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Digital Technologies for Innovation and Access in Nigeria Academic Libraries

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Abstract
This paper explores the transformative potential of digital technologies in enhancing innovation and access in Nigeria academic libraries. Faced with challenges such as limited resources, outdated collections, and inadequate infrastructure, academic libraries are at a critical juncture where digital solutions can significantly improve their service delivery. The paper examines the current state of academic libraries, highlighting issues related to underfunding and infrastructural deficits, particularly in rural areas. It then outlines key digital interventions, including the development of digital collections, adoption of Library Management Systems (LMS), promotion of Open Educational Resources (OER), mobile access to library resources, and the digitization of special collections. Furthermore, emerging technologies such as Artificial Intelligence (AI) and Machine Learning (ML) are discussed for their potential to automate services and personalize user experiences. The paper emphasizes the need for robust infrastructure, digital literacy, adequate funding, and clear policy frameworks to ensure the successful implementation of digital technologies in academic libraries. By integrating these technologies, academic libraries can become more inclusive, accessible, and effective in supporting academic research and allowed people to access resources from anywhere, encouraged more teamwork in learning. These tools have turned the library from a quiet, book-only space into a vibrant, user-focused hub for study and innovation. The study recommends that government should increase funding and infrastructure development, capacity building, collaborative partnership, policy and maintenance framework and user-centered innovation.

Keyword: Digital Technology, Innovative Technology, Academic Libraries, Nigeria

Introduction
Academic libraries in Nigeria are indispensable hubs of academic engagement, facilitating research, knowledge dissemination, and educational support for students and faculty alike. However, these libraries are often constrained by challenges such as inadequate resources, outdated collections, and insufficient infrastructure as a result of inadequate funning, which impede their capacity to fulfill their roles. (Ullah A, Usman .M. and Khan M.K. 2023) The integration of digital technologies offers a transformative solution to these challenges,

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enabling enhanced access to information, improved user experiences, and promoting innovation in academic activities (Oni, Momoh & Odaro-Ekhaguebo, 2019). Digital transformation in this context transcends the simple digitization of existing materials; it involves a paradigm shift in how information is curated, accessed, and utilized. The adoption of digital tools in Nigerian academic libraries could significantly democratize access to knowledge, breaking down barriers imposed by geographical distance or economic limitations, and positioning these libraries as inclusive environments that foster educational excellence.

The Current State of Nigerian Libraries

Academic libraries in Nigeria like many institutions in the developing world face numerous systemic issues. Chronic underfunding has left many libraries relying on outdated resources, limiting their ability to provide up-to-date and relevant academic materials. This issue is common in many academic libraries in Nigeria, where inadequate infrastructure such as unreliable internet connectivity and outdated library management systems further constrains service delivery. These deficiencies not only hinder the libraries' capacity to support their academic communities but also limit the scope of their contributions to national and global knowledge economies (Genevieve & Obiano and Durje, 2022; Marke & Waziri, 2023).

Despite these constraints, the potential of digital technologies to transform academic libraries are vast. Digital tools can help bridge the gap between these libraries' current state and their potential in providing solutions that improve the quality of resources, expand access to information, and enable the libraries to better serve the needs of students and faculty.

The Role of Digital Technologies in Nigerian Academic Libraries

Digital Collections and E-Libraries

Digital collections are increasingly seen as a critical component of contemporary academic libraries. These collections offer access to vast amounts of information that it would be impossible to house in a traditional library setting due to space and financial constraints. For Nigerian academic libraries, the creation of e-libraries and digital repositories represents a significant opportunity to enhance access to academic resources (Otulugbu, 2019). By digitizing key academic materials such as textbooks, journals, theses, and research publications—libraries can extend access to these resources beyond their physical premises. E-libraries allow students and faculty to access materials from any location, facilitating learning and research even in remote areas. Furthermore, the development of e-libraries enables higher institutions to engage in collaborative resource sharing with other academic institutions, both within Nigeria and internationally. Platforms such as the National Virtual Library of Nigeria serve as exemplars of how digital repositories can enhance access to knowledge, fostering a culture of collaboration and resource-sharing among academic institution

However, there are still hurdles to overcome before e-libraries can reach their full potential in Nigerian polytechnics. Many schools still deal with unreliable internet and unstable electricity, especially in rural and semi-urban areas. On top of that, not all students and

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lecturers have the digital skills needed to make the most of these platforms, and we still don't fully understand how this skill gap affects usage. Another challenge is that while e-libraries offer access to a lot of global content, there's still not enough locally relevant material tailored to Nigeria's needs. Sustainability is also a concern—issues like regular updates, technical support, and steady funding don't get enough attention. Finally, we don't have enough evidence on how well students and lecturers know about or use these platforms, or how effective resource-sharing partnerships between institutions really are. Tackling these challenges is key to unlocking the full benefits of digital technologies for learning, research, and innovation in Nigerian academic libraries.

