ADOPTION OF AI-BASED LIBRARY SERVICES: A NECESSITY FOR NIGERIAN UNIVERSITIES

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Abstract

The increasing demand for advanced information management systems has prompted universities to explore AI technologies to optimize library resources and improve user experiences. Therefore, this paper explores the need for a paradigm shift in Nigerian universities by integrating Artificial Intelligence (AI) into library services. The study examines the potential benefits, challenges, and ethical considerations associated with integrating AI in the academic library context. It highlights the potential advantages of AI, such as improved information retrieval, personalized recommendations, and streamlined administrative processes. However, challenges including limited infrastructure, financial constraints, and data privacy concerns are identified as potential hurdles that universities must navigate. In addressing these challenges, the paper emphasizes the importance of capacity building, stakeholder collaboration, and the establishment of ethical guidelines. It underscores the need for a balanced approach that preserves human involvement and upholds ethical standards, ensuring responsible AI integration in library services. Drawing on lessons from global AI implementations in academic libraries, this paper provides insights into the implications of AI for Nigerian universities, emphasizing the importance of strategic planning, continuous monitoring, and user education. Finally, the integration of AI in library services emerges as a transformative opportunity for Nigerian universities to enhance academic support, research endeavors, and user satisfaction in the ever-evolving digital landscape.
Keywords: AI-Based Library Services, Internet, University System

Introduction

In the active scenery of higher education, the integration of cutting-edge technologies has become imperative for institutions to enhance the quality and efficiency of academic services (Abduldayan et al., 2019; Omame & Alex-Nmecha, 2020; Tella, 2022). One such transformative force is Artificial Intelligence (AI), a technological paradigm that holds immense potential for reshaping traditional library services in higher institutions. This introduction delves into the pressing need for adopting AI-based library services for students in universities, recognizing the transformative impact it can have on resource accessibility, user experience, and overall academic success

(Okunlaya et. al. 2022; Wheatley & Hervieux, 2019). The twenty-first century has witnessed unprecedented advancements in technology, revolutionizing the way educational institutions operate. As the global academic community embraces digital transformation, universities find themselves at a crucial juncture where the adoption of innovative solutions is not just desirable but necessary. In this context, AI emerges as a beacon of progress, offering multifaceted benefits that extend far beyond the confines of traditional academic paradigms (Cox et al. 2019; Lund et. al., 2023; Rahmat et. al., 2022).

Artificial Intelligence, with its capacity for learning, adaptation, and automation, stands out as a transformative force capable of revolutionizing library services. In the university context, the adoption of AI promises to address existing challenges and pave the way for a more efficient, responsive, and user-centric library experience. From intelligent search algorithms to personalized recommendations, AI has the potential to optimize resource utilization and significantly enhance the overall academic journey for students. One of the primary concerns in the current library landscape is the accessibility of resources (Yakubu & Yagana, 2022). AI-based systems can revolutionize the way students discover and access information, providing tailored recommendations based on individual preferences and learning patterns. Moreover, the implementation of natural language processing and machine learning algorithms can streamline search processes, ensuring that students can retrieve relevant materials with unprecedented speed and accuracy (Odunlade & Ojo, 2023; Zhou, 2022).

Nigerian universities, pivotal institutions in shaping the academic landscape of the nation, face a critical challenge in the inadequacy of library services. Despite being the cornerstone of scholarly pursuits, the prevailing dearth of effective library services in these institutions hinders the holistic development of students, compromises research endeavors, and impedes the overall advancement of academic excellence. The existing gaps in resource accessibility, technological integration, and user-centric services pose a significant threat to the educational aspirations of students and the scholarly output of faculty members, thus necessitating urgent attention and comprehensive solutions. Despite the strides made in education, many Nigerian universities grapple with the challenges of delivering seamless and efficient library services. Issues such as resource accessibility, user engagement, and the personalized nature of academic support pose significant hurdles. Traditional library models, while valuable, may no longer be sufficient to meet the diverse and dynamic needs of today's tech-savvy student population (Tella & Odunola, 2020).

Ajani et. al. (2023) opined that Nigerian universities are facing challenges in meeting the evolving needs of students in the digital age. Traditional library services are struggling to keep pace with the increasing volume of digital resources and the expectations of students for modern, efficient, and personalized services. The adoption of AI-based library services presents a compelling solution to these challenges. Abduldayan et. al. (2019) are of the view that the problem at hand underscores the imperative need for a systematic overhaul and strategic investment in library services to align with the evolving demands of twenty-first-century education and foster a conducive environment for robust intellectual growth within Nigerian universities. It is against this backdrop that this study examines the need for AI-based library services in Nigerian universities.

