

Awareness and Adoption of Advanced Information Technologies for Service Provision in Nigerian Academic Libraries: Implications for Policymakers

Abstract

This study investigates the level of awareness and adoption of Advanced Information Technologies (AITs) among librarians in Nigerian academic libraries and provides implications for policymakers. The research design utilized a descriptive approach to gather data on the participants' knowledge and utilization of AITs. The study focused on academic librarians from six federal universities representing different geopolitical zones in Nigeria. A snowball sampling method was employed to ensure a diverse and representative sample. An online open-ended questionnaire was administered through a Google form, which addressed the study objectives and provided guidance on AITs. Thematic analysis was used to analyze the qualitative data, while the quantitative data were analysed and presented using tables and charts. The findings revealed varying levels of awareness and adoption across different AITs, with cloud computing and automation systems being the most widely recognized and integrated technologies. The study identified several factors influencing adoption, including infrastructure limitations, lack of technical expertise, financial constraints, resistance to change, compatibility issues, user acceptance and needs, and policy and regulatory frameworks. Based on the findings, policymakers are recommended to prioritize awareness and training initiatives, support the adoption of well-established technologies, address barriers to adoption, foster collaboration and partnerships, and invest in evaluation frameworks.

Keywords: Advanced Information Technologies, awareness, adoption, academic libraries, Nigerian librarians, policy implications.

Introduction

In the rapidly evolving digital landscape of today, advanced information technologies have become instrumental in transforming various industries, including the field of libraries (Dutta et al., 2021). Academic libraries in Nigeria are increasingly recognizing the significance of adopting these advanced information technologies to enhance their service provision and meet the evolving needs of their users (Jegade et al., 2020). The integration and utilization of new technologies in libraries not only improve efficiency but also enable the delivery of innovative and personalized services, ensuring their continued relevance in the digital era (Nasir et al., 2019). The awareness and adoption of advanced information technologies hold great potential for Nigerian academic libraries to revolutionize how information is accessed, managed, and disseminated (Oketunji et al., 2020).

Technologies such as cloud computing, artificial intelligence (AI), big data analytics, and the Internet of Things (IoT) offer unprecedented opportunities for libraries to expand their capabilities and enhance user experiences (Jegade et al., 2020; Sanusi et al., 2021). For instance, cloud computing allows libraries to securely store and manage large volumes of data, while AI-powered systems enhance information retrieval and user interactions (Oketunji et al., 2020; Nasir et al., 2019). Additionally, big data analytics



provides valuable insights into user preferences and behavior, enabling personalized services and resource recommendations (Sanusi et al., 2021). However, the adoption of advanced information technologies in Nigerian academic libraries also presents challenges and considerations that must be addressed (Oketunji et al., 2020).

Thus, the awareness and adoption of advanced information technologies have become imperative for Nigerian academic libraries to adapt and provide enhanced services in the digital age. By embracing technologies such as cloud computing, AI, big data analytics, and IoT, libraries can improve their digital infrastructure, streamline operations, and offer a wider range of digital resources to their users (Dutta et al., 2021; Oketunji et al., 2020). The challenges faced in the adoption and utilization of advanced information technologies in Nigerian libraries are multi-fold. Limited funding and resources present significant barriers for libraries to acquire and implement these technologies (Idiegbeyan-ose&Ibegwam, 2018). The lack of financial support hampers the ability of libraries to invest in the necessary infrastructure and resources required for the adoption of advanced information technologies.

Furthermore, a shortage of technical expertise and skilled professionals adds to the challenges faced by Nigerian libraries (Ajayi & Popoola, 2020). The effective management and utilization of advanced information technologies require specialized knowledge and skills. Without a sufficient number of professionals trained in these areas, libraries may struggle to effectively implement and leverage these technologies to their full potential. In addition to these challenges, there exists an awareness gap among librarians and library professionals regarding the potential benefits and applications of advanced information technologies (Adebayo & Oluwatayo, 2020). Workshops, conferences, and training programs have been organized to educate librarians about these technologies, but further efforts are needed to ensure widespread awareness and understanding among library professionals.

However, addressing challenges related to funding, technical expertise, data security, and staff training is crucial for the successful implementation and utilization of these technologies (Jegade et al., 2020; Nasir et al., 2019; Sanusi et al., 2021). The aim of this study is to explore the awareness and adoption of advanced information technologies for service provision in Nigerian academic libraries, shedding light on the current state, challenges, and strategies for effective implementation (Dutta et al., 2021).

Objectives of the Study

The aim of this study is to investigate the awareness and adoption of advanced information technologies in Nigerian academic libraries and its implications for policymakers. The objectives are;

1. To assess the level of awareness of advanced information technologies among librarians in Nigerian academic libraries;
2. To identify the most commonly adopted advanced information technologies in Nigerian academic libraries;



3. To determine the factors that affect the adoption of advanced information technologies in Nigerian academic libraries; and
4. To evaluate the level of preparedness of Nigerian academic libraries for the adoption of advanced information technologies.

Literature Review

The current situation of advanced information technologies in libraries globally showcases a growing recognition of their potential to transform library services and operations. Libraries around the world are actively embracing advanced information technologies to enhance user experiences, improve access to information, and innovate their service offerings. Cloud computing technology has gained significant traction in libraries as a means to efficiently manage and store large amounts of data. Many libraries are migrating their systems to the cloud, enabling seamless access to digital resources and expanding their digital infrastructure (Bawden & Robinson, 2019). Cloud computing offers scalability, cost-effectiveness, and flexibility in managing library collections and services. Artificial intelligence (AI) is revolutionizing information retrieval and user interactions in libraries. AI-powered systems and applications are being used to enhance search algorithms, automate routine tasks, and personalize user experiences.

