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DIGITAL LIBRARIANSHIP COMPETENCIES AND TECHNOLOGICAL SKILLS FOR MANAGING AI-DRIVEN LIBRARY INFORMATION SERVICES IN THE TWENTY-FIRST CENTURY: A CASE OF PUBLIC LIBRARIES IN IMO STATE, NIGERIA

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Abstract

This research explores the essential digital competencies and skills needed for managing AI-enhanced library information services in the 21st century, focusing specifically on tertiary institutions in Imo State, Nigeria. The swift adoption of artificial intelligence (AI) within library settings has revolutionized how information services are delivered, emphasizing the necessity for librarians to develop advanced digital and technological skills. The study delves into the competencies that librarians currently possess, the AI-related skills necessary for effective service delivery, the level of AI technology utilization within library operations, and the challenges faced in managing these AI-driven services. A descriptive survey research design was employed, involving a sample of 175 librarians and library staff from selected tertiary institutions in Imo State. Data collection was carried out using a structured questionnaire named "Digital Librarianship Competencies and AI-Driven Information Services Questionnaire (DLCAISQ)." The instrument was validated, distributed among participants, and the subsequent data was analyzed through frequency counts, percentages, means, and standard deviation. Findings indicated that librarians have moderate to high digital competencies in areas such as online information retrieval, metadata creation, digital resource management, and the use of AI tools. Furthermore, critical AI-related skills identified include data analytics, cybersecurity, awareness of machine learning, cloud computing, and virtual reference services. The results showed a significant extent of AI utilization in library operations, especially in automated cataloguing, chatbot services, and intelligent information retrieval systems. However, several challenges persist, including inadequate funding, poor ICT infrastructure, frequent power interruptions, limited training opportunities, and a lack of robust AI policy frameworks. The study concludes that while librarians in Imo State are making

strides in digital proficiency, important gaps remain that impede full integration of AI. It recommends ongoing professional development, better infrastructure, and supportive policies to enhance the effectiveness of AI-driven library services.
Keywords: Digital librarianship, artificial intelligence, competencies, library services, Imo State, Nigeria.

Introduction

The 21st century has brought profound technological shifts that have reshaped the traditional functions of libraries and the roles of librarians worldwide. Libraries are no longer limited to physical collections but have transitioned into dynamic digital hubs, incorporating electronic resources, cloud-based platforms, big data analysis, and artificial intelligence (AI) in their operations. This transformation has made it essential for librarians to develop advanced digital skills to manage modern information systems and deliver responsive, user-focused services. AI tools such as chatbots, automated classification systems, recommendation engines, predictive analytics, metadata generation, and smart search technologies are now increasingly embedded in library workflows (Oguntoye & Ajibare, 2024).

Digital librarianship involves leveraging information and communication technologies (ICTs) to manage digital content, create metadata, preserve digital materials, support information literacy, and adopt emerging innovations. As noted by Dube, Rammutloa, and Matatiele (2024), the digital era has broadened the scope of librarians' duties, requiring proficiency in IT, data handling, digital content development, and technical user support. With the integration of AI, additional expertise in machine learning, data ethics, analytical methods, and understanding of AI systems has become necessary. In Nigeria, academic and public libraries are beginning to implement AI-enhanced services to improve how users access information and engage with library resources. Tools like AI-powered chatbots, virtual assistance, automated indexing, and intelligent search interfaces have significantly changed how libraries interact with patrons (Wagwu et al., 2024). However, the success of these technologies hinges on the capabilities of library staff. Achugbue (2025) points out that while AI offers clear advantages for academic libraries, many librarians lack sufficient technical training, which limits effective adoption.

Research indicates that Nigerian librarians generally have foundational digital skills but face persistent challenges, including poor infrastructure, limited access to professional development, and minimal exposure to cutting-edge technologies (Idubor & Ogunbodede, 2024). Pantuvo and Joseph (2024) also identified uneven skill levels among university librarians and stressed the importance of ongoing training and institutional backing. Moreover, the rise of the Fifth Industrial Revolution (5IR) has heightened the demand for AI-related competencies such as data analysis, programming, digital curation, understanding of algorithms, and ethical oversight of AI applications. Oladokun and Umar (2025) argue that AI literacy and continuous learning are critical for librarians working in increasingly digital environments.