Library Management Systems (LMS)

Running a library well in the digital age depends a lot on having a strong Library Management System (LMS) to handle everyday tasks like cataloging books, managing new acquisitions, tracking borrowed items, and keeping user records. In Nigerian academic libraries, cloud-based systems such as Koha, Evergreen, and DSpace offer a smart way to manage large and growing collections. These tools can easily be adjusted to fit the library's size and needs, helping to reduce pressure on physical infrastructure and allowing more flexible services (Ezechukwu & Adewole-Odeshi, 2018). They also provide useful data on how people use the library, making it easier to see what's popular, where resources are needed most, and how to better engage users. This shift toward making decisions based on real data is helping Nigerian academic libraries adapt and better serve the changing needs of their students and staff.

Despite these advantages, there are still notable gaps in the adoption and use of LMS platforms in Nigerian academic libraries. First, the rate of adoption remains low, as many institutions have yet to fully integrate such systems into their daily operations. Second, infrastructural limitations—including poor internet connectivity, unreliable power supply, and outdated hardware—continue to hinder optimal performance. Third, a shortage of skilled personnel means that librarians and IT staff often lack the training needed to implement, customize, and maintain these systems effectively. In addition, while LMS platforms offer powerful analytics tools, there is little evidence that Nigerian academic libraries are using these insights to guide resource allocation or improve services. Challenges also exist around customization, as many LMS features are not tailored to the specific needs of Nigerian academic contexts. Finally, sustainability concerns—such as securing consistent funding, ensuring regular updates, and providing ongoing technical support—are rarely addressed in existing studies. Addressing these issues is crucial for ensuring that LMS platforms truly deliver on their potential to transform library services in Nigeria's academic institutions.

Open Educational Resources (OER)

Open Educational Resources (OER) are teaching, learning, and research materials that are freely available and openly licensed for anyone to use. In Nigerian academic libraries, OER provide a cost-effective solution to the issue of limited access to academic materials, particularly in fields where current textbooks and resources may be scarce or prohibitively expensive. Academic libraries can play an active role in curating OER collections that are specifically tailored to the needs of their students and faculty. This may include open textbooks, lecture notes, research papers, and multimedia resources that support the

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curriculum. By promoting the use of OER, libraries can alleviate the financial burden on students while ensuring that they have access to high-quality, up-to-date materials that are relevant to their studies (Smart & Ogbomo, 2023).

Despite these advantages, several gaps remain in the adoption and effective use of OER in Nigerian Academic libraries. First, awareness of OER among students, faculty, and even librarians is still low, limiting widespread adoption. Second, few institutions have formal policies or structured programs to guide the integration of OER into library services and academic curricula. Third, many available OER resources are developed for foreign contexts, with limited localization to reflect Nigerian culture, curriculum requirements, and societal needs. Additionally, digital literacy gaps among students and faculty mean that even when OER are available, they may not be fully utilized. Quality assurance is another challenge, as there is little evidence of robust review processes to ensure accuracy and academic relevance. Furthermore, sustaining OER collections requires consistent updates and maintenance, yet long-term strategies and funding models are rarely discussed. Finally, there is limited empirical research on the real impact of OER adoption in Nigerian academic libraries, particularly regarding its effect on learning outcomes, accessibility, and cost savings for students. Addressing these gaps is essential for unlocking the full potential of OER in supporting equitable and high-quality education.

Mobile Access to Library Resources

Given the widespread use of mobile phones in Nigeria, enabling mobile access to library resources is a critical aspect of the digital transformation process. Academic libraries can leverage mobile-friendly websites and applications to ensure that students and faculty can access library resources from anywhere, at any time. This is particularly important for students in rural areas who may have limited access to computers but can readily use their mobile devices to access digital content. Mobile applications can further enhance user engagement by offering features such as push notifications for upcoming due dates, event reminders, and instant access to digital collections. Such functionalities make the library more accessible and user-friendly, ensuring that students and faculty can access the information they need when they need it, (Udem & Ogungbeni, 2023).

