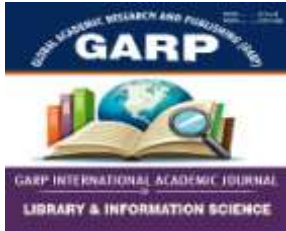


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THE ADOPTION AND IMPACT OF ARTIFICIAL INTELLIGENCE AND BIG DATA TOOLS ON INFORMATION SERVICE DELIVERY IN NIGERIAN ACADEMIC LIBRARIES

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Abstract

The rapid emergence of Artificial Intelligence (AI), Big Data Analytics (BDA), machine learning, natural language processing, intelligent search systems, recommendation engines, and conversational agents is transforming how information is created, organized, accessed, evaluated, and delivered. Academic libraries are increasingly expected to provide intelligent, personalized, timely, accessible, and data-driven information services. In Nigeria, however, the adoption of these technologies remains uneven due to inadequate digital infrastructure, unreliable electricity supply, limited funding, shortage of specialized skills, weak institutional policies, data-quality challenges, and concerns about privacy, copyright, algorithmic bias, and professional displacement. This seminar examines the adoption and impact of AI and Big Data tools on information service delivery in Nigerian academic libraries. The study adopts a content analysis research design, drawing evidence from relevant scholarly journal articles, books, conference proceedings, research reports, policy documents, and other credible literature on AI, Big Data, and academic library services. The Technology Acceptance Model (TAM), Technology-Organization-Environment (TOE) Framework, and DeLone and McLean Information Systems Success Model provide the theoretical foundation. The review focuses on the applications, adoption patterns, benefits, challenges, and implications of AI and Big Data for information service delivery. Findings from the reviewed literature indicate that these technologies can significantly enhance information organization, retrieval, reference services, resource discovery, user experience, and evidence-based library management through applications such as chatbots, predictive analytics, automated cataloguing, personalized recommendations, and intelligent search systems. However, infrastructural deficiencies, inadequate funding, shortage of skilled professionals, ethical concerns, privacy issues, and limited institutional preparedness constrain effective adoption. The seminar concludes that AI and Big Data have considerable potential to transform Nigerian academic libraries but require strategic planning, institutional support, continuous professional training, adequate infrastructure, responsible data governance, and ethical regulatory frameworks. It recommends a sustainable, human-centred digital transformation strategy that integrates emerging technologies with librarians' professional expertise to improve information service delivery and meet the changing needs of library users.

Keywords: *Artificial Intelligence, Big Data, Academic Library, information services, Library Automation, Technology Adoption, Nigeria Universities.*

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Introduction

The global academic libraries are changing like never before as a result of technological progress in Artificial Intelligence (AI) and Big Data. Historically, libraries were used as knowledge and information dissemination centres, which have been redefined in the 21st century through digital disruption. Specifically, the use of AI and Big Data technologies is helping libraries shift their focus to non-static information archives into active, user-friendly knowledge environments. The implementation of these tools is a shift in the paradigm of library functioning worldwide in line with the increased attention to the importance of data-driven decision-making and individual services to users (Ifijeh & Yusuf, 2021). As the players of the national education system, the Nigerian academic libraries are no exception to these changes. They are slowly becoming AI solution-centric to improve accessibility of information, automate repetitive processes and offer new services to students and researchers.

The sphere of Artificial Intelligence is very broad, and it consists of a variety of computational methods that allow machines to replicate the process of learning, thinking, and problem solving of people. Big Data, in its turn, is a huge amount of structured and unstructured information that digital systems and people create every day (Adebayo and Adetimirin, 2022). Applying the Big Data analytics in the library services context, one can comprehend user behaviour, optimize resource procurement, as well as assess service efficiency. To take an illustration, data mining methods could show trends in resource use so that the librarians may make evidence-based decisions regarding the collection development and digital repository. On the same note, chatbots and virtual reference assistants are becoming common AI-driven application to address more mundane queries and librarians are free to do more professional work.

