning management system integration, artificial intelligence-powered chatbots, and repository use, where support from colleagues and management plays a critical role.

3. Connectivism Theory: Connectivism theory emphasises learning in a digital age, where knowledge is distributed across networks of people and technology. For university libraries, this theory underscores the importance of digital services in supporting lifelong learning, research collaboration, and global scholarly networks. Nigerian libraries that implement digital repositories, online user education, and AI-driven discovery systems are aligning with connectivist principles by facilitating access to distributed knowledge and enabling students and faculties to learn through connected systems (Adetayo et al., 2023; Nkomo, 2025). Among the three, UTAUT exhibits the strongest alignment with this study, as it integrates individual perceptions with social, organisational, and infrastructural factors, providing a comprehensive lens for examining digital library adoption. By employing UTAUT, this study can holistically assess the determinants

of technology use in Nigerian academic libraries, capturing both user behaviour and institutional influences.

A library is an organised institution dedicated to the acquisition, organisation, preservation, and dissemination of knowledge in various formats, including print, non-print, and digital media. Traditionally, libraries were understood primarily as physical spaces housing books, manuscripts, and other recorded materials for reading, study, and reference. They served as custodians of knowledge and culture, supporting teaching, learning, and research within educational institutions (Hudson, 2024).

Traditionally, libraries have served as custodians of knowledge and culture, focusing on the acquisition, organisation, preservation, and dissemination of recorded information. In universities, they are often described as the "heart of the institution," providing essential support for teaching, learning, and scholarly research (Hudson, 2024). While this traditional role remains significant, technological advancements have broadened the library's functions, transforming how knowledge is accessed, utilised, and shared.

In contemporary scholarship, libraries are increasingly understood as hybrid knowledge environments that integrate both print and digital resources while serving users on-site and remotely. The proliferation of electronic information resources, institutional repositories, digitisation initiatives, and artificial intelligence applications has transformed libraries into comprehensive knowledge hubs. Modern libraries prioritise access to information in multiple formats whether licensed externally, curated locally, or produced by institutional scholars rather than focusing solely on the ownership of physical collections (Ezema et al., 2024; Farouk, 2025).

University libraries in Nigeria exemplify this evolving concept. They play a crucial role in advancing the educational and research mission of their institutions by providing access to scholarly materials, supporting information literacy, and facilitating digital scholarship. In a context where funding and infrastructural challenges persist, Nigerian university libraries are compelled to innovate by adopting electronic databases, online catalogs, and institutional repositories as cost-effective ways of expanding access to information. Moreover, the pandemic period

reinforced the idea that libraries are not confined by walls, but can serve as virtual gateways to information for students and staff regardless of geographical barriers (Adetayo et al., 2023).

Libraries are increasingly understood not only as information providers but also as collaborative spaces where users can engage in group study, digital learning, and knowledge creation. With the infusion of technology, services such as virtual conference, online orientations, and AI-powered chat support illustrate that libraries are now participatory platforms rather than passive depositories of knowledge (Nkomo, 2025).

Dimensions of Library Service through Technology in Nigerian Universities

University libraries in Nigeria have undergone significant transformation with the introduction of digital technologies. In the past, their functions revolved around manual cataloguing, circulation, and in-person reference services. Today, technology has expanded the range of services they provide, redefining their role as academic support hubs. As Ifijeh (2020) notes, technology in academic libraries is no longer an optional tool but a fundamental aspect of library operations. Nigerian universities have increasingly adopted electronic resources, institutional repositories, digitization projects, social media communication, and even artificial intelligence to serve their diverse user populations. These dimensions not only enhance access to information but also address the needs of the digital generation of students and researchers.

1. **Provision of Electronic Resources:** One of the most prominent dimensions is the acquisition and provision of electronic resources such as e-books, e-journals, and subject database. Nigerian university libraries subscribe to platforms like EBSCOhost, JSTOR, and ProQuest, which allow users to access global scholarship in real time. This service removes the spatial and temporal barriers associated with physical libraries, enabling users to retrieve resources remotely. According to Ifijeh (2020) and Hudson (2024), electronic resources have significantly broadened the research horizon for Nigerian scholars, although challenges such as high subscription fees and poor bandwidth persist.

2. **Institutional Repositories (IRs):** Institutional repositories are another important dimension, serving as digital archives that collect, preserve, and disseminate scholarly works produced within Nigerian

universities. These include theses, dissertations, technical reports, and journal articles. IRs promote global visibility of Nigerian research outputs, thus, enhancing institutional reputations. Ezema et al., (2024) and Farouk (2025) argue that repositories also support the principles of open access, allowing unrestricted access to indigenous knowledge.