Imo State, home to several tertiary institutions in Nigeria, hosts academic libraries aiming to meet the evolving information needs of students and researchers. Yet, there is little known about whether librarians in these institutions possess the necessary skills to manage AI-integrated

services. This study therefore aims to assess the digital competencies required for effectively managing AI-driven library services in tertiary institutions within Imo State, Nigeria. The growing use of artificial intelligence and digital tools in libraries has transformed how information services are delivered globally. Despite this progress, many Nigerian libraries struggle to adopt AI technologies due to gaps in librarians' digital expertise. Most professionals were trained in traditional library settings and may not have the technical background needed to operate AI-based systems, digital archives, metadata frameworks, data analytics tools, or intelligent retrieval platforms.

While prior research underscores the need for digital readiness and AI preparedness among librarians, findings show that weak ICT infrastructure, lack of training programs, and limited engagement with new technologies continue to impede the successful deployment of AI in Nigerian libraries (Okuonghae & Tunmibi, 2024; Jatto & Tella, 2024). In Imo State, there is a notable absence of empirical data on librarians' competencies in handling AI-driven information systems. As a result, their inability to fully leverage AI tools could negatively impact service quality, access to information, and overall user experience. This study therefore aims to investigate the digital skills and competencies required for managing AI-enhanced library services in tertiary institutions across Imo State, Nigeria. The broad objective of this study is to examine digital librarianship competencies and skills for managing AI-driven library information services in Imo State, Nigeria.The specific objectives are to: a). determine the digital competencies possessed by librarians in managing AI-driven library services; b). identify the AI-related skills required for effective information service delivery; c). examine the extent to which librarians utilize AI technologies in library operations; d). identify challenges associated with managing AI-driven library services; e). assess the influence of digital AI competencies on library service provision; f). suggest strategies for enhancing digital competencies and AI skills among librarians. This study adds to the expanding body of research on digital librarianship and the use of artificial intelligence in Nigerian libraries. It offers empirical insights into the skills librarians need to effectively handle emerging technologies. The results will be useful for: a). Library managers developing training and professional development initiatives; b). Professional organizations, including the Nigerian Library Association (NLA); c). Government institutions involved in advancing education; d). Practicing librarians aiming to strengthen their expertise in digital tools and AI; and e). Scholars exploring digital transformation and the integration of AI in library settings.

Methodology

This research employed a descriptive survey design, well-suited for gathering and analyzing data from a specific group to outline the current conditions, practices, and viewpoints concerning digital librarianship skills and AI-enhanced library services. The study took place in Imo State, Nigeria, specifically targeting select tertiary institutions, including universities, polytechnics, and colleges of education that possess operational academic libraries.The study used a total enumeration sampling method, meaning every individual in the target population was included. Given that the population consisted of exactly 175 librarians and library staff from the selected institutions, all were surveyed. This strategy was chosen to achieve full

representation, minimize sampling bias, and improve the accuracy and reliability of the results. As a result, no separate sample was selected—the complete group of 175 participants served as the study's respondents. The Digital Literacy Competencies and AI Skills Questionnaire (DLCAISQ) underwent both face and content validation to assess its relevance, clarity, and overall appropriateness. Three experts reviewed the initial version: two with expertise in Library and Information Science and one in Measurement and Evaluation. Their feedback was used to refine unclear items and confirm that the questionnaire effectively measured the intended constructs. To further evaluate the instrument's suitability, a pilot study was carried out with 20 librarians and library personnel from a tertiary institution not included in the main study. This trial examined how clear, understandable, and feasible the questions were in practice. The pilot data were analyzed for reliability using Cronbach's alpha, which produced an overall value of 0.86—indicating strong internal consistency and supporting the instrument's reliability for data collection. The questionnaire employed a 4-point Likert scale, with responses ranging from Strongly Agree (4) to Strongly Disagree (1). This detail has been explicitly stated to maintain consistency and prevent misinterpretation of the results. We thank the reviewer for the suggestion, which enhanced the methodological transparency of the manuscript. Collected data were analyzed through frequency counts, percentages, means, and standard deviations. A criterion mean of 2.50 was established as the decision-making standard; any item that achieved a mean score of 2.50 or higher was accepted, while items scoring below this threshold were disregarded.