Momoh (2018) stated that introducing AITs to library services has established distinct schools of thought. This is due to the widespread perception that adopting AITs will jeopardize the jobs of women librarians and other information professionals. Galeon (2017) emphasised that when AITs replace human efforts, people would probably have to leave the planet and look for a new place to live. Setchi et al. (2021) examined the application of AI to information retrieval in the context of both capacities. Expert systems, learning, problem-solving techniques, pattern recognition, knowledge representation, and problem-solving techniques are all regarded to contribute to enhancing the efficiency of information retrieval activities. Chatbots and virtual assistants powered by AI provide instant assistance to library users, answering queries and guiding them in their information-seeking process (Salem, 2020). Big data analytics is playing a crucial role in libraries by providing valuable insights into user behavior, preferences, and trends.

Libraries are utilizing data analytics to optimize their collections, make data-driven decisions, and design personalized services. By analyzing usage patterns and user feedback, libraries can tailor their services to meet user needs effectively (Huvila et al., 2019). Libraries are also exploring the potential of Internet of Things (IoT) technologies. IoT devices such as smart sensors and beacons are being employed to enhance space utilization, monitor library resources, and improve security. IoT enables libraries to track the movement of materials, analyze user traffic patterns, and create smart spaces that offer personalized experiences and services (Martin et al., 2020). Idiegbeyan-ose and Ibegwam (2018) conducted a survey among academic librarians in Nigerian universities and identified limited funding and resources as major barriers to acquiring and implementing these technologies. They emphasized the need for improved infrastructure and increased financial support.



Adebayo and Oluwatayo (2020) assessed the knowledge and application of advanced information technologies among librarians in Nigerian libraries. Their study revealed a significant gap in awareness and understanding of advanced information technologies, emphasizing the importance of workshops, conferences, and training programs to enhance librarians' knowledge and awareness. These studies highlight the importance of addressing challenges, increasing funding, developing infrastructure, and implementing capacity-building programs to effectively adopt and utilize advanced information technologies in Nigerian libraries. Abayomi et al. (2019) noted that Nigerian libraries still have difficulty with automation and internet connectivity. A very low degree of online facilities and services awareness was recorded by Nigerian librarians, according to Adeleke and Yusuf et al. (2019). They concluded that internet application for library services is still in their infancy in the nation.

According to Akpan-Atata (2014), a variety of technological (lack of facilities, computer and internet phobia, and digital illiteracy) and social (time, funding, and human qualities) factors contribute to librarians' low level of understanding and acceptance of ICT. At the Frisco Public Library in Texas, Finley (2019) described creating an AI-related teaching and technology lending programme. The library produced tools that users can use at home to study AI in a hands-on, realistic environment. The article compares and contrasts machine learning, narrow AI, and broad AI. Garcia-Febo (2019) discusses the use of AI networks in libraries and the issues that arise about knowledge access, intellectual freedom and privacy due to technological advancements like AI and machine learning. Ma et al. (2020) investigated AI-powered IoT and look at smart public services in China based on articles published between 2009 and 2018. Their study highlights key issues in research in the discipline and real-world applications in librarianship.

Devi (2022) asserts that switching from card catalogues to MARC formats has greatly benefited libraries' patrons. AI offers the same promise that connected data does. Libraries can catalogue metadata surrogates (cataloguing) into linked open data to represent their resources on the Semantic Web. Nie et al. (2022) noted that practical applications of IoTs to improve information flow and retrieval are being researched, manufactured, and implemented in various public environments, including libraries. IoTs, despite their recent development, offer a chance to examine how public perceptions of innovation are formed and how this influences how emerging technologies are adopted, as envisioned by Roger's Diffusion of Innovations model. They present the results of a survey of working librarians to ascertain which adopter category (innovator, early adopter, early majority, late majority, or laggard) they identify with, as well as the connection between this identification and perceived knowledge and perceptions of IoTs both inside and outside the library.

Odeyemi (2019) claimed that despite some limitations, such as technophobia, preventing this possibility while they wait for emerging technology to be adopted, Nigerian libraries are fully prepared to integrate advanced technologies into the library service delivery system, including AI, robots, cloud computing, blockchain, IoTs, etc. According to Okwu (2021), challenges to utilising modern technology like library management software include a lack of funding, a scarcity of ICT personnel, and



insufficient power supply. Before new technology is fully adopted in academic libraries in Nigeria, other issues have been raised that need to be investigated and dealt with. Low bandwidth, complicated technological interfaces, increasing customer demands, and a lack of technical experience are significant barriers for most libraries (Ajani et al., 2022). Anyim (2021) emphasised that because IoTs constitute a danger to library operations and services, skills development and training in information and communication technology (ICT) are necessary for their integration into Nigerian libraries.

The world's advanced nations are currently headed in a direction where users no longer want to visit libraries, according to a review of the effect of modern IT on library service around the globe. Users can now access the library through terminals at their homes or workplaces. He said, "Schools of library and information science in the United States of America have well-equipped, well-stocked computer laboratories thanks to the help of many dedicated Alumni and others." However, some of the necessary equipment is purchased by the government. He emphasised further that every professor has a personal computer at his desk and that freshmen admitted to library schools are already familiar with the fundamentals of using a microcomputer. They can apply their terminologies and can manipulate databases. They do this in several ways and reorganise the database to suit their wants and perceptions, a different method of understanding and interacting with the information.