The implementation of AI and Big Data tool in academic libraries is in its early stages in Nigeria, most probably because of infrastructural and financial barriers (Okike and Adekoya, 2022; Oluwaseun, 2023). Nevertheless, the increasing awareness of the digital transformation has led individual universities, including university of Ibadan and Covenant University to test out intelligent cataloguing, plagiarism detection, and user support systems (Oluwaseun, 2023). These initiatives highlight the need to bring a slow yet gradual shift towards library services that are technologically supported. However, various obstacles prevent the

mass implementation, such as low internet connection, intermittent power outage, lack of technical expertise, and lack of national policies of supporting AI integration (Okike and Adekoya, 2022).

In addition to technological and infrastructural constraints, social-economic and cultural aspects have an impact on the level of adoption as well. The digital gap between urban and non-urban institutions has been growing, and the situation is where well-endowed libraries in urban areas can easily afford technology than those in less-developed areas (Igbinovia, 2023). In addition, the ethical concerns of privacy of data, bias in algorithms and accountability cast doubt on the responsible application of AI in government institutions. These issues require a critical analysis of the ways in which AI and Big Data could be adopted in a sustainable manner that does not contribute to the further inequality.

This research is important because it is based on the Nigerian environment where academic libraries contribute immensely to the national development in form of education and research. Libraries need to change to keep up with the evolving knowledge economies that are more data-driven and more automated. This paper aims to establish the tactics that will help close the divide of technology in the information sector by exploring adoption and influence of AI and Big Data tools in academic libraries in Nigeria and other third world countries. The aims are to determine the level of adoption, examine the advantages and the issues and give practical suggestions to the policymakers, library administrators and higher education institutions.

Finally, the implementation of AI and Big Data in the libraries of Nigeria is not only a technological tool that was introduced to the country, but also a shift in the philosophy of informational delivery. It also puts the accent on the active service delivery rather than the responsive one and allows libraries to predict customer demands and provide them with personalized information experiences. In this regard, this research paper will be part of the wider discussion on digital transformation in higher education and will help understand how academic libraries in Nigeria can use the new technologies to achieve better learning outcomes and research productivity.

Statement of the Problem

In the current research, it is argued that the adaptation of Artificial Intelligence and Big Data technologies is an

essential part of the modernization of the academic libraries in Nigeria. It is argued that the successful implementation of these tools will increase the efficiency of the services, improve user satisfaction, and expand the knowledge base. However, to effect sustained implementation, there is a need to have a holistic approach which includes the development of infrastructure, policy support, capacity building and ethical governance. To this end, it is important that libraries strike a balance between technological innovation and human-oriented values to guarantee equal and non-discriminatory access to information.

Academic libraries occupy a strategic position in the university system because they provide students, researchers and academic staff with access to scholarly information required for teaching, learning, research and innovation. The traditional library environment, characterized by print collections, manual reference services and conventional cataloguing, has progressively evolved into an electronically mediated environment involving online databases, institutional repositories, discovery systems, electronic journals, digital libraries and virtual reference services. The emergence of Artificial Intelligence and Big Data represents another major stage in this transformation. AI can enable machines to perform tasks associated with human intelligence, including natural-language processing, pattern recognition, prediction, classification, recommendation and conversational interaction. In academic libraries, these capabilities can support intelligent discovery, automated cataloguing and metadata generation, reference chatbots, recommendation systems, plagiarism detection, information retrieval and analysis of user behaviour.

Big Data, on the other hand, concerns the generation, collection, storage, processing and analysis of large, diverse and rapidly generated datasets. In libraries, such data may include circulation records, database usage statistics, repository downloads, search histories, electronic-resource usage, borrowing patterns, reference transactions and other forms of interaction data. Big Data Analytics can transform these data into evidence for collection development, resource allocation, service planning and personalization. Recent Nigerian evidence demonstrates that Big Data applications are already relevant to digital-library operations. A study of selected academic libraries in Kwara State found that librarians recognized applications such as Apache Hadoop and Python and reported uses in resource transfer, borrowing management, understanding user needs, usage tracking and personalized content recommendation. However, scalability, complex data

structures, lack of processing capacity, electricity problems and data-privacy concerns remained significant challenges.

Similarly, research on AI adoption in Nigerian academic libraries identifies infrastructure, funding, human-capital development, data availability, privacy and institutional policies as important prerequisites for implementation. ([Nigerbiblios](#))

Consequently, the central issue is no longer whether Nigerian academic libraries should consider AI and Big Data, but how these technologies can be adopted responsibly and how their actual impact on information service delivery can be measured.