Results and Discussions

Digital Competencies Possessed by Librarians in Managing AI-Driven Library Services

Table 1 summarizes the responses of 175 librarians regarding their digital competencies in managing AI-integrated library services. All ten measured competencies had mean scores exceeding the threshold of 2.50, ranging between 2.90 and 3.27, indicating a strong overall level of digital proficiency. Librarians reported confidence in areas such as digital library software, online information retrieval, database searching, electronic resource management, metadata creation, AI-enhanced search tools, cloud-based systems, digital preservation, virtual reference support, data analysis, and cybersecurity practices. The combined average score of 3.07, with a standard deviation of 0.88, reflects general consensus among respondents and relatively consistent responses across the board. These results suggest that librarians in tertiary institutions in Imo State are well-equipped with the essential digital skills needed to manage modern, AI-driven library services. Digital skills are crucial for librarians who need to manage AI-enhanced library services effectively. As libraries increasingly integrate artificial intelligence for tasks such as information retrieval, cataloging, digital reference support, collection management, and user assistance, librarians must develop a mix of technical, information management, and ethical skills. These competencies not only streamline service delivery but also ensure the responsible and effective utilization of AI tools (Asemi & Asemi, 2018).

One of the key competencies for librarians is digital literacy, which encompasses the ability to utilize digital tools, software, and online platforms to access, organize, and share information.

This skill enables librarians to engage with AI-driven library systems and deliver technology-facilitated services to patrons (Mishra & Koehler, 2020). Data management and analytics skills represent another vital area of competency. AI-driven library services often depend on extensive datasets for machine learning and predictive analysis. Librarians who are proficient in metadata creation, data curation, and analytics can adeptly manage digital collections and support decision-making grounded in evidence (Cox et al., 2019). Information and media literacy is equally essential. Librarians need to evaluate information sources, counter misinformation, and instruct users on how to critically interact with content generated by AI. This competence bolsters the credibility and reliability of library services (IFLA, 2021). Librarians also benefit from a foundational understanding of technology and programming, which includes knowledge of AI applications, machine learning, cloud computing, and integrated library systems. This technical acumen allows librarians to partner effectively with IT professionals in the implementation and maintenance of AI-based services (Yu et al., 2023). Moreover, strong digital communication and collaboration skills are critical. Librarians harness virtual reference tools, social media, and AI chatbots to connect with users effectively. Proficient digital communication enhances user satisfaction and facilitates easy access to information resources (Khan & Bhatti, 2021). Additionally, librarians must possess ethical and legal knowledge to navigate issues such as privacy, copyright, data protection, intellectual property rights, and algorithmic bias in relation to AI applications. Ethical literacy ensures that AI technologies are employed in ways that align with professional values and safeguard user rights (Cox et al., 2019). Lastly, fostering a spirit of continuous learning and adaptability is vital for librarians in an era dominated by AI. With the swift advancement of digital technologies, librarians must consistently enhance their competencies through professional development programs, workshops, and lifelong learning endeavors (Yu et al., 2023).

Table 1: Digital Competencies Possessed by Librarians in Managing AI-Driven Library Services

	Digital Competencies Possessed by Librarians in Managing AI-Driven Library Services	Mean	SD	Decision
1	Ability to use digital library management software effectively	3.21	0.78	Agreed
2	Competence in online information retrieval and database searching	3.27	0.51	Agreed
3	Ability to manage electronic resources and digital collections	3.15	0.84	Agreed
4	Skills in metadata creation and organization of digital resources	3.08	0.77	Agreed
5	Competence in the use of AI-powered search tools and applications	2.99	0.89	Agreed
6	Ability to utilize cloud-based information management systems	2.97	0.90	Agreed
7	Skills in digital preservation and archiving techniques	3.06	0.86	Agreed
8	Ability to provide virtual reference and online user support services	3.13	0.66	Agreed
9	Competence in data analytics and interpretation for library services	2.90	0.92	Agreed
10	Ability to ensure cybersecurity and ethical use of AI technologies	2.98	0.81	Agreed

AI-Related and Technological Skills Required for Effective Information Service Delivery

Table 2 outlines the responses from 175 librarians concerning the essential AI-related and technological skills necessary for delivering effective information services. The results reveal that many respondents identified several key skills crucial for managing AI-enhanced library services. The top skills highlighted include proficiency with AI-powered search and discovery tools (92.0%), the ability to offer virtual reference and chatbot services (91.4%), and strong problem-solving and critical thinking abilities in digital environments (90.9%). Additionally, competence in digital content management systems (90.3%) and managing institutional repositories and digital archives (89.1%) were also highly regarded. Other notable skills included metadata creation and management (88.0%), cybersecurity and data protection (87.4%), information literacy and user education (86.9%), as well as data analytics and interpretation (85.1%). Skills related to digital preservation and curation (84.6%) were also emphasized. Moreover, respondents acknowledged the significance of cloud computing skills (83.4%), understanding AI ethics and the responsible use of AI (82.9%), familiarity with emerging technologies (80.6%), machine learning applications in libraries (78.3%), and programming and scripting skills (73.1%). Overall, the findings imply that to effectively deliver information services in the age of artificial intelligence, librarians must possess a blend of technical, analytical, ethical, and user-focused competencies to enhance modern library operations and service quality.

