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Artificial Intelligence in Academic Libraries: Opportunities and Challenges

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Abstract

The study investigates the dual benefits and challenges that KNUST and UDS academic libraries in Ghana encounter while deploying Artificial Intelligence (AI) systems. The research investigated how academic libraries in Ghana are preparing for and responding to new AI technologies because these technologies show promise to enhance information access and research support and operational efficiency. A qualitative multiple case study design was employed, and data were collected through semi-structured interviews with librarians from both universities. The research shows that AI adoption exists at a beginning stage, yet librarians understand its positive aspects. The KNUST works to create AI chatbots for service quality improvement, but UDS recognizes AI advantages yet lacks detailed plans for its implementation. The two institutions have implemented AI tools including Turnitin for plagiarism detection and AI content detection which indicates their current use of AI technology. The research found multiple chances for AI adoption, but it also revealed four main obstacles which included insufficient financial support and insufficient physical infrastructure and insufficient technical skills and non-existent institutional frameworks for AI implementation. The research shows that Ghanaian academic libraries need ongoing financial support and policy creation and staff training to successfully implement AI systems. The report supports capacity development and institutional partnerships and ethical guidelines to ensure proper and efficient AI system deployment in academic libraries. The integration of AI technology will boost academic library operations in Ghana's knowledge economy through improved efficiency and innovative capabilities and enhanced impact.

Keywords: *Artificial Intelligence, Academic Libraries, Opportunities, Challenges, Ghana, Librarians.*

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1. *Introduction*

Artificial Intelligence (AI) stands as the primary transformative technology of the twenty-first century because it revolutionizes the way knowledge is generated and distributed across various academic disciplines. Academic libraries undergo an intellectual and technological transformation through AI because it uses automation to change cataloging operations and reference services and user interactions through predictive analytics and data-based choices. AI technology enables libraries worldwide to provide enhanced search results and customized learning experiences through advanced management systems which organize large digital collections according to Wheatley & Hervieux (2019) and Jha (2023). Higher education institutions must convert their libraries into AI-compatible systems because this change affects their research visibility and service quality and institutional competitiveness.

The implementation of AI technology by libraries produces advantages for students and researchers and policymakers through quick information access and enhanced scholarly resource availability and improved academic choice quality. The study by Echedom & Okuonghae (2021) shows that institutions experience operational inefficiencies and data system fragmentation and reduced international market reach because of delayed AI adoption. AI technology integration in Ghana and other developing nations produces two opposing outcomes because it enables better access to knowledge yet deepens existing digital inequalities between social classes. The global adoption of intelligent library systems requires Ghanaian universities to assess their readiness and current status of AI system deployment. The research centers on three specific universities in Ghana which include the University of Ghana and Kwame Nkrumah University of Science and Technology (KNUST) and the University for Development Studies (UDS).

The current circumstances continue to be difficult to understand. AI technologies function as drivers of innovation and efficiency but their adoption in African and Ghanaian academic libraries occurs at a slow and unpredictable rate. AI technology integration in libraries will lead to operational changes because it enables better metadata organization and automated classification systems and research assistance according to Atikuzzaman (2025) and Barsha & Munshi (2024). The same technologies which benefit society generate risks that block access to users and staff members who lack digital competencies while causing employment instability and privacy risks (Adu, 2025; Alala, Uzoaru, & Odikwa, 2024). The ongoing conflict demonstrates an ongoing disagreement about AI capabilities because its achievement requires specific regional elements including financial support and infrastructure and personnel skills and organizational environments. The academic libraries of Ghana face both advantages

and challenges when implementing AI technology because their universities operate with restricted technology infrastructure and unpredictable ICT guidelines.

The research investigates how Artificial Intelligence (AI) technology enables Ghanaian university libraries including KNUST and UDS to access new opportunities. and What challenges do these institutions face in implementing and utilizing AI technologies for effective service delivery?The following essential inquiries explain how AI technology enables academic library modernization in Ghana while revealing the current obstacles to its implementation. By focusing on librarians' and administrators' experiences, the study explores not only what AI can do but also what it fails to achieve in the absence of enabling conditions.

