

DEVELOPING DIGITAL LITERACY SKILLS FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN NIGERIAN LIBRARIES: AN OVERVIEW

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Abstract

In the modern era, digital literacy is indispensable for meaningful engagement with technology. This paper explores the development of digital literacy skills for artificial intelligence (AI) and machine learning (ML) in Nigerian libraries, emphasising the critical need for such skills. The paper assesses the current state of digital literacy in Nigerian libraries, identifies gaps and challenges, and proposes strategies for enhancement, utilising a qualitative research design approach that reviews existing literature, empirical studies, and professional development programmes. Despite efforts to improve digital literacy, significant challenges, such as inadequate funding and training, persist. The paper concludes that a strategic approach involving policy advocacy, infrastructure investment, capacity building, and inclusivity is essential for empowering individuals with necessary digital skills and fostering innovation and inclusivity in the digital era.

Keywords: *Digital Literacy, Artificial Intelligence, Machine Learning, Nigerian Libraries, Technology-Driven Society, Skills*

Introduction

The rapid evolution of digital technologies, particularly Artificial Intelligence (AI) and Machine Learning (ML), has significantly transformed the landscape of information access and management. As global societies increasingly rely on digital systems for communication, research, and daily activities, the demand for digital literacy has become more pressing than ever. Digital literacy, defined as the ability to effectively and critically navigate, evaluate, and create information using digital technologies, is fundamental for individuals to thrive in today's interconnected world (Oyighan, 2023). Libraries, traditionally seen as custodians of knowledge, have a pivotal role to play in fostering these skills. In the context of Nigerian libraries, developing digital literacy skills tailored for AI and ML is not just a matter of keeping pace with technological advancements, but a necessity for ensuring equitable access to information and empowering communities.

In Nigeria, where digital disparities are prevalent, libraries can act as catalysts for change by providing access to technology and education. Libraries have a unique opportunity to bridge the digital divide by providing resources and training that equip individuals with essential digital competencies. Investing in digital literacy initiatives within Nigerian libraries is crucial for promoting a more inclusive and informed society where individuals can engage with AI and ML technologies that are reshaping various sectors, including healthcare, education, and finance. Understanding the principles and applications of AI and ML enables individuals to make informed decisions, drive innovation, and leverage these technologies for personal and professional growth (Ridley & Pawlick-Potts, 2021).

Despite the potential benefits, the development of digital literacy skills in Nigerian libraries faces numerous challenges, including insufficient funding, lack of training opportunities, and inadequate infrastructures. These barriers hinder the ability of libraries to fully embrace and integrate emerging technologies, limiting their capacity to serve as centres for digital empowerment and innovation. Furthermore, the unequal distribution of resources between urban and rural libraries exacerbates these challenges, underscoring the need for strategic interventions that address the unique needs of different communities (Sambo *et al.*, 2022).

This paper aims to explore the current state of digital literacy in Nigerian libraries, with a particular focus on AI and ML technologies. It seeks to identify the key barriers that impede the development of digital literacy skills and propose strategies to enhance these initiatives. By examining existing literature, empirical studies, and professional development programmes, this study provides insights into the transformative potential of digital literacy in Nigerian libraries and offers recommendations for fostering a more inclusive and innovative digital landscape.

Objectives of the Study

The objectives of the study are to:

- investigate the current state of digital literacy in Nigerian libraries, and how AI and ML technologies are integrated.
- identify the significance of acquiring AI and ML skills in driving innovation and enabling informed decision-making.
- Digital literacy initiatives be designed to promote inclusivity and ensure equitable access to technology, particularly for marginalized communities
- The key barriers that impede the development of AI and ML-related digital literacy skills in Nigerian libraries.
- The strategies to enhance digital literacy initiatives in Nigerian libraries, focusing on policy, infrastructure, capacity building, and inclusivity.

Review of Related Literature

The current state of digital literacy in Nigerian libraries, and how AI and ML technologies are integrated

Digital literacy is crucial in Nigerian libraries, especially with the increasing integration of AI and machine learning (ML) technologies, it empowers individuals to discern the reliability of AI-generated content, understand the potential for manipulation or misinformation, and recognize when human intervention is necessary to verify or contextualize AI outputs. Digital literacy is essential in the context of AI and ML as it enables individuals to understand and effectively utilize these technologies. AI involves machines performing tasks that typically require human intelligence, while ML is a subset of AI where systems learn from data to enhance performance (Salhab, 2024). These technologies have diverse applications across sectors such as healthcare, education, finance, and more (Yang *et al.*, 2022). By grasping the fundamental concepts and applications of AI and ML, individuals can comprehend their potential impact and make informed decisions regarding their use.