Conceptual Clarification

Artificial Intelligence

Artificial Intelligence refers broadly to computational systems capable of performing tasks that ordinarily require aspects of human intelligence. These include learning from data, recognizing patterns, understanding language, making predictions and supporting decision-making.

Within academic libraries, AI may be applied through:

- AI-powered discovery systems;
- Intelligent search and information retrieval;
- Chatbots and virtual reference assistants;
- Automated cataloguing and classification;
- Natural Language Processing (NLP);
- Machine-learning recommendation systems;
- Automated indexing and metadata generation;
- Plagiarism and similarity detection;
- Predictive analytics;
- User-behaviour analysis; and
- Generative AI applications for research and information assistance.

Research in Nigerian libraries has reported growing awareness and experimentation with AI, although institutional application remains uneven. A recent study involving Nigerian librarians found high levels of awareness, acceptability and application of AI, while also identifying differences associated with institutional ownership and other characteristics.

Big Data

Big Data refers to datasets whose size, complexity, diversity and speed of generation make conventional data-processing approaches inadequate. For libraries, Big Data can originate from multiple sources, including:

- Online Public Access Catalogues;
- institutional repositories;
- electronic databases;

- library management systems;
- circulation systems;
- authentication systems;
- website analytics;
- digital-resource platforms;
- user-search histories;
- social-media interactions; and
- electronic-resource usage statistics.

The value of Big Data is not simply in possessing large quantities of information but in the ability to transform the data into useful intelligence for decision-making.

Information Service Delivery

Information service delivery encompasses the activities through which libraries connect users with information resources and assist them in identifying, locating, evaluating and using information.

AI and Big Data can therefore affect:

- reference services;
- current-awareness services;
- selective dissemination of information;
- literature searching;
- information retrieval;
- document delivery;
- research support;
- institutional repositories;
- collection development;
- user education;
- bibliographic services;
- digital-library services; and
- personalized information services.

AI and Big Data Applications in Nigerian Academic Libraries

Intelligent Information Retrieval

AI-powered search systems can understand natural-language queries instead of relying exclusively on traditional keyword matching. This can make library discovery systems more responsive to users who formulate questions conversationally.

AI Chatbots and Virtual Reference Services

- AI chatbots can provide first-level assistance to users at any time of the day. They can answer frequently asked questions about opening hours, databases, borrowing rules, library locations, citation styles and access procedures.

However, AI should not completely replace librarians. Evidence from Nigerian academic libraries indicates that AI-driven reference tools can improve efficiency while complex enquiries still require human professional judgement and oversight.

Automated Cataloguing and Metadata Generation

Machine-learning and natural-language technologies can assist librarians in extracting bibliographic information, generating metadata and classifying resources. Such applications can reduce repetitive workloads and allow librarians to devote more time to higher-level professional activities.

Personalized Information Services

Big Data Analytics can reveal users' information interests and patterns. Libraries can use properly governed usage data to recommend books, journals, databases and other resources relevant to particular users or academic disciplines.

Collection Development

Analysis of circulation, downloads, database usage and other resource-use statistics can help librarians identify heavily used and underused resources. This provides an evidence base for subscription decisions and collection development.

Predictive Library Services

Predictive analytics can help libraries forecast resource demand, identify likely periods of high usage and support decisions concerning staffing, database subscriptions and digital infrastructure.

Institutional Repository Management

AI and Big Data can assist with automatic metadata extraction, document classification, content recommendation, duplicate detection and analysis of repository usage.

Research Support

AI can assist researchers with literature discovery, summarization, language support, citation management and research organization. However, libraries must emphasize verification because generative AI systems can produce inaccurate or fabricated information. UNESCO emphasizes a human-centred approach to generative AI, including data privacy, ethical validation, institutional preparedness and capacity development.

Theoretical Framework

The proposed theoretical framework combines Technology Acceptance Model (TAM), Technology-Organization-Environment (TOE) Framework and DeLone and McLean Information Systems Success Model.

This combination is appropriate because the study examines two distinct but interconnected questions:

- Why do academic libraries and librarians adopt AI and Big Data tools?
- What impact does adoption have on information service delivery?