3. **Digitisation of Local Content**: Digitisation involves converting print or fragile documents into electronic formats for preservation and access. Nigerian universities have begun digitising theses, rare manuscripts, and historical collections to ensure long-term survival and accessibility. Obiozor-Ekeze (2022) notes that digitisation protects fragile materials from physical damage and extend their reach to wider audiences. Despite infrastructural challenges like unreliable electricity and high equipment costs, digitisation represents a vital service dimension that safeguards cultural and academic heritage.

4. **Online Public Access Catalogues (OPACs):** The introduction of OPACs has changed the way library users locate materials. Unlike manual card catalogues, OPACs provide real-time, searchable databases of library holdings, often accessible remotely. Nigerian university students and staff can search for books, journals, and electronic content from outside the physical library. Ojobor (2025) emphasises that OPACs enhance efficiency and improve user experience, especially when integrated with mobile interfaces.

5. **Virtual Reference Services:** Technology has extended reference services beyond the traditional desk into virtual environments. Nigerian university libraries now provide reference services through emails, WhatsApp, social media, and chat platforms. During the COVID-19 lockdowns, virtual reference became indispensable in responding to users' academic queries. Adetayo et al., (2023) report that many libraries developed innovative online reference services, ensuring that students and researchers maintained access to scholarly support even when campuses were closed.

6. **Integration with Learning Management Systems (LMS):** A growing trend is the integration of library resources into institutional LMS such as Moodle or Blackboard. This allows students to access course readings, e-books, and repositories directly within their virtual classrooms. Awoyemi (2023) observes that integration with LMS makes

libraries active partners in pedagogy, positioning them as collaborators in teaching and learning rather than mere support structures.

7. **User Education and Information Literacy through Technology:** User education is central to effective library service. Nigerian libraries now use online tutorials, digital orientations, webinars, and instructional videos to teach students how to use electronic resources. Hudson (2024) highlights that technology-enabled information literacy programmes ensure that students develop critical digital skills needed for academic success. This dimension reflects a shift from in-person orientation to blended and virtual teaching of library skills.

8. **Adoption of Artificial Intelligence (AI) Tools in University**: Libraries emerging artificial intelligence (AI) technologies are gradually being integrated into Nigerian university library services. For instance, universities such as the University of Lagos and Ahmadu Bello University have begun experimenting with AI chatbots and recommendation systems to respond to user queries, enhance cataloguing efficiency, and provide personalized reading suggestions. Nkomo (2025) observes that AI has the potential to make Nigerian university libraries more proactive, user-centered, and responsive to the evolving needs of students and faculty. Nevertheless, challenges related to technical expertise, data privacy, and funding limitations continue to constrain the widespread adoption of AI tools within these institutions.

9. **Social Media Engagement and Outreach:** social media has become an important dimension of service delivery. Hudson (2024) explains that this approach brings library services into the digital spaces where students already spend much of their time, thereby increasing relevance and visibility.

10. **Collaborative and Remote Access Services:** collaboration and remote access represent an advanced dimension of library technology use. Nigerian university libraries engage in consortium arrangements to provide shared access to electronic resources at reduced costs. Remote access tools, including Virtual Private Networks (VPNs) and authentication systems, allow users to access licensed databases off-campus. Ezema et al., (2024) stress that such collaborations expand the range of resources available to Nigerian scholars while reducing the financial burden on individual institutions.

Technology-Driven Library Services in Nigerian Universities

The twenty-first century has ushered in a new era of academic librarianship, in which technology has become the primary driver of innovation, efficiency, and accessibility. Nigerian university libraries, traditionally anchored in print-based collections and manual processes, are increasingly embracing digital tools to remain relevant in the global academic community. As Ifijeh (2020) notes, technology has redefined the roles of academic libraries by transforming them into knowledge hubs that extend beyond physical walls. The advent of e-resources, digitisation, institutional repositories, and online learning integration illustrates how Nigerian libraries are repositioning themselves. Although, challenges such as infrastructural deficits and inadequate funding remain, the integration of technology is enabling libraries to provide diverse, user-centered services. Below are ten key technology-driven library services that characterise the contemporary Nigerian university library.