Concept of Library

The concept of a library has evolved and has transformed from traditional repositories of physical books to dynamic information hubs employing diverse formats and technologies. A library, in its essence, is a curated collection of resources, knowledge, and information made accessible to a community for learning, research, and intellectual growth. The term "library" can refer to both the physical space where these resources are housed and the institution or organization responsible for managing and facilitating access to them. Libraries play a crucial role in education, supporting academic and intellectual pursuits by offering a quiet and conducive environment for study, and access to information, and often serving as community hubs (Bharadiya, 2023; Shahzad & Khan, 2023). According to Omame and Alex-Nmecha (2020), libraries are not static entities, they have evolved to adapt to changing technologies and societal needs. In addition to traditional print materials, many modern libraries offer digital resources, online databases, and multimedia collections. The concept of a library extends beyond a simple storage facility for books and encompasses a dynamic institution that promotes literacy, learning, and community engagement.

Rahmat (2022) opined that the library is a collection of organized and curated resources, often with a focus on books and other materials, made available to a community for learning, research, and general use. Libraries serve as repositories of knowledge, providing access to a diverse range of information in various formats, including books, periodicals, audiovisual materials, and digital resources. A library is a collection of books and other informational materials, systematically organized for use, study, and reference. It is a place where individuals can access a variety of written, printed, and digital resources. A library is a learning center that provides a quiet and conducive environment for study, research, and intellectual exploration. It is often an integral part of educational institutions, supporting academic endeavors. Beyond being a collection of materials, a library is a community resource center. It may offer services, programs, and events that cater to the needs and interests of the local community, fostering cultural enrichment and engagement. In the contemporary context, a library is not limited to physical spaces. It can also be a digital hub that provides online access to databases, e-books, multimedia resources, and other digital materials. A library serves as a repository of knowledge and information, offering a diverse collection of resources that may include books, periodicals, manuscripts, audiovisual materials, and digital content.

A library often serves as a guardian of cultural heritage, preserving and providing access to historical documents, rare manuscripts, and materials of cultural significance. Libraries play a role in promoting information literacy by offering guidance on effective research, critical thinking, and the responsible use of information resources (Zhou, 2022). The concept of a library has evolved into a dynamic institution that adapts to technological advancements and changing educational paradigms. Modern libraries may include collaborative workspaces, maker spaces, and technology hubs. With the advent of digital technologies, a library can extend its reach globally, serving as a knowledge hub accessible to users from different parts of the world through online platforms. Libraries provide educational support by offering resources and services that complement academic curricula, facilitate research, and contribute to the overall intellectual development of individuals (Goss, 2022).

These definitions highlighted the multifaceted nature of a library, encompassing its role as a repository of information, a learning space, a community resource, and a promoter of cultural and intellectual enrichment. According to Gasparini and Kautonen (2022), the purpose of a library extends beyond merely being a storage facility for books; it serves several important functions that contribute to education, research, and community development. Here are the key purposes of a library:

1. The primary purpose of a library is to provide access to a wide range of information resources. This includes books, journals, newspapers, magazines, audiovisual materials, and digital content. Libraries aim to make diverse knowledge easily accessible to users.

2. Libraries play a crucial role in supporting education by providing resources that supplement academic curricula. They serve as learning spaces for students, offering a quiet environment for study and research.

3. Libraries are essential for research activities. They house scholarly publications, reference materials, and databases that researchers can use to conduct in-depth investigations and contribute to the advancement of knowledge in various fields.

4. Libraries promote literacy by offering a variety of reading materials suitable for different age groups and reading levels. They often organize literacy programs and reading initiatives to encourage a love for reading and lifelong learning.

5. Libraries serve as guardians of cultural heritage by preserving rare and historical manuscripts, documents, and artifacts. They contribute to the conservation of cultural knowledge and traditions for future generations.

6. Libraries are community hubs that host events, workshops, and activities to engage and connect with the local community. They may organize book clubs, lectures, and cultural programs to foster a sense of community and intellectual exchange.

7. Libraries play a role in developing information literacy skills among users. They offer guidance on effective research, critical evaluation of information, and ethical use of resources, empowering individuals to navigate an information-rich world.

8. In the digital age, libraries provide access to technology, computers, and the internet. They may offer training programs to help users develop digital literacy skills, ensuring that individuals are equipped to use technology for learning and research.

9. Libraries contribute to promoting equal access to information. By providing resources and services to all members of the community, regardless of socioeconomic status, libraries strive to bridge information gaps and promote inclusivity.

10. Libraries support lifelong learning by offering resources and services that cater to individuals of all ages. From children's reading programs to adult education initiatives, libraries facilitate continuous learning throughout a person's life.