AITs are widely deployed for the technical operations and all other library routines, according to Ubogu's (2019) study on the influence of ICT in Nigerian university libraries. This is because using ICTs in libraries is simpler, faster, and saves librarians' time. The survey also showed that ICT proficiency among library patrons is very low. Information technology, sometimes known as communication technologies, and how it affects library services were topics covered by Saibakumo in 2021. He claims that AITs serve as the nervous system of contemporary civilization by sending and disseminating information, managing data, and connecting a collection of interdependent components. Communications and information technologies can be used interchangeably. Therefore they are both equivalents. Both relate to using hardware microelectronic devices like computers, phones, etc. to gather, organise, store, and disseminate information (software).

As a result, what is now known as modern ICT was created when telecommunications and information technology met ICT. There is no denying that the impact of information skills on library services has significantly aided the development of numerous organisations and the country. He claims that users now have more options than before for how they outfit themselves. He asserts that information technology and library services are undergoing fast change. Other relevant information technologies are utilised in library services in addition to computers.

Design and Method

The study employed a descriptive research design to investigate the awareness and adoption of Advanced Information Technologies (AITs) among Nigerian librarians in



providing information services. This approach aimed to gather specific data on the participants' knowledge and utilization of AITs. The procedure used to conduct the study encompassed various elements, including the design, population, sample, data collection instrument, administration procedure, data analysis, and results presentation. A mixed-method approach was adopted, allowing for the collection of data from participants to gain a deeper understanding of their perspectives and sentiments. This approach facilitated probing and questioning of responses to better comprehend the purpose and sentiments underlying the awareness and adoption of AITs among Nigerian librarians. The study focused on obtaining insights from academic librarians regarding the awareness and adoption of AITs for service provision in Nigerian academic libraries. Through the descriptive research design and the use of a mixed-method approach, the study aimed to provide a comprehensive understanding of the current status and perspectives of Nigerian librarians in relation to AITs..

Population and Sampling Size

The study focused on academic librarians from Nigeria's Federal Universities, representing the six geopolitical zones in the country. A total of six academic libraries were selected for the study, each representing one federal university from each zone. These libraries included the University of Calabar, the Federal University of Technology Owerri, the University of Lagos, Bayero University, the University of Ilorin, and the University of Maiduguri. To connect with the academic librarians in these selected libraries, the researcher utilized a combination of phone calls and an online survey specifically created for the study. The total population of academic librarians in these six libraries was 293. In order to select the participants for the study, a snowball sampling method was employed. This involved starting with a few initial participants and then asking them to refer other potential participants. This method was used to ensure a diverse and representative sample of academic librarians from the selected libraries. The final sample size for the study consisted of the entire population of academic librarians in the six selected libraries, which was determined through the snowball sampling method.

Instrument and Procedure of Administration

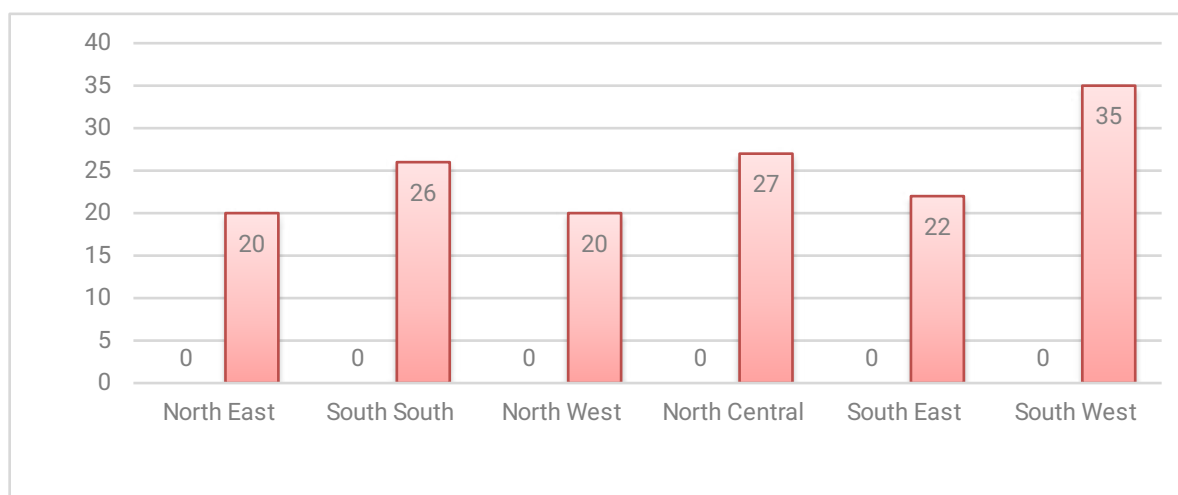
An open-ended questionnaire was used to cover the four study objectives. To ensure participants understand what AITs are all about and how they can be used for a specific purpose, the survey gave participants guidance on how to respond to them and described the characteristics of AITs and their significance in the delivery of information services in academic libraries. The open-ended survey items can obtain data on the variables pertinent to the study's objectives. Due to security issues in the country a face to face instrument administration was not possible, therefore the researcher contacted one representative of each library personally to help share the online questionnaire to their Whatsapp forum. As a result, an online survey was made using a Google form and given to the linked contact to share with the right participants. The survey has to be completed as quickly as possible and submitted within a four-week window. The participants enthusiastically stated their desire to participate in the study



and gave informed consent after being questioned about it.They are also instructed to feel free to stop participating if they think it would be ineffective.