TAM explains individual acceptance, TOE explains organizational adoption, while DeLone and McLean explains the success and service impact of information technologies.

Technology Acceptance Model (TAM)

The Technology Acceptance Model was developed by Davis (1989). It proposes that perceived usefulness and perceived ease of use are fundamental determinants of users' acceptance of information technology.

Application to the present study

TAM is particularly useful because librarians are central actors in implementing AI and Big Data tools. A librarian is more likely to use a new technology when he or she believes that the technology:

- improves productivity;
- saves time;
- improves information retrieval;
- enhances reference services;
- reduces repetitive work;
- improves service quality; and
- is relatively easy to learn and operate.

For example, if librarians perceive an AI reference chatbot as useful but extremely difficult to operate, adoption may remain low. Conversely, an easy-to-use technology that provides little professional value may also fail to achieve sustained adoption.

TAM variables for this study

Independent variables:

- Perceived usefulness;
- Perceived ease of use.
- Intervening variable:
- Attitude/acceptance.
- Dependent variable:
- Actual use of AI and Big Data tools.

TAM therefore provides the individual-level explanation of adoption.

Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment Framework developed by Tornatzky and Fleischer (1990) explains organizational technology adoption through three contextual dimensions: technological, organizational and environmental factors. (Technology Adoption Barriers Survey)

A. Technological context

This includes:

- availability of appropriate AI technologies;
- Big Data infrastructure;
- internet bandwidth;
- servers and storage;
- software compatibility;
- data quality;
- cybersecurity;
- interoperability; and
- technological complexity.

B. Organizational context

This includes:

- management support;
- institutional funding;
- staff competence;
- organizational readiness;
- library policies;
- ICT support;
- leadership commitment;
- organizational culture; and
- strategic planning.

C. Environmental context

This includes:

- government policy;
- professional regulations;
- vendors;
- technology providers;
- university regulations;
- legal requirements;
- copyright environment;
- data-protection requirements; and
- inter-institutional collaboration.

The TOE framework is particularly appropriate for Nigerian academic libraries because technology adoption cannot be explained solely by librarians' attitudes. A librarian may be willing to use AI, but adoption can still fail if the university lacks adequate internet connectivity, electricity, funding, servers, technical personnel or institutional policy.

DeLone and McLean Information Systems Success Model

The DeLone and McLean model is appropriate for examining the impact of AI and Big Data on information service delivery.

The updated model identifies six interconnected dimensions:

- system quality;
- information quality;
- service quality;

- system use/intention to use;
- user satisfaction; and
- net benefits. (Taylor & Francis Online)

Application to academic libraries

System quality can be measured through:

- reliability;
- accessibility;
- response time;
- usability;
- flexibility; and
- system availability.

Information quality can be measured through:

- accuracy;
- relevance;
- completeness;
- timeliness;
- credibility; and
- consistency.

Service quality can include:

- responsiveness;
- technical support;
- reliability;
- personalization; and
- user assistance.

Use refers to how frequently and extensively librarians and users employ AI/Big Data systems.

User satisfaction concerns users' perceptions of the quality and usefulness of technology-supported library services.

Net benefits include:

- time savings;
- improved access;
- increased productivity;
- reduced workload;
- better decision-making;
- improved research support;
- enhanced user satisfaction; and
- improved overall information-service delivery.

Thus, the DeLone and McLean model provides the impact and outcome dimension of the study.

Objectives of the Study

The general objective is to examine the adoption and impact of Artificial Intelligence and Big Data tools on information service delivery in Nigerian academic libraries.

The specific objectives are to:

1. determine the level of awareness of AI and Big Data tools among librarians in Nigerian academic libraries;
2. identify the major AI and Big Data tools currently available or being used in Nigerian academic libraries;

3. determine the extent to which academic libraries have adopted AI and Big Data technologies for information service delivery;
4. examine librarians' perceived usefulness and ease of use of AI and Big Data technologies;
5. identify the technological, organizational and environmental factors influencing the adoption of AI and Big Data tools;
6. examine the effects of AI and Big Data adoption on information retrieval and reference services;
7. determine the effects of AI and Big Data on the speed, accessibility, accuracy and personalization of information services;
8. examine the effects of AI and Big Data adoption on user satisfaction;
9. identify the major challenges associated with the adoption of AI and Big Data in Nigerian academic libraries;
10. examine ethical, legal and professional concerns associated with AI and Big Data use in academic libraries; and
11. propose strategies for sustainable, ethical and effective adoption of AI and Big Data tools in Nigerian academic libraries.

