

LEVERAGING ARTIFICIAL INTELLIGENCE (AI) AND CREATIVITY: LIBRARY AS CATALYST FOR REVOLUTIONISING EDUCATION IN NIGERIA

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Abstract

This paper focused on leveraging Artificial intelligence and creativity, library as catalyst for revolutionizing education in Nigeria. The accelerating integration of Artificial Intelligence (AI) within educational frameworks presents unique opportunities to redefines the functions of libraries in Nigeria's educational sector. This paper investigated the fundamental roles of libraries as catalyst for educational transformation by harnessing AI technologies alongside innovative strategies. The study explores the concept of library, education, artificial intelligence and how libraries can transform user experience using AI tools. The study revealed that libraries are uniquely positioned to empower educators, learners, researchers to effectively navigate complex information landscapes in the digital world. The study further investigated the challenges experienced by libraries while integrating artificial intelligence into their operations and service delivery which includes limited financial capacity, insufficient technical expertise, poor digitization of collections and organizational resistance to technological change, unstable internet connectivity and weak maintenance culture. Based on these finding, the study recommends that government agencies and relevant stakeholders should prioritize sustained investments in robust digital infrastructure, national and institutional policies should be formulated to guide ethical AI use with emphasis on data privacy and algorithm transparency. Consistent professional development programmes should be implemented to enhance the competencies of librarians, library technologist in AI, and digital literacy skills for proficiency and improving overall job performance.

Keywords: Artificial Intelligence (AI), Creativity, Libraries, Educational reforms,

Introduction

The accelerating advancement of digital technologies has fundamentally reconfigured the processes through which knowledge is created, accessed and disseminated. Towards this innovations, artificial intelligence (AI) stand out as a transformative force capable of reshaping pedagogical practices, research paradigms and scholarly communication. This positions libraries to operate strategically as catalysts for educational transformation. Meanwhile, Nigeria stands at the threshold of a new era, ready to harness its dynamic population and expanding technological capacity to build a strong knowledge-driven economy. Realizing this potential however, depends on addressing deep rooted challenges within the nation's educational sector and stimulating widespread innovation driven economy growth. In this pivotal landscape, library is poised for reinvention strategically by harnessing the power of AI and human creativity aimed to transform their traditional roles to dynamic catalysts in revolutionizing education in Nigeria. Irenoa, Bribena and John (2021) submitted that the integration of Artificial Intelligence (AI) enables unprecedented personalization

of learning, democratizes access to information and automate complex processes thereby increase the access and reach of library services. They stated further that, for education, Artificial Intelligence (AI) enhances libraries to offer adaptive learning platforms and also provide educators with data driven insights to involve pedagogy and cultivate essential digital critical gaps in quality and accessibility. For the economy, they can function as open-access innovation hubs, equipping entrepreneurs and small businesses with Artificial Intelligence (AI) powered market intelligence, advanced prototyping tools and critical technical training.

Artificial intelligence displaces an established technology to fundamentally reconfigure the contour of education, the global economy, social institutions and industrial paradigms. This contemporary epoch often termed the digital age is the ascendancy of artificial intelligence, a technology exhibiting profound capacity to reconstitute foundational institutions including education, economic models, societal dynamics and industrial operations. (Johnson, 2020). Artificial intelligence (AI) is a dynamic field of computer science and engineering dedicated to create machines capable of performing tasks that normally require human intelligence. Its core goal is to build intelligence machines that can mimic cognitive functions associated with human mind, such as learning, reasoning and problem solving. (Vashita, 2024).

However, library is fundamentally intertwined with education, serving as its vital support system. In Nigeria's technology driven age, libraries are evolving from passive repositories into dynamic hubs that can significantly enhance learning thereby serve as instrument of self-development and agent of education. They function as vital institutions for pedagogy, knowledge dissemination, and civic engagement and their core mission is to provide public access to information, facilitate lifelong learning and foster community engagement and development. They are quintessential public spheres, subject to the pressures of progress in information and communication technologies that emerge from changing ideological superstructures and continuously redefine the institutional role and praxis. However, the contemporary library is evolving into an agile nexus of technology, community and knowledge.