Sarmiento and Duarte (2023) posited that the concept of a library encompasses more than just a collection of books; it is a dynamic and evolving institution that serves as a knowledge hub, a learning space, and a community resource. The modern library adapts to technological advancements and changing educational paradigms, ensuring its continued relevance in the digital age. Traditionally, libraries housed physical books, manuscripts, and periodicals. However, modern libraries have expanded their collections to include a wide array of resources, including e-books, audiobooks, multimedia materials, and digital databases. Libraries are designed to facilitate access to information. This involves cataloging, organizing, and storing resources in a manner that allows users to find and retrieve information efficiently. In the digital age, libraries increasingly leverage technology to enhance information accessibility. Libraries serve as vital spaces for learning and education. They provide a quiet and conducive environment for study, research, and academic collaboration. Libraries in educational institutions are integral to the academic ecosystem, supporting students, faculty, and researchers in their quest for knowledge. Libraries often play a role in preserving cultural heritage by housing rare and historical materials. They also serve as community centers, hosting events, lectures, and activities that engage and enrich the local community.

In the digital age, libraries have embraced technology to expand their services. Digital catalogs, online databases, and e-learning platforms are examples of how libraries have evolved to meet the changing needs of users. Modern libraries are designed as multifunctional spaces. They may include collaborative work areas, computer labs, and multimedia centers. This reflects a shift from the traditional perception of libraries as silent reading spaces to dynamic hubs for various forms of learning and interaction. Libraries actively engage with their communities, offering services that cater to diverse demographics. This includes programs for children, literacy initiatives, and partnerships with local organizations to address community needs. Libraries play a crucial role in promoting information literacy. They provide resources and guidance to help users critically evaluate information, distinguish between reliable and unreliable sources, and develop effective research skills. The concept of a library has expanded beyond physical boundaries. Digital libraries and online resources enable global connectivity, allowing users to access information from anywhere in the world (Nethersole, 2022; Tella & Odunola, 2020), the purpose of a library is multifaceted, encompassing the provision of information, support for education, and research, cultural preservation, community engagement, and the promotion of literacy and lifelong learning. Libraries are dynamic institutions that evolve to meet the changing needs of their users and the broader community (Adeyeye & Oladokun, 2023; Anyim, 2018).

Component of Library Services

Library services in universities are designed to support the academic and research needs of students, faculty, and staff. These services often include a combination of traditional library resources and modern technologies (Kouis& Agiorgitis, 2022). Here are some key components of library services in universities:

1. Collection Development: Traditional books, journals, magazines, and other print materials. Online databases, e-journals, e-books, and other digital resources. Audiovisual materials, DVDs, CDs, and streaming media.

2. Reference and Research Assistance: Staffed by librarians who assist with research queries and information needs. Compiled resources and guides to help users navigate specific subjects or research topics. Help with citation styles and bibliography creation.

3. Information Literacy Programs: Workshops and classes to teach students and faculty how to effectively use library resources and conduct research. Web-based guides and tutorials on various research and information literacy skills.

4. Interlibrary Loan Services: Facilitation of borrowing materials from other libraries for users when needed resources are not available locally.

5. Technology Services: Access to computers for research and academic purposes. Connectivity for users to access online resources. Access to specific software relevant to academic needs.

6. Special Collections and Archives: Unique and rare materials, manuscripts, and archives that support specialized research. Preservation and conservation services for delicate materials.

7. User Services: Check-in and check-out of library materials. Short-term loan of high-demand materials. Extension of loan periods for borrowed materials.

8. Collaboration Spaces: Group study rooms, collaborative workspaces, and areas for discussions.

9. Events and Exhibitions: Organizing lectures, book launches, and exhibitions to promote academic and cultural engagement.

10. 24/7 Access and Remote Services: Access to electronic resources and online services beyond regular library hours. Remote assistance for users who are not physically present on campus.

11. Accessibility Services: Services and accommodations for users with disabilities to ensure equitable access to resources.

12. Feedback and Assessment: Systems for collecting feedback from users to improve services. Assessment of library services to ensure they meet the changing needs of the academic community.

Libraries in universities continually evolve to meet the changing needs of their user community, integrating new technologies and adapting to shifts in academic research and learning practices.