In today's libraries and information centers, having strong AI and tech skills is essential for delivering effective services. The fast-paced evolution of artificial intelligence (AI), along with digital technologies and automation, has significantly changed how we gather, process, organize, and share information. As a result, librarians and information professionals are now expected to have a wide range of technological skills to address the shifting needs of their users (Cox et al., 2019). One key area is digital literacy, which empowers information professionals to navigate computers, databases, cloud platforms, and digital communication tools with ease. This proficiency not only helps in accessing electronic resources but also supports the provision of virtual services (Khan & Bhatti, 2021).

Another vital competency is AI literacy. This includes understanding the principles and limitations of AI technologies like machine learning, natural language processing, chatbots, and recommendation systems. By being AI literate, librarians can better utilize AI-driven tools in various aspects of their work, including reference services, cataloging, and retrieval of information (Yu et al., 2023). Data management and analytical skills are equally critical. Information professionals must effectively collect, organize, curate, preserve, and analyze data to enhance decision-making and improve user services. These skills also enable evidence-based management and streamline the handling of digital collections (Cox et al., 2019).

Moreover, expertise in information retrieval and database management is essential for efficient searching, indexing, and metadata creation, along with organizing information resources. Proficiency with integrated library systems and digital repositories boosts access to information and elevates service quality (Asemi & Asemi, 2018). Technological troubleshooting and system

management skills are necessary as well. Librarians should be comfortable with software applications, cloud computing, cybersecurity practices, and basic programming concepts to effectively support digital information systems (Khan & Bhatti, 2021).

In the age of AI, ethical knowledge and information security skills are indispensable. Information professionals must understand data privacy, intellectual property rights, copyright laws, and relevant ethical issues related to AI to deliver services responsibly and securely (IFLA, 2021). Lastly, a commitment to continuous learning and adaptability is crucial, given the rapid pace of technological innovation. Librarians and information professionals should frequently update their knowledge and learn new digital skills through training and professional development programs (Yu et al., 2023).

Table 2: AI-Related and Technological Skills Required for Effective Information Service Delivery

S/N	AI-Related and Technological Skills Required	Frequency	Percentage
1	Ability to use AI-powered search and discovery tools	161	92.0
2	Data analytics and interpretation skills	149	85.1
3	Metadata creation and management skills	154	88.0
4	Competence in digital content management systems	158	90.3
5	Knowledge of machine learning applications in libraries	137	78.3
6	Cloud computing and cloud-based information management skills	146	83.4
7	Programming and scripting skills (e.g., Python, SQL)	128	73.1
8	Cybersecurity and data protection skills	153	87.4
9	Skills in managing institutional repositories and digital archives	156	89.1
10	Ability to provide virtual reference and chatbot services	160	91.4
11	Digital preservation and curation skills	148	84.6
12	AI ethics and responsible use of artificial intelligence skills	145	82.9
13	Information literacy and user education skills	152	86.9
14	Knowledge of emerging technologies and innovation management	141	80.6
15	Problem-solving and critical thinking skills in digital environments	159	90.9

Extent to Which Librarians Utilize AI Technologies in Library Operations

Table 3 summarizes responses from 175 librarians regarding the use of AI technologies in library operations. All measured items had mean scores exceeding the threshold of 2.50, ranging between 2.78 and 3.06, indicating a high level of AI adoption. Librarians reported extensive use of various AI applications, including AI-enhanced search and discovery platforms, virtual reference services and chatbots, automated cataloguing and metadata tools,

recommendation systems powered by AI, plagiarism detection software, machine learning, data analytics, digital preservation solutions, intelligent indexing, and cybersecurity tools. The overall mean of 2.93, with a standard deviation of 0.92, reflects a general trend of significant AI integration in libraries across tertiary institutions in Imo State. The low standard deviation suggests a strong consensus among respondents on the widespread and effective use of AI technologies in delivering library services.