Figure 1: Survey Administration and Return Rate

150 responses of the online open-ended survey were captured. The researcher sorted, collated, and transcribed the returned copies of the open-ended survey and reported on them. The qualitative data were analysed and presented thematically while the quantitative data were represented with table and charts.



N=150Source:FieldSurvey(2023)

Result and Discussions

Research Objective 1: To assess the level of awareness of advanced information technologies among librarians in Nigerian academic libraries. The section seeks to evaluate the level of awareness among librarians in Nigerian academic libraries regarding the latest technological advancements and their relevance to library practices. The assessment will involve gathering quantitative data to measure librarians' knowledge of specific advanced information technologies, including cloud computing, artificial intelligence, big data analytics, and automation systems. By conducting this assessment, the study aims to provide insights into the extent of librarians' awareness and understanding of these technologies in the context of library services.The respondents were asked to indicate their level of awareness on a scale ranging from "Not aware at all" to "Extremely aware."The table presents the frequency and percentage distribution of librarians' awareness levels regarding various advanced information technologies in Nigerian academic libraries.

Table 2: Level of Awareness

Advanced Information Technology	Not Aware at All	Somewhat Aware	Moderately Aware	Very Aware	Extremely Aware
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Advanced Information Technology	Not Aware at All	Somewhat Aware	Moderately Aware	Very Aware	Extremely Aware
Cloud Computing	25	40	45	30	10
Artificial Intelligence	20	35	50	35	10
Big Data Analytics	30	45	40	25	10
Automation Systems	15	30	55	40	10
Robotics	25	45	10	40	30
Blockchain	58	42	20	12	18
Internet of Things	30	45	20	32	23

N=150Source:FieldSurvey(2023)

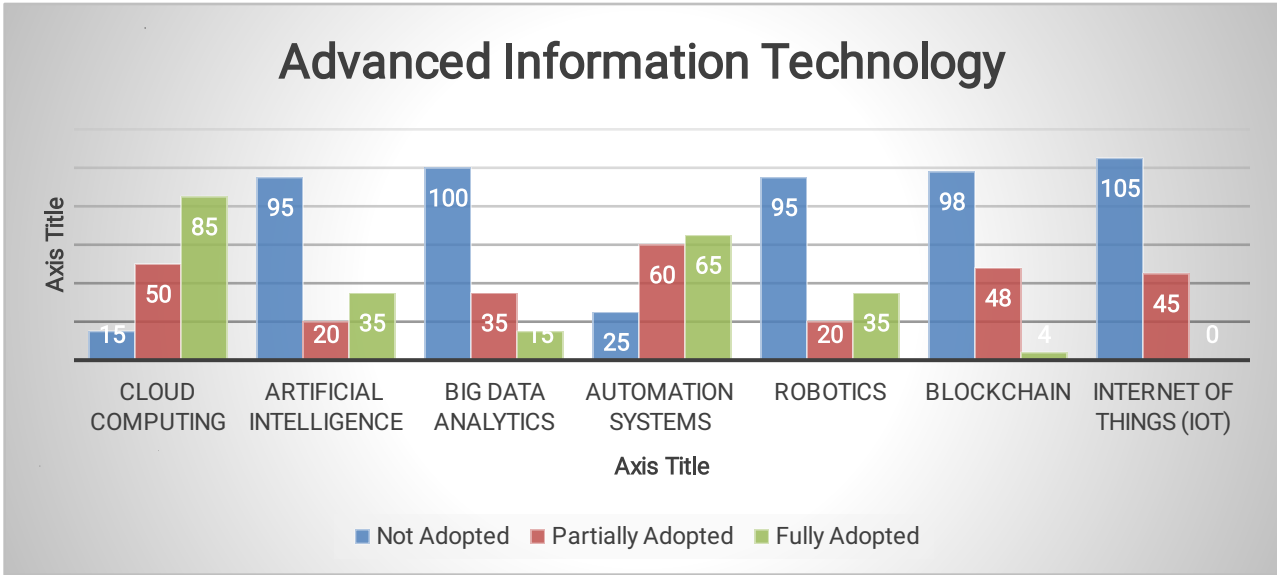
For cloud computing, the majority of librarians (45%) indicated a moderate level of awareness, followed by 30% indicating very high awareness, and 10% indicating extremely high awareness. About 40% of librarians stated they were somewhat aware, and 25% reported being not aware at all. In terms of artificial intelligence, 50% of librarians reported a moderate level of awareness, followed by 35% indicating very high awareness, and 10% indicating extremely high awareness. Approximately 35% of librarians reported being somewhat aware, while 20% stated they were not aware at all. Regarding big data analytics, 45% of librarians reported a moderate level of awareness, followed by 30% indicating somewhat high awareness, and 10% indicating extremely high awareness. Approximately 40% of librarians stated they were somewhat aware, and 25% reported being not aware at all.