Concept of Artificial Intelligence

The concept of artificial intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, understanding natural language, speech recognition, and visual perception, among others. The goal of AI is to create machines or systems that can mimic or simulate human-like cognitive functions (Idemudia & Makinde, 2022; Lund et. al., 2020). According to Bribena,

Dushu, and Irenoa (2021), artificial intelligence (AI) can be defined in various ways, reflecting its multifaceted nature and the diverse applications within the field. Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Artificial Intelligence (AI) is the subfield of computer science concerned with understanding the nature of intelligence and constructing computer systems capable of intelligent action. Artificial Intelligence is the study of agents that receive percepts from the environment, perform actions, and infer from these percepts and actions to maximize some notion of cumulative performance. Artificial intelligence is a branch of computer science that aims to create machines capable of intelligent behavior. These definitions collectively capture the essence of artificial intelligence as a field that involves creating machines or systems capable of performing tasks that typically require human intelligence. AI encompasses a broad spectrum of technologies, approaches, and applications, ranging from machine learning and natural language processing to robotics and autonomous systems. The field continues to evolve, with ongoing research and advancements contributing to its rapid development. According to Enakrire and Smuts (2023), artificial intelligence (AI) can be categorized into different types based on its capabilities, functions, and applications. The main types of artificial intelligence are often classified as follows:

1. **Narrow or Weak AI:** Weak AI is designed and trained for a specific task or a narrow set of tasks. It operates within a limited context and does not possess the broad cognitive abilities of a human. Examples include virtual personal assistants, image recognition software, and speech recognition systems.
2. **General or Strong AI:** Strong AI refers to a form of artificial intelligence that exhibits intelligence comparable to human intelligence across a wide range of tasks. It can understand, learn, and apply knowledge in diverse domains. Achieving strong AI remains a theoretical goal and has not been realized as of now.
3. **Machine Learning (ML):** Machine learning is a subset of AI that focuses on developing algorithms and statistical models that enable computers to improve their performance on a specific task over time. It includes supervised learning, unsupervised learning, and reinforcement learning.
4. **Supervised Learning:** In supervised learning, the algorithm is trained on a labeled dataset where the input data is paired with the corresponding output. The model learns to map

According to Ogbonnia (2017), artificial intelligence (AI) exhibits a variety of characteristics that distinguish it from traditional computer systems. These characteristics contribute to the unique capabilities of AI and its ability to perform tasks that typically require human intelligence. Artificial intelligence systems can learn from data and experiences, improving their performance over time. Machine learning algorithms enable AI to adapt to new information and make better decisions. AI can perform logical reasoning and make decisions based on available information. It can analyze data, draw inferences, and derive conclusions, often mimicking human cognitive processes. AI systems are designed to solve complex problems. They can handle intricate tasks and develop strategies to achieve specific objectives exhibit adaptability by adjusting their behavior based on changing circumstances or input. This adaptability is particularly evident in machine learning algorithms that can modify their models in response to new data. AI systems can perceive and interpret the world through sensors and data. Computer vision and natural language

processing are examples of AI capabilities that involve understanding and interpreting visual and textual information. AI systems can interact with humans and other machines. This interaction may involve natural language communication, speech recognition, and response generation. Some AI systems can operate autonomously, making decisions and taking actions without continuous human intervention. This autonomy is often seen in applications like autonomous vehicles and drones.

Tella (2022) opined that AI has the potential to exhibit creativity by generating new ideas, designs, or content. Creative AI applications can be found in fields such as art, music composition, and content generation. As AI becomes more advanced, there is a growing emphasis on incorporating ethical considerations into AI systems. This involves making decisions that align with ethical principles and societal values. AI systems can continue to learn and improve their performance without explicit programming. This self-learning capability is a key aspect of machine learning, where algorithms can update their models based on new data. AI systems often leverage parallel processing, allowing them to perform multiple tasks simultaneously. This parallelism contributes to the efficiency and speed of AI computations.

Furthermore, Aniedu et al. (2023) opined that AI can analyze historical data to make predictions and forecasts. This capability is valuable in various domains, including finance, healthcare, and weather prediction. Some AI systems can perceive and interpret information from the environment through sensory inputs, such as cameras and microphones. This enables applications like facial recognition and voice recognition. AI excels at recognizing patterns in data, which is crucial for tasks like image recognition, speech recognition, and fraud detection. AI systems are capable of continuous improvement through iterative learning and updates. This characteristic allows AI to stay relevant and effective in dynamic environments. These characteristics collectively contribute to the versatility and potential of artificial intelligence across a wide range of applications and industries. However, it's important to note that AI systems also raise ethical considerations, and responsible development and deployment are essential to ensure positive societal impacts.