The use of artificial intelligence (AI) in library operations has seen a significant surge in recent years, although the degree of adoption varies among different institutions and regions. Libraries are leveraging AI technologies to enhance the efficiency, accuracy, and quality of their information services. As highlighted by Cox et al. (2019), numerous academic and research libraries are gradually integrating AI tools into their everyday tasks to elevate user experiences and streamline resource management. In the realm of information retrieval and discovery services, librarians are heavily utilizing AI technologies through advanced search engines, recommender systems, and semantic indexing. These innovative tools enable quicker and more precise access to information resources, leading to higher levels of user satisfaction (Asemi & Asemi, 2018).

AI applications extend to cataloguing and classification as well, where machine learning algorithms and metadata automation tools empower librarians to organize information resources more effectively. This not only lessens the manual workload but also ensures greater consistency in bibliographic records (Yu et al., 2023). In reference and user support, AI-powered chatbots and virtual assistants have become invaluable, offering users around-the-clock assistance. These technologies address frequently asked questions, guide users during their information searches, and enhance overall service accessibility (Khan & Bhatti, 2021). Additionally, AI plays a role in collection development and management. Tools like predictive analytics and data mining help librarians pinpoint users' information needs, assess resource usage trends, and make well-informed decisions regarding new acquisitions and subscriptions (Cox et al., 2019).

However, despite these advances, many developing countries, including Nigeria, still experience moderate levels of AI utilization. Challenges such as inadequate infrastructure, limited funding, insufficient technical expertise, and a lack of training opportunities hinder progress. As a result, many librarians continue to depend on traditional methods for library operations (Asemi & Asemi, 2018). Moreover, AI technologies are increasingly finding applications in digital preservation, plagiarism detection, research support services, and institutional repositories. The successful implementation of these technologies largely hinges on librarians' digital skills and the readiness of their institutions (Yu et al., 2023).

Table 3: Extent to Which Librarians Utilize AI Technologies in Library Operations

	Extent of Utilization of AI Technologies in Library Operations	Mean	SD	Decision
1	Use of AI-powered search and discovery tools for information retrieval	3.06	0.91	High Extent
2	Utilization of virtual reference services and chatbots to assist users	3.03	0.87	High Extent

	Extent of Utilization of AI Technologies in Library Operations	Mean	SD	Decision
3	Application of automated cataloguing and metadata generation tools	2.97	0.90	High Extent
4	Use of AI-based recommender systems for personalized information services	2.89	0.91	High Extent
5	Utilization of AI-driven plagiarism detection and content analysis tools	3.01	0.94	High Extent
6	Application of machine learning technologies in information organization	2.78	0.95	High Extent
7	Use of data analytics tools for decision-making and user behavior analysis	2.90	0.92	High Extent
8	Utilization of AI-assisted digital preservation and archiving systems	2.85	0.92	High Extent
9	Use of intelligent indexing and classification systems	2.92	0.93	High Extent
10	Utilization of AI technologies for cybersecurity and data protection	2.90	0.91	High Extent

Challenges Associated with Managing AI-Driven Library Services

Table 4 summarizes the multiple responses from 175 librarians regarding challenges in managing AI-driven library services. The most commonly cited issue was an unreliable power supply, reported by 170 respondents (97.1%) as a significant obstacle. This was closely followed by insufficient funding for AI and digital infrastructure (94.9%), poor internet connectivity (93.7%), lack of adequate ICT infrastructure (92.6%), and the high costs associated with acquiring and maintaining AI technologies (91.4%). Additional major concerns included limited government support and weak policy implementation (90.9%), as well as a shortage of digital and AI skills among library staff (90.3%). Other notable challenges mentioned were the absence of regular training opportunities (89.1%), a shortage of technical support staff (88.0%), risks related to data privacy and cybersecurity (86.9%), low awareness of AI applications (85.1%), lack of institutional policies on AI adoption (84.6%), difficulties in integrating AI systems with current platforms (84.0%), staff resistance to technological change (82.9%), and ethical concerns about AI use (81.1%). Overall, the results highlight that shortcomings in infrastructure, financial limitations, skill gaps, and inadequate policy frameworks are key barriers to successfully implementing and managing AI-based library services in tertiary institutions across Imo State, Nigeria.Implementing AI-powered services in libraries offers substantial benefits, including greater efficiency, improved personalization, and enhanced access to information. Yet, it also brings a variety of challenges that impact how these systems are deployed, maintained, and used effectively. These obstacles span technological, financial, human resource, ethical, and policy-related areas, and are especially pronounced in library settings with limited resources (Cox et al., 2019). The research highlights that librarians and library personnel face a range of practical challenges in managing AI-based services,

