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Leave No one Behind: Empowering Librarians with AI Skills and Competencies in the Libraries of 5IR

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ABSTRACT

This study explores how librarians can be empowered with artificial intelligence (AI) skills and competencies to effectively operate in libraries within the Fifth Industrial Revolution (5IR). The specific objectives were to assess the current level of AI competencies among librarians, identify specific AI skills required for emerging technologies, and explore challenges in acquiring and applying these skills. Adopting a qualitative approach, the study employed a systematic literature review of 30 peer-reviewed articles published between 2020 and 2025 across Google Scholar, Springer, and Emerald databases. Findings reveal that while librarians show basic awareness of AI, significant gaps remain in advanced competencies and practical application. Key challenges include limited institutional support, training opportunities, and ethical concerns. The study concludes that upskilling librarians is vital to ensure equitable, innovative, and inclusive library services. It recommends institutional investments in training, curriculum reforms, and national policies to support inclusive AI literacy in librarianship.

KEYWORDS

AI skills; librarianship; 5IR; digital inclusion; professional development

1. Introduction

The Fifth Industrial Revolution (5IR) is characterized by the convergence of digital, physical, and biological technologies, which herald a new era of innovation and transformation across industries. As society transitions into this era, libraries play a crucial role in bridging the digital divide and ensuring access to information for all. However, to fulfill their mission effectively in the 5IR landscape, librarians are expected to possess the necessary AI skills and competencies. As noted by Eiriemiokhale and Sulyman (2023), libraries have long been regarded as bastions of knowledge and learning, serving as community hubs that provide access to

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information, resources, and services. In the 5IR, libraries are facing unprecedented challenges and opportunities. The rapid advancement of technology, particularly AI, is transforming the way information is generated, accessed, processed, and disseminated to diverse user communities. For this to happen, libraries are required to adapt to these changes in order to survive, remain relevant, and continue to fulfill their role as information providers and educators.

The essence of empowering librarians with AI skills and competencies is crucial for several reasons. Firstly, AI has the potential to enhance library services and improve user experience. By leveraging AI technologies, libraries now streamline their operations, automate routine tasks, and provide personalized services to patrons. Secondly, AI helps librarians manage the vast amounts of data available in the digital age, which makes it easier to organize and retrieve information. Lastly, AI enables librarians to engage with new technologies and stay abreast of emerging trends in information management and services. Given these analyses, the role of librarians in the 5IR is evolving. Traditionally, librarians have been responsible for curating and organizing information. However, in the 5IR, librarians are increasingly being called upon to act as mediators between AI technology and library patrons (Adjei, 2023). They must not only possess the technical skills to harness AI tools but also the critical thinking and problem-solving skills to evaluate and contextualize AI-generated information.

The implications of the 5IR on libraries and information services are profound. This is why Weijia (2022) submits that libraries are expected to adapt to the changing needs and expectations of patrons in the digital age. This requires investing in new technologies, such as AI, and providing training and support to librarians to ensure they are equipped to navigate the complexities of the 5IR landscape (Enakrire & Oladokun, 2024; Masenya & Chisita, 2022; Omame & Alex-Nmecha, 2020). Consequently, failure to do so risks leaving behind marginalized communities who may not have access to the resources and services offered by libraries.

Despite the growing recognition of the importance of empowering librarians with AI skills and competencies in the libraries of the Fifth Industrial Revolution (5IR), there is a noticeable gap in the existing literature. A comprehensive review of academic databases, journals, and publications reveals a scarcity of research specifically focused on this critical intersection of librarianship and emerging technologies. Several studies reveal that while some libraries have begun to incorporate AI into their services, many are still lagging. While there is extensive literature on the role of libraries in the digital age and the impact of AI on various industries, there is a lack of in-depth exploration into the specific skills and competencies required by librarians to effectively utilize AI in 5IR libraries. Existing studies have only covered the awareness, readiness, and application

of AI technologies in libraries but lack evidence or insights into the area of skills and competencies required for utilizing AI in the 5IR libraries. Furthermore, the few studies that do touch upon this topic often focus on the technical aspects of AI implementation in libraries, neglecting the broader implications for librarianship and information services. There is a notable absence of research that examines the dimensions of empowering librarians with AI skills in the context of 5IR libraries. Hence the need for the study to bridge the existing gap in knowledge.

Finally, this gap in the literature is a pointer to the need for further research to address this critical issue. The outcome of this paper would not only contribute to our understanding of the evolving role of librarians in the digital age but also provide valuable insights into the specific skills and competencies required to navigate the complexities of 5IR libraries. In so doing, this study harvests and analyzes relevant literature to fill this identified gap and provide a foundation for future research and practice in empowering librarians with AI skills and competencies in the libraries of 5IR.