Enhancing information access is another critical aspect where digital literacy intersects with AI and ML. Through improved information retrieval and data management facilitated by AI and ML algorithms, individuals can efficiently access and process vast amounts of data (Yang *et al.*, 2022). Personalized learning experiences are also enabled through AI and ML, tailoring content to individual preferences and learning styles, thereby enhancing user engagement and knowledge retention (Su, 2023). Digital literacy empowers individuals to navigate these personalized systems effectively, maximizing the benefits of tailored information delivery. Fostering innovation and research is a crucial outcome of digital literacy in the realm of AI and ML. These technologies enable advanced research methodologies by analyzing complex datasets and identifying patterns that may not be apparent through traditional methods (Boscardin, 2023). Moreover, AI and ML encourage creative problem-solving and innovation by automating repetitive tasks and freeing up time for higher-order thinking and ideation (Boscardin, 2023). By developing digital literacy skills, individuals can leverage AI and ML tools to drive innovation in their respective fields and contribute to cutting-edge research.

Empowering library users is a fundamental goal of promoting digital literacy in the context of AI and ML. Equipping library users with critical thinking and analytical skills is essential in navigating the complexities of these technologies (Salhab, 2024). By understanding how AI systems operate and the implications of their decisions, individuals can make informed choices and assess the reliability of AI-generated outputs. Furthermore, promoting lifelong learning and adaptability through digital literacy ensures that individuals can continuously update their skills to keep pace with technological advancements (Salhab, 2024). This adaptability is crucial in a rapidly evolving digital landscape. Digital literacy is

paramount in the context of AI and ML as it underpins individuals' ability to comprehend, utilize, and critically engage with these technologies. By understanding the basic concepts and applications of AI and ML, enhancing information access, fostering innovation and research, and empowering users, digital literacy serves as a cornerstone for leveraging the potential of AI and ML effectively. Through continuous learning and skill development, individuals can harness the transformative power of AI and ML to drive innovation, make informed decisions, and contribute meaningfully to a technology-driven society.

Significance of acquiring AI and ML skills in driving innovation and enabling informed decision-making

Assessment of digital literacy initiatives in Nigerian libraries, implementing various programmes like professional development, training sessions, conferences, and academic programmes to improve the skills of library staff (Chimah, 2023). These initiatives aim to equip library personnel with the necessary competencies to navigate the digital realm effectively (Odu & Omosigho, 2017). However, the effectiveness and reach of these initiatives remain a subject of analysis, requiring a comprehensive evaluation to determine their impact on improving digital literacy levels across Nigerian libraries (Sambo *et al.*, 2022). Nigerian libraries have designed professional development programmes to cater to the changing digital requirements of their staff. Staff programmes often focus on equipping librarians with the skills necessary to manage digital resources, use library management software, and understand emerging technologies such as AI and machine learning (Odu & Omosigho, 2017).

For instance, the Nigerian Library Association (NLA) frequently organizes workshops and seminars aimed at updating the technical skills of library staff (Sambo *et al.*, 2022). These sessions cover a range of topics, including digital cataloging, online database management, and the integration of digital tools into everyday library operations (Sambo *et al.*, 2022). A programable example of such a program is the annual NLA conference, where librarians from various regions come together to discuss the latest trends in digital literacy (Odu & Omosigho, 2017). These sessions include hands-on training sessions in which participants can engage directly with new software and technologies (Sambo *et al.*, 2022). Regular training sessions are another critical component of digital literacy initiatives in Nigerian libraries. These sessions are typically more focused and aim to provide in-depth knowledge on specific digital tools or platforms (Sambo *et al.*, 2022). For example, library staff might receive training on how to use digital archiving software, manage e-books, or facilitate online research services for library patrons (Sambo *et al.*, 2022). The University of Ibadan Library has implemented a series of training sessions focused on digital archiving and electronic resource management (Emiri, 2015). These sessions aim to improve librarians' digital collection maintenance and management, ensuring resource accessibility and organization.