Strategies that can be adopted for AI based Library Services in Nigerian Universities

Integrating Artificial Intelligence (AI) into library services in Nigerian universities can enhance efficiency, accessibility, and the overall user experience (Awodoyin & Okiki, 2023; Tella, 2022). Here are strategies for the integration of AI in library services:

1. **Needs Assessment:** There is a need to conduct a comprehensive needs assessment to identify specific challenges and opportunities within the library system. Understand the user requirements and the areas where AI could provide the most significant impact. Foster collaboration between librarians, IT professionals, faculty, and students. Engage stakeholders in discussions about the potential benefits of AI and gather input to ensure that AI solutions align with the university's goals. Provide training programs for library staff to enhance their understanding of AI technologies. This includes workshops on data science, machine learning, and other relevant skills needed for the successful implementation and maintenance of AI systems.

2. **Data Management:** Establish robust data management practices to ensure the availability and quality of data needed for AI applications. This involves creating structured datasets, addressing privacy concerns, and implementing data security measures. Implement AI algorithms to enhance search and discovery capabilities within the library catalog. AI-powered search engines can provide more accurate and personalized results, improving the efficiency of information retrieval. Introduce virtual assistants or chatbots to assist users in navigating the library's resources. These AI-driven tools can answer queries, provide guidance, and offer instant support, improving user engagement. Implement recommendation systems based on AI algorithms to suggest relevant books, articles, or resources to users. This enhances the personalized experience and encourages the exploration of diverse materials.

3. **Automated Cataloging and Metadata Enhancement:** Use AI to automate cataloging processes and enhance metadata. AI can streamline the organization of materials, improving the accuracy and efficiency of library cataloging. Utilize predictive analytics to forecast trends in resource usage, helping with strategic collection development. This ensures that the library acquires materials that align with the evolving needs of students and faculty. Implement AI tools to support academic research, including tools that assist in literature reviews, citation management, and identifying relevant research trends. Integrate Optical Character Recognition (OCR) technology with AI to digitize and make searchable handwritten or printed materials. This enhances the accessibility of historical documents and rare manuscripts.

4. **User Training and Awareness:** Conduct training sessions and awareness campaigns to educate users about the new AI-enhanced library services. This promotes user adoption and ensures that students and faculty make the most of the available AI tools. Explore partnerships with external AI solution providers or research institutions. Collaborating with experts in the field can bring cutting-edge AI technologies to the library system. Implement a robust monitoring and evaluation framework to assess the effectiveness of AI integration. Regularly review key performance indicators and user feedback to make continuous improvements.

5. **Budgeting and Sustainability:** Develop a budget for AI integration and ensure a sustainable financial model for ongoing maintenance and upgrades. Consider long-term strategies for scaling AI initiatives in response to future needs.

By implementing these strategies, Nigerian universities can harness the benefits of AI to transform their library services, making them more efficient, user-friendly, and aligned with the evolving needs of the academic community. Integrating Artificial Intelligence (AI) into library services in Nigerian universities requires the establishment of appropriate facilities to support the development, deployment, and maintenance of AI technologies (Nkiko & Okuonghae, 2021). Yakubu and Yagana (2022) itemized essential facilities needed for the successful integration of AI in library services:

1. **IT Infrastructure:** Robust server infrastructure and cloud computing resources are essential for handling the computational demands of AI algorithms, especially for tasks such as data processing, machine learning, and natural language processing. Establish a secure and well-managed data center for storing the large volumes of data needed for training and deploying AI models. Ensure compliance with data privacy and security regulations applications, particularly deep learning models, benefit from parallel processing capabilities offered by GPUs. Investing in GPU servers enhances the performance of AI algorithms. Provide dedicated spaces equipped with the necessary hardware and software tools for AI development, testing, and experimentation. This may include platforms like Jupyter Notebooks, TensorFlow, and PyTorch. Create collaborative spaces where multidisciplinary teams, including librarians, data scientists, and IT professionals, can work together on AI projects.

2. **Internet Connectivity:** Ensure reliable and high-speed internet connectivity to support the exchange of data and communication between AI systems and external resources. Set up training rooms equipped with computers and software for conducting workshops and training programs to up-skill library staff in AI-related technologies. Establish facilities for processing, cleaning, and organizing large datasets that are essential for training machine learning models. Create labs to assess and enhance the user experience of AI-powered library services. This may involve testing interfaces, conducting user studies, and gathering feedback. Enhance or establish facilities for digitizing physical materials, such as books, manuscripts, and historical documents, making them accessible for AI-driven applications.

3. **Security Measures:** Implement robust cyber security measures to protect AI systems, data, and the overall library infrastructure from potential threats and unauthorized access. Install video conferencing facilities to facilitate communication and collaboration with external AI experts, solution providers, and researchers. Develop facilities focused on creating accessible AI applications and services, ensuring that they cater to the diverse needs of all users, including those with disabilities.