Several strands of prior research inform this study. Studies from worldwide researcher's track AI library development through their analysis of automated cataloging systems and virtual reference services and intelligent search capabilities (Wheatley & Hervieux, 2019; Jha, 2023). Echedom and Okuonghae (2021) explain in their African context that AI technology has the potential to transform the continent by addressing its current infrastructure and human resource challenges according to Zondi et al. (2024) study shows that South African librarians have mixed feelings about using AI tools in their work. Research in Ghana shows that people are becoming more aware of AI technology and they are starting to try out its applications. Danquah et al. (2024) study examines Ghanaian academic libraries' adoption of AI-based chatbots and automated indexing systems which exist in experimental phases. The study by Adjei and Agyeman (2024) shows that AI tools enhance both cataloging precision and e-resource searchability but their implementation faces barriers from insufficient technical assistance and budget limitations. Owusu-Ansah et al. (2025) research demonstrates that librarians understand AI advantages yet they remain hesitant because they require training and question organizational support for AI implementation. The research delivers important results but most studies stick to description by studying specific tools and institutions while neglecting the full scope of AI adoption challenges and possibilities.

Prior literature is therefore incomplete in three respects. Most of the worldwide research studies have taken place in modern technological environments which restricts their practical use in developing countries. The third point identifies that African studies do not take into account how institutional differences and local restrictions impact the deployment of AI systems. The research about AI applications in Ghanaian university libraries fails to present any studies that compare institutions situated across various

regions of the country. The research lacks sufficient knowledge about how infrastructure and policy and human capacity factors work together to affect AI implementation in Ghanaian academic libraries.

The research adds value through its comprehensive analysis of AI benefits and obstacles which studies various universities in Ghana to create a balanced evidence-based contribution for academic theory and practical applications. The paper uses the Technology Acceptance Model (TAM) to explain AI adoption through the combination of perceived usefulness and ease of use and institutional support systems. The research demonstrates how theoretical concepts relate to actual experiences of Ghanaian university librarians to show the impact of acceptance and readiness on technological change. The research delivers particular guidance to policymakers and library consortia and university administrators for developing digital library capabilities and AI accessibility for all users. The research contributes to African university technology adoption discussions by studying local perspectives instead of international methods.

1. The Evolution of Artificial Intelligence in Academic Libraries

The global academic library sector has experienced a complete transformation through Artificial Intelligence (AI) because it now delivers services and manages knowledge resources more effectively. AI emerged from science fiction concepts to develop into operational technology which enables developers to build intelligent information systems and automated cataloging systems and deliver personalized user experiences (Wheatley & Hervieux, 2019). The development of AI in libraries follows the implementation of machine learning and natural language processing and robotics technologies which have been incorporated into library operations to boost operational efficiency and innovation. AI system deployment across the world depends on automated systems which produce metadata to improve data collection techniques and search results and develop predictive analytics for decision support (Jha, 2023).

According to Echedom and Okuonghae (2021) AI technology has shifted librarians from their traditional role as information protectors into contemporary digital knowledge facilitators. The authors demonstrate how AI technologies including chatbots and recommender systems and intelligent retrieval tools improve user interaction and speed up service delivery. The authors Monyela and Tella (2024) explain how AI systems use semantic indexing and data mining to create sustainable knowledge organization systems which improve academic resource availability and scholarly exposure. Academic libraries have evolved into data-driven smart institutions through AI technology implementation which enables them to support research and learning analytics according to Atikuzzaman (2025).