Concept of Library

Libraries have traditionally been the vital institutions and cornerstone for the preservation and sharing of knowledge. They serve as trusted spaces where communities, learners, researchers can access wealth of information. Historically, they centered on physical collection of books and manuscripts, which evolved into active learning environments, they promotes education, research and cultural engagement. However, they remain essential pillars in supporting academic growth and lifelong learning for people from all walks of life (Jaeger, 2020). In today's digital era, the role of libraries has expended dramatically. Modern libraries are no longer confined to physical spaces but have embraced technology to provide access to digital resources, online databases and interactive learning tools. By integrating innovations

such as artificial intelligence and digital catalogues, libraries have transformed into versatile knowledge hubs that facilitate easy access, personalized learning experiences and foster collaboration, thus enhancing educational outcomes and inclusivity. (HarperCollins, 2023).

Gaspamin and Kautonen (2022) describes library as an organized collection of physical and digital information resources such as books, journals, multimedia, databases, curated to support learning, teaching and research accessible both on site and online. They stated further that, library is an open interconnected system that supports the free flow of knowledge across different formats platforms and communities to encourage open access collaboration and innovation.

Concept of Education

Education is multifaceted, encompassing not just the process of teaching and learning, but also the broader development of an individual's reasoning, character and skills. According to Herbert (2023), the term education originates from the Latin words "educare" meaning to train, mold or bring up and "educere" to bring forth or lead out. He stated further that education nurtures intellectual abilities, skills and attitudes promoting all round development of a person. This description of education has been explored by theorist from various fields. For instance, According to Historian of twenty-first century education Mirra and Garcia (2020) described education as the ability to effectively use technology to access information online and critically evaluate digital content in an age shaped like tools such as artificial intelligence, automation and global connectivity. He also stated further that education is the transmission of knowledge and skills and the development of character and traits. In their own research, Onuka and Arowojolu (2018) stated that education is the act of making available to each generation the organized knowledge of the past. They stressed further that education is the total efforts of a community to raise its economic, social and political standards of life. Paulley and Buseri (2021) as cited in (Tella, 2020) describes education as a dynamic interactive process, the primary purpose of which is for the teachers to fulfill their fundamental responsibility to facilitate a positive, desire expected changes in the learners behaviour. This was agreed and supported by the definition of education provided by Ekundayo and Akinrosoju (2022) that whether formal or informal, education is the process through which an individual acquires the majority of their ideas, beliefs, attitudes, skills and knowledge. The purpose of this process is not only to equip information users to confront life's hazards but also to secure what is needed to integrate effectively into society.

Hussain, (2021) however views education as a socializing agent to equip its beneficiaries with the necessary tools including knowledge, skills, attitudes, cultural values, languages and social skills to enable them to conform to the desired demands of the wider society.

In this emerging trends age, technology has advanced to the point where many classrooms and many teachers no longer use paper for assignments. Also, assignment are done online, and graded online. Chazan, (2022) in his own research discovered

that Laptops are a must to be able to access the textbooks and research online in most universities. Artificial intelligence has exploded into education with chatbots having the ability to write essays for students who know how to request them. Therefore, working with AI is a skill in itself that has the ability to synthesize information in a few seconds.

Artificial Intelligence

Artificial Intelligence is a branch of computer science that enables machines to stimulate human intelligence, performing tasks like learning, problem-solving, decision making and natural language understandable. (Sanjay, 2023).