In the context of academic libraries in Nigeria, mobile access means students and lecturers can use their smartphones, tablets, or laptops to connect to the library's digital resources without having to be physically present in the building. This could be through mobile-friendly library websites, dedicated library apps, or platforms that work well on smaller screens. With mobile access, users can search the catalogue, read e-books, download journal articles, watch educational videos, or even renew borrowed books from anywhere—whether they are on campus, at home, or travelling. For students in areas with limited physical library facilities, this kind of access is a game changer, as it makes research and study materials available on the go. Some Nigerian institutions have also integrated their e-libraries with learning management systems (LMS) or used WhatsApp and other messaging apps to share links, answer queries, and provide quick research support. While mobile access is expanding, challenges like poor internet connectivity, high data costs, and limited awareness among users still affect how much it is used.

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Despite these benefits, several gaps remain in the effective implementation and use of mobile access to library resources in Nigerian academic libraries. First, internet connectivity issues and high data costs continue to limit access, especially for students in rural or low-income areas. Second, many library platforms are not fully optimized for mobile use, leading to slow loading times or poor user experiences on smaller devices. Third, there is a lack of institutional policies and strategies specifically aimed at promoting and supporting mobile access. Additionally, awareness of mobile library services among students and faculty is still relatively low, resulting in underutilization. Digital literacy challenges further reduce the ability of some users to navigate and benefit from mobile resources effectively. Finally, there is little empirical research on the actual impact of mobile access on learning outcomes, research productivity, and user satisfaction within Nigerian academic libraries. Addressing these gaps is essential to ensuring that mobile access fulfills its promise of making library services more inclusive, flexible, and user-centered.

Digitization of Special Collections

Nigerian academic libraries are often custodians of unique local and historical materials, including rare books, manuscripts, and archival documents that are of immense cultural and academic value. Digitizing these special collections not only ensures their preservation for future generations but also opens them up to a global audience of researchers and academics.

Through the digitization process, academic libraries can create digital archives that enable researchers to explore these materials from anywhere in the world, without the need to physically visit the library. This expansion of access is crucial in a globalized academic environment, where research collaboration often spans national boundaries. Furthermore, by digitizing rare and fragile materials, libraries contribute to the broader effort of preserving Nigeria's cultural heritage for future generations (Ogbu, Oche, Nwachukwu & Batagarawa, 2020).

Despite these benefits, several gaps still limit the full potential of digitization in Nigerian academic libraries. First, only a small portion of collections has been digitized, leaving many valuable resources inaccessible online. Second, technical challenges such as inadequate scanning equipment, limited storage capacity, unstable electricity, and poor internet connectivity slow down large-scale digitization efforts. Third, there is a shortage of skilled personnel trained in digitization techniques, metadata creation, and digital preservation. Preservation standards are another concern, with limited evidence that current practices meet international requirements for long-term access and quality. Copyright and intellectual property issues also remain a barrier, particularly for older or rare works. Additionally, many users are either unaware of these digital archives or struggle to navigate them effectively. Finally, there is little research on the actual impact of digitization in Nigerian academic libraries—whether in boosting global research collaboration, enhancing cultural heritage preservation, or improving academic output. Addressing these gaps will be crucial to maximizing the value of digitization for research and heritage preservation.

Artificial Intelligence (AI) and Machine Learning (ML)

The emergence of Artificial Intelligence (AI) and Machine Learning (ML) technologies holds the potential to further transform library services. AI-driven tools can enhance the user

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experience by automating routine tasks such as cataloging, answering queries, and providing personalized recommendations based on user preferences and search behaviors. For instance, AI-powered search engines can improve the discoverability of resources by offering more accurate and contextually relevant search results. Chatbots, another application of AI, can provide 24/7 support to users, answering common questions and guiding them through the library's digital resources. The ability of AI to analyze user behavior patterns allows libraries to tailor their services, ensuring that they meet the specific needs of their academic communities (Ajakaye, 2022).