The developing world especially Africa faces slow AI adoption because of inadequate infrastructure and insufficient skills and inappropriate policies (Barsha & Munshi, 2024). Yet, as Zondi et al. (Academic libraries have become more receptive to AI adoption in their operations according to the 2024 study because they understand its academic value even though they face ongoing implementation challenges. AI serves as a strategic tool to boost knowledge equity by creating digital connections between developed and developing nations. Ghanaian academic libraries are no exception to this global evolution. Owusu-Ansah et al. (The 2025 report indicates that the University of Ghana and Kwame Nkrumah University of Science and Technology (KNUST) and University for Development Studies (UDS) have started to use AI for digital cataloging and virtual assistance and automated service systems although the adoption is still in its early stages. The transition shows knowledge of worldwide developments yet reveals differences between preparedness levels of infrastructure and workforce abilities.

Opportunities of AI Integration in Academic Libraries

Academic libraries can achieve improved user satisfaction and operational efficiency and research productivity through their integration of AI technology into their services. AI technologies across the world now perform repetitive work like cataloging and classification and circulation tasks which enables librarians to dedicate their time to advanced intellectual work (Wheatley & Hervieux, 2019; Jha, 2023). AI systems with chatbots and virtual reference tools provide users with continuous 24/7 access to instant query responses which Echedom and Okuonghae (2021) state improves information accessibility. The new technologies enable user-centered service delivery and inclusive practices through flexible information systems which provide customized content for different learning requirements.

The academic libraries of Africa can use AI technology to solve their resource limitations and operational performance problems. The authors Alala, Uzoaru and Odikwa (2024) describe how AI technologies improve collection management through predictive analytics and budget optimization and user-friendly search functionality. Barsha and Munshi (2024) state that AI automation systems improve cataloging accuracy and eliminate repetitive metadata entry work according to their research. Digital repositories serve developing countries through two main advantages which include improved scholarly digital content availability and institutional reputation growth through enhanced information sharing.

Within the Ghanaian context, AI integration in academic libraries aligns with the national digitization agenda and offers practical avenues for innovation. Danquah et al.

(2024) found that Ghanaian academic libraries were testing three AI implementation methods which included machine learning for resource prediction and voice search systems for accessibility and chatbots for user help. The authors emphasize that these tools enhance service personalization and operational resilience. The research by Adjei and Agyeman (2024) shows that Ghanaian libraries which use AI technology achieve enhanced cataloging precision and better e-resource discovery and decision support systems.

Owusu-Ansah et al. (2025) explain that AI technology enables resource recommendation systems which assist students and researchers in finding suitable literature more quickly. The study by Samuel et.al. (2024) supports this finding through their bibliometric analysis which shows AI scholarly output in Ghanaian universities is increasing due to data analytics and automation. Adu (2025) states that AI implementation brings two benefits to libraries by enhancing operational efficiency and decreasing both librarian workloads and their anxiety levels through automated task execution. The research findings demonstrate how AI technology can develop Ghanaian academic libraries into intelligent systems which will support modern research activities and digital literacy and user-driven innovation. The opportunities establish connections between contemporary technological advancements and educational methods which align with Ghana's current educational system.

Challenges and Barriers to AI Adoption in Academic Libraries

Academic libraries in developing countries encounter various barriers to full AI technology implementation because of its numerous benefits. The academic sector worldwide encounters four major challenges which consist of technical issues and financial limitations and ethical challenges and human resource management difficulties (Atikuzzaman, 2025; Wheatley & Hervieux, 2019). The main technical obstacles to AI adoption continue to exist because organizations do not have suitable infrastructure and experience unstable internet connections (Echedom & Okuonghae, 2021). The current systems fail to work with new AI applications which results in operational problems that create integration challenges and duplicate system implementations according to Jha (2023).

Financial limitations stand as the primary factor which impacts the situation. Academic libraries in developing countries face budget restrictions according to Barsha and Munshi (2024) which prevent them from acquiring and maintaining and enhancing their AI systems. AI system management becomes difficult to manage because librarians do not possess the necessary technical abilities needed for system operation and improvement (Zondi et al. ,2024). Staff members require continuous professional

development and retraining to handle the present skills shortage because it enables them to develop technological competencies and sustain their work performance levels. Academic libraries encounter extra challenges when implementing AI because of privacy issues related to data and algorithmic bias and challenges with maintaining accountability (Adu, 2025).