Literature Review

There is an emergence of scholarly literature that highlights the disruptive potential of Artificial Intelligence and Big Data to alter the workings of academic libraries. According to Ifijeh and Yusuf (2021), AI technologies have significantly transformed the ways in which libraries provide access to, handle and distribute information. Machine learning algorithms are now being used to sort and index large collections of material using automated cataloguing systems to achieve increased efficiency.

Chatbots are driven by natural language processing (NLP) and allow engaging in real-time communication with users to answer their commonly asked questions and refer them to relevant resources. Such tools aid in increased user satisfaction, reduce work pressure on the librarians, and increase the efficiency of the services.

The technologies of the Big Data supplement AI by providing high-order system analysis, which enables the library to utilize user-generated data to inform evidence-based decisions. Adebayo and Adetimirin (2022) noted that it is possible to use Big Data analytics to identify trends in the use of library resources, consequently, developing specific services that meet the demands of the end-users. An example would be to analyse the pattern of borrowing and search history that will help the librarians predict future

demand and make better resource allocation choices. On the same note, predictive analytics would contribute to the development of personalized recommendation systems, which are similar to the ones used by commercial applications like Amazon and Netflix but usable in an academic research setting.

However, even with such possibilities, the adoption of AI and Big Data tools in academic libraries in Nigeria is limited. Okike and Adekoya (2022) explain that this weakness is due to the lack of ICT infrastructure, insufficient funding, and technical skills among librarians. The state of library automation in most universities in Nigeria is primitive and is based on the use of simplified integrated library systems as opposed to advanced and well-informed platforms. Furthermore, the poor culture of maintenance and the lack of systematic programmes of training have hampered the sustainability of the technological innovations that were brought in the past.

The ethical aspects are one of the most noticeable in the literature on AI and Big Data in libraries. Igbinoia (2023) warns that user trust may be undermined in the event that algorithmic bias and the issue of data-privacy are not dealt with appropriately. Libraries gather and archive sensitive user information such as search queries, records of borrowings and personal data, improperly handled of which may trigger confidentiality violations. In turn, researchers highlight the importance of the explicit ethical frameworks and institutional policies that would be applied to regulate the responsible usage of data and AI systems in libraries.

Research in the developed world has shown that the integration of AI has resulted in high productivity and user experience in the global context. As an illustration, the University of Helsinki introduced an AI-powered research assistant which automates literature searches among the university students and faculty (Chen and Lee, 2023). On a different note, South African and Kenyan libraries have started considering its use of AI technology to generate metadata and digital preservation (Moyo and Ndlovu, 2024). These illustrations provide useful information to the Nigerian academic libraries willing to improve its efficiency in operations.

However, a number of Nigerian academics argue that the use of technology has to be sensitive to the local conditions. Aina (2024) stresses those foreign technologies, which have not been contextualised and imported, are likely to be underutilised. Based on this, the Nigerian academic libraries should focus more on developing the native capacity by working with the technology gurus, universities and research centres.

Data analytics and machine learning are the two professional training programmes that the library science courses must include to equip future librarians with the digital age.

Altogether, the literature indicates that the AI and Big Data have the potential to transform the Nigerian academic libraries, but to accomplish this goal, it is necessary to overcome some systemic issues. They include enhancement of infrastructure, enhancing of digital literacy, establishment of ethical governance and development of local research on technology adaptation. The socio-economic consequences of AI and Big Data in the long term on knowledge access particularly in resource limited academic settings also deserves long term research.

Challenges to Adoption in Nigerian Academic Libraries

- Inadequate Infrastructure

Reliable electricity, high-speed internet, servers, storage systems and computing resources remain fundamental requirements.

Inadequate Funding

- AI and Big Data implementation requires investment in:
- hardware;
- software;
- connectivity;
- cloud services;
- staff training;
- cybersecurity; and
- maintenance.

