Navigating the AI Era: Opportunities and Challenges for Library Services in Developing Countries

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ABSTRACT

This paper explored the opportunities and challenges of integrating artificial intelligence (AI) into library and information services, with a focus on developing countries, particularly African academic libraries. It highlights AI's potential to enhance library practices while addressing adoption barriers, proposing strategies to ensure libraries remain relevant in the digital era. The study employs a comprehensive literature review, synthesizing scholarly works (primarily 2020–2024) on AI applications in libraries. The study utilized peer-reviewed articles, conference papers, and reports sourced through structured searches in Scopus, Web of Science, and Google Scholar using relevant keywords. Selected publications, focused on developing-country contexts, were screened and analyzed to identify key opportunities, challenges, and recommendations. AI offers opportunities for automation, personalised services, enhanced information retrieval and stakeholder partnerships to improve digital infrastructure and skills. Challenges in developing countries include low digital literacy, inadequate infrastructure, unreliable power, resistance to change, funding constraints and limited AI policies. Proposed strategies include fostering AI literacy, interdisciplinary collaboration, alternative energy solutions (e.g., solar) and robust policy formulation. The integration of AI into library services in developing countries, particularly Africa, presents a pivotal opportunity to redefine librarianship in the digital age. Despite challenges, proactive adoption of AI through skill development, policy frameworks and partnerships can position libraries as dynamic knowledge hubs, ensuring their relevance and impact in the AI era.

Abstract

This paper explored the opportunities and challenges of integrating artificial intelligence (AI) into library and information services, with a focus on developing countries, particularly African academic libraries. It highlights AI's potential to enhance library practices while addressing adoption barriers, proposing strategies to ensure libraries remain relevant in the digital era. The study employs a comprehensive literature review, synthesizing scholarly works (primarily 2020–2024) on AI applications in libraries. The study utilized peer-reviewed articles, conference papers, and reports sourced through structured searches in Scopus, Web of Science, and Google Scholar using relevant keywords. Selected publications, focused on developing-country contexts, were screened and analyzed to identify key opportunities, challenges, and recommendations. AI offers opportunities for automation, personalised services, enhanced information retrieval and stakeholder partnerships to improve digital infrastructure and skills. Challenges in developing countries include low digital literacy, inadequate infrastructure, unreliable power, resistance to change, funding constraints and limited AI policies. Proposed strategies include fostering AI literacy, interdisciplinary collaboration, alternative energy solutions (e.g., solar) and robust policy formulation. The integration of AI into library services in developing countries, particularly Africa, presents a pivotal opportunity to redefine librarianship in the digital age. Despite challenges, proactive adoption of AI through skill development, policy frameworks and partnerships can position libraries as dynamic knowledge hubs, ensuring their relevance and impact in the AI era.

Artificial Intelligence
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Introduction

As the world continues to change, the library must adapt and change to meet the needs of its patrons. The rise of emerging technologies and innovation is transforming the landscape of library practice. Libraries have evolved from primarily physical repositories of books into dynamic, hybrid hubs that blend traditional services with digital and intelligent capabilities. This shift enhances accessibility, efficiency, personalization, and community engagement while addressing modern user expectations in an increasingly digital world. The dynamic force of

Akidi et al. (2025). Navigating the AI Era…

Gateway Information Journal
G I J

emerging technologies cutting across various disciplines provides challenges and opportunities for information professionals. Emerging technologies have revolutionised society and offer librarians exceptional opportunities to significantly advance user-centred services and facilitate collaboration between libraries and their users. To sustain their relevance, library and information professionals must proactively adopt and integrate emerging technologies into the delivery of library and information services. One of these new technologies is artificial intelligence (AI). Artificial intelligence, like any other technology-driven tool, presents both significant benefits and notable challenges that must be carefully considered in its adoption and application. AI has pervaded contemporary society, transforming various aspects of our daily lives and reshaping interactions with technology (Kalbande et al, 2024).