The existing international barriers in Ghana make the existing domestic problems more challenging to handle. The research by Danquah et al. (2024) reveals that Ghanaian academic libraries face three key obstacles to AI system adoption because of insufficient funding and inadequate network infrastructure and insufficient technical assistance. The authors of Adjei and Agyeman (2024) demonstrate that educational institutions do not have established AI policies or implementation standards which leads to uncoordinated AI project implementation without strategic planning. The study by Owusu-Ansah et al. (2025) shows that Ghanaian librarians recognize AI capabilities yet they remain uncertain because they need more training and institutional support. The study by Gyesi et.al. (2025) demonstrates that users do not trust AI systems because they do not understand AI operations and the systems demonstrate unreliability.

The unequal distribution of AI tools between large universities and smaller institutions creates new obstacles which prevent students from receiving equivalent educational access. Adu (2025) shows in his study that Ghana experiences digital inequality in its higher education because the country lacks enough human resources and infrastructure to properly implement AI systems. AI technology has the ability to revolutionize academic library services but its effective implementation requires intentional leadership combined with training initiatives and sustained financial backing to achieve equitable and efficient results.

AI technology enables worldwide academic libraries and Ghanaian libraries to transform their operations according to research findings yet its implementation faces barriers because of insufficient infrastructure and financial resources and lacking technical expertise. The research of Danquah et al. (2024) and other studies along with Owusu-Ansah et al. (2025) and Gyesi et.al. (2025) do not have enough empirical data to support their findings about AI readiness in Ghanaian universities and academic library applications. Research studies about this subject exist in scattered form with descriptive information that does not provide sufficient direction for Ghanaian libraries to use AI for sustainable service delivery. The research fills an important knowledge gap through its detailed assessment of AI adoption advantages and challenges at the University of

Ghana and KNUST and UDS which enables the development of essential academic library transformation policies and practices.

Theoretical Framework

The research bases its foundation on the Technology Acceptance Model (TAM) which Davis (1989) created to explain how users accept and adopt technology systems in workplace environments. The model shows that perceived usefulness (PU) and perceived ease of use (PEOU) serve as the essential factors which determine how people will use and accept new technologies. Academic libraries use TAM to understand how staff members including librarians assess AI systems through their perceived value for work improvement and workflow optimization and service enhancement. Library professionals choose to implement AI technologies such as chatbots and recommendation systems and automated cataloging tools because these systems prove useful and easy to operate (Wheatley & Hervieux, 2019; Jha, 2023). The tools become more difficult to implement when they seem complicated or unreliable or when they threaten job security (Adu, 2025; Barsha & Munshi, 2024). The TAM framework proves useful for this research because it shows how people view technology while also showing how institutions support new ideas and how technology changes over time. The research helps scientists determine how Ghanaian academic librarians' professional attitudes and training and institutional support influence their readiness to use AI-driven services which directly affects the speed and effectiveness of AI service adoption in university libraries.

Methodology

Twelve (12) participants from two Ghanaian public universities, Kwame Nkrumah University of Science and Technology (KNUST) and University for Development Studies (UDS), participated in this research study. Six participants were chosen from each college. The attendees were responsible for main staff positions for academic libraries such as University Librarians, Deputy Librarians, Systems/ICT Librarians, Digital Services Librarians, Senior Library Assistants, and ICT professionals. Professionally, they had experience across five to more than 20 years of academic librarianship. Most participants had involvement in directly managing the digital library, managing the ICT infrastructure, organizing automation projects or working with AI tools and technologies (librarians). In the IT role roles, the participants had hands on experiences of handling library management systems, institutional repository management, digital cataloguing, database subscriptions, training of users about digital resources, support of the new technologies as well as the incorporation of Artificial Intelligence for information retrieval and user services. As knowledgeable

informants on the adoption and impact of Artificial Intelligence in academic libraries, they had professional backgrounds and direct engagement with ICT and digital service delivery.