Asemi, Ko and Nowkarizi (2020) are of the opinion that Artificial Intelligence (AI) is the science and engineering of making intelligence machines, especially intelligent computer programs. For instance, with the aid of automated cataloguing systems, AI can intelligently organize and tag new resources in the library. Artificial Intelligence can also be seen as the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision making and translation between languages. AI chatbots can handle researcher's queries in the library every time on how to access e-journal according to them. (UNESCO, 2021) Smith, (2021) opines that Artificial Intelligence (AI) is the ability of a digital computer or computer- controlled robot to perform tasks commonly associated with intelligent beings. There is robotic process automation (RPA) that can be used in large academic libraries for sorting, scanning and moving of books. David (2022) described Artificial Intelligence (AI) systems as software and hardware designed by humans to give a complex goal and act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured data, reasoning on the knowledge derived from this data and deciding the best action(s) to take to achieve the given goal. Smart resources allocation as one of AI system can manage books loan durations from room bookings or staff scheduling based on usage patterns.

Examples of AI tools that can facilitate effective services in the library include the following:

Research rabbit, Puzzle labs, Consensus, Lateral, Chatbots, Perplexity ai, Quilibot, fable fiesta etc. (Sanjay, 2023).

Using Artificial Intelligence (AI) to transform library user experience

Artificial intelligence stands as a pivotal disruptive with considerable capacity to augment and streamline library services. Empirical investigation such as the study conducted by Hussain and Abu (2023) confirmed the operational values of these tools. Their findings indicated that AI-powered Chabot's significantly enhance users support in libraries by delivering uninterrupted automated assistance. This functionality effectively manages high volume, repetitive queries improves resources discovery for patrons. However, Ibrahim and Okpala (2024) is of the opinion that Artificial intelligence powered Chabot's can provide round the clock assistance to

patrons, addressing common queries and guiding information users to the relevant needed resources.

- **Information insight powered by AI in library:**
By harnessing adaptive learning technologies, artificial intelligence AI systems can tailor pedagogical content and sequencing to meet the unique needs of each user. This evolution positions libraries beyond mere repositories but reimage them as dynamic hubs for self-directed, personalized education.
- **Intelligent discovery and retrieval:**
By leveraging Natural Language Processing, (NLP), Chatbots AI enables semantic search functionalities that allow information users to conduct intuitive, conversational queries, moving beyond simple keyword matching to understand user intent and context. This facilitates intelligent, dramatically improve discovery by delivering more precise results and uncovering hidden connections within the library collections. Also assist to provide instant help anytime from basic queries to initial research support.
- **Automation of Technical Services:**
The adoption of artificial intelligence to automate core technical services such as metadata generation, bibliographic classification and subject indexing mitigates administrative overhead. The reallocation of human capital enables information professionals to shift from procedural tasks to more complex user centric services. However, this evolution allows professionals to concentrate on high level cognitive and service oriented roles, including scholarly support, information literacy instruction and specialized research consultation. By deploying machine learning and natural language processing for the automation of routine bibliographic control operations, this paradigm reduces the cognitive load on library staff, empowering them to dedicate their efforts to advanced analytical services, personalized research assistance, and the curation of complex digital collections.
- **Recommendation systems:**
 - i. AI technology discovers relevant resources effortlessly, saves time and introduces serendipitous discovery. Artificial intelligence (AI) can revolutionize Nigerian libraries and education through personalized Learning and user's experience; Enhanced library operations and efficiency and Fostering creativity and innovation;
- **Personalized learning and users experience:**
Artificial intelligence driven search engines will tailor resources suggestions to individual library users and researcher needs. It can also improve information discovery and engagement. Personalized learning tools and intelligent tutoring systems supported by library resources can also adapt to individual learning paces and styles enhancing educational outcomes (Sharma, 2022)

- **Enhanced Library Operations and Efficiency:**
Robotics can assist with tasks such as items retrieval and shelf management, this can also improve efficiency and service delivery. Artificial intelligence can also automate routine task like cataloguing, metadata extraction and indexing, freeing up library staff to focus on more complex, strategic and creative roles.
- **Fostering creativity and Innovation**
Libraries can become hubs for AI-powered content creation, providing access to tools and platforms that support creative projects and innovations. Also, by leveraging AI in research, libraries can empower users to generate new insights and content, fostering a more dynamic and creative academic environment (Ardichivill, 2022).
- **Integration of Artificial Intelligence (AI) into Curriculum:**
Library must assume central role to lead advocacy efforts and provide institutional support for the systematic integration of artificial intelligence (AI) into the national education framework and curriculum, thereby cultivating a cohesive nexus between pedagogical advancement and technological innovation.