Conferences play a significant role in promoting digital literacy among Nigerian library staff. They provide a platform for knowledge exchange, networking, and the dissemination of best practices. These events often feature keynote speakers who are experts in digital literacy and emerging technologies, offering insights into the latest advancements and their implications for libraries (Akparobore, 2015). The Digital Library Conference, held annually in Lagos, brings together library professionals, technology experts, and policymakers to discuss the future of digital literacy in Nigerian libraries (Ekoja *et al.*, 2022; Ibitoye *et al.*, 2024). The conference includes panels, workshops, and technology showcases, providing attendees with a comprehensive understanding of the digital landscape (Ahmed *et al.*, 2020). Academic programmes offered by Nigerian universities also contribute to the development of digital literacy among library staff. These programmes encompass formal education in library and information science, with a significant focus on digital technologies (Lawal-Haruna *et al.*, 2024). Courses might cover topics such as digital curation, data management, and the use of AI in information technologies (Sambo *et al.*, 2022). Ahmadu Bello University's Master's program in Library and Information Science includes courses on digital libraries, information technology, and data science, preparing graduates to handle the challenges of digital transformation in library settings (Lawal-Haruna *et al.*, 2024).

Despite these initiatives, the effectiveness and reach of digital literacy programmes in Nigerian libraries require a thorough evaluation. Factors such as accessibility, frequency, and the practical application of learned skills play a crucial role in determining their success (Strover *et al.*, 2020). Moreover, the geographical and infrastructural disparities across Nigeria mean that not all libraries have equal access to these initiatives (Mehra *et al.*, 2020). While urban libraries might benefit from regular and advanced training sessions, rural libraries often struggle with limited resources and a lack of access to professional development opportunities (Strover *et al.*, 2020; Mehra *et al.*, 2020). This disparity highlights the need for a more inclusive approach to digital literacy training that addresses the needs of all libraries, regardless of their location.

A comprehensive evaluation of these initiatives would include assessing their impact on library staff's digital literacy levels and the overall improvement in library services. This could include surveys, interviews, and performance metrics to gauge the effectiveness of training programmes and identify areas for improvement (Martzoukou, 2021). The NLA might conduct an evaluation study, surveying librarians across different regions to assess their digital literacy skills before and after participating in training programmes (Martzoukou, 2021). Additionally, Deja *et al.* (2021) stated that performance metrics such as increased digital resource usage and improved user satisfaction could provide insights into the practical benefits of these initiatives. Nigerian libraries have made significant efforts to enhance digital literacy among their staff, but a comprehensive evaluation is necessary to determine the effectiveness and reach of these initiatives. By addressing the gaps and challenges identified

through such evaluations, Nigerian libraries can better equip their staff to navigate the digital realm and provide improved services to their patrons.

Digital literacy initiatives be designed to promote inclusivity and ensure equitable access to technology, particularly for marginalized communities

Integrating emerging technologies in Nigerian university libraries to enhance operational efficiency and service delivery, research by Owolabi *et al.* (2022) highlights the readiness of academic librarians in Nigerian university libraries towards the use of robotic technologies, emphasizing how such advancements optimize collection analysis, visualization, and preservation while reducing operational costs. This exemplifies how embracing emerging technologies like robotics can significantly improve operational efficiency within library settings. Additionally, the study by Massougboji *et al.* (2022) on scaling up citizen workshops in public libraries for disseminating primary care research results demonstrates the successful implementation of knowledge translation strategies through public libraries, fostering collaboration between researchers, clinicians, and citizens.

Incorporating AI and machine learning into library services has been a focal point for enhancing efficiency and service delivery. Yakubu *et al.* (2023) delve into the intention of librarians to use artificial intelligence for effective service delivery, emphasizing the potential of AI to address inefficiencies in Nigerian academic libraries. Furthermore, Adeyeye (2023) discusses the application of emerging technologies in Nigerian academic libraries, emphasizing how technologies like data mining and management can revolutionize existing services and create new avenues for scholarly communication. These insights underscore the importance of continuous innovation and adaptation to leverage digital tools effectively in library settings.