The integration of AI in libraries harnesses advanced technologies, enabling machines to perceive, understand, act, and learn, thereby transforming library services. The rise of artificial intelligence (AI) presents both opportunities and challenges for libraries engaged with digital technologies. However, by integrating artificial intelligence, libraries gain a pivotal edge in delivering superior services to their patrons (Folorunso and Momoh, 2020). Mwilongo and Mwageni (2023) and Echedom and Okuonghae (2021) observed that although the potential for adopting and implementing artificial intelligence technologies in academic libraries across developing countries, particularly in Africa, is rapidly increasing, the policy frameworks and institutional strategies required to support this transformation are still at an embryonic stage.

The information environment has undergone significant transformation due to the rapid emergence and adoption of technologies such as artificial intelligence (AI) in driving digital transformation (Dx), with consequent implications for the professional skills and competencies required of library staff. By leveraging AI, libraries can tailor their services to meet the evolving needs of the next generation of users ensuring a high standard of service delivery (Tshabala and Dube, 2024; Rabetseta, Modiba and Ngulube, 2024). Nevertheless, to advance the integration of AI into academic library services, a comprehensive approach that considers both the potential and the obstacles is essential (Zondi et al, 2024).

The advent of the artificial intelligence (AI) era presents a paradigm shift for library and information services, offering a transformative potential for operational efficiency, user experience and service personalisation. However, a significant disparity exists in the readiness and capacity to harness these opportunities between developed and developing nations. In developing countries, libraries are confronted with a complex of challenges, including a low level of digital literacy among librarians, insufficient technological infrastructure, persistent underfunding, unreliable power supply and resistance to technological change. This situation creates a risk of these institutions being further marginalised in the global information landscape. While the potential of AI in librarianship is widely acknowledged in literature, there is a pressing need to synthesise the specific opportunities, contextual challenges and actionable strategies for academic libraries in developing countries to navigate this transition effectively. This paper addresses this critical gap by exploring the dichotomy between the promising opportunities and the challenges of providing AI-driven library and information services in developing nations. This paper examined the benefits and applications of artificial intelligence in library settings, while also exploring the current state of its adoption in developing countries. It further discussed the evolving expectations of librarians in the artificial intelligence era and highlighted the challenges associated with its effective use, along with possible pathways for addressing these issues.

Artificial intelligence: Is it really new?

Artificial intelligence can be understood as the collection of technologies that enable machines to sense, comprehend, act, and perform several functions matching up with human intelligence. AI is a term that has been around since the 1950s, referring to a machine's ability to do tasks that normally require human thinking (Okoye, 2024). According to Krizhevesky, Sutskever and Hinton (2022), the concept of AI dates to the early stages of computers. The philosophical examination of the implications of emerging computer technology began in particular with a workshop held in 1956 at Dartmouth College that included early greats like John McCarthy and Marvin Minsky. AI already touches many of our daily computing activities, most of the computer systems and mobile phones being developed today have artificial intelligence features and they may have been employed unaware that they function as intelligent

machines. (Omame and Alex-Nmecha, 2020). As stated by McNeal and Newyear (2013), 'because AI is often used in subtle ways, it can be hard to recognise, even though many of us use some form of it every day'. They see AI as a wide and diverse field with many subfields, ranging from the creation of machine intelligence that equals or surpasses human intelligence to problem-solving natural language processing machine perception and learning robotics.

According to Eito (2021), artificial intelligence has been applied for many years in recommendation systems, rule-based expert systems and others. AI is being used through technologies for pattern recognition in computer vision, speech recognition and machine learning. Interestingly, the dynamic and evolving intersection of emerging technology and libraries is unmistakably evident in the transformative journey libraries have undertaken (Zondi et al., 2024).