Findings/Results

This section presents the findings from semi-structured interviews conducted with twelve librarians and ICT staff from two Ghanaian universities—Kwame Nkrumah University of Science and Technology (KNUST) and the University for Development Studies (UDS). The research employed Braun and Clarke's (2006) thematic approach to discover two main themes which achieved the research objectives: (1) Artificial Intelligence (AI) applications in Academic Libraries and (2) The implementation and usage challenges of AI technologies in Academic Libraries. The research shows that both organizations understand AI's growing importance in academic library management systems but they have achieved different stages of AI solution deployment. KNUST is moving towards the adoption of AI solutions by developing AI-powered chatbots but UDS has not yet started any AI initiative although the librarians at UDS see the potential of AI in enhancing their service delivery.

Perceived Usefulness (PU): Opportunities of Artificial Intelligence (AI) in Academic Libraries

Academic librarians at these institutions demonstrated positive interest in AI library applications yet they acknowledged that theoretical advantages remain inaccessible to them. The participants understood that AI technologies would change information retrieval and delivery systems through automated process management and individualized intelligent services. A KNUST librarian stated that "the institution works to establish AI chatbots which will help users find their way through library databases and retrieve necessary resources more effectively"

This statement reflects KNUST's forward-thinking orientation toward AI integration. Organizations keep improving their AI chatbot systems because they understand the need for user-focused solutions which provide better information access and improved user interface experiences. AI chatbots function as library support tools because they provide fundamental information while helping users find their way through the catalog system search features. The implementation of this initiative would free librarians from basic information requests so they can concentrate on advanced work including digital curation and research assistance and instructional programs.

The study has found that academic librarians of Kwame Nkrumah University of Science and Technology (KNUST) and University for Development Studies (UDS) perceive the use of AI technologies as very useful in academic library operations. Throughout the study, respondents affirmed that AI technologies could help improve service quality and operational effectiveness as well as managerial and strategic planning. One KNUST librarian mentioned that the university is in the process of implementing AI chatbots to assist users in querying library databases and retrieving their intended contents. Librarians recognized that AI-powered chatbots could answer common queries, guide users through catalog searches, and enhance user interface experiences. This will decrease the amount of time devoted by librarians to less comprehensive duties such as digital curation, research assistance as well as instructional support. Such views exactly correlate with the TAM construct of perceived usefulness, as the librarian thinks that AI will improve his work performance.

A KNUST librarian explained to me as I quoted "AI technology has the ability to automate cataloging and classification tasks which would decrease human work while enhancing precision". The perception demonstrates that automation technology leads to significant operational efficiency improvements. AI tools can reduce human mistakes and create uniform collection organization through their ability to manage metadata tagging and indexing and content classification.

UDS librarians, on the other hand, admitted that "there are currently no conscious efforts toward AI integration in our services." The participants demonstrated knowledge about AI system capabilities for library system improvement yet they did not implement these tools in their work. The UDS librarian showed how AI technology would study user search behaviors and system usage data to identify needs which would result in improved collection development. The recognition shows that librarians see the worth of AI-based data analytics for decision-making and resource management yet they have not deployed these systems.

The two organizations have selected AI applications for academic integrity promotion as their main academic priority. The integration of AI-based plagiarism and content detection tools into institutional systems has already started according to librarians. As one KNUST librarian stated, "We are subscribed to Turnitin, which uses AI to detect plagiarism and ensure originality in student and faculty submissions". The UDS librarian also stated that "Turnitin and other AI tools serve as essential tools to defend academic integrity while assisting students in developing their writing competencies". The universities gain advantages from AI through third-party research tools which support academic integrity maintenance.