1.1. Research objectives

1. To assess the current level of AI skills and competencies among librarians in libraries operating in the context of the Fifth Industrial Revolution (5IR).
2. Identify the specific AI skills and competencies necessary for librarians to utilize emerging technologies in library services
3. To identify the key challenges faced by librarians in acquiring and applying AI skills and competencies in 5IR libraries.

1.2. Research questions

The following research questions served as a tool to refine the study's focus and guide the analysis of findings from the systematic literature review (SLR) conducted by Guyatt et al. (2008). These questions were instrumental in filtering the research results and drawing relevant conclusions from the selected literature. By formulating a general research question and breaking it down into four specific questions (Q1, Q2, and Q3), the study maintained a clear focus on various aspects. Table 1 outlines the proposed research questions for conducting the SLR and their respective purposes.

2. Methodology

2.1. Research approach

The paper employed a qualitative research approach of systematic literature review. Articles published between 2020 and 2025 were considered

Table 1. Research questions and their purpose.

General research question		
How can librarians be empowered with AI skills and competencies to ensure inclusivity and address the challenges posed by the Fifth Industrial Revolution (5IR) in library settings, while ensuring that no one is left behind?	Q1: What is the current level of AI skills and competencies among librarians working in libraries operating within the context of the Fifth Industrial Revolution (5IR)?	To assess and understand the existing proficiency levels of AI skills and competencies among librarians who are operating in libraries within the context of the Fifth Industrial Revolution (5IR).
	Q2: What specific AI skills and competencies are required for librarians to effectively utilize emerging technologies in library services?	To identify and delineate the specific AI skills and competencies that librarians need in order to proficiently utilize emerging technologies within library services.
	Q3: What are the key challenges faced by librarians in acquiring and applying AI skills and competencies in libraries operating within the context of the Fifth Industrial Revolution (5IR)?	To identify and understand the primary obstacles and difficulties encountered by librarians as they strive to acquire and apply AI skills and competencies within libraries operating in the context of the Fifth Industrial Revolution (5IR).

for this exploration. A systematic literature review is a rigorous research approach that involves following a specific review protocol and quality procedures to select relevant studies, extract information, and analyze data to answer specific research questions (Tjebane et al., 2022). This method has been widely used in various fields to explore different topics, including competencies and skills related to librarianship (Ali et al., 2024; Aryanto et al., 2020; Cox & Mazumdar, 2024; Khrushch, 2023; Vera-Rivera et al., 2021).

For this research, the SLR was conducted by searching for literature sources through the journal databases of Google Scholar, Springer, and Emerald. The SLR opened up the possibility of synthesizing the findings on librarian competencies, AI applications in libraries, and strategic perspectives on AI for librarians. This becomes evident that a systematic approach is crucial for understanding and enhancing librarians' skills and competencies in the era of the Fifth Industrial Revolution.

2.2. Keywords and criteria used for research

Having established the research questions, we looked through journal databases selected for this study with the use of series of keywords that helped to gather enough information while keeping the research within the same field (in this case, librarianship). For this research, the series of keywords used to filter the search results in each of the different journal databases selected were the following:

((“Librarians” AND (“AI skills” OR “AI competencies” OR “current AI skills” OR “challenges”) AND (“5IR” OR “fifth industrial revolution”))

Table 2. Article inclusion and exclusion criteria.

Criterion	Criterion description	Inclusion and exclusion status
Language	Articles written in English	Article is included
Year of publication	Articles published in the past five years	Article is included
Field	Articles that are related to librarians' AI competencies	Article is included
	Articles that are related to librarians' current AI skills	Article is included
	Articles that are related to the 5IR	Article is included
Article content	Article does not mention Librarians AI skills	Article is not included
	The article does not mention librarian's AI competences	Article is not included
	Articles that have high similarities across databases	Article is not included
	Article data are inconclusive	Article is not included
Relevance of content	The article talks about current AI skills and competencies for librarians	Article is included
	The article talks about challenges of acquiring or applying AI skills in the 5IR	Article is included

Table 3. Number of articles found in each journal database searched.

Journal database	Number of Articles
Springer	3
Google Scholar	18
Emerald	9
Total	**30**

The keywords facilitated the sorting of literature retrieved from databases and the review of articles relevant to the study subject. However, for a more comprehensive understanding, additional criteria were employed to exclude articles not aligned with the research's objectives. Thus, Table 2 outlines the criteria used to refine the selection process.

After applying these criteria, a series of articles was collected. The 30 research articles were successfully screened and included for the study, as shown in Table 3.

3. Results and discussion

The data collected for this SLR created a better understanding of the objectives of this study. Through a comprehensive analysis of existing studies, this SLR uncovered valuable insights into the current level of AI skills among librarians, the required AI skills and the challenges faced by librarians in acquiring and applying AI skills in the 5IR. To answer each of the research questions, the findings regarding the current level of AI skills and competences among librarians, the specific AI skills and the challenges faced by librarians were organized into different categories. The categorization is found in Table 4.