Despite these promising possibilities, the use of AI and ML in Nigerian academic libraries is still in its early stages. First, adoption remains very low, with few institutions integrating these tools into their library systems. Second, infrastructure challenges—such as unreliable internet, limited computing resources, and unstable electricity—make implementation difficult. Third, many library staff lack the skills and training needed to set up, manage, and maintain AI-driven services. Cost is another major barrier, as acquiring, customizing, and maintaining AI tools can be expensive for budget-limited institutions. Data privacy and ethical considerations also present a gap, with little policy guidance on how to handle and protect the user data that AI systems collect. Additionally, most AI tools are designed for global use and may not fully align with Nigerian cultural, linguistic, or academic needs. Finally, there is very little research evaluating the real impact of AI and ML adoption in Nigerian academic libraries—whether in improving service efficiency, boosting user satisfaction, or enhancing resource discovery. Addressing these gaps will be essential if AI is to truly reshape library services in Nigeria.

Collaborative Platforms and Knowledge Sharing

Digital technologies enable academic libraries to foster collaboration and knowledge sharing among students, faculty, and researchers. Platforms such as Google Workspace, Microsoft 365, and other collaborative tools facilitate online interactions, allowing users to work together on research projects, share resources, and communicate in real-time. Academic libraries can support these collaborative efforts by providing access to digital workspaces and encouraging their use for academic purposes. By facilitating knowledge sharing and collaboration, libraries not only enhance research productivity but also help build a more connected and engaged academic community.

Challenges and Opportunities for Nigerian Academic Libraries

Digital technology has the power to change the way Nigerian academic libraries serve their students, lecturers, and researchers. It can make resources easier to find, improve services, and connect libraries to the global academic community. But turning this vision into reality isn't always easy.

Poor Infrastructure

One of the biggest problems is simply having the right foundation. Many libraries still deal with constant power cuts and slow or unreliable internet connections. These problems make it difficult for students to use e-libraries, download resources, or attend online training sessions. Without steady electricity and fast internet, even the best digital tools can't work as

they should. Investing in stable power supply, backup systems, and better internet service is essential if libraries are to keep up with modern demands.

Low Digital Skills

Digital tools are only as useful as the people who use them. Some librarians still need more training in areas like managing online databases, creating digital catalogs, or helping users navigate e-resources. At the same time, many students and lecturers don't always know how to search effectively, filter information, or make the most of the resources available. Regular workshops, training sessions, and awareness campaigns can help both staff and users get the full benefits of digital library services.

Lack of Steady Funding

Running a modern digital library is expensive. There are costs for buying equipment, paying for software, maintaining systems, and training staff. Most Nigerian academic libraries work with very limited budgets, and this makes it hard to sustain digital services in the long run. This is why libraries need creative funding solutions—such as partnering with private companies, applying for government grants, or working with international organizations.

Weak Policy and Guidelines

When libraries go digital, they also have to deal with new issues like protecting user data, respecting copyright, and making sure digital content lasts for the long term. Without clear rules and policies, there's a risk of breaking laws or losing important information. Libraries need strong policies that protect both the users and the resources, while also keeping in line with national and international standards.

Opportunities Despite the Challenges

The good news is that these challenges can be turned into opportunities. If Nigerian academic libraries invest in better infrastructure, train their people, secure more funding, and create strong policies, they can offer world-class services. Digital technology can help them share resources with other institutions, preserve cultural heritage, and give students and researchers instant access to information—no matter where they are.

Conclusion

Digital technologies have the power to transform Nigerian academic libraries into vibrant hubs of innovation and learning. With the right mix of modern infrastructure, supportive policies, and skilled personnel, these libraries can move beyond traditional roles to provide faster, broader, and more relevant access to knowledge. By embracing tools such as digital collections, mobile platforms, AI solutions, and collaborative systems, academic libraries can directly strengthen academic success, skills development, and national progress.

Recommendations

To optimize the use of digital technologies, polytechnic libraries should:

- Invest in reliable infrastructure, including stable electricity, broadband internet, and modern hardware.

- Implement continuous capacity-building programs to improve digital competencies among staff and users.
- Adopt sustainable funding strategies, leveraging government support, public–private partnerships, and international grants.
- Establish comprehensive policies on copyright, data protection, and digital preservation.
- Standardize the adoption of core digital platforms to ensure equitable and consistent service delivery across institutions.

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