The history of AI in libraries is like a story of adaptation and innovation where technology meets the age-old quest for knowledge preservation and accessibility. It all started with the early efforts in the 1950s when researchers envisioned AI as a tool to help manage vast collections of information (Sangapur and Kumbar, 2021). The Idea of creating artificial intelligence systems in Libraries dates back to 1990 (Omame and Alex-Nmecha, 2020). It was not until the dawn of the 21st century that AI truly began to revolutionise libraries, with the advent of sophisticated recommendation engines and virtual reference assistants (Sangapur and Kumbar, 2021). Artificial intelligence is a crucial technology in the fourth industrial revolution. Simply put, the exploration of AI in libraries by library and information scientists as well as academics has been a long-standing pursuit (Jan, Atikham and Khan, 2024). The concept of artificial intelligence has been around since ancient times with myths and stories about artificial beings endowed with intelligence (Pawar, 2024).

Benefits and Application of Artificial Intelligence in Libraries

The intensive pressure on library to provide high quality services to users due to information explosion in our present society have led to incorporation of modern technologies. The use of artificial intelligence (IA) is increasing in all areas of libraries. The application of AI in libraries can offer suggestions, streamline repetitive tasks and support informed decision-making through data analysis. AI can be practically applied to every facet of library services.

Gateway Information Journal
G I J

Operational automation and efficiency

Artificial intelligence is progressively automating routine library administrative processes, including book checkouts, loan renewals and overdue notifications. In libraries, AI encompasses a suite of technologies that allow machines to perceive, understand, respond and learn, thereby executing administrative tasks and delivering advanced technological solutions. AI-powered systems can automatically classify, tag and categorize vast amounts of digital content based on prompts or commands making it easier for users to navigate through complex collections. These systems employ machine learning algorithms to analyse metadata and user interactions thereby improving the accuracy and relevance of results from searches (Odigie, 2024). Also, by automating library tasks, AI can improve the efficiency and accuracy of library operations, leading to faster and more reliable services for library users. AI technology has been integrated to library services in recent years in an effort to boost user satisfaction and operational effectiveness (Baber et al., 2024).

Artificial intelligence presents a significant potential for revolutionising library systems through increased operational efficiency enhanced accuracy in record management and improved user experiences (Osagie and Oladokun, 2024). In the field of librarianship, AI is revolutionizing delivery of services, offering novel solution to enhance efficiency accessibility and user experience (Odigie, 2024). Artificial intelligence can help libraries improve their service in different ways like handling book loans, organising shelves and categorising material (Okoye, 2024). The application of AI in library services is vast and continually expanding, with numerous practical implementations enhancing both the user experience and operational efficiency (Kalbande et al., 2024).

Artificial intelligence has revolutionised the way we use and engage with physical library resources. By utilising sophisticated algorithms and machine learning methodologies, AI systems have the potential to transform traditional library services by improving the accessibility, organisation and analysis of library items (Bassey and Daniel, 2024). Artificial intelligence represents a pivotal digital advancement that enables academic libraries to harness its capabilities, offering users a wider array of convenient and tailored service options. The integration of AI in academic libraries is a revolutionary change that is redefining the landscape

70

of library service with unprecedented levels of efficiency. This adoption holds immense potential to improve accessibility, accuracy and personalised user experience (Zondi *et al.,* 2024).

Data-driven management

AI has helped solve important challenges in libraries, like organising books, cataloguing materials and acquiring new items. This has made library services more effective and efficient leading to happier users who can access information quickly and accurately (Okoye, 2024). According to Bassey and Daniel (2024), traditional library management systems are revolutionised by the incorporation of AI technology which provides cutting-edge features for user engagement, search, recommendation and cataloguing. AI in the context of libraries is analogous to having a super smart librarian who not only organises books but also anticipates your reading preferences and recommends the perfect titles just for you (Sangupur and Kumbar, 2021). Omame and Alex-Nmecha (2020), added that an AI system could handle resource development or collection development of the library. The implementation of AI not only positions libraries as technologically adept but also augments library productivity and overall operational efficiency (Rabatseta, Modiba and Ngulugbe, 2024).