Studies have highlighted the influence of ICT competencies on job performance in Nigerian university libraries, stressing the need for adequate training and retraining of librarians in ICT utilization (Ubogu, 2022). Moreover, the relevance of e-aesthetics in sustaining Nigerian libraries in the digital era has been discussed, emphasizing the significance of aesthetic conditions and facilities in enhancing library usage and sustainability amidst digital transformations (Ogunbanjo & Bakare, 2022). Furthermore, insights into the status of electronic records management in African university libraries, drawing from experiences in Nigerian universities, underscore the importance of efficient records management systems in enhancing information access and organizational efficiency (Asogwa *et al.*, 2021). Additionally, challenges faced in rendering effective library services in select Nigerian university libraries have been highlighted, emphasizing the critical role of current materials acquisition, robust budgeting, and competent personnel recruitment in improving service delivery (Okonoko *et al.*, 2023).

Key barriers to development of AI and ML-related digital literacy

In striving to provide effective library services in Nigerian university libraries, several challenges have been identified, hindering optimal service delivery. One significant challenge highlighted is the critical role of current materials acquisition (Okonoko *et al.*, 2023). The availability of up-to-date and relevant materials is essential for meeting the diverse information needs of users. However, inadequate funding poses a major obstacle to acquiring current materials, limiting the library's ability to offer comprehensive resources to its patrons. Insufficient financial resources hinder the procurement of new books, journals, and digital resources, thereby impeding the library's capacity to support research and learning effectively.

Additionally, robust budgeting emerges as another crucial challenge in enhancing service delivery in Nigerian university libraries (Okonoko *et al.*, 2023). Libraries require adequate financial allocations to sustain their operations, invest in new technologies, and expand their collections. However, limited budgetary provisions often lead to constraints in implementing innovative services, upgrading infrastructure, and providing professional development opportunities for staff. Without a robust budget, libraries struggle to keep pace with evolving information needs and technological advancements, hampering their overall service quality and relevance. Furthermore, competent personnel recruitment stands out as a fundamental challenge affecting the effectiveness of library services in Nigerian university libraries (Okonoko *et al.*, 2023).

The recruitment and retention of skilled library professionals are essential for ensuring the delivery of high-quality services to users. However, the lack of qualified personnel, coupled with the competitive job market for librarians, poses a significant hurdle in maintaining a proficient workforce. Inadequate staffing levels and the absence of specialized expertise in emerging areas such as digital literacy and information technology further exacerbate the challenges faced by libraries in meeting the evolving demands of users. In addition to the challenges mentioned above, the status of Electronic Records Management (e-RM) in Nigerian university libraries presents another obstacle to effective service delivery (Asogwa *et al.*, 2021). Inadequate funding, unreliable power supply, and the absence of full internet services hinder the proper management of digital records, making them vulnerable and potentially inaccessible for future transactions. The lack of robust e-RM practices not only jeopardizes the preservation and accessibility of valuable information but also undermines the efficiency and effectiveness of library operations, impacting user satisfaction and overall service quality.

Yet again, the readiness of academic librarians towards the use of robotic technologies in Nigerian university libraries poses a significant challenge (Owolabi *et al.*, 2022). The levels of readiness in terms of digital infrastructure, policy frameworks, and human development for the adoption of robotics in libraries reflect the need for

comprehensive training and capacity building initiatives. The integration of robotic technologies requires a supportive environment and a skilled workforce, yet the existing gaps in readiness hinder the successful implementation of innovative technologies, limiting the library's ability to enhance services and user experiences effectively. Finally, challenges related to institutional repository development in African universities, including Nigerian institutions, further compound the obstacles faced by university libraries (Baro & Nwabueze-Echedom, 2022). Inadequate facilities, unstable internet connectivity, lack of funds, irregular power supply, and a shortage of skilled information and communications technology personnel hinder the establishment and sustainability of institutional repositories. These challenges impede the effective management and dissemination of scholarly outputs, hindering the visibility and impact of research conducted within the academic community.

Ultimately, the integration of emerging technologies in Nigerian university libraries shows enormous potential for improving operations and service delivery, though it faces challenges such as inadequate funding, insufficient training, and unreliable infrastructure. Overcoming these obstacles through strategic investments is essential to fully leveraging digital tools and meeting users' evolving information needs.