rooted in their everyday use of these technologies within library functions. A lack of technical proficiency—especially among staff who have not received sufficient training—leads to difficulties in setting up, using, and resolving issues with AI-driven systems such as automated cataloguing tools, chatbots, and digital reference services (Cox et al., 2019). Financial limitations further hinder the ability of libraries to acquire, maintain, and update AI software and the necessary technological infrastructure, restricting how broadly these tools can be adopted (Asemi & Asemi, 2018). In many regions, particularly in developing countries, unreliable internet connections and inconsistent electricity supply interfere with access to cloud-hosted AI platforms, slowing down service delivery and undermining system reliability (Okunlaya et al., 2022). Staff also expressed concerns about data privacy and security, especially regarding the risks to user confidentiality when AI systems collect and analyze personal information, raising ethical questions about data handling (Cox et al., 2019). Additionally, the lack of formal institutional policies leaves key issues—such as accountability, ethical standards, and responsible AI deployment—unclear and inconsistently managed (IFLA, 2020). Together, these findings emphasize the importance of long-term investments in infrastructure, ongoing professional development, and the establishment of clear policy guidelines to support the responsible and effective integration of AI in academic libraries. One major barrier is insufficient technological infrastructure. AI applications depend on reliable internet, modern hardware, cloud computing capabilities, and strong digital platforms. Many libraries—particularly in less developed regions—face ongoing issues such as unstable power supply, slow internet connections, and obsolete equipment, all of which limit the successful adoption of AI solutions (Asemi & Asemi, 2018). The high cost of acquiring and maintaining AI systems is another significant hurdle. Expenses related to software licensing, system updates, cybersecurity measures, and ongoing technical support often exceed typical library budgets. As a result, many institutions implement AI initiatives only partially or fail to sustain them over time (Khan & Bhatti, 2021).

A shortage of technical skills among library staff further complicates matters. Effectively managing AI tools requires knowledge in areas like data analysis, machine learning principles, system setup, and digital content handling. However, many librarians have not had access to training in these advanced technologies, limiting their ability to make full use of available AI capabilities (Yu et al., 2023). Resistance to change also plays a role in slowing AI adoption. Some library professionals are hesitant to embrace AI due to concerns about job security, lack of familiarity, or discomfort with complex new systems. This reluctance can delay innovation and weaken the overall impact of AI integration (Cox et al., 2019).

Privacy and cybersecurity risks are additional serious concerns. AI-driven services often collect and analyze large amounts of user data to enable personalized experiences, increasing the potential for data breaches, unauthorized access, or misuse of sensitive information. Ensuring strong data protection is therefore essential (IFLA, 2021). Ethical issues, such as algorithmic bias and limited transparency, also pose challenges. If AI systems are trained on incomplete or skewed data, they may generate unfair or inaccurate recommendations, undermining trust and equity in library services unless carefully monitored (Cox et al., 2019). Moreover, the lack of

established policies and standards for AI use in libraries creates uncertainty. Many institutions operate without clear guidelines on data management, copyright compliance, ethical practices, or acceptable use of AI, resulting in inconsistent and sometimes risky implementation approaches (IFLA, 2021). Finally, the fast pace of AI development demands ongoing learning and professional growth. Librarians frequently find it difficult to stay current with new tools and updates due to heavy workloads and limited access to training programs, which threatens the long-term viability of AI initiatives (Yu et al., 2023).

Table 4: Challenges Associated with Managing AI-Driven Library Services

	Challenges Associated with Managing AI-Driven Library Services	Frequency	Percentage
1	Inadequate funding for AI technologies and digital infrastructure	166	94.9
2	Insufficient digital and AI competencies among librarians	158	90.3
3	Inadequate ICT infrastructure and facilities	162	92.6
4	Unstable power supply affecting digital operations	170	97.1
5	Poor internet connectivity and network challenges	164	93.7
6	Lack of regular training and capacity-building programmes	156	89.1
7	High cost of acquiring and maintaining AI technologies	160	91.4
8	Resistance to technological change among library staff	145	82.9
9	Concerns over data privacy and cybersecurity threats	152	86.9
10	Lack of institutional policies and guidelines for AI adoption	148	84.6
11	Inadequate technical support and maintenance personnel	154	88.0
12	Limited awareness of AI applications in library services	149	85.1
13	Difficulty integrating AI systems with existing library platforms	147	84.0
14	Ethical concerns regarding AI usage and decision-making	142	81.1
15	Inadequate government support and policy implementation	159	90.9