Skills Gap

- Librarians increasingly require competencies in:
- AI literacy;
- data analytics;
- programming;
- data visualization;
- data governance;
- cybersecurity;
- prompt engineering;
- machine learning concepts; and
- critical evaluation of AI-generated information.

A Nigerian study specifically examining AI skills in South-South university libraries identified the need for continuous development of librarians' AI competencies

Data Privacy

- Library records can contain sensitive information concerning users' searches, borrowing patterns, research interests and online behaviour.

Libraries therefore need clear policies regarding data collection, retention, access, processing and deletion.

Copyright and Intellectual Property

- The use of copyrighted materials in AI systems raises important questions concerning training data, licensing, reproduction and access.

IFLA's recent statement on copyright and AI emphasizes that libraries should pay attention to transparency and integrity when developing or providing access to AI tools.

Algorithmic Bias

- AI systems can reproduce biases present in training data. Consequently, librarians must evaluate AI outputs critically rather than assuming that algorithmically generated information is automatically neutral or accurate.

Job Displacement Concerns

- Some librarians may perceive AI as a threat to professional employment. A more appropriate approach is to conceptualize AI as a tool that changes professional roles.

The librarian of the future is likely to move increasingly from routine information processing toward:

- AI governance;
- information literacy;
- data stewardship;
- research support;
- digital scholarship;
- information evaluation; and
- ethical oversight.

Integrated Theoretical Framework

The three frameworks can be integrated as follows:

TAM

Perceived usefulness + Perceived ease of use



Acceptance/intention to use



TOE

Technological factors + Organizational factors + Environmental factors



AI/Big Data Adoption



DeLone & McLean

System quality + Information quality + Service quality



Use + User satisfaction



Net benefits / improved information service delivery

The integrated framework is superior to relying on one theory alone because AI and Big Data adoption in Nigerian academic libraries is simultaneously an individual, organizational, technological and service-outcome phenomenon.

Methodology

The study adopted a **content analysis research design** to examine the adoption and impact of Artificial Intelligence (AI) and Big Data tools on information service delivery in Nigerian academic libraries. Content analysis was considered appropriate because the study relied on systematically examining existing scholarly literature, research reports, policy documents, professional publications, conference papers, and other relevant documentary sources on AI, Big Data and academic library services. The approach enabled the researcher to identify, classify, compare and interpret documented evidence on the adoption, applications, benefits, challenges and implications of these technologies in Nigerian academic libraries. Data for the study were obtained from relevant secondary sources, including peer-reviewed journal articles, conference proceedings, academic books, theses and dissertations, institutional reports, professional library publications, government and regulatory documents, and credible electronic databases. Particular attention was given to literature focusing on Nigerian academic libraries and, where Nigerian evidence was limited, selected studies from comparable developing-country contexts. Relevant publications were identified through databases and scholarly search platforms using keywords such as **“Artificial Intelligence,” “Big Data,” “AI in academic libraries,” “Big Data Analytics,” “information service delivery,” “Nigerian academic libraries,” “library automation,” “AI adoption,” and “digital library services.”** Documents were included when they addressed one or more of the following: AI adoption, Big Data applications, information service delivery, academic libraries, technological transformation, user services, professional practice, ethical issues, or challenges associated with AI and Big Data. Priority was given to recent and peer-reviewed literature, while seminal theoretical works were retained where necessary. Publications that were unrelated to libraries, lacked sufficient scholarly information, or did not contribute directly to the objectives of the study were excluded. A structured documentary-review matrix was used to extract relevant information from the selected sources. The extracted information was categorized under **AI and Big Data applications, level of adoption, benefits, impact on information service delivery, infrastructural and financial challenges, human-**

resource requirements, ethical and legal issues, and policy implications. The collected data were subjected to qualitative content analysis through coding, categorization and thematic interpretation. Recurring themes and patterns were identified and compared across the reviewed literature. The findings were synthesized narratively to establish how AI and Big Data are transforming information organization, retrieval, reference services, personalization, research support and other library services in Nigerian academic libraries. The analysis also identified gaps in existing literature and provided a basis for recommendations concerning sustainable, ethical and strategic adoption of AI and Big Data technologies in Nigerian academic libraries.