Challenges in adopting AI to Nigeria Libraries

Based on the findings of this study, Nigerian libraries are confronted with numerous multifaceted challenges that hindered the seamless adoption and utilization of AI technologies in their services. These challenges includes inadequate infrastructure, power supply instability, lack of technical expertise or skill, financial constraints and high cost, poor digitization of collection and data availability, Policy regulatory and ethical support, insufficient digitization of library resources, unstable internet connectivity and weak maintenance culture.

- **Infrastructural deficiency:**
A fundamental barrier to artificial intelligence (AI) adoption in libraries is the pervasive inadequate technological infrastructure. Many libraries operate with obsolete and outdated computer systems and limited internet bandwidth. However, application of AI demands high speed internet, sufficient digital infrastructure fundamentally impairs libraries ability to deploy AI-driven tools such as intelligent search systems, virtual assistants and machine learning application. (servers, computers, sensors), and maintenance. (Winkler and KIszl 2022). AI technologies require compatible existing facilities in many institutions. So, lack of digital infrastructure fundamentally impairs libraries ability to deploy AI-driven tools such as intelligent search systems, virtual assistants and machine learning application.
- **Power supply instability:**
Many artificial intelligent (AI) tools and servers require consistent, uninterrupted power, frequent outages, voltage fluctuations and inadequate

back up power (generators, UPS) can degrade equipment and disrupt effective service.

- **Lack of technical expertise/ skills or human capacity:**
AI adoption demands a workforce or human resources skilled with data analytics, programming, machine learning and information systems management. However, the current cadre of library professionals in Nigeria largely lacks these competencies. Most so called librarians have limited exposure to emerging technologies due to outdated curricula in library and information science education, as well as insufficient opportunities for continuous professional development. (Osterlund, Jarrahi, Boyd and Wolf 2021). This skills deficit severely limits the capacity for innovation and technical implementation.
- **Financial limitations and high cost:**
The high capital cost associated with procuring AI-enabled tools (robotics, automated cataloguing systems, machine learning platforms), acquiring licenses, implementing and maintaining AI systems is another significant obstacle. Libraries in Nigeria typically operate under constraints budgets, while little funds often prioritized for print resources / materials over technological innovation. Consequently, the financial investment required for AI adoption including software licensing, hardware acquisition and personnel training remains prohibitive (Hodonu, 2024).
- **Poor digitization of Content and Data availability:**
AI systems often require large volumes of well-structured, digitized data for training, indexing and retrieval purposes. Many libraries in Nigeria have partially digitized their collections, metadata may be inconsistent, archival resources may not be digitized or may not exist in machine readable formats. These factors tend to limit what AI tools (search, Natural Language Processing (NLP), recommendation systems can do. (Herbert 2023).
- **Unstable Internet Connectivity:**
Reliable broadband or high speed internet is often lacking even where infrastructure exists particularly in remote areas. Cost of internet usage can severely limit AI functions that depend on cloud services, streaming real time processing.
- **Ethical Concerns, Policy regulatory, Privacy and User trust:**
According to Hussain (2018) Use of AI raises concerns and issues around data privacy, security, and protection of personal information, bias in algorithmic decisions, transparency and impact on academic integrity. He stressed further that AI is poorly addressed in many Nigeria institutions and absence or inadequacy of institutional policies and guidelines for AI deployment can lead to misuse, lack of accountability and risk. Users may distrust AI if these concerns are not well addressed.

Solutions to the challenges

- **Infrastructural Deficiency:**

There is need to survey the existing library in other to identify current infrastructure to plan towards investment on stable and resilient infrastructure. Appeal to government for institutional funding specifically to earmark for well-equipped functioning ICT in the library.

