International Journal of Information Resource Management (IJIRM)
Volume 3, Number 4 (October, 2026)
E- ISSN: 1118-7786

NAVIGATING THE DIGITAL FRONTIER: ICT AND DIGITAL TRANSFORMATION OF LIBRARY SERVICES IN NIGERIA

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Abstract

The digital transformation of library services has become an imperative for academic libraries worldwide, and Nigeria is no exception. This paper examines the current state of ICT adoption and digital transformation in Nigerian libraries, drawing on the visionary leadership and contributions of Professor Ahmad Abdu Balarabe, who has been at the forefront of digital initiatives at Usmanu Danfodiyo University, Sokoto. Through a comprehensive review of literature, the paper conceptualizes digital transformation across three dimensions: ICT infrastructure, digital content and services, and digital competencies. Findings reveal that while Nigerian libraries have made significant strides in adopting ICT including integrated library management systems, institutional repositories, mobile

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applications, and e-learning platforms, substantial challenges persist, including inadequate funding, unreliable electricity, poor internet connectivity, and skills gaps among librarians. The paper argues that Balarabe's pioneering initiatives including the development of a Mobile Library App, the digitization of over 200,000 academic materials, and the establishment of e-learning infrastructure provide a model for digital transformation in Nigerian libraries. Recommendations include enhanced investment in ICT infrastructure, comprehensive digital skills development programmes, and the adoption of national digital library policies.

Keywords: ICT, digital transformation, library automation, institutional repositories, mobile library services, Nigerian libraries, e-learning

Introduction

The advent of Information and Communications Technology (ICT) has fundamentally transformed the landscape of library and information services globally. Libraries that once operated primarily as physical repositories of print materials have evolved into hybrid institutions offering both traditional and digital services. This digital transformation encompasses automated library operations, electronic information resources, digital repositories, mobile library services, and virtual reference services. In Nigeria, the journey towards digital library services has been a story of aspiration, innovation, and persistent challenges. Nigerian academic libraries have made significant efforts to leverage ICT to enhance service delivery, despite operating within a challenging environment characterized by inadequate funding, unreliable electricity, and limited internet connectivity. The 21st century has witnessed remarkable growth in ICT infrastructure in Nigerian university libraries, including integrated library management systems, institutional repositories, and e-learning platforms.

Despite the recognized importance of ICT for library services, evidence suggests that Nigerian libraries face significant challenges in achieving full digital transformation. The National Universities Commission and the Association of University Librarians of Nigerian Universities have identified poor ICT infrastructure, unstable power, inadequate funding,

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and low digital literacy as critical barriers to effective library services. Furthermore, studies indicate significant skills gaps among librarians in areas such as digital literacy, data analytics, artificial intelligence, and repository management. The COVID-19 pandemic exposed these gaps, as libraries struggled to provide virtual services during lockdowns. It is against this backdrop that this paper examines the current state of ICT and digital transformation in Nigerian libraries, using the visionary leadership and practical initiatives of Professor Ahmad Abdu Balarabe as a guiding framework. The paper specifically explores the conceptualization and dimensions of ICT and digital transformation in academic libraries, assesses the current state of ICT adoption and digital services in Nigerian libraries, identifies challenges hindering digital transformation, applies Balarabe's digital initiatives and leadership principles to propose a framework for digital transformation, and recommends practical strategies for advancing ICT and digital transformation in Nigerian libraries.

This paper contributes to the literature on library and information science in Nigeria by synthesizing recent research on ICT and digital transformation and connecting it to the legacy of a distinguished Nigerian librarian. It offers practical insights for library managers, policymakers, and LIS educators. The analysis is conceptual, relying primarily on secondary sources published between 2020 and 2026, supplemented by foundational works. The paper is organized into conceptual discussions of key issues, followed by recommendations and conclusion.

Conceptualizing ICT and Digital Transformation in Libraries

Digital transformation in libraries refers to the comprehensive integration of digital technologies into all areas of library operations, fundamentally changing how libraries deliver services and engage with users. This transformation is not merely about adopting new technologies but about reimagining library services in response to the digital age. The

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author conceptualizes digital transformation as encompassing three interconnected dimensions that must be addressed simultaneously for meaningful transformation to occur. The first dimension is ICT infrastructure, which includes hardware such as computers, servers, networking equipment, and mobile devices; software including integrated library management systems, digital repository platforms, and discovery tools; and connectivity encompassing internet access, intranet, and wireless networks. Without robust infrastructure, other aspects of digital transformation cannot be realized. The second dimension is digital content and services, which encompasses electronic information resources such as e-journals, e-books, and databases; institutional repositories; digital collections; virtual reference services; and mobile library services. This dimension represents the visible outputs of digital transformation that users interact with directly. The third dimension is digital competencies, which includes the skills and knowledge required by librarians and users to effectively utilize digital technologies and resources. For librarians, this encompasses digital literacy, data management, metadata creation, digital preservation, and familiarity with emerging technologies. For users, it involves information literacy and digital skills necessary to navigate digital library environments.