Discussion

Discussion of the Theoretical Framework in Relation to the Study

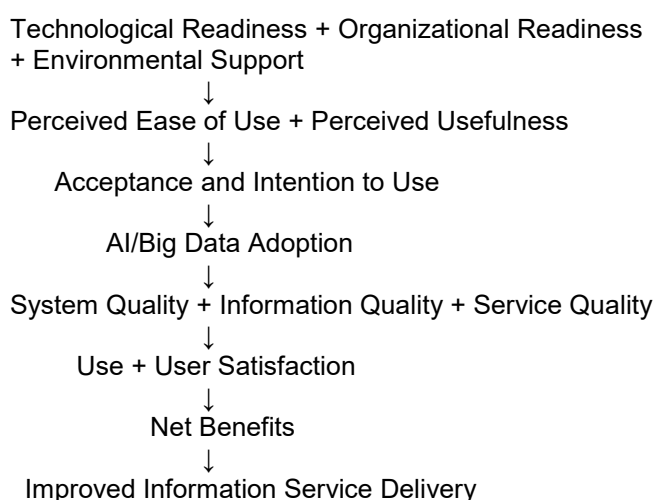
The integration of TAM, TOE and DeLone-McLean provides a comprehensive explanation of the proposed study.

TAM explains individual acceptance. It answers the question: *Why would a librarian want to use AI or Big Data?*

TOE explains institutional adoption. It answers: *What technological, organizational and environmental conditions allow the library to adopt AI and Big Data?*

DeLone and McLean explain outcomes. It answers: *Does adoption actually improve information service delivery?*

The framework therefore establishes the following logical chain:



This integrated framework is especially suitable for Nigeria because adoption cannot be understood solely from the perspective of individual librarians.

The institutional environment including infrastructure, funding, policy, management support and technical capacity is equally important.

Technological and Organizational Factors

Institutional readiness is also a major precondition to the successful adoption of AI and big data tools. The infrastructure and budget of most Nigerian academic libraries are usually outdated, which restricts capital expenditure on advanced technologies (Adebayo and Adetimirin, 2022).

However, organizations that have implemented AI-based cataloguing information and predictive analytics systems have recorded an improvement in operational efficiency and user interaction. To maintain such innovations, the organization must have strong support and dedication by the leadership cadres.

Ethical and Policy Issues

The technologies of artificial intelligence (AI) and big data present significant ethical and policy issues. In the library environment, sensitive information about users will require high levels of data protection and privacy. Furthermore, one of the most heated issues is the problem of algorithmic bias since AI systems can implicitly discriminate against certain user groups (Igbinoia, 2023). In this light, the libraries in Nigeria need to come up with clear ethical frameworks and effective data governance rules to protect fairness, transparency, and accountability in the application of AI.

Social Effects

The adoption of AI and big data technologies could be used either to reduce or to increase the existing digital gaps. In as much as these technologies have the potential of improving service delivery, they may at the same time exclude users with low digital literacies or access to ICT resources. As a result, libraries need to conduct continuous user education and provide digital services that are responsive to the needs of all users to include (Okike and Adekoya, 2022).

Counterarguments and Sustainability

Critics are of the view that overdependence on artificial intelligence would trigger job loss to the library staff. However, AI is to be understood as something that enhances and not replaces human knowledge. Librarians need to master new skills in data analytics and digital curating so as to remain relevant. AI systems also require constant maintenance, financing, and technical assistance to be viable in the long term (Ifijeh and Yusuf, 2021).

Conclusion

The technologies of Artificial Intelligence (AI) and Big Data are technological avenue of increasing efficiency, access and user satisfaction in the context of the Nigerian academic libraries. However, achievement of these benefits requires strategic investment, ethical management and long-term institutional commitment. Digital transformations cannot be limited to simply a technological upgrade by the libraries but are a paradigm shift to data-based and user-friendly service delivery.

Artificial Intelligence and Big Data are emerging as important technologies capable of reshaping information service delivery in Nigerian academic libraries. Their potential extends from intelligent information retrieval and automated cataloguing to virtual reference services, personalized recommendations, predictive analytics, institutional repository management and evidence-based library administration.