According to Mwilongo and Mwageni (2022), academic libraries have adopted AI in at least all areas of library services, information delivery, marketing library products and assessment and evaluation of library services. A practical application of AI in libraries is subject indexing. This task requires the technical expertise of the librarian or indexer and their intellectual judgment to peruse, analyse and suggest the appropriate terms to be used as index terms or keywords of a given document (Omame and Alex-Nmecha, 2020).

Personalised user services

Artificial intelligence will have implications for several services from offering insights to collections, easily storing and transferring files. AI is not merely a technological advancement but a necessity for libraries in the 21st century librarians must adapt to changing user expectations and leverage AI to enhance efficiency, personalisation and competitiveness (David-West and Ig-Worlu, 2023). AI presents a unique opportunity to revolutionise library services in

Akidi et al. (2025). Navigating the AI Era…

Gateway Information Journal
G I J

developing countries but its successful integration requires careful consideration of the context and unique challenges faced by these institutions. Libraries are also adopting AI technologies to enhance their services, making librarianship a profession that embraces innovation and technological advancement (Odigie, 2024; Okoye, 2024). AI applications in academic librarians can help bridge the resource gap, improve efficiency and effectiveness empower users and provide a more personalised and inclusive learning environment (Ogwo, Ibegbulam and Nwachukwu, 2023).

Enhanced discovery, retrieval and user efficiency

In the library setting, the adoption of AI can improve library services and provide access to accurate information that can drive growth and development in this information age (Moustapha and Yusuf, 2023). AI in library service delivery has aided in the improvement of librarians' job responsibilities including cataloguing, indexing, information retrieval, reference and other tasks. It can be used in a variety of applications including speech recognition, machine translation and library robots (Emezaiwakpor, Idiodi and Urhiewhu, 2023). The integration of AI has the potential to elevate the role of librarians from mere custodians of information to knowledge-navigating meaningful interactions between users and resources (David-West and Ig-Worlu, 2023).

The integration of AI into academic libraries is a big step towards better satisfying users' changing needs and offering helpful assistance for teaching, learning and research (Akinyemi, 2023). Access to timely information can only occur in a situation where AI is being used to guide and support and at the same time user-friendly, particularly in information search. While the use of AI has been increasing exponentially in other fields, this has not been the case in library and information science (Yusuf et al., 2022).

Cost *efficiency and time saving*

AI has benefited libraries in terms of saving time and costs in the course of the provision of library resources and services (Mwilongo and Mwageni, 2022). AI has the potential to greatly enhance service delivery in academic libraries. Furthermore, AI-driven analytics can forecast

user demand patterns, allowing for proactive collection development and personalised recommendation systems. This strategic application not only streamlines administrative processes but also elevates the user experience in academic environments.

Fostering collaboration

This form of collaborative technology will enhance partnership between the librarian and stakeholders (Gujral, Shivararma and Choukmath, 2019). Information technology has an essential role in libraries, where libraries consistently adopt it to help carry out routine library activities and decision-making (Rudiansyab, 2023). No doubt, the integration of AI in library science represents a profound opportunity to revolutionising the way libraries operate and serve their communities (Sangapur and Kumbar, 2024). Furthermore, AI-enabled platforms can support predictive analytics for collection management and user behaviour modelling, thereby enhancing service personalisation. This integration ultimately positions libraries as proactive agents in the knowledge economy, driving innovation and accessibility.

The Prevailing Situation of Artificial Intelligence in Developing Countries

The 21st century has seen libraries evolve from traditional repositories to dynamic hubs of digital innovation, driven by the integration of artificial intelligence (AI) to enhance operations, user experiences and information retrieval (Bassey and Owushi, 2023). This transformation aligns with libraries' historical adaptation to technological shifts from clay tablets to cloud computing (Omame and Alex-Nmecha, 2020). However, AI's adoption in libraries, particularly in developing countries, remains uneven, presenting both opportunities and significant challenges.