Strategies and Recommendations for effective implementation

Developing digital literacy skills strategies enable Nigerian libraries to be open to users without library staff restrictions through the use of AI and ML. (Afolabi, Oyebola and Komolafe, 2024). In the digital age, libraries' role in creating digital literacy has grown increasingly important, particularly in developing countries such as Nigeria. As information access increasingly transfers to digital platforms, Nigerian libraries must improve digital literacy in order to overcome the digital divide. To do this, libraries must implement comprehensive plans that address critical issues such as policy formulation, facility enhancement, capacity building, and inclusion. Implementing effective regulations will create a structured framework for digital activities, while infrastructure investment will ensure access to critical technology. Capacity building is critical for equipping both library staff and users with the skills necessary to navigate digital settings, and inclusion ensures that disadvantaged populations are not left behind. Together these strategies form the foundation for enhancing digital literacy initiatives across Nigerian libraries; as stated by Nikou *et al*, 2022; Baro & Nwabueze-Echedom, 2022; Afolabi, Oyebola and Komolafe, 2024; Ibitoye *et al* 2024; Oyedokun, S. (2024).

Policy and Advocacy: Advocating for supportive government policies is crucial to ensure that there is a conducive environment for the development and implementation of digital literacy programmes in Nigerian libraries. This involves lobbying for policies that prioritize digital literacy education and support the integration of technology into library services. Developing national standards for digital literacy education is essential to provide a framework for consistent and high-quality digital literacy training across Nigerian libraries.

By establishing clear standards, libraries can ensure that their digital literacy programmes meet the required benchmarks and effectively address the needs of their users.

Investment in Infrastructure: Securing funding for technological upgrades is paramount to enable Nigerian libraries to acquire the necessary hardware, software, and infrastructure to support digital literacy initiatives. Adequate funding will facilitate the purchase of modern technology tools and resources needed to deliver effective digital literacy training. Ensuring reliable internet connectivity and access to devices is critical for Nigerian libraries to effectively deliver digital literacy programmes. Access to the internet and devices is fundamental in enabling library users to acquire digital skills and engage with online resources. Libraries need to invest in robust internet connectivity and provide access to devices to bridge the digital divide.

Capacity Building: Enhancing digital literacy initiatives in Nigerian libraries requires targeted training programs for library staff and users, equipping them with the necessary skills to effectively utilize digital tools and resources for information access and management, training library staff to become digital literacy educators is essential for Nigerian libraries to build internal capacity and expertise in delivering digital literacy programmes. By equipping library staff with the necessary skills and knowledge, libraries can enhance the quality of digital literacy training and better support their users in acquiring essential digital skills. Encouraging peer-to-peer learning and knowledge sharing among library staff can further strengthen the capacity of Nigerian libraries in digital literacy education. Peer-to-peer learning initiatives can facilitate the exchange of best practices, innovative approaches, and experiences among library staff, fostering a culture of continuous learning and improvement in digital literacy provision.

Inclusive Approach: To enhancing digital literacy in Nigerian libraries involves ensuring that digital initiatives are accessible to all, particularly marginalized groups such as rural communities, individuals with disabilities, and economically disadvantaged populations, so that no one is excluded from the benefits of digital access. Designing programmes that cater for diverse user needs is crucial to ensure that digital literacy initiatives in Nigerian libraries are accessible and relevant to all segments of the population. Libraries should tailor their programmes to address the specific needs and preferences of diverse user groups, including marginalized communities, to promote inclusivity and equity in digital skills development. Addressing barriers to access for marginalized communities is essential to ensure that all individuals, regardless of their background or circumstances, have equal opportunities to benefit from digital literacy programmes. Nigerian libraries need to identify and mitigate barriers such as lack of resources, language barriers, or digital exclusion to ensure that marginalized communities can fully participate in and benefit from digital literacy initiatives.

Conclusion

Drawing from the above overview, there is no gainsaying that, investing in digital literacy initiatives tailored for AI and ML in Nigerian libraries is essential for empowering individuals with crucial technological skills, fostering innovation, and promoting inclusivity in the digital age. But then, despite significant efforts to improve digital literacy among library staff, gaps and challenges persist, including inadequate funding, inadequate training, and infrastructural disparities, impeding the optimal development of these skills. Hence, there is a comprehensive evaluation of existing initiatives to determine their effectiveness which can help in addressing identified gaps and challenges. These can be done by adopting strategic approach that includes policy advocacy, investment in infrastructure, capacity building, and an inclusive approach to program design. By so doing, Nigerian libraries can equip their staff and users much better, to navigate the digital realm and contribute meaningfully to a technology-driven society.

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