- Financial constraints
Advocate for increase library budget at governmental levels including AI adoption explicitly in national education and library policies. Also, seeking grants from international donors (World Bank, NGOs, UNESCO) for digital library capacity building. Using opens-source AI tools and platforms can reduce licensing cost, sharing of service models among different libraries or institutions can also reduce unit cost. However, public/private partnership, companies may fund or donate hardware, software etc. in exchange for recognition. Bulk purchase or cooperative procurement of software to reduce unit costs is an added advantage.
- Lack of technical expertise
Organize regular training including workshops, seminars and conferences for librarians in AI skills, data science, digital literacy skills etc. Moreover, libraries that have adopted AI can mentor others, recruitment of AI/IT specialist and experts in larger institutions to lead AI initiatives thereby transfer the skills to internal staff. This training should equally involves inclusion of short courses like data ethics, AI tools, usage and how to maintain the system.
- Promotion of awareness among users by organizing user training sessions for students, researchers and others members of library users and faculties on how AI tools can help in research, information retrieval and facilitate effective teaching and learning process.
- Create library specific policies for AI usage, data collection, storage and user privacy. Inclusion of libraries who have adopted AI usage into national education and technology policy is necessary to regulate data protection. On this note, advocate for state and national policies is required and also set up committees or taskforces to monitor compliance.

Conclusion

In conclusion, Nigerian libraries serve as catalyst for educational advancement through the adoption of Artificial Intelligence (AI) technologies. By integrating AI tools, libraries can transform into dynamic hubs for education and creativity through professional training of information users, researchers, librarians on AI tools used to create more engaging, tailored educational experience and unlocking improved access to resources. The adoptions of Artificial intelligence (AI) in libraries will also enables personalized learning pathways enhanced research capabilities and streamlined other operations. According to the study, the integration of Artificial intelligence (AI) into library system holds transformative potential for Nigerian educational landscape by offering innovative pathways to improve access to knowledge, support personalized learning and bridge the information gaps. The realization of this potential remains

constrained by systemic challenges, including infrastructural deficits, financial limitations, digital illiteracy, inadequate policy frameworks, and resistance to change according to the study. Without addressing these foundational issues, the promise of AI in revolutionising education through library services may remain largely aspirational. So, advancement of academic libraries from traditional knowledge repositories to intelligent learning environments becomes imperative for stakeholders including government agencies, academic institutions and development partners to adopt proactive, inclusive and strategic approach. A successful transition into AI-enabled services must be secured by robust infrastructure, capacity development, ethical consideration and sustained policy support. The future of education in Nigeria depends not only on technological advancement but also on how institution such as libraries can leverage creativity and innovation to ensure that such technologies are effectively harnessed, equitably distributed and sustainably managed.

Recommendations

To successfully integrate AI into Nigerian libraries as catalyst for educational transformation and development, the following recommendations were made:

1. Government and institutional stakeholders must prioritized investments in digital infrastructure, including high speed internet, reliable electricity, cloud computing systems and AI compatible hardware.
2. Comprehensive professional development initiatives should be instituted to cultivate requisite competencies in AI, data analytics, machine learning and digital literacy among librarians and other information professionals. Collaboration between academic institutions and technology experts can facilitate curriculum reforms and continuous training programmes to bridge the existing skills gap by up skill librarians and library technologist in AI, data science, machine learning and digital literacy. This is imperative for libraries to lead effort in creating awareness and cultivate positive attitudes towards AI technologies among staff and users by implementing structured change management strategies alongside digital literacy programmes to mitigate resistance and foster a culture of innovation and adaptability.
3. National and institutional policies should be developed to guide ethical AI use, data privacy, content ownership, algorithmic transparency and user protection in libraries. Furthermore, a coordinated and comprehensive national digitization programme should be ensured to convert physical collections into accessible digital formats, underpinned by standardized metadata frameworks. This effort will enhance the efficacy of AI applications such as intelligent retrieval, recommendation systems and data analytics within library services.

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