In developed nations, AI has revolutionised academic library services, enabling automation, advanced cataloguing, and personalised user interactions (Sambo and Oyovwe-Tinuoye, 2023). For instance, AI-driven recommendation systems and virtual assistants are now common in Western university libraries. In contrast, developing countries libraries such as Africa's, as noted by Mwilongo and Mwageni (2022), are in the early stages of AI adoption, constrained by nascent digital ecosystems. Nigerian universities, however, show progress by

Gateway Information Journal
G I J

incorporating AI-related courses like machine learning into curricula (Ibanga, Atairet, and Atakpa, 2024), signalling a gradual shift toward technological readiness.

The capacity of artificial intelligence to improve library services is demonstrated through its role in optimising operational processes and facilitating greater user access to information. Artificial intelligence and librarians' function in a mutually reinforcing manner, with AI enhancing professional capabilities in managing digital library environments rather than merely serving as an adjunct tool. For example, AI-powered systems for subject indexing and metadata analysis improve search accuracy, complementing librarians' intellectual judgment (Omame and Alex-Nmecha, 2020). Despite slower adoption in library and information science compared to other fields (Yusuf et al., 2022), AI's transformative impact is growing, particularly in automating routine tasks and enhancing library service delivery.

Also, Oyetola et al. (2023) emphasise that while the potential for AI adoption in libraries is significant, substantial investment in resources and concerted efforts are essential for its successful implementation. This is particularly critical in developing countries, where libraries face financial constraints and limited technological infrastructure. The high costs of AI systems, often proprietary, coupled with ongoing maintenance expenses, pose significant barriers (Kalbande et al., 2024). Additionally, unreliable power supply further complicates AI integration, as stable electricity is vital for digital operations (Oyedokun et al., 2023). These challenges highlight the need for strategic resource allocation and innovative solutions, such as alternative energy sources like solar power, to support AI-driven library services.

Librarians' limited familiarity with advanced AI applications such as book-reading robots or virtual learning environments hinders progress (Osaroluka et al., 2024). Moreover, fears of job displacement persist, with some librarians viewing AI as a threat to human roles (Mwilongo and Mwageni, 2022). However, the eventual acceptance of AI promises to unlock its potential, positioning libraries as technologically adept institutions that enhance user satisfaction and operational efficiency (Ogwo, Ibegbulam and Nwachukwu, 2023). Overcoming these barriers requires addressing low AI literacy among users and practitioners, alongside fostering a culture of innovation (Pawar, 2024).

Gateway Information Journal
G I J

Expectations from Librarians Developing Countries in Artificial Intelligence Era

It is anticipated that modern libraries should evolve into dynamic knowledge hubs, providing innovative and intelligent opportunities for users. To meet these demands, librarians must adapt by developing new competencies and fostering strategic initiatives. The following outlines key expectations for library and information professionals to effectively integrate AI into their practice:

a. *Applying AI to information literacy*: Librarians should harness AI to create learning opportunities that enable users to engage with generative AI tools critically and creatively, fostering information literacy while addressing ethical and social implications (Bridges, McElroy and Welhouse, 2024). This approach involves curating interactive workshops and digital modules that guide patrons through prompt engineering, bias detection and output validation within AI-generated content. The application of artificial intelligence in information literacy instruction requires librarians to develop targeted learning experiences that encourage users to critically and creatively utilise generative AI tools, simultaneously strengthening literacy skills and confronting the broader ethical and social ramifications. These programs should incorporate scenario-based simulations and collaborative critiques to deepen understanding of AI limitations, data provenance and cultural implications in knowledge production.

b. *Developing AI literacy*: Librarians are uniquely positioned to promote AI literacy, leveraging their roles as educators to enhance users' understanding of AI tools, information authority and critical evaluation skills. Insufficient AI literacy can hinder service delivery (Tshabala and Dube, 2024). Inadequate AI literacy constitutes a critical barrier to optimal service delivery within contemporary library ecosystems. Comprehensive programs must integrate hands-on tool demonstrations, case-study analyses of AI outputs and reflective discussions on societal impacts to foster holistic competence.