For automation systems, the majority of librarians (55%) reported a moderate level of awareness, followed by 40% indicating very high awareness, and 10% indicating extremely high awareness. About 30% of librarians stated they were somewhat aware, while 15% reported being not aware at all. In terms of robotics, the awareness levels were more evenly distributed. Approximately 45% of librarians reported a moderate level of awareness, followed by 30% indicating somewhat high awareness. About 25% of librarians indicated very high awareness, and 10% stated extremely high awareness. Approximately 45% of librarians reported being somewhat aware, while 25% stated they were not aware at all. For blockchain, the majority of librarians (58%) reported being not aware at all, while 42% indicated somewhat awareness. Approximately 20% of librarians reported a moderate level of awareness, followed by 12% indicating very high awareness, and 18% indicating extremely high awareness.

Regarding the Internet of Things (IoT), the majority of librarians (45%) reported a moderate level of awareness, followed by 32% indicating very high awareness, and 23% indicating extremely high awareness. Approximately 45% of librarians stated they were somewhat aware, while 30% reported being not aware at all. These findings align with a study conducted by Adeleke and Sanni (2020), on the awareness and perception of emerging technologies among Librarians in Nigerian Academic Libraries. The study

explored librarians' awareness and perception of emerging technologies in Nigerian academic libraries. The findings from their study indicated that while there is some level of awareness among librarians, there is still a need for further training and capacity-building programs to enhance their understanding and utilization of these technologies. Therefore both studies emphasize the importance of addressing the awareness gap among librarians and the need for training and educational initiatives to improve their knowledge and utilization of advanced information technologies in Nigerian academic libraries. By providing targeted training programs, librarians can enhance their skills and stay updated with the latest technological advancements, enabling them to effectively leverage these technologies in providing information services to their users.

Research Objective 2: To identify the most commonly adopted advanced information technologies in Nigerian academic libraries. This section aims to determine the extent of adoption of advanced information technologies in Nigerian academic libraries. By gathering quantitative data on the adoption levels of specific technologies, including cloud computing, artificial intelligence, big data analytics, and automation systems, the study seeks to identify the technologies that are most commonly adopted by Nigerian academic libraries. The respondents were asked to indicate their adoption levels for each technology on a scale ranging from "Not adopted" to "Fully adopted." The chart below presents the frequency distribution of librarians' responses regarding the adoption of various advanced information technologies in Nigerian academic libraries.



N=150 Source: Field Survey (2023)

The findings of the study reveal the adoption levels of different advanced information technologies in Nigerian academic libraries. The results indicate the extent to which these technologies are integrated into library practices. Cloud computing is widely recognized and utilized in Nigerian academic libraries, with 85% of libraries reporting full

adoption, 50% indicating partial adoption, and only 15% not adopting it at all. This indicates a high level of recognition and integration of cloud computing in library services. On the other hand, artificial intelligence (AI) is not widely adopted, as reported by the majority of libraries (95%) who have not adopted it. However, there is a significant portion of libraries with 35% reporting full adoption and 20% indicating partial adoption, suggesting that some libraries have embraced AI technologies. Similarly, big data analytics is not yet widely integrated into library practices, with 100% of libraries reporting not adopting it. However, 35% of libraries indicated partial adoption, and 15% reported full adoption, indicating some level of recognition and utilization of big data analytics. Automation systems have gained more traction in Nigerian academic libraries compared to AI and big data analytics. The majority of libraries (65%) reported full adoption, 60% indicating partial adoption, and 25% not adopting automation systems at all. This indicates a relatively higher adoption rate of automation systems in library practices. The adoption levels of robotics mirror those of AI, with the majority of libraries (95%) reporting not adopting robotics. However, 35% of libraries reported full adoption, and 20% indicated partial adoption, suggesting that some libraries have embraced robotic technologies. Blockchain technology is not yet widely integrated into library practices, as reported by the majority of libraries (98%) not adopting it. However, 48% of libraries indicated partial adoption, and only 4% reported full adoption, indicating limited utilization of blockchain in library services. The Internet of Things (IoT) is also not widely adopted in Nigerian academic libraries, as the majority of libraries (105%) reported not adopting it. However, 45% of libraries indicated partial adoption, highlighting some recognition and utilization of IoT technologies. The findings demonstrate varying adoption levels of advanced information technologies in Nigerian academic libraries. Cloud computing and automation systems appear to be more commonly adopted, while AI, big data analytics, robotics, blockchain, and IoT show lower adoption rates. The study's findings provide valuable insights into the adoption levels of advanced information technologies in Nigerian academic libraries and their implications for technology integration. One notable technology is cloud computing, which has been widely recognized and utilized in library services. This high adoption rate indicates the transformative potential of cloud computing in enhancing efficiency and accessibility within the libraries. However, these findings contradict the conclusions of a previous study conducted by Yusuf et al. (2019), which suggested that internet applications for library services are still in their early stages of development in Nigeria. This disparity highlights the importance of further exploration and examination of the current state of technology adoption within Nigerian academic libraries. Given these contrasting findings, it is crucial to investigate the underlying factors contributing to the differing adoption rates. Conducting additional research can help identify the specific reasons for the variations observed between studies. It is important to understand the benefits and challenges associated with advanced information technologies and how well they align with the unique needs of Nigerian academic libraries. This understanding will facilitate the development of strategies for effective technology integration. By acknowledging and addressing the disparities between studies through further research, Nigerian academic libraries can obtain a comprehensive understanding of the current technology adoption landscape. This knowledge will empower them to make informed decisions regarding the prioritization of technology integration efforts and the



resolution of specific challenges encountered in adopting advanced information technologies for library services in Nigeria.