The author argues that these three dimensions are mutually reinforcing and that weakness in any one dimension undermines the entire digital transformation effort. A library may have excellent infrastructure but lack the content to populate it, or may have rich digital content but lack staff with the competencies to manage it effectively. Sustainable digital transformation therefore requires balanced attention to all three dimensions. The Technology Acceptance Model (TAM), developed by Davis (1989), provides a useful framework for understanding ICT adoption in libraries. TAM posits that two primary factors influence technology acceptance: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance their job performance. Perceived ease of use refers to the degree to which a

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person believes that using a particular system would be free of effort. In the Nigerian library context, TAM helps explain the adoption patterns observed in the literature. When librarians perceive that ICT tools enhance their ability to serve users and are easy to learn and use, adoption is more likely. Conversely, when librarians lack ICT skills or face infrastructure challenges, the perceived ease of use is low, hindering adoption. The author observes that this theoretical lens is particularly relevant in Nigeria, where both perceived usefulness and perceived ease of use are often compromised by systemic challenges.

ICT Infrastructure and Digital Services in Nigerian Academic Libraries

The evolution of ICT infrastructure in Nigerian academic libraries has been incremental but significant. Many Nigerian university libraries have adopted integrated library management systems such as Koha, Virtua, and Alexandria to automate core library functions including cataloguing, circulation, acquisitions, and serials management. For example, the Covenant University Library and the University of Nigeria, Nsukka, have implemented extensive ILMS. However, a study on the use of Koha in Kenneth Dike Library, University of Ibadan, revealed that while the system is used for cataloguing and circulation, not all modules are fully utilized. The author notes that this partial utilization represents a significant gap between potential and actual use, suggesting that infrastructure alone is insufficient without corresponding competencies and institutional commitment. Institutional repositories have emerged as a key component of digital library infrastructure in Nigeria. A survey of open access institutional repositories in Nigerian university libraries revealed that only a few universities have successfully developed open access IRs to preserve and manage their intellectual outputs. The most common content hosted includes journal articles, theses and dissertations, and conference and workshop papers. However, the majority of the IRs studied lacked defined policies in access, submission, preservation, content, and copyright. Challenges identified included inadequate funding, difficulties in collecting content, shortage of skilled ICT personnel, and inadequate facilities. The author

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contends that the absence of defined policies is particularly problematic because it creates uncertainty about content ownership, access rights, and preservation responsibilities, thereby undermining the sustainability of institutional repositories.

Electronic information resources represent another critical component of digital library services. Nigerian university libraries provide access to a range of electronic information resources, including e-journals, e-books, and databases. The Nigerian University System has been supported by initiatives such as the Nigerian Research and Education Network and the Tertiary Education Trust Fund subscription to databases. However, a study on e-resource utilization in three Nigerian universities found that students lacked adequate digital literacy skills to effectively use these resources. This finding underscores the author's argument that content provision must be accompanied by user education and digital literacy programmes for digital resources to be fully utilized. Mobile library services represent a significant innovation in Nigerian library services. The Abdullahi Fodiyo Library at Usmanu Danfodiyo University, Sokoto, has pioneered the development of a mobile library application that enhances access to over 200,000 academic materials, representing a groundbreaking effort to bridge accessibility gaps. A study on mobile library services in Nigerian universities examined the extent of mobile technology adoption for service delivery, finding that while some libraries have developed mobile apps and SMS services, adoption remains limited. The author observes that mobile technology holds particular promise in Nigeria because mobile phones are the primary means of internet access for most Nigerians, making mobile-first approaches essential for reaching users where they are.

The COVID-19 pandemic accelerated the adoption of virtual reference services in Nigerian libraries. Studies examined how libraries provided reference services during the pandemic, including the use of email, WhatsApp, and social media for reference queries. However, the adoption of more sophisticated virtual reference tools such as chatbots and video conferencing remains limited. Nigerian libraries have also increasingly adopted social

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media platforms including Facebook, Twitter, Instagram, and WhatsApp for library communication, marketing, and user engagement. Studies have examined the use of social media for library services in Nigerian universities, identifying benefits including improved communication and user engagement, but also challenges such as low user engagement. The author argues that while these platforms offer low-cost channels for service delivery, their effectiveness depends on consistent and strategic use rather than ad hoc adoption.