Influence of Digital AI Competencies on Library Service Provision

The findings indicate that digital AI competencies significantly improve library service delivery. The most strongly endorsed benefits were greater efficiency in information retrieval and reduced librarian workloads, both cited by 85.7% of respondents, highlighting AI's role in boosting operational effectiveness. A high proportion also noted increased user satisfaction (82.9%) and expanded access to digital materials (80.0%), underscoring improvements in user experience and resource availability. Additionally, many reported that AI supports more effective reference services (77.1%) and enables round-the-clock access (75.4%), reflecting its contribution to extended service hours and faster response times. While somewhat lower, the percentages for improved decision-making (68.6%) and collection development (67.4%) still point to meaningful, if more modest, impacts. Overall, the results demonstrate that librarians' proficiency in AI enhances the quality, efficiency, and overall performance of library services. Digital AI skills play a crucial role in shaping the quality, efficiency, and innovative capacity

of library services. With these competencies, librarians can successfully incorporate artificial intelligence tools into essential operations like searching for information, organizing collections, supporting users, and managing knowledge. As libraries increasingly function as technology-centered information centers, the extent of librarians' AI proficiency directly affects how effectively services meet user needs (Cox et al., 2019).

A key benefit of strong AI capabilities is more efficient information access and service delivery. Librarians skilled in AI can leverage smart search platforms, automated chat systems, and recommendation algorithms to respond to user inquiries more quickly and accurately. This leads to shorter response times and higher levels of user satisfaction (Yu et al., 2023). These competencies also strengthen decision-making in library administration. Expertise in data analysis and machine learning enables staff to examine patterns in user behavior, monitor how resources are used, and anticipate future information demands. Such insights support data-driven strategies for building collections and enhancing services (Khan & Bhatti, 2021). Moreover, digital AI skills facilitate the automation of repetitive tasks such as cataloging, indexing, and creating metadata. Automating these processes decreases manual effort, lowers error rates, and frees up librarians to focus on higher-level activities like assisting researchers and teaching digital literacy (Asemi & Asemi, 2018).

Another significant impact is the improvement of personalized services. Librarians with AI knowledge can implement systems that customize content delivery based on individual preferences and previous interactions, leading to deeper user engagement and more relevant access to information (Cox et al., 2019). Additionally, AI competencies drive innovation and the modernization of library offerings. Professionals with advanced digital expertise are better positioned to adopt new technologies—such as virtual helpers, predictive modeling, and intelligent digital archives—helping transform conventional libraries into smart, responsive environments (IFLA, 2021). Nonetheless, the impact of AI skills can be limited by challenges including insufficient technological infrastructure, lack of training, and reluctance to embrace change, especially in less developed regions. When these barriers are present, the potential advantages of AI may remain underutilized (Yu et al., 2023).

Table 5: Influence of Digital AI Competencies on Library Service Provision

S/N	Influence of Digital AI Competencies on Library Services	Frequency	Percentage
1	Improved information retrieval efficiency	150	85.7
2	Enhanced user satisfaction	145	82.9
3	Faster cataloguing and classification of resources	130	74.3
4	Improved decision-making in library operations	120	68.6
5	Better reference services through AI chatbots/assistants	135	77.1
6	Increased access to digital and online resources	140	80.0
7	Improved accuracy of information services	125	71.4
8	Reduced workload of librarians	150	85.7
9	Improved collection development and resource management	118	67.4

S/N	Influence of Digital AI Competencies on Library Services	Frequency	Percentage
10	Enhanced 24/7 library service availability	132	75.4

Strategies for Enhancing Digital Competencies and AI Skills Among Librarians

The results show a high level of consensus among respondents that ongoing training and capacity development are key to strengthening librarians' digital AI skills. Structured ICT and AI workshops were the most frequently cited approach, mentioned by 91.4% of participants, underscoring their perceived effectiveness. Continuous professional development programs (88.6%) and practical, hands-on training (85.7%) also received strong support, highlighting the value of experiential learning in building AI proficiency. Institutional backing—particularly through dedicated funding (85.7%) and access to up-to-date ICT infrastructure (84.6%)—was seen as vital for enabling successful skill acquisition. Respondents also emphasized the importance of incorporating AI and digital competencies into library science education (82.9%) and partnering with IT experts (80.0%) to address technical skill gaps. Additional avenues such as online learning platforms (78.9%) and participation in conferences and seminars (77.1%) were noted for their role in familiarizing librarians with new technologies. Overall, the findings point to the need for a multifaceted strategy—combining training initiatives, infrastructure investment, institutional support, and curriculum updates—to effectively build librarians' digital and AI capabilities and improve library services.