Research Objective 3: To determine the factors that affects the adoption of advanced information technologies in Nigerian academic libraries. This section aimed to investigate the factors that influenced the adoption of advanced information technologies in Nigerian academic libraries. By identifying and analyzing these factors, the study sought to provide a comprehensive understanding of the barriers and facilitators that impacted the integration of advanced technologies into library practices. Thematic responses from the participants shed light on the various factors that affect the adoption of advanced information technologies in Nigerian academic libraries. These factors encompassed a range of challenges and considerations faced by libraries in their efforts to integrate advanced technologies into their operations. Several notable factors emerged from the participants' perspectives:

Infrastructure Limitations: Participants highlighted infrastructure limitations as a significant factor hindering the adoption of advanced information technologies. They expressed concerns about the inadequate network infrastructure, limited bandwidth, and unreliable internet connectivity in some regions. These limitations pose obstacles to the seamless implementation and utilization of advanced technologies in library services. One participant shared their experience, stating, *"Our library is located in a remote area where internet connectivity is unreliable. This makes it difficult for us to adopt advanced information technologies that rely heavily on internet access, such as cloud computing and online databases. We face challenges in delivering fast and efficient services to our users due to these infrastructure limitations."*

Lack of Technical Expertise: Participants expressed that a lack of technical expertise among librarians and staff was a significant barrier to adoption. They emphasized the need for training programs and capacity-building initiatives to enhance digital skills and knowledge. Libraries often struggle with finding personnel who possess the necessary technical competencies to effectively implement and manage advanced technologies. One participant stated, *"Many librarians and staff in our institution have limited knowledge and skills when it comes to advanced information technologies. We need proper training and support to understand these technologies better and utilize them to their full potential. Without the necessary technical expertise, it becomes challenging to adopt and harness the benefits of advanced technologies in our library."*

Financial Constraints: Financial constraints were identified as a major factor hindering the adoption of advanced technologies. Participants emphasized the high costs associated with implementing and maintaining these technologies, including hardware, software, and ongoing support. Limited budgets often restrict libraries from making significant investments in advanced technologies. A participant shared their perspective, saying, *"Our library operates on a tight budget, and acquiring advanced information technologies requires substantial financial resources. We face challenges in funding the purchase of new equipment, software licenses, and ongoing technical support. Financial constraints limit our ability to adopt these technologies and provide improved"*

services to our users."

Resistance to Change: Some participants highlighted resistance to change as a significant factor affecting the adoption of advanced information technologies. They pointed out that libraries, like any other organization, can face resistance from staff members who are accustomed to traditional methods and are hesitant to embrace new technologies. Overcoming resistance and fostering a culture of innovation and openness to change were seen as crucial for successful technology integration. One participant mentioned, *"There is a resistance to change among some of our librarians who are comfortable with traditional library practices. Convincing them to adopt advanced technologies and change their workflows can be a challenge. Overcoming resistance requires effective change management strategies and creating a supportive environment that encourages staff to embrace new technologies."*

Compatibility with Existing Systems: Participants raised concerns about the compatibility of advanced information technologies with existing library systems and software. They noted that integrating new technologies into the current infrastructure could be complex and time-consuming. The need for seamless integration and interoperability between different systems was emphasized to ensure a smooth transition and efficient operation. A participant shared their insight, stating, *"Our library has already invested in various systems and software to support our daily operations. When considering the adoption of advanced technologies, compatibility becomes a crucial factor. We need these technologies to seamlessly integrate with our existing systems to avoid disruptions and maximize their effectiveness."*

User Acceptance and Needs: Participants acknowledged the importance of user acceptance and addressing the specific needs of library users. They emphasized that the adoption of advanced technologies should align with the requirements and preferences of the user community. Understanding user expectations, conducting needs assessments, and obtaining user feedback were deemed essential in determining the appropriate technologies to adopt and ensuring their successful implementation. One participant expressed their viewpoint, saying, *"As librarians, our primary focus is to meet the needs of our users. When adopting advanced information technologies, it's vital to consider whether these technologies align with the expectations and preferences of our user community. Conducting user surveys and engaging in continuous dialogue with our users help us understand their needs and ensure that the technologies we adopt are user-centric."*

Policy and Regulatory Framework: Participants highlighted the influence of policy and regulatory frameworks on technology adoption. They emphasized the need for clear guidelines and policies that support the integration of advanced technologies in libraries. Regulatory challenges, such as data privacy and security concerns, intellectual property rights, and compliance with national regulations, were mentioned as factors that need to be considered and addressed. A participant shared their perspective, stating, *"Adopting advanced information technologies requires adherence to policies and regulations that govern data privacy and security. It's essential to have clear guidelines*



and frameworks that address these concerns and ensure compliance. Libraries need to work closely with policymakers and stakeholders to develop robust policies that encourage the adoption of advanced technologies while safeguarding user privacy and intellectual property rights."