The participants stated that AI technology needs data processing to create individualized learning experiences which will result in service delivery. A KNUST librarian explained that "AI can tailor recommendations based on users' previous searches and borrowing history, helping them discover relevant resources more easily". The discovery confirms that AI recommendation systems create the same digital learning environment changes which researchers have documented globally. The library staff used predictive analytics to enhance their ability to make informed decisions. The participant explained that "AI technology allows us to pick the most crucial academic resources which helps improve our collection development strategy". The system provides predictive capabilities which help libraries allocate their budget resources to support academic needs through appropriate resource distribution.

The research findings show that KNUST and UDS librarians agree on the potential of AI technology to transform academic library management systems. The two institutions have started their integration process at KNUST but UDS has not started yet while both institutions agree that AI will transform the processes of cataloging and user services and plagiarism detection and strategic management. The librarians show they are prepared to adopt new approaches because they understand that sufficient institutional backing and infrastructure development is needed.

The qualitative findings above demonstrate a strong Perceived Usefulness (PU) librarians from KNUST and UDS believe AI enhances job performance, service quality, operational efficiency, academic integrity, as well as strategic decision-making.

Perceived Ease of Use (PEOU): Challenges of Implementing and Utilizing AI Technologies in Academic Libraries

The librarians showed understanding of AI capabilities yet they pointed out various obstacles which prevent its effective implementation in Ghanaian university libraries. The two universities struggled with the same problem because they did not have sufficient financial resources to purchase and sustain their technological equipment. A KNUST librarian explained, "We have great ideas about AI integration, but funding has always been the major limitation." Higher education institutions in Ghana operate under budget restrictions which prevent them from adopting new technologies because they need to distribute their funds across various essential needs. AI systems need major financial support for software acquisition and hardware purchase and training programs which most academic libraries do not have access to.

The survey showed that insufficient technical abilities of library staff members stood as the primary challenge. A UDS librarian revealed that "most librarians do not possess the necessary technical abilities to properly use or maintain AI systems". The response shows that capacity development needs to happen right away. The digital transformation process will stop librarians from participating because they lack proper training for AI systems. Organizations fail to establish professional development programs which results in skill deficits that prevent them from successfully implementing AI initiatives and achieving lasting success.

The research established that infrastructure problems stood as the main obstacle which blocked the project from reaching its targets. As one KNUST librarian observed, "Our internet connectivity is often unreliable, which makes it difficult to run cloud-based AI applications smoothly." A UDS participant mentioned that "We have the interest and motivation but poor infrastructure makes it difficult to sustain such systems." The integration of AI faces limitations because of unstable internet connections and power outages and outdated ICT equipment which exist in public universities with limited resources.

The participants pointed to insufficient institutional policies as their main challenge. The UDS librarian stated that "the absence of established institutional rules for AI implementation makes it difficult to create plans for system deployment". The absence of policy frameworks results in ambiguous data management procedures which generates moral conflicts while defining operational limits for automated library systems. Academic institutions need established governance frameworks to handle data privacy protection and intellectual property defense and ethical AI tool deployment.

Some participants expressed doubts about how library staff would execute the new technological system. As one KNUST respondent explained, "Some staff members are hesitant about AI because they fear it might replace their jobs." Public fear toward AI technology develops from incorrect beliefs which prevent new technologies from moving forward according to the observation. The demonstration of AI capabilities as an enhancement tool for human abilities will result in library staff members adopting AI technology.

The research shows that KNUST and UDS encounter identical obstacles which include insufficient funding and insufficient technical skills and insufficient infrastructure and insufficient policies and opposition to change. The main distinction exists in institutional preparedness because KNUST has started initial steps toward AI implementation but UDS exists only in conceptual development. The universities encounter various challenges but their knowledge of AI applications shows potential for

future development. AI technology allows Ghanaian academic libraries to transform into modern institutions which provide better services through sufficient funding and training and policy support.

The challenges reflect limitations in Perceived Ease of Use (PEOU) librarians perceive financial, technical, infrastructural, policy as well as organizational barriers that make AI systems difficult to implement and sustain, despite recognizing their usefulness.