1. **Provision of Electronic Information Resources:** The most fundamental technology-driven service in Nigerian universities is the provision of electronic resources such as e-books, e-journals, and subscribed databases. Through platforms like EBSCOhost, JSTOR, and ProQuest, libraries give students and researchers access to global scholarship from any location. This service eliminates spatial restrictions associated with print collections and aligns with the increasing demand for remote learning. According to Hudson (2024), electronic resources now form the backbone of academic research, enabling students to participate in global knowledge exchanges. However, challenges of unstable internet and expensive subscriptions still limit full utilisation in many Nigerian universities.

2. **Institutional Repositories:** Institutional Repositories (IRs) are central to Nigerian academic libraries' embrace of technology. They serve as digital archives for theses, dissertations, conference proceedings, and journal articles produced within universities. By hosting and disseminating these works, repositories enhance the visibility of Nigerian scholarship globally. Ezema et al., (2024) argue that IRs democratise knowledge by providing open access to indigenous research outputs, thus reducing dependence on Western sources. In

addition, repositories strengthen university rankings since citations and global visibility are key metrics in academic evaluations.

3. **Digitisation of Local and Archival Content:** Digitisation is another vital service that allows libraries to convert fragile or rare print resources into electronic formats. Nigerian universities are digitizing theses, manuscripts, and local newspapers to ensure long-term preservation and access. Obiozor-Ekeze (2022) emphasises that digitisation protects unique collections from physical deterioration while also providing students with easy access to valuable historical resources. This service highlights the library's dual role as both an academic support system and a preserver of cultural heritage.

4. **Online Public Access Catalogues (OPACs):** The introduction of OPACs has transformed the way library users search for and locate materials. Unlike manual card catalogues, OPACs allow users to conduct real-time searches of library holdings using digital interfaces. Ojobor (2025) notes that many Nigerian universities have upgraded their cataloguing systems to web-based platforms, which can be accessed both on and off campus. This makes the discovery of resources more user-friendly and aligns with the digital preferences of modern students.

5. **Virtual Reference Services:** Virtual reference services are another technology-driven innovation. Instead of visiting a desk officer in the library, students can now consult librarians through emails, live chat, WhatsApp, or social media platforms. During the COVID-19 pandemic, virtual reference became particularly critical, as students required continuous guidance in navigating digital resources while campuses were shut down. Adetayo et al. (2023) document how Nigerian libraries effectively used Zoom and WhatsApp to maintain user support, demonstrating the flexibility of virtual reference in crisis periods and beyond.

6. **Integration with Learning Management Systems (LMS):** Modern Nigerian university libraries now integrate their digital resources with institutional Learning Management Systems (such as Moodle or Blackboard). Through this integration, students gain access to curated reading lists, e-resources, and repositories directly within their online classrooms. Awoyemi (2023) argues that this service transforms libraries into active partners in pedagogy, embedding them within the

core of academic instruction rather than limiting them to peripheral support functions.

7. **Information Literacy and User Education through Technology:** Information literacy training has become technology-driven, as libraries increasingly conduct digital orientations, webinars, and online tutorials. These programmes help students develop the skills to evaluate information critically and use electronic resources effectively. Hudson (2024) observes that digital information literacy programmes equip students with lifelong learning competencies essential in the information society. Nigerian libraries now use videos, infographics, and e-learning modules to reach wider audiences and to accommodate students who learn best in online environments.

8. **Artificial Intelligence (AI)-Enabled Services:** Although still in its infancy, artificial intelligence is making its way into Nigerian university libraries. AI-driven chatbots, for instance, can answer routine queries instantly, while machine learning algorithms can recommend personalised resources based on user history. Nkomo (2025) explains that AI can transform libraries from reactive to proactive institutions, anticipating user needs and streamlining workflows. While issues of cost, expertise, and data security remain challenges, AI is a promising direction for technology-driven library services in Nigeria.

9**. Social Media Communication and Outreach:** Nigerian libraries are increasingly using social media platforms such as Twitter, Facebook, Instagram, and WhatsApp to engage users, advertise resources, and promote events. According to Hudson (2024), social media platforms serve as cost-effective tools for outreach, bridging communication gaps between libraries and digital-native students.

10. **Remote Access and Collaborative Resource Sharing:** Technology has enabled Nigerian university libraries to provide remote access to electronic resources and to engage in collaborative resource sharing. Through authentication tools like VPNs and federated authentication systems, users can access subscribed databases off-campus. In addition, consortium arrangements such as the Nigerian Research and Education Network (NgREN) allow multiple universities to share resources at reduced costs. Ezema et al. (2024) stress that collaborative access

widens the scope of resources available to users while promoting sustainability in resource acquisition.