4. **Monitoring and Analytics Facilities:** Establish facilities for monitoring the performance of AI systems, analyzing user interactions, and extracting insights to inform ongoing improvements. Implement environmentally friendly practices and technologies to ensure the sustainability of AI infrastructure, considering energy efficiency and resource conservation.

By investing in these facilities, Nigerian universities can create a conducive environment for the successful integration of AI in library services, fostering innovation and improving the overall quality of academic and research support provided to students and faculty.

Potential Benefits of the Integration of AI-based Library Services in Nigerian Universities

According to Ogunode et al. (2022) and Yusuf et al. (2022), the integration of Artificial Intelligence (AI) into library services in Nigerian universities can bring about numerous benefits,

enhancing efficiency, accessibility, and the overall quality of the academic experience. Here are some potential benefits:

- AI-powered search engines and recommendation systems can enhance information retrieval, providing more accurate and relevant results to users. AI technologies, such as virtual assistants and chatbots, can improve the overall user experience by offering instant support, answering queries, and guiding users through library resources. AI-driven recommendation systems can provide personalized suggestions for books, articles, and other resources based on user's preferences and past behaviour can automate cataloging processes, and enhance metadata management, making it easier to organize and access library materials.

- Predictive analytics can assist in optimizing collection development by identifying trends and predicting future resource needs, ensuring the acquisition of materials aligned with academic requirements. AI can enable continuous access to library resources by automating certain services, allowing users to access information and assistance at any time. AI technologies, including Optical Character Recognition (OCR), can facilitate the digitization of historical manuscripts and rare materials, preserving them for future generations and making them more accessible. AI tools can assist researchers by providing automated literature reviews, citation management, and identifying relevant research trends.

- AI can analyze large datasets to extract valuable insights, helping librarians and researchers understand patterns and trends in resource usage. AI can automate administrative tasks, such as circulation management, inventory tracking, and user authentication, freeing up staff time for more strategic activities. Natural Language Processing (NLP) can enable libraries to provide multilingual support, allowing users to interact with library services in their preferred languages. AI-powered technologies can improve accessibility for individuals with disabilities by providing features such as text-to-speech, speech-to-text, and other assistive technologies.

- Through automation and optimization, AI can lead to cost savings in terms of staff time, resource allocation, and overall operational efficiency. Integrating AI positions libraries at the forefront of technological advancements, fostering a culture of innovation and preparing students for emerging trends in information science. AI can contribute to robust data security measures, ensuring compliance with privacy regulations and safeguarding sensitive user information. AI-generated insights can inform strategic decision-making within the library, helping administrators allocate resources effectively and adapt services to meet evolving user needs.

The integration of AI in library services holds significant potential to transform the way information is managed, accessed, and utilized in Nigerian universities, ultimately contributing to a more dynamic and responsive academic environment.

Potential Problems of AI-based Library Services in Nigerian Universities

While the integration of AI-based library services in Nigerian universities brings about numerous benefits, it also poses several potential challenges and problems. It's crucial to address these issues to ensure a successful and ethical implementation. Here are some potential problems associated with the integration of AI in library services as opined by Idemudia and Makinde (2022):

1. Many Nigerian universities may have limited IT infrastructure and resources, making it challenging to implement and maintain AI systems effectively. The cost of implementing and sustaining AI technologies can be high. Limited budgets may hinder the adoption of sophisticated AI solutions, affecting the scope and quality of integration. There may be a shortage of AI experts, data scientists, and professionals with the necessary skills to develop, implement, and maintain AI-based library services.

2. Collecting and managing large volumes of user data for AI applications raises concerns about privacy and security. Universities need to implement robust measures to protect sensitive information.AI algorithms can inherit biases present in the training data, potentially leading to biased recommendations and decisions. Ensuring fairness and mitigating biases is a critical challenge in AI integration. Some users may be resistant to AI-based services due to concerns about job displacement, privacy issues, or a lack of trust in automated systems. Adequate user education and engagement are essential to address these concerns.

3. The ethical implications of AI in libraries, such as the responsible use of data and AI algorithms, require careful consideration. Establishing ethical guidelines and standards is crucial. Integrating AI with existing library management systems may pose technical challenges. Compatibility issues and the need for system updates can complicate the integration process. The deployment of AI may lead to unintended consequences or unforeseen challenges, such as changes in user behavior, dependency on technology, or disruptions in traditional library services.

4. AI systems may unintentionally exclude individuals with disabilities if not designed with accessibility considerations in mind. Ensuring inclusivity is essential. Excessive dependence on AI systems may reduce human involvement in critical decision-making processes, potentially leading to a lack of human oversight and accountability. Choosing proprietary AI solutions may lead to vendor lock-in, making it challenging to switch to alternative systems or technologies in the future.