Available Nigerian evidence demonstrates that awareness and experimentation with AI and Big Data are increasing, but institutional adoption remains uneven. Nigerian academic libraries continue to face infrastructural, financial, human-resource, policy, data-governance and ethical challenges. Studies of AI adoption identify inadequate infrastructure, digital-literacy gaps and limited funding as persistent barriers, while Big Data research highlights processing capacity, power supply, data complexity and privacy as major concerns.

The major conclusion of this seminar is that technology adoption should not be measured simply by whether an academic library has purchased or experimented with an AI or Big Data tool. True adoption should be reflected in sustained use, improved information quality, improved service quality, increased accessibility, user satisfaction and measurable institutional benefits.

The proposed combination of TAM, TOE and the DeLone and McLean model provides an appropriate theoretical basis for investigating these relationships.

AI should therefore be viewed not as a replacement for librarians but as an augmentation technology. Its greatest value will emerge when intelligent technologies are combined with librarians' professional judgement, information-literacy expertise, ethical responsibilities and understanding of users' information needs.

Recommendations

Based on the foregoing discussion, the following recommendations are made:

1. Develop institutional AI and Big Data policies

Every university library should develop a clear policy governing the acquisition, use, evaluation and monitoring of AI and Big Data technologies.

2. Invest in digital infrastructure

University management should provide reliable electricity, high-speed internet, adequate servers, storage, cybersecurity infrastructure and modern library-management systems.

3. Establish continuous AI and Big Data training

Librarians should receive regular training in:

- AI literacy;
- Big Data Analytics;
- machine learning;
- natural-language technologies;
- data visualization;
- prompt engineering;
- cybersecurity;
- copyright;
- privacy; and
- ethical AI.

4. Establish library AI governance committees

Academic libraries should establish multidisciplinary AI governance committees involving librarians, ICT personnel, legal officers, data-protection officers and university management.

5. Adopt a phased implementation strategy

Libraries should begin with high-value, manageable applications such as:

- chatbot reference;
- intelligent discovery;
- automated metadata;
- usage analytics;
- recommendation services; and
- repository analytics.

Successful pilot projects can then be expanded.

6. Strengthen data governance

Libraries should establish procedures governing:

- data collection;
- data quality;
- storage;
- access;
- sharing;
- retention;
- anonymization; and

- deletion.

7. Protect user privacy

User data should not be transferred unnecessarily to third-party AI systems. Privacy assessments should be undertaken before adopting external AI platforms. IFLA has emphasized that AI applications in libraries should not unduly compromise user privacy and that transparency and appropriate risk assessment are important.

8. Address copyright issues

Libraries should ensure that AI tools comply with applicable copyright and licensing requirements. Contracts with vendors should be examined carefully to ensure that they do not unnecessarily restrict legitimate library and research activities.

9. Maintain human oversight

AI-generated information should be evaluated by librarians and users, particularly where accuracy, scholarly credibility or consequential decisions are involved.

10. Promote inter-university collaboration

Nigerian universities should establish collaborative AI and Big Data initiatives that enable libraries to share:

- expertise;
- training resources;
- software;
- datasets;
- research findings;
- technical infrastructure; and
- best practices.

11. Establish AI laboratories or innovation hubs

Selected university libraries should establish Library Technology Innovation Hubs where librarians, students, researchers and ICT personnel can experiment with AI, Big Data and emerging information technologies.

12. Encourage evidence-based technology procurement

Libraries should not purchase AI or Big Data systems simply because they are fashionable. Procurement should be based on demonstrated service needs, interoperability, security, usability, cost-effectiveness and measurable expected benefits.

13. Develop ethical AI guidelines

Academic libraries should adopt principles emphasizing:

- transparency;
- accountability;
- fairness;
- privacy;

- human oversight;
- inclusiveness;
- accuracy; and
- responsible use.

This is consistent with UNESCO's global AI ethics framework, which emphasizes human dignity, human rights, transparency, fairness and human oversight.

14. Measure technology impact continuously

Libraries should develop Key Performance Indicators (KPIs) for measuring:

- service response time;
- search effectiveness;
- resource utilization;
- user satisfaction;
- cost savings;
- staff productivity;
- accuracy;
- accessibility; and
- research-support outcomes.

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