Gateway Information Journal
G I J

c. *Engaging in stakeholder partnerships*: Librarians must pursue collaborative partnerships with stakeholders in the information sector, including technology providers and academic institutions, to facilitate seamless AI integration and knowledge sharing (Benson, Oduagwu and Orisakwe, 2023). These consortia facilitate resource pooling for infrastructure upgrades, curriculum co-design and evidence-based advocacy that aligns AI initiatives with institutional priorities. Additionally, multi-stakeholder governance committees can oversee equitable access protocols and continuous evaluation metrics, ensuring transparency and accountability. This synergistic approach not only optimises technical implementation but also amplifies libraries' influence in shaping ethical AI policies at national and international levels.

d. *Investing in digital infrastructure*: Library leaders should proactively invest in robust digital infrastructure to support AI-driven services, ensuring accessibility and operational efficiency in resource-constrained settings (Kalbande et al., 2024). This entails deploying scalable cloud architectures, high-throughput networking and secures data repositories tailored to AI workloads such as machine learning inference and automated metadata generation. Furthermore, adopting open-source frameworks and modular hardware solutions can mitigate vendor lock-in while optimising cost-effectiveness over the technology lifecycle. Such forward-thinking investments position libraries as adaptive knowledge hubs resilient to evolving computational demands.

e. *Acquiring technical skills*: Proficiency in technical skills is essential for librarians to deploy AI effectively. Continuous professional development is critical to meet the demands of sustainable AI integration (Benson et al., 2023; Cox, 2024). Ongoing professional development programs are vital to equip library professionals with evolving skills in data science, algorithmic literacy and systems integration required for enduring AI adoption. Targeted training should encompass programming languages, API management, and model interpretability to enable independent customisation of AI tools. Furthermore, institutional certification pathways and peer-mentoring networks can institutionalise skill retention and foster a culture of continuous technological adaptation.

f. *Aligning with UNESCO's digital literacy frameworks*: Librarians should align with UNESCO's digital literacy frameworks to enhance their capacity for integrating AI-driven tools

Akidi et al. (2025). Navigating the AI Era…

Gateway Information Journal
G I J

and fostering digital competency among users, ensuring libraries contribute to global digital inclusion goals (Bridges et al., 2024). This alignment entails mapping local AI literacy programs to UNESCO's competency benchmarks, including critical data interpretation, algorithmic awareness and ethical technology use. Furthermore, adopting UNESCO's assessment rubrics enables standardised evaluation of user proficiency, facilitating scalable impact measurement across diverse socioeconomic contexts. Such integration positions libraries as key implementers of global policy agendas, promoting equitable access to AI-empowered knowledge systems.

Challenges to Effective Use of Artificial Intelligence (AI) by Librarians in Developing Countries

There are several challenges associated with integrating AI to library service delivery with reference to developing countries. These challenges include but not limited to the following:

a. **Financial implication:** The insufficient funding provided to libraries is grossly insufficient to procure and maintain the right infrastructure relating to AI applications in libraries. Deploying AI systems incurs high costs, including those associated with acquiring software and maintaining operational functionality over time. As rightly captured by Gujral, Shivaranma and Choukimath (2019), cost is one of the major barriers to the implication of AI in the information sector. They noted further that most of the AI systems are in the form of proprietary software. Development and maintaining AI systems can be expensive and many libraries particularly those in developing regions, struggle with limited budgets. It is one of the most significant requirements to implement AI technologies (Kalbande *et al*., 2024).