Table 4 shows how librarians can be empowered with AI skills and competencies to ensure inclusivity and address the challenges posed by the Fifth Industrial Revolution (5IR) in library settings, while ensuring that no one is left behind. As shown in the table. Three categories were

Table 4. Categorization of selected articles.

Research question	Article title	Author(S)	Category
Q1: What is the current level of AI skills and competencies among librarians working in libraries operating within the context of the Fifth Industrial Revolution (5IR)?	Artificial intelligence tools and perspectives of university librarians: an overview	Ali et al. (2020)	Current level of AI skills and competencies among librarians
	Perceptions toward artificial intelligence among academic library employees and alignment with the diffusion of innovations' adopter categories.	Lund et al. (2020)	
	Malaysian research-support librarians' self-directed learning traits: examining demographic differences and their relationship with competencies.	Samah et al. (2021)	
	Top trends in academic libraries: A review of the trends and issues	Research Planning and Review Committee (2022)	
	A study on the knowledge and perception of artificial intelligence.	Subaveerapandiyan et al. (2023)	
	Identifying librarians' readiness to leverage artificial intelligence for sustainable competence development and smart library services: an empirical investigation from universities' librarians	Shahzad et al. (2024)	
	AI Literacy and Zambian Librarians: A Study of Perceptions and Applications	Alam et al. (2024)	
	The use of artificial intelligence in university libraries in Türkiye: Practices, and perspectives of library directors	Çakmak and Eroğlu (2024)	
	A review of artificial intelligence applications in libraries in Southeast Asia: where are we now?	Xu and Loo (2025)	
	Use of artificial intelligence innovations in public academic libraries	Molaudzi and Ngulube (2025)	
	The impact of artificial intelligence on Sri Lanka libraries: an interview with Premila Gamage	Gamage and Tammaro (2025)	
	Exploring the integration of AI in library services: Perspectives and considerations	Patra et al. (2025)	
Q2: What specific AI skills and competencies are required for librarians to effectively utilize emerging technologies in library services?	Artificial intelligence and race: a systematic review	Intahchomphoo and Gundersen (2020)	Required specific AI skills and competencies for librarians
	Digital environment in academic libraries: leveraging on advanced information communication technologies for better service delivery	Ngoaketsi (2021)	
	Artificial intelligence application in university libraries of Pakistan: SWOT analysis and implications	Ali et al. (2024)	
	Leaders, practitioners and scientists' awareness of artificial intelligence in libraries: a pilot study	Harisanty et al. (2024)	
	The level of digital competencies for the provision of smart information service at academic libraries in Jordan	Hamad et al. (2024)	
	Capabilities and apparent implications of artificial intelligence (AI) adoption in Nigerian academic libraries	Akinola,(2023)	
	Metaverse-infused academic libraries: a glimpse into the future.	Amzat and Adewojo (2023)	
	Emerging technologies: leveraging digital literacy for self-sufficiency among library professionals	Diseiye et al. (2023)	
	A study on the knowledge and perception of artificial intelligence.	Subaveerapandiyan et al. (2023)	
	Comparative analysis of AI applications in libraries: a systematic literature review.	Tang and Zhang (2023)	
	Academic librarian competencies and artificial intelligence	Cox (2024)	
	Skilled for the Future: Information Literacy for AI Use by University Students in Africa and the Role of Librarians	Akakpo (2024)	
	Artificial Intelligence Integration in Academic Libraries: Perspectives of LIS Professionals in India	Kalbande et al. (2024)	
	Academic Librarians in Times of AI and AI Literacy: Tasks, Responsibilities, and Leadership	Miltenoff (2024)	
	Use of artificial intelligence innovations in public academic libraries	Molaudzi and Ngulube (2025)	
	The impact of artificial intelligence on Sri Lanka libraries: an interview with Premila Gamage	Gamage and Tammaro (2025)	

(*Continued*)

Table 4. Continued.

Research question	Article title	Author(S)	Category
Q3: What are the key challenges faced by librarians in acquiring and applying AI skills and competencies in libraries operating within the context of the Fifth Industrial Revolution (5IR)?	Artificial intelligence tools and perspectives of university librarians: an overview.	Ali et al. (2020)	Challenges faced by librarians in acquiring AI skills in the 5IR
	Metaverse-infused academic libraries: a glimpse into the future	Amzat and Adewojo (2023)	
	Changing behavior of academic libraries and role of library professionals.	Aslam (2022)	
	Implementing artificial intelligence in library services: a review of current prospects and challenges of developing countries	Barsha and Munshi (2024)	
	Mapping the literature on the application of artificial intelligence in libraries (aail): a scientometric analysis	Borgohain et al. (2024)	
	Listen to librarians: highlighted core competencies for librarianship