Discussion

The research shows that AI integration in Ghanaian university libraries has just started but KNUST and UDS librarians recognize its potential to revolutionize academic information management and user services. The library operations have undergone a transformation according to Wheatley and Hervieux (2019) because AI technology now performs essential tasks like cataloging and classification and metadata generation to deliver better services to users. The present research shows KNUST librarians expect the university to create AI-based chatbots which will help users find databases and access resources because libraries worldwide now use AI to provide continuous reference support. The UDS librarians stated that their institution has not established any specific AI programs but they understand the extensive potential of AI to support data-based choices and predictive analysis and scholarly material accessibility. Echedom and Okuonghae (2021) receive backing from the research which shows African libraries understand AI capabilities yet they struggle because of limited infrastructure and institutional limitations.

The librarians' acknowledgment of AI tools like Turnitin as part of their institutional systems demonstrates that Ghanaian universities are already engaging indirectly with AI technologies for plagiarism detection and content validation. The study confirms Adu (2025) who stated that plagiarism detection tools powered by AI represent the first and most accessible AI-based applications which academic libraries in Africa have adopted. The tools demonstrate the Technology Acceptance Model (TAM) principle of perceived usefulness because users tend to adopt technologies which improve their operational efficiency and performance (Wheatley & Hervieux, 2019). The librarians at KNUST and UDS agree with Jha (2023) that AI tools help maintain academic integrity and simplify research assessment because these tools improve academic standards and institutional reputation through their automated and precise content verification processes.

The two institutions recognized AI applications that extend past plagiarism detection to provide enhanced user experiences and strategic management capabilities. The library professionals recognized AI capabilities for automated cataloging and intelligent search assistance and collection prediction. The research by Alala, Uzoaru and Odikwa (2024) demonstrates that AI systems improve collection management and budget allocation efficiency through data analysis. Barsha and Munshi (2024) also noted that automation helps to eliminate duplication of work and ensures consistency in cataloging which Ghanaian librarians are interested in using when they have sufficient support systems. The shared optimism expressed by KNUST and UDS librarians resonates with Owusu-Ansah et al. (2025) discovered that Ghanaian academic libraries show increasing understanding about AI applications in digital cataloging and virtual assistance and intelligent service delivery although these applications exist only as theoretical concepts.

The research findings show that organizations continue to face barriers to AI adoption which validate previous research studies. The main barriers include financial limitations together with insufficient technical knowledge and insufficient infrastructure and unclear policy guidelines. The financial constraints that librarians face support Barsha and Munshi (2024) in their conclusion that budgetary restrictions act as a primary obstacle for AI implementation in developing regions. AI technology acquisition and maintenance expenses remain high which hinders sustainable implementation because public universities must allocate their budgets across various priorities. Echedom and Okuonghae (2021) found that African academic libraries face two main obstacles to AI adoption because of unreliable internet access and inadequate infrastructure which aligns with the current problems at KNUST and UDS libraries regarding internet connectivity and outdated ICT systems.

The shortage of skilled personnel presented itself as a major obstacle which matches the findings of Zondi et al. (2024) and Danquah et al. (2024) points out that African librarians typically do not receive training in AI system management. The participants from both institutions agreed that librarians require particular training to prevent their exclusion from digital transformation initiatives. The perceived ease of use construct in TAM framework shows a direct relationship with this concern because users tend to avoid technology when they find it difficult to understand or use (Adu, 2025). The absence of AI-related training and professional development opportunities therefore diminishes librarians' confidence in engaging with such technologies.

The interview process revealed multiple policy-related challenges which appeared repeatedly. The lack of institutional policies for ethical AI use and data

privacy and automation boundaries presented a major issue to librarians who supported Adjei and Agyeman (2024) that Ghanaian libraries operate without defined technological integration standards. The implementation of AI systems will encounter three major challenges because of unclear governance structures which create risks of fragmentation and ethical uncertainty and inconsistent results. The study also found that librarians experienced psychological barriers to technological change through their fear of job loss which supported Atikuzzaman (2025) and Adu (2025) in their argument that AI misconceptions lead to librarian anxiety that hinders adoption.