b. **Human capital and skill gaps:** The low level of digital knowledge among library practitioners is a major challenge. This invariably contributes to why most libraries are yet to come to grips with the realities of integrating technologies into the provision and delivery of library services in developing countries (Benson, Igbokwe and Onyam, 2020). Beyond the integration of AI to library practice, the tools require the operations of human for optimal delivery. Also, a low level of innovative capacity among heads of libraries is another human factor. This will limit the extent to which AI can be incorporated into the library and information profession. Implementing and managing AI technologies requires specialised technical

Akidi et al. (2025). Navigating the AI Era…

Gateway Information Journal
G I J

knowledge that many librarians currently lack (Kalbande *et al.*, 2024). It takes professionals with high level of technological drive to exploit the various technological tools for sustainable information service delivery (Benson, Obichere and Orisakwe, 2024). Innovative skills are one of those that librarians in the various libraries cannot afford to ignore in this age (Benson, Igbokwe and Onyam, 2020). Another human factor according to Benson, Obichere and Orisakwe (2024), is that library and information professionals in developing countries often limit their activities to the library building or related working environment and this no doubt has affected the level of partnership drive among them. Most librarians lack the capacity to initiate collaborative ventures that will promote library service delivery.

  c. **Socio-cultural barriers:** Library users ought to be digitally inclined to get the best out of new technologies. One of the challenges affecting the application of AI in libraries is the low level of AI literacy among the users (Mwilongo and Mwageni, 2022). Osagie and Oladolkun (2024) citing several authors affirmed that the introduction of AI in library systems can face resistance from both staff and users. Librarians are afraid that AI will take over the job in libraries thereby rendering them jobless. Mwilongo and Mwageni (2022) posit that most if not all library operations done by the library staff will now be taken over by the AI. Many operational tasks traditionally performed by librarians, such as cataloguing, circulation management and reference inquiries, are increasingly being assumed by AI systems. Furthermore, cultural perceptions of technology as a threat rather than an enabler exacerbate adoption challenges, underscoring the need for targeted change-management initiatives. Addressing these barriers through comprehensive literacy programs and transparent communication about AI's augmentative role is essential for sustainable implementation.

  d. **Technical factor:** Evidence from the literature indicates that digital facilities are not sufficiently available in libraries and information centres, especially in developing countries unlike most developed nations. The near absence of digital infrastructure affects the overall integration of AI tools. Some of these tools are interdependent on each other, and the non-existences of basic digital infrastructural facilities is such a hurdle that should be addressed in developing countries. These challenges relate to the technological infrastructure and expertise required to implement and sustain AI systems in libraries. Libraries in developing countries often lack robust technological infrastructure, unlike their counterparts in developed nations, hindering

AI deployment (Kalbande et al., 2024). Also, inconsistent electricity, prevalent in many African regions, disrupts the operation of AI systems, negatively affecting service delivery (Oyedokun et al., 2023). The complexity of AI systems, including advanced hardware and software requirements, poses significant challenges, particularly in settings with limited technical expertise and infrastructure (Kalbande et al., 2024).

Conclusion and the Way Forward

The advent of the artificial intelligence (AI) era offers transformative opportunities for library and information services in developing countries, particularly in African academic libraries, while presenting significant challenges that demand urgent attention. By leveraging AI's potential for automation, personaliswed services and enhanced information access, libraries can redefine their role as dynamic knowledge hubs. However, barriers such as inadequate funding, limited digital infrastructure, low AI literacy and resistance to technological change threaten to widen the digital divide. This paper underscores the need for library leaders, policymakers and professional bodies to align efforts in fostering digital skills, securing sustainable funding, building robust infrastructure and formulating AI policies tailored to resource-constrained contexts. Through strategic partnerships, innovative leadership and alignment with global frameworks like UNESCO's digital literacy agenda, libraries can overcome these challenges. Embracing AI proactively will not only ensure libraries' relevance in the digital age but also position them as vital catalysts for equitable access to information, driving societal development in developing regions.