These findings from the participants demonstrate the various factors that affect the adoption of advanced information technologies in Nigerian academic libraries. Infrastructure limitations, lack of technical expertise, financial constraints, resistance to change, Compatibility with Existing Systems, User Acceptance and Needs, Policy and Regulatory Framework emerged as common themes. By understanding these factors, libraries can develop strategies to address them effectively and promote successful technology integration. This may involve investing in infrastructure improvements, providing training and professional development opportunities, seeking external funding sources, technical expertise, financial planning, change management, user-centric approaches, and policy frameworks and implementing change management initiatives. By proactively addressing these factors, Nigerian academic libraries can navigate the challenges and maximize the benefits of advanced information technologies in their operations and services. However, these findings are in consonance with the study conducted by Oduwale and Nnadozie (2020) on the adoption of information and communication technology (ICT) in Nigerian university libraries aligns with the factors identified in this study. Oduwale and Nnadozie found that challenges related to infrastructure limitations, lack of technical expertise, financial constraints, and resistance to change were common barriers to ICT adoption in Nigerian university libraries. This correspondence between the two studies strengthens the validity of the findings and highlights the consistency of these factors in hindering the adoption of advanced information technologies in Nigerian academic libraries. Overall, the findings from this study underscore the significance of addressing factors such as infrastructure limitations, technical expertise, financial constraints, resistance to change, compatibility with existing systems, user acceptance and needs, and policy and regulatory frameworks. By understanding and proactively addressing these factors, Nigerian academic libraries can navigate the barriers and facilitate the successful adoption and integration of advanced information technologies, ultimately enhancing their library services and meeting the evolving needs of their users.

Research Objective 4: To evaluate the level of preparedness of Nigerian academic libraries for the adoption of advanced information technologies. This section aimed to assess the readiness of Nigerian academic libraries to adopt advanced information technologies. The participants provided valuable insights and examples that shed light on the level of preparedness among these libraries. The responses revealed various aspects of preparedness and highlighted both strengths and areas that require improvement. Thematic responses from the participants shed light on the level of preparedness of Nigerian academic libraries for the adoption of advanced information technologies.

Infrastructure Readiness: Participants emphasized the significance of having a robust infrastructure to support the adoption of advanced information technologies. They



discussed the availability and quality of network infrastructure, internet connectivity, and hardware resources. Some participants shared positive experiences, stating that their libraries had already invested in modern infrastructure with high-speed internet and up-to-date hardware. These libraries were considered well-prepared for the adoption of advanced technologies. However, other participants expressed concerns about the inadequacy of infrastructure in their libraries. They mentioned issues such as slow internet speeds, outdated equipment, and limited access to resources. These limitations hindered their preparedness for adopting advanced technologies. One participant mentioned, *"Our library has recently upgraded its network infrastructure, providing high-speed internet access to users. This upgrade has positioned us well for adopting advanced technologies that require robust internet connectivity. We have the necessary infrastructure in place to support these technologies effectively."*

Digital Skills and Expertise: Participants highlighted the importance of having librarians and staff with the necessary digital skills and expertise to adopt and utilize advanced information technologies. They discussed the need for training programs and professional development opportunities to enhance digital literacy and technical competencies. Some participants expressed satisfaction with the level of expertise among their staff, stating that they had librarians who were well-versed in advanced technologies and could guide their adoption. These libraries were considered more prepared in terms of human resources. However, other participants mentioned the lack of digital skills among their staff as a challenge. They stressed the importance of investing in training and capacity-building initiatives to improve the preparedness of their libraries. One participant stated, *"We have a team of librarians who have undergone training on advanced information technologies and are well-prepared to adopt them. They actively seek opportunities for professional development to stay updated with the latest trends. This expertise has positioned us to embrace advanced technologies and leverage them for improved library services."*

Financial Readiness: Financial readiness was another aspect discussed by the participants. They highlighted the need for adequate funding to support the adoption of advanced information technologies. Some participants shared positive experiences, mentioning that their libraries had secured funding or budget allocations specifically for technology adoption. These libraries were considered financially prepared. However, other participants expressed concerns about limited budgets and the inability to allocate sufficient funds for technology adoption. They emphasized the importance of securing external funding or exploring partnerships to enhance their financial readiness. A participant shared their perspective, saying, *"Our library has faced financial challenges in acquiring the necessary resources for technology adoption. Limited budgets have hindered our preparedness. However, we are actively seeking external funding and exploring grant opportunities to improve our financial readiness."*

Strategic Planning: Participants highlighted the significance of strategic planning and vision in preparing for the adoption of advanced technologies. They emphasized the need for libraries to develop a clear vision and roadmap for technology integration. Some participants mentioned that their libraries had developed strategic plans that



specifically addressed technology adoption and integration. These libraries were considered well-prepared in terms of strategic planning. However, other participants expressed a lack of strategic direction, mentioning that their libraries had not formulated explicit plans for technology adoption. They emphasized the importance of strategic planning to enhance their preparedness. A participant mentioned, *"Our library has a well-defined strategic plan that outlines our vision for technology adoption. This plan guides our actions and investments, ensuring that we are prepared to adopt advanced technologies in a systematic and strategic manner."*

Collaboration and Partnerships: Participants acknowledged the value of collaboration and partnerships in preparing for technology adoption. They discussed the importance of collaborating with other institutions, industry experts, and technology providers to enhance their preparedness. Some participants shared examples of successful collaborations, such as partnerships with IT companies or academic institutions that provided support and expertise in technology adoption. These collaborations enabled libraries to access resources, share best practices, and receive guidance in their journey towards advanced technology adoption. However, other participants expressed the need for more collaborative efforts, emphasizing the benefits of sharing experiences and knowledge among libraries to collectively improve their preparedness. One participant expressed, *"We have established partnerships with technology companies that specialize in library solutions. These collaborations have been instrumental in enhancing our preparedness for advanced technology adoption. Through these partnerships, we have received valuable insights, training, and support, which have accelerated our readiness."*