Factors to be considered in Technology-Enhanced Library Services in Nigerian Universities

The introduction of technology-enhanced services in university libraries is not a straightforward process. It requires careful planning, consideration of institutional realities, and alignment with broader academic goals. In the Nigerian context, where infrastructural and financial challenges persist, the adoption of such services must be strategic and sustainable. As Ifijeh (2020) observes, libraries that rush into technology adoption without addressing foundational requirements often face failure or underutilization of digital services. Below are ten critical factors to be considered when implementing technology-enhanced library services in Nigerian universities:

1. **Infrastructure and Power Supply:** A fundamental factor is the availability of reliable infrastructure, including electricity and internet connectivity. In Nigeria, frequent power outages and unstable broadband connections hinder smooth access to electronic resources. According to Obiozor-Ekeze (2022), a strong ICT backbone is essential for technology-driven services to thrive. Without consistent infrastructure, even well-designed systems risk becoming redundant.
2. **Funding and Sustainability:** The implementation of technology-enhanced library services requires significant financial investment in hardware, software, licensing fees, and maintenance. Adetayo et al. (2023) argue that many Nigerian university libraries struggle with erratic funding, leading to stalled projects. Before introducing new technologies, universities must develop sustainable funding models, such as consortia participation, institutional budget prioritisation, or partnerships with donor agencies.
3. **Staff Training and Capacity Development:** Technology will be as effective as the staff managing it. Librarians and ICT personnel must be adequately trained to use, maintain, and upgrade digital systems. Hudson (2024) emphasises that continuous professional development programmes, including workshops and certifications, are crucial for building technical expertise. A lack of skilled personnel staff often leads to underutilisation of technological innovations.

4. **User Digital Literacy:** Another important factor is the digital competence of library users. Students and academic staff must be able to navigate online catalogues, databases, and repositories effectively. According to Awoyemi (2023), opines that libraries should incorporate structured digital literacy training into their orientation programmes to ensure that technology adoption translates into meaningful use.
5. **Policy and Strategic Frameworks:** Technology adoption in libraries should be guided by clear institutional policies and strategies. These frameworks provide direction on issues such as digital preservation, open access, data protection, and intellectual property. Ezema et al., (2024) argue that without coherent policies, technology adoption risks becoming fragmented and unsustainable. Universities must therefore embed technology-enhanced services within their broader ICT and academic development plans.
6. **Compatibility and Integration with Existing Systems:** Introducing new technologies should not create silos but rather integrate seamlessly with existing systems such as Learning Management Systems (LMS), student portals, and research databases. Ojobor (2025) stresses that integration enhances user convenience, reduces duplication, and maximises the impact of investments. For example, embedding e-resources directly into LMS platforms ensures that students can access materials within their learning environments.
7. **Data Security and Privacy:** Technology-enhanced library services involve large volumes of user and institutional data. Protecting this data from breaches, unauthorised access, or misuse is critical. Nkomo (2025) notes that libraries must adopt robust cybersecurity measures, including encryption, authentication, and data backup systems. Neglecting this factor can compromise institutional trust and lead to legal or reputational consequences.
8. **Cost of Licensing and Intellectual Property Issues:** Many electronic resources come with complex licensing agreements and intellectual property considerations. Libraries must ensure compliance with copyright laws and negotiate favorable terms that allow fair use by students and staff. Farouk et al., (2025) warns that ignoring licensing complexities may expose institutions to legal risks while limiting access to vital resources.

9. **Cultural and Institutional Readiness:** The culture of both staff and users must be receptive to technological change. Resistance to new systems, whether due to fear of redundancy or preference for traditional methods, can undermine implementation efforts. Ifijeh (2020) states that stakeholder buy-in is critical for success. Libraries must therefore foster a change management culture that encourages adoption and experimentation.

10. **Monitoring, Evaluation, and Continuous Improvement:** libraries must establish mechanisms to evaluate the effectiveness of technology-enhanced services. This involves gathering user feedback, assessing usage statistics, and reviewing system performance. Adetayo et al., (2023) argue that continuous monitoring ensures that libraries can adapt to emerging technologies and user needs, thereby remaining relevant in a rapidly changing environment.

Challenges of Technology-Enhanced Library Services in Nigeria

The introduction of technology-enhanced services in university libraries is not a straightforward process. It requires careful planning, consideration of institutional realities, and alignment with broader academic goals. In the Nigerian context, where infrastructural and financial challenges persist, the adoption of such services must be strategic and sustainable.