Developing digital expertise and artificial intelligence (AI) capabilities among librarians is crucial for enhancing library services in today's technology-rich information landscape. To keep pace with evolving tools and platforms, libraries need consistent, well-organized training initiatives that enable staff to confidently apply AI, digital systems, and emerging technologies in their work (Yu et al., 2023). Ongoing professional development—through workshops, seminars, and conferences centered on digital librarianship and AI—offers a practical pathway for skill enhancement. These learning opportunities introduce librarians to innovations like machine learning, chatbots, data analytics, and automated cataloguing, helping them build hands-on proficiency (Cox et al., 2019). Equally important is incorporating AI and digital literacy into university-level library and information science programs. By including applied courses on AI, academic institutions can ensure that new professionals enter the field equipped with the technological skills required in contemporary library settings (Khan & Bhatti, 2021).

In-house training and re-skilling efforts also contribute significantly to workforce readiness. Libraries can conduct internal sessions where staff gain experience with specific AI-powered tools, such as integrated library systems, digital archives, and automated reference services (Asemi & Asemi, 2018). Collaborating with ICT firms and technology specialists further broadens librarians' access to advanced systems. These partnerships facilitate knowledge exchange, mentorship, and direct engagement with cutting-edge AI applications in information management (IFLA, 2021). Establishing digital learning spaces and innovation labs within libraries offers another effective approach. Such environments support experimentation with AI technologies, encourage knowledge sharing, and foster the development of tailored solutions to operational challenges, reinforcing learning through practice (Yu et al., 2023). Promoting self-guided learning via online courses, webinars, and certification programs also

helps librarians stay informed about global advancements in AI and digital tools. This supports a culture of continuous learning and professional adaptability (Cox et al., 2019). Lastly, sustained progress depends on institutional backing and adequate funding. Support from library leadership and government bodies—including investments in training, infrastructure, and staff incentives—is essential to maintain momentum in building and updating digital competencies (Khan & Bhatti, 2021).

Strategies for Enhancing Digital Competencies and AI Skills Among Librari

Strategies for Enhancing Digital AI Competencies	Frequency	Percentage
Regular ICT and AI training workshops	160	91.4
Continuous professional development (CPD) programs	155	88.6
Hands-on practical training on AI tools	150	85.7
Provision of modern ICT infrastructure in libraries	148	84.6
Collaboration with IT professionals and experts	140	80.0
Attendance at conferences and seminars on AI and librarianship	135	77.1
Integration of AI and digital skills into library science curriculum	145	82.9
Institutional funding for ICT and AI development	150	85.7
Online courses and certifications in AI and data science	138	78.9
Establishment of digital learning/resource centers in libraries	132	75.4

Conclusion

The study found that librarians and library staff demonstrate a moderate to high level of digital literacy and proficiency in artificial intelligence, with an overall average score of 3.21 on a 4-point scale. It also showed that 72.6% of participants regularly use AI-powered services, and 68.4% reported improvements in information access, user assistance, and operational effectiveness due to AI technologies. Despite these positive outcomes, 74.9% of respondents identified significant barriers, including limited technical skills, lack of funding, unreliable internet, weak infrastructure, and the absence of institutional policies to guide AI adoption. These results suggest that effectively incorporating AI into academic libraries demands targeted policy measures at both institutional and national levels. Universities and library administrations should therefore create governance frameworks outlining ethical AI use, data protection, accountability, and implementation standards. Libraries are also encouraged to introduce ongoing training programs focused on digital skills and AI applications to strengthen staff capabilities. At the same time, government bodies and institutional leaders must prioritize upgrading digital infrastructure, ensuring consistent internet access, and establishing long-term funding models to support AI integration. Moreover, professional organizations like the Nigerian Library Association (NLA) and relevant regulatory authorities should develop national guidelines for AI use in libraries, aligning them with global standards such as the IFLA Statement on Libraries and Artificial Intelligence (2020) and UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021). These frameworks would support ethical, transparent, and equitable use of AI, helping libraries maintain their role as key hubs for

information and knowledge sharing. In sum, the study highlights the importance of coordinated policy development, workforce training, and infrastructure investment to fully realize AI's potential in academic libraries and enhance service quality in the digital age.

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