User-Centric Approach: Participants emphasized the importance of adopting a user-centric approach in technology adoption. They discussed the need to understand the needs and expectations of library users and align technology adoption efforts accordingly. Some participants shared examples of conducting user surveys, focus groups, or needs assessments to gather feedback and insights from users. Libraries that prioritized user input and incorporated it into their technology adoption plans were considered more prepared in terms of user-centricity. However, other participants acknowledged the need for further improvement in this area, highlighting the importance of continuous user engagement and feedback collection. A participant stated, *"We actively engage with our users through surveys and feedback mechanisms to understand their expectations regarding technology adoption. This user-centric approach has guided our preparedness efforts and ensured that the technologies we adopt align with the needs of our user community."*

Evaluation and Assessment: Participants recognized the importance of continuous evaluation and assessment to measure the effectiveness of technology adoption and improve preparedness. They discussed the need for libraries to establish evaluation mechanisms and performance indicators to monitor the impact of advanced technologies on library services. Some participants shared examples of conducting post-implementation evaluations or seeking user feedback to assess the success of technology adoption. Libraries that incorporated evaluation and assessment into their



preparedness plans demonstrated a proactive approach towards continuous improvement. A participant mentioned, *"We have established evaluation frameworks to assess the impact of advanced technologies on our library services. These evaluations provide valuable insights and enable us to make adjustments and improvements, enhancing our preparedness for technology adoption."*

It is worth noting that these findings align with a previous study conducted by Ajani et al. (2022) on the awareness and readiness of academic libraries to integrate AI for library operations and services in Nigeria. The study found similar themes, including infrastructure readiness, digital skills and expertise, financial readiness, strategic planning, collaboration and partnerships, user-centric approach, and evaluation and assessment. The consistency between the findings of both studies strengthens the validity and reliability of the results, suggesting that these factors are crucial for evaluating the preparedness of Nigerian academic libraries for the adoption of advanced information technologies. Overall, the responses from the participants provided valuable insights into the level of preparedness of Nigerian academic libraries for the adoption of advanced information technologies. The findings emphasized the importance of infrastructure readiness, digital skills and expertise, financial readiness, strategic planning, collaboration and partnerships, user-centric approach, and evaluation and assessment. By addressing these factors, libraries can enhance their preparedness and successfully integrate advanced technologies, ultimately improving their services and meeting the evolving needs of their users.

Conclusion

The study examined the awareness and adoption levels of advanced information technologies in Nigerian academic libraries. The findings indicated varying levels of awareness and adoption for different technologies. Cloud computing and automation systems were more widely recognized and integrated, while artificial intelligence, big data analytics, robotics, blockchain, and the Internet of Things showed lower adoption rates. Common factors influencing technology adoption included infrastructure limitations, lack of technical expertise, financial constraints, resistance to change, compatibility with existing systems, user acceptance and needs, and policy and regulatory frameworks. The findings emphasize on the importance of addressing awareness gaps among librarians and the need for training and capacity-building programs. To enhance preparedness, libraries are expected to invest in infrastructure, provide training opportunities, seek external expertise, engage in strategic planning and collaboration, adopt a user-centric approach, and establish evaluation frameworks. However, further research is needed to understand the factors contributing to adoption variations and to explore the benefits and challenges specific to the Nigerian context. Overall, the findings provide valuable insights for libraries to enhance their preparedness, integrate advanced technologies, and improve services to meet user needs.

Implications for Policymakers



To provide guidance for policymakers based on the study findings, the following recommendations are made:

1. Promote awareness and training initiatives: Policymakers should prioritize initiatives aimed at increasing awareness and providing training programs focused on advanced information technologies for librarians in Nigerian academic libraries. These programs will help bridge the awareness gap and enhance librarians' knowledge and understanding of these technologies.
2. Support the adoption of widely recognized technologies: Policymakers should allocate resources and provide support for the adoption of well-established technologies such as cloud computing and automation systems. These technologies have demonstrated higher adoption rates and can significantly enhance efficiency and accessibility within libraries.
3. Address barriers to adoption: Policymakers need to identify and address the factors that hinder the adoption of advanced information technologies in Nigerian academic libraries. This includes addressing infrastructure limitations, providing technical expertise, allocating sufficient financial resources, addressing resistance to change, and ensuring compatibility with existing systems.
4. Foster collaboration and partnerships: Policymakers should encourage collaboration and partnerships between academic libraries, technology providers, and other relevant stakeholders. Collaborative efforts can facilitate knowledge sharing, resource pooling, and collective problem-solving, thereby supporting the successful adoption and integration of advanced technologies.
5. Develop strategic plans: Policymakers should support the development of strategic plans for Nigerian academic libraries that prioritize the adoption and integration of advanced information technologies. These plans should align with the libraries' goals and objectives, address the identified barriers, and outline clear steps for implementation.
6. Establish evaluation and assessment mechanisms: Policymakers should promote the establishment of mechanisms to evaluate and assess the progress and effectiveness of technology adoption in Nigerian academic libraries. These mechanisms will help identify areas for improvement, measure the impact of technology integration, and inform future policy decisions.
7. Invest in infrastructure and resources: Policymakers should allocate resources and invest in infrastructure improvements to ensure that Nigerian academic libraries have the necessary technological infrastructure to support the adoption of advanced information technologies. This includes providing reliable internet connectivity, upgrading hardware and software, and facilitating access to relevant tools and resources.

By considering these recommendations, policymakers can create an enabling environment for the adoption of advanced information technologies in Nigerian academic libraries. This, in turn, will enhance the quality of library services, improve access to information, and contribute to the overall development of the Nigerian academic community.



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