Emerging Technologies in Nigerian Libraries

The literature identifies several emerging technologies that are beginning to be adopted or considered for adoption in Nigerian libraries. Artificial intelligence represents one of the most significant emerging technologies with potential application in library services. A comprehensive study on the application of emerging technologies for research support in Nigerian academic libraries examined the integration of AI into library services. AI-enabled chatbots now provide round-the-clock reference services, offering researchers assistance at any time. Modern OPACs integrated with AI have evolved into real information systems that can track user preferences and make recommendations. The author notes that while AI adoption remains nascent in Nigeria, the technology offers particular promise for extending service hours and personalizing user experiences without requiring proportional increases in staffing.

Data mining and analytics tools such as Rapid Miner, Orange, and Weka enable librarians to support researchers by identifying emerging trends in research and providing current awareness services. These tools also help with bibliometric analysis and research impact assessment. Research data management tools such as the Open Science Framework, DMP Tool, ORCID, and various data repositories have become essential for managing research data. Some Nigerian libraries have begun creating data repositories or partnering with international repositories. Cloud computing offers opportunities for Nigerian libraries

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to overcome infrastructure challenges. A study on cloud computing adoption in Nigerian university libraries found that while librarians had knowledge of cloud computing and acknowledged its potential, adoption remains low. The author contends that cloud computing is particularly relevant in the Nigerian context because it can circumvent local infrastructure limitations such as unreliable electricity and inadequate server capacity, yet adoption remains hindered by concerns about data sovereignty, connectivity reliability, and institutional resistance to change.

Librarian Digital Competencies in Nigeria

The effectiveness of digital library services depends significantly on librarian competencies. Studies consistently identify skills gaps among Nigerian librarians. Future academic librarians in Nigeria demonstrated moderate awareness of digital trends but significant gaps in technical skills, including data analytics, digital literacy, and AI tool usage. Librarians reported inadequate knowledge of strategies for navigating disruptions and low confidence in managing electronic resources and leading technological projects. The survey of open access institutional repositories identified shortage of skilled ICT personnel as a key challenge. Librarians must build expertise in repositories, metadata management, digital preservation, copyright, licensing, and compliance with open access mandates. The author argues that these competency gaps are not merely individual deficiencies but reflect systemic underinvestment in professional development and outdated curricula in library and information science programmes. Addressing these gaps requires coordinated action from library management, LIS educators, and professional associations. The author further observes that the rapid pace of technological change means that digital competencies cannot be acquired once and for all but must be continuously updated through ongoing professional development.

Challenges Hindering ICT and Digital Transformation in Nigeria

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A comprehensive synthesis of the literature identifies multiple categories of challenges that hinder digital transformation in Nigerian libraries. Funding and infrastructure deficits represent the most foundational challenges. These include inadequate funding for ICT infrastructure, hardware, and software; unreliable electricity supply; and poor internet connectivity. The author contends that these infrastructure challenges are systemic and require policy-level solutions that exceed the capacity of individual libraries to address. Skills and competency gaps constitute another major category of challenges. These include low digital literacy among librarians, inadequate ICT skills for managing institutional repositories, and limited knowledge of emerging technologies. Policy and institutional challenges include lack of clear ICT policies in libraries, inadequate institutional support for digital transformation, and weak copyright and open access policies. User-related challenges encompass low digital literacy among users, limited awareness of available digital resources, and low engagement with digital library services. Content and infrastructure challenges include difficulties in collecting content for institutional repositories, obsolete ICT equipment, and inadequate facilities for digital services.

The author observes that these challenges are interconnected and mutually reinforcing. For example, inadequate funding leads to poor infrastructure, which in turn makes it difficult to attract and retain skilled personnel, which further undermines digital transformation efforts. Breaking this cycle requires coordinated interventions at multiple levels, including institutional commitment, government policy support, and professional development initiatives.

The Balarabe Digital Transformation Model

Professor Ahmad Abdu Balarabe's leadership at Usmanu Danfodiyo University, Sokoto, has been characterized by pioneering digital initiatives that provide a model for Nigerian libraries. The author identifies five key elements of what may be termed the

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Balarabe Digital Transformation Model, each of which offers lessons for other Nigerian libraries seeking to advance their own digital transformation journeys. The first element is a mobile-first strategy. The development of a Mobile Library App reflects an understanding that mobile technology is the primary means of internet access for many Nigerians. This mobile-first strategy ensures that digital library services reach users where they are, rather than requiring users to come to the library. The author argues that this approach is particularly appropriate for the Nigerian context, where smartphone penetration exceeds computer ownership and where physical access to campus libraries may be limited by distance, security concerns, or scheduling constraints.