5. Resistance to change within the organizational culture and institutional structures may hinder the successful integration of AI into library services. Ensuring compliance with local and international regulations, such as data protection laws, can be challenging, especially as these regulations evolve. AI systems require continuous maintenance, updates, and monitoring. Universities may face challenges in sustaining the necessary support and resources for ongoing system management.

Addressing these potential problems requires careful planning, collaboration between stakeholders, ongoing assessment, and a commitment to ethical AI practices. By proactively mitigating these challenges, Nigerian universities can maximize the benefits of AI-based library services while minimizing potential risks.

Conclusion and Recommendations

In conclusion, the integration of Artificial Intelligence (AI) into library services in Nigerian universities holds significant promise for transforming the academic landscape. While the potential benefits are substantial, including improved information retrieval, enhanced user experiences, and optimized resource management, several challenges must be addressed for successful implementation. The limited IT infrastructure, financial constraints, and a shortage of expertise present hurdles that require strategic planning and investment. Data privacy and security concerns, potential biases in AI algorithms, and user resistance necessitate careful ethical considerations and transparent communication to build trust. To navigate these challenges, Nigerian universities should prioritize capacity building, investing in the necessary infrastructure, and fostering collaboration between IT professionals, librarians, and other stakeholders. Moreover, the development of ethical guidelines, accessibility considerations, and robust data protection measures are imperative for responsible AI integration. As technology advances, Nigerian universities must balance the benefits of AI with the preservation of human involvement, ensuring that AI complements rather than replaces the valuable contributions of library staff. Continuous monitoring, adaptation, and user education will be key to the success of AI-based library services, fostering a dynamic, innovative, and inclusive academic environment. In essence, the integration of AI into library services presents a transformative opportunity for Nigerian universities to enhance efficiency, accessibility, and user satisfaction. By approaching this integration strategically, addressing challenges proactively, and upholding ethical standards, Nigerian universities can harness the full potential of AI to support academic excellence and research endeavors.

References

Abduldayan, F. J., Fasola, A., Oyedum, G. U., & Jibril, A. A. (2019). Research data management and information security: role of library and information technology service (ITS) units in federal universities of technology in Nigeria. *Information, 8(2), 67-81*.

Adeyeye, S. V., & Oladokun, T. A. (2023). Application of emerging technologies for research support in Nigerian academic libraries: Trends, problems and prospects. *Quarterly*, *47*(3-4).

Ajani, Y. A., Tella, A., Salawu, K. Y., & Abdullahi, F. (2022). Perspectives of librarians on awareness and readiness of academic libraries to integrate artificial intelligence for library operations and services in Nigeria. *Internet Reference Services Quarterly*, *26*(4), 213-230.

Aniedu, O. N., Anyim, B. A., Anyim-Ben, F. O., & Anyim, N. A. (2023). Managing emerging technological resources and information needs of academic staff in public universities in Ebonyi State, Nigeria. *International Journal of Public Administration and Management Research*, *9*(2), 73-84.

Anyim, W. O. (2018). E-Library resources and services: Improvement and innovation of access and retrieval for effective research activities in university e-libraries in Kogi State Nigeria. *Library Philosophy and Practice*, 21(2), 23-46.

Awodoyin, A., & Okiki, O. (2023). Integrating internet of things (iot) into library and information science (lis) school's curriculum in selected universities in Nigeria. *Folia Toruniensia*, *23(2)*, 97-117.

Bharadiya, J. P. (2023). A comparative study of business intelligence and artificial intelligence with big data analytics. *American Journal of Artificial Intelligence*, *7*(1), 24-45.

Bribena, E. I., Dushu, T. Y., & Irenoa, L. A. (2021). Electronic libraries in tertiary institutions in Nigeria: The Issues and Prospects. *Niger Delta Journal of Library and Information Science*, *2*(1), 120-128.

Cox, A. M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*, *37*(3), 418-435.

Eli-Chukwu, N. C., Igbokwe, I. C., Ifebude, B., Nmadu, D., Iguodala, W., Uma, U., ... & Akudo, F. U. (2023). Challenges confronting e-learning in higher education institutions in Nigeria amid Covid-19. *Journal of Applied Research in Higher Education*, *15*(1), 238-253.

Enakrire, R. T., & Smuts, H. (2023). Efficacy of knowledge management tools in support of university library operations. *International Journal of Information Science and Management, 21*(4), 215-233.