The study validates the Technology Acceptance Model (TAM) because users choose to adopt technology based on their evaluation of its usefulness and simplicity of use (Wheatley & Hervieux, 2019). The librarians at KNUST and UDS showed positive views about AI capabilities to boost operational efficiency and service quality but they identified insufficient training and equipment as major obstacles which limited their ability to use AI systems effectively. The students' use of Turnitin and other AI tools supports TAM because users choose new technologies based on their perceived usefulness (Adu, 2025; Jha, 2023).

The research shows that KNUST and UDS librarians demonstrate growing interest in AI yet their institutions encounter various obstacles which prevent AI implementation. The research findings confirm previous studies by Wheatley and Hervieux (2019) and Jha (2023) which demonstrated that AI readiness depends on institutional backing and sufficient infrastructure and trained staff. The planning process at KNUST shows better readiness for AI adoption than UDS because their understanding of AI exists only at a conceptual level. The two institutions show signs of improvement which can be speeded up by dedicated funding and policy development and staff training programs.

Academic libraries in Ghana exist at a transitional phase between their initial understanding of AI and their actual implementation of AI systems. The opportunities match international standards of best practice but the challenges demonstrate typical barriers which exist in developing higher education systems. Consistent with Barsha and Munshi (2024) and Owusu-Ansah et al. (Academic libraries in Ghana need ongoing financial support together with trained staff and institutional backing to achieve their AI goals by 2025. The three institutions can achieve this transformation through strategic planning which will result in intelligent data-driven libraries that support research excellence and deliver better user experiences and global scholarly communication.

Conclusion

The research investigated how Artificial Intelligence (AI) implementation affects academic libraries at Kwame Nkrumah University of Science and Technology (KNUST) and University for Development Studies (UDS). The research demonstrates that librarians understand AI functions better than most people do but AI system deployment has only started its initial phase. The KNUST focuses on developing AI-based chatbots and digital services but UDS understands AI benefits without taking any steps to implement them. The two institutions demonstrate their understanding of AI tools through their adoption of Turnitin for plagiarism and AI content detection which represents their indirect use of artificial intelligence technologies. The advancement of telemedicine faces multiple obstacles which include insufficient financial support and insufficient trained staff and insufficient facilities and non-existent organizational policies. The obstacles Ghanaian libraries face match those which other developing nations encounter which indicates that Ghanaian libraries share common challenges with libraries in other developing countries. The research indicates that Ghanaian academic libraries need universities to establish human resources and technological infrastructure through strategic planning and financial stability. The institutions of KNUST and UDS can use AI to transform their research capabilities and library operations and user experience in the modern digital academic environment.

Recommendations

The research contains vital recommendations which work to boost AI adoption within academic libraries. The first requirement for institutions needs to create capacity-building programs which should run scheduled workshops and seminars to teach librarians about digital literacy and AI competency. The professional development programs would instruct staff members about correct usage and management of AI-based systems. Universities need to establish specific financial resources which will enable them to purchase and sustain AI infrastructure through software and hardware and fast internet access. Financial investment functions as an essential component which enables AI projects to achieve long-term sustainability while advancing their capabilities. The development of institutional policies and ethical frameworks serves as the third requirement to establish guidelines for AI deployment which includes data security and intellectual property protection and responsible automation practices. These frameworks would defend against improper use while ensuring AI implementation meets international standards of best practice. The fourth recommendation involves universities and government agencies and technology firms working together to use their combined resources and expertise for AI system deployment. Librarians should join awareness programs that show AI functions as a helpful tool to build positive technology mindsets since they do not replace human work. The systematic implementation of these

recommendations will enable Ghanaian university libraries to move beyond awareness to achieve complete AI-driven innovation adoption for learning and teaching and research support.

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