The following are hereby recommended in line with the identified challenges

1. ***Recruitment of librarians with digital-related skills combined with know-how in deploying digital tools to library practice***: there is need for libraries to recruit skilled personnel with experience in deploying digital tools to library service delivery. The lack of digital literacy skills would lead to slow adoption of the new technologies that are implemented, hence, staff and students need to be equipped with the relevant skills to adapt to changes in an AI-driven environment (Tshabala and Dube, 2024). Recruitment frameworks should incorporate validated assessments of technical proficiencies, such as machine learning literacy and systems interoperability, to align human capital with technological trajectories. Additionally, instituting

cross-functional training cohorts will cultivate organisational resilience, enabling libraries to leverage AI as a catalyst for enhanced service excellence and scholarly impact.

2. ***Librarians should be innovative and creative:*** Hooper (2023) citing Wojcik (2019) averred that if librarians are able to innovate and advance, they can gain a competitive advantage and potentially increase the usage of the library. Furthermore, if librarians are encouraged to try new ideas without the fear of punishment or failure, the innovative culture could flourish. Furthermore, institutional recognition of innovative contributions through awards and professional development incentives reinforces a cycle of continuous improvement. Such a proactive stance positions libraries as dynamic leaders in the knowledge ecosystem rather than passive repositories.

3. ***Formulating viable AI policy to guide AI implementation process***: There should be proper policy formulation and implementation prior to, during and after the adoption of AI in African libraries (Yusuf *et al.,* 2024). As put forward by Bridges, McElroy and Welhouse (2024), libraries should be involved in policy making about AI at all levels of the government and within institutions. As suggested by Bassey and Daniel (2024), libraries must uphold ethical AI practice, including data privacy, transparency and fairness. This cannot be achieved with a well-articulated AI policy in place. A rigorously articulated AI policy is foundational for upholding ethical standards encompassing user privacy, explainable decision-making and bias mitigation across library systems. Policy instruments must incorporate compliance benchmarks, training mandates and redress pathways to operationalise fairness in AI-mediated services. Additionally, harmonising library AI policies with international frameworks, such as UNESCO guidelines, enhances global interoperability and accountability. This strategic policy architecture positions libraries as ethical stewards in the AI-enabled knowledge ecosystem.

4. ***Engaging in collaborative partnership:*** Library and information professionals should engage in collaborative efforts with regards to incorporation of AI to library practice. Kalbande *et al* (2024) contend that librarians collaborating with technology providers to design AI systems that align with ethical standards is crucial in this digital era. More so, fostering partnerships with academic institutions and other libraries can facilitate knowledge-sharing and collaborative problem-solving. As put forward by Zondi *et al (*2024), strategic alliances and partnerships between libraries, technology experts, policy makers and funding agencies can serve as a catalyst

in progress. Benson, Oduagwu and Orisakwe (2023) affirmed the importance of library and information science professionals partnering with specialist, experts in data management and developers of AI tools to ensure seamless integration of AI to library service delivery. According to Bassey and Daniel (2024), collaborative efforts can lead to the creation of innovative AI applications that optimise library services and enhance user experience. The AI-driven future according to David-West and Ig-Worlu (2023) necessitates a multi-disciplinary approach, encompassing technological proficiency, data literacy, critical thinking and adaptability. This point to the need for timely engagement in a collaborative partnership.

5. ***Introduction of AI to library and information science curricula:*** it is imperative that library schools in Africa should introduce AI to the curricula used in grooming prospective librarians. This requires urgent attention in developing countries. Specific modules should address machine learning applications in metadata generation, natural language processing for query resolution and ethical AI governance to ensure graduates possess both technical and critical competencies. Furthermore, collaborative curriculum design with industry partners and regional accreditation bodies will facilitate standardisation and relevance across diverse educational contexts.

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Gateway Information Journal
G I J

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