Gasparini, A. A., & Kautonen, H. (2022). Understanding artificial intelligence in research libraries: an extensive literature review. *Te Journal of European Research Libraries*, *32*(1), 1-36.

Goss, H. (2022). Student learning outcomes assessment in higher education and in academic libraries: A review of the literature. *The Journal of Academic Librarianship*, *48*(2), 102485.

Idemudia, B. E., & Makinde, B. (2022). Artificial intelligence in libraries: Prospect and challenges for Nigerian academic libraries. *Communicate: Journal of Library and Information Science*, *24*(2).

Ikechukwu, B. I., & George, C. N. (2023). Issues and challenges of tertiary/higher education curriculum change in Nigeria. *International Academic Journal of Educational Research*, *8*(1), 11-24.

Kouis, D., & Agiorgitis, G. (2022). Library service platforms (LSPs) characteristics classification and importance ranking through DELPHI method application. *International Information & Library Review*, *53*(4), 291-305.

Lund, B. D., Omame, I., Tijani, S., & Agbaji, D. (2020). Perceptions toward artificial intelligence among academic library employees and alignment with the diffusion of innovations' adopter categories. *College & Research Libraries*, *81*(5), 865.

Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., Shimray, S., & Wang, Z. (2023). ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing. *Journal of the Association for Information Science and Technology*, *74*(5), 570-581.

Nethersole, R. (2022). World Literature and the Library. In *The Routledge Companion to World Literature* (pp. 250-258). Routledge.

Nkiko, C., & Okuonghae, O. (2021). Achieving the 4IR university library in sub-saharan Africa: trends, opportunities, and challenges. *Library Information, 24(1), 19-34.*

Odunlade, R., & Ojo, J. (2023). Digital transformation and service delivery in academic libraries a post covid-19 approach. *Lokoja Journal of Information Science Research*, *1*(1), 41-60.

Ogbonnia, O. O. (2017). Artificial intelligence as an imperative to the effective delivery of instructional materials' content. *International Journal of Advanced Research and Publications*, *1*(5), 323-327.

Ogunode, N. J., & Adah, S. (2022). Accreditation of academic programs in public universities in Nigeria: Challenges and way forward. *Electronic Research Journal of Social Sciences and Humanities*, *4*(2), 15-27.

Ogunode, N. J., Ohunene, L. A., & Olatunde-Aiyedun, T. G. (2022). A review of factors responsible for high rate of financial corruption in public universities in Nigeria. *Central Asian Journal of Social Sciences and History*, *3*(7), 30-44.

Okunlaya, R. O., Syed Abdullah, N., & Alias, R. A. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library Hi Tech*, *40*(6), 1869-1892.

Omame, I. M., & Alex-Nmecha, J. C. (2020). Artificial intelligence in libraries. In *Managing and adapting library information services for future users* (pp. 120-144). IGI Global.

Rahmat, T. E., Raza, S., Zahid, H., Abbas, J., Sobri, F. A. M., & Sidiki, S. N. (2022). Nexus between integrating technology readiness 2.0 index and students'e-library services adoption amid the COVID-19 challenges: implications based on the theory of planned behavior. *Journal of Education and Health Promotion*, *11*(1), 23-46.

Sarmiento, C. S., & Duarte, C. (2023). All paths leading to the library: youth mobility and community-based planning. *Journal of Planning Education and Research*, *43*(2), 388-401.

Shahzad, K., & Khan, S. A. (2023). Effects of e-learning technologies on university librarians and libraries: A systematic literature review. *The Electronic Library*, *41*(4), 528-554.

Tella, A. (2022). Teaching information literacy in Nigerian universities using advanced technologies. *Management*, *7*(2), 38-53.

Tella, A., & Odunola, A. O. (2020). Demographic variables and library patronage of undergraduate students at universities in southwest Nigeria. *Mousaion*, *38*(4), 234-267.

Wheatley, A., & Hervieux, S. (2019). Artificial intelligence in academic libraries: An environmental scan. *Information Services & Use*, *39*(4), 347-356.

Yakubu, A. S., & Yagana, A. A (2022). Investigating librarians' intention to use artificial intelligence for effective library service delivery: A partial least square-structural equation modeling-based approach. *Information Technology, 9(1), 45.59.*

Yusuf, S, Mustapha, I. A., Shakirat, S. O., Oluwaseun, L. S., & Kamal, O. M. (2022). A Qualitative Study on Contribution of Private Universities to the Development of Kwara State, Nigeria: An Empirical Evidence from Al-Hikmah University. *Journal of Management in Practice*, *7(1), 12(2), 34-58.*

Zhou, J. (2022). The role of libraries in distance learning during COVID-19. *Information Development*, *38*(2), 227-238.