1. **Inadequate Infrastructure:** One of the foremost challenges is the lack of adequate infrastructure, particularly electricity and internet connectivity. Libraries depend heavily on uninterrupted power supply and stable broadband to sustain online catalogues, databases, and repositories. Unfortunately, frequent blackouts and poor ICT infrastructure remain a reality in many Nigerian universities.

2. **Insufficient Funding:** The financial burden of establishing and maintaining technology-enhanced library services is another major challenge. Nigerian university libraries operate within institutions that face chronic underfunding from government and limited internally generated revenue. Subscription fees for databases such as JSTOR, EBSCOhost, and ProQuest are expensive, and many libraries cannot sustain them consistently.

3. **Skill Gaps among Library Staff:** Technology adoption is dependent on staff competence. Many librarians in Nigerian universities lack

advanced ICT skills required to manage digital repositories, troubleshoot e-resource platforms, or implement emerging tools such as artificial intelligence. Although training programs exist, they are often irregular and insufficient.

4. **Low Digital Literacy among Users:** Beyond staff capacity, user competence also poses a serious challenge. Many students and even academic staff in Nigerian universities struggle with navigating databases, using reference management tools, or conducting advanced online searches. As a result, even where e-resources are available, usage statistics remain low because students prefer open-access sources like Google Scholar over licensed databases.

5. **Policy and Regulatory Deficiencies:** Policy frameworks guiding technology-enhanced services in Nigerian universities are often inadequate or outdated. Issues such as digital preservation, open access mandates, copyright compliance, and data protection require robust institutional policies.

6. **High Cost of Licensing and Subscriptions:** Most electronic resources require recurring subscription fees that are denominated in foreign currencies, making them vulnerable to exchange rate fluctuations. This financial strain is worsened by Nigeria's unstable economy, which directly affects universities' ability to maintain subscriptions. Farouk (2025) highlights that many Nigerian libraries have lost access to critical databases after failing to renew subscriptions, leaving users with incomplete or outdated information access. This cyclical loss of access undermines trust in the library as a reliable academic partner.

7. **Resistance to Change:** Cultural and institutional resistance also hampers the adoption of technology in libraries. Some librarians fear redundancy due to automation, while some academics and students continue to prefer print resources.

8. **Data Security and Privacy Concerns:** Technology-enhanced services generate and store sensitive user data, making libraries vulnerable to cyberattacks, data breaches, and unauthorized access.

9. **Maintenance and Technical Support Challenges:** Introducing digital systems is one thing, but sustaining them requires ongoing maintenance and technical support. Many Nigerian libraries struggle

with broken servers, outdated software, and insufficient IT staff to address technical glitches.

10. **Socio-Economic and Regional Disparities**: Socio-economic and regional inequalities also affect the adoption of technology-enhanced library services in Nigeria. Universities in urban centers such as Lagos, Abuja, and Ibadan tend to have better ICT infrastructure and funding opportunities compared to universities in rural center.

Awoyemi (2023) stresses that the effectiveness of technology-driven services depends on user ability to maximize them, yet most Nigerian universities provide minimal digital literacy training. Ezema et al., (2024) argue that this digital divide risks entrenching inequalities in knowledge access, as students in less privileged universities may lack exposure to the same resources as their counterparts in better-funded institutions. Ifijeh (2020) points out that resistance to digital transformation stems from lack of awareness of the benefits of technology-enhanced services. However, without proper change in management strategies, new technologies risk being underutilized or outrightly rejected by stakeholders. Nkomo (2025) stresses that Nigerian university libraries often lack robust cybersecurity measures, leaving them exposed to risks that could compromise institutional trust. Furthermore, limited awareness of data protection policies among staff and users heightens the vulnerability of these systems. Hudson (2024) notes that without continuous professional development, library staff may become overwhelmed by new technologies, resulting in underutilization or poor service delivery. The skill gap thus remains a bottleneck in the effective deployment of technology-enhanced services.