The second element is content aggregation. The digitization of over 200,000 academic materials represents a commitment to building comprehensive digital collections. This content aggregation approach recognizes that users need access to a critical mass of digital resources for a digital library to be truly useful. The author notes that many Nigerian libraries have focused on acquiring access to external databases while neglecting the digitization of their own unique collections, thereby missing an opportunity to create distinctive digital assets that reflect local scholarship and heritage. The third element is an integrated approach. Balarabe's initiatives demonstrate an integrated approach to digital transformation, combining infrastructure, content, services, and competencies. Rather than pursuing these dimensions in isolation, the Abdullahi Fodiyo Library has addressed them simultaneously, recognizing their interdependence. The fourth element is strategic partnerships. Balarabe's engagement with TETFund and other partners suggests a strategic approach to leveraging external funding and expertise. The author observes that no single library can achieve comprehensive digital transformation alone, and that successful transformation requires building partnerships with funding agencies, technology providers, and peer institutions.

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The fifth element is sustained commitment. Balarabe's 21-year tenure and sustained commitment to digital transformation demonstrate that meaningful digital transformation requires long-term commitment. The author contends that digital transformation is not a project with a defined endpoint but an ongoing process of adaptation and improvement. Libraries that treat digital transformation as a one-time initiative are unlikely to achieve lasting results, whereas those that embed it in their institutional culture and leadership priorities are better positioned for sustained success. The COVID-19 pandemic exposed the vulnerability of libraries that lacked robust digital services. The pandemic accelerated the shift to virtual services, with libraries adopting social media, WhatsApp, and other platforms for service delivery. The author argues that the pandemic demonstrated that digital transformation is no longer optional but essential for library resilience and relevance. The AULNU conference emphasized that university libraries are shifting from custodial roles to strategic centers for research dissemination, digital preservation, and digital literacy. This shift requires accelerated digital transformation, and the Balarabe model offers a proven framework for achieving it.

Recommendations

Based on the analysis presented in this paper, the following recommendations are offered for advancing ICT and digital transformation in Nigerian libraries.

For library management, libraries should prioritize ICT infrastructure investment by allocating dedicated budgets for reliable internet connectivity, modern hardware, and software systems. They should develop mobile library services following the mobile-first approach demonstrated by the Abdullahi Fodiyo Library, recognizing that mobile devices are the primary means of internet access for most Nigerian users. Libraries should also build institutional repositories by investing in repository infrastructure, developing clear policies, and training staff in repository management. They should explore adoption of emerging

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technologies including AI, data mining, and cloud computing tools to enhance services. Furthermore, libraries should strengthen staff digital competencies through comprehensive training programmes in digital literacy, repository management, data analytics, and emerging technologies.

For LIS education, library schools should update curricula for the digital age by including comprehensive modules on ICT, digital libraries, data management, and emerging technologies. They should emphasize practical ICT skills through hands-on training in ILMS, institutional repository platforms, and digital tools. Professional development programmes should be organized regularly by library associations and institutions to provide workshops on ICT skills and digital transformation for practicing librarians.

For policymakers, TETFund and government agencies should strengthen support for broadband connectivity, digital repositories, and electronic resource access. A national digital library policy should be developed to provide a framework for digital transformation in Nigerian libraries. Government policies should address the unreliable electricity and poor internet connectivity that hinder digital transformation. Open access publications and institutional repositories should be recognized in accreditation and research assessments to incentivize their development and use.

Conclusion

This paper has examined ICT and digital transformation in Nigerian libraries through the lens of Professor Ahmad Abdu Balarabe's visionary leadership and pioneering digital initiatives. The literature reveals that Nigerian libraries have made significant progress in adopting ICT and developing digital services, but substantial challenges remain in funding, infrastructure, skills, and policies. Professor Balarabe's leadership at Usmanu Danfodiyo University provides a powerful model of digital transformation in Nigerian libraries. His development of a Mobile Library App, the digitization of over 200,000 academic materials,

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the establishment of e-learning infrastructure, and his advocacy for ICT adoption demonstrate that meaningful digital transformation is possible even within constraints. His sustained commitment over 21 years shows that digital transformation requires long-term vision and dedication. The COVID-19 pandemic has underscored that digital transformation is no longer optional but essential for library relevance and resilience. As Nigerian libraries continue their digital journey, Balarabe's vision and initiatives provide a guiding framework. The paper contributes to the literature on ICT and digital transformation in Nigerian academic libraries by synthesizing recent research, conceptualizing digital transformation across three dimensions, identifying persistent challenges, and proposing a model based on Balarabe's pioneering initiatives. It is hoped that this analysis will stimulate further discussion and action toward the accelerated digital transformation of Nigerian libraries.

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