Prospects of Technology-Enhanced Library Services in Nigerian Universities

The followings are some of the identified prospects of technology enhanced library service:

1**. Global Integration and Access to International Research:** Technology-enhanced library services provide Nigerian universities with the unprecedented opportunity to integrate into the global academic ecosystem. Through subscription-based and open-access platforms, Nigerian scholars and students can access high-impact journals,

conference proceedings, and databases that were previously beyond reach

2. **Remote Learning and Inclusive Education:** The COVID-19 pandemic demonstrated the importance of digital libraries in sustaining academic continuity when physical spaces were inaccessible. Technology-enhanced library services enable Nigerian universities to support remote and distance learning programmes by granting users access to e-books, e-journals, and institutional repositories from anywhere with internet connectivity

3. **Cost-Effective Dissemination through Digital Platforms:** Another significant opportunity lies in the cost-effectiveness of digital dissemination. Traditional print-based services are expensive due to costs of printing, binding, physical storage, and distribution. By contrast, digital platforms reduce recurrent expenditure while enabling instant and wide-scale dissemination of scholarly output. According to Adetayo et al. (2023), institutional repositories allow Nigerian universities to share theses, dissertations, and faculty publications without recurring print costs. Moreover, open access publishing through digital platforms improves the visibility of research at minimal cost to the institution. Farouk (2025) stresses that although initial investments in technology may be high, the long-term benefits of reduced physical handling and scalable digital dissemination make technology-driven services more sustainable and economically viable.

4. **Enhanced Research Visibility and Student Engagement**: Technology-enabled library services significantly improve the visibility of Nigerian research outputs and foster student engagement. By hosting institutional repositories and digitising local content, Nigerian universities can showcase indigenous research to a global audience.

5. **Personalised Services through Data Analytics:** The use of data analytics in library systems provides opportunities for personalized service delivery. Technology-enhanced services can collect and analyse user behaviour, such as frequently accessed materials, peak usage times, and preferred formats. This data allows librarians to tailor services to meet specific user needs. For instance, students in engineering can receive alerts about new e-books or journals relevant to their field, while postgraduate researchers may be directed to advanced research tools.

6. **Collaboration through Library Consortia and Public-Private Partnerships (PPPs):** Technology-enhanced services facilitate collaboration among libraries, universities, and external partners. Consortia such as the Nigerian University Libraries Consortium (NULC) enable institutions to pool resources and collectively subscribe to expensive databases, thus reducing individual costs.

7. **Strengthening Open Access and Knowledge Democratization:** One of the major prospects of technology-enhanced services is the expansion of open access initiatives in Nigerian universities. Open access repositories and journals democratise knowledge by removing financial and institutional barriers to information.

8. **Capacity Building and Digital Literacy Development**: Technology-driven services create opportunities for capacity building among librarians, faculty, and students. Training programs in information literacy, digital research skills and the use of library technologies empower users to effectively navigate vast digital resources. libraries that invest in digital literacy initiatives enhance student learning outcomes and research quality. Additionally, continuous professional development for librarians ensures that they remain current with evolving technologies and user expectations. This dual focus on user education and staff capacity building positions university libraries as leaders in digital literacy advocacy within the Nigerian higher education sector.

9. **Preservation and Digitization of Indigenous Knowledge:** Nigerian universities are custodians of rich cultural and historical materials, including rare manuscripts, oral histories, and local publications. Technology-enhanced library services provide opportunities for preserving and digitizing these resources, ensuring their accessibility for future generations.

10. **Innovation and Future-Ready Libraries:** Technology-enhanced services open the door for Nigerian university libraries to evolve into innovative and future-ready institutions. Emerging technologies such as artificial intelligence, machine learning, and virtual reality offer possibilities for smarter cataloging, immersive learning environments, and intelligent research support.

Conclusion

Nigerian university libraries have transformed from traditional print based repositories into technology-driven knowledge hubs, leveraging electronic resources, institutional repositories, digitalisation, LMS integration and emerging AI tools to enhance access, research visibility and academic collaboration. Despite persistent challenges such as limited infrastructure, funding constraints, skill gaps and weak policy frameworks. Strategic investments, staff capacity building and digital literacy initiatives can ensure sustainable adoption. Effective implementation of these technology-enhanced services offer opportunities for global integration, preservation of indigenous knowledge, personalised support and development of future-ready libraries that advance scholarship and learning in Nigeria.

Recommendations

The following recommendations were proffered:

1. University should sustain financial investment to support modern library technologies, expand digital collections, and keep facilities up to date.
2. Collaboration with private organisations and technology firms to provide additional resources, technical expertise, and infrastructure support that universities alone cannot afford.
3. Clear policies should be established and enforced to guide the implementation, regulation, and long-term sustainability of digital library initiatives in our universities.
4. Librarians and other staff should undergo regular training to acquire modern digital skills and remain effective in delivering technology-enhanced services.
5. Universities should embrace open access models and strengthen institutional repositories to promote wider visibility of local research and scholarship.
6. Libraries should design flexible and user-friendly digital platforms, including mobile access that respond to the needs and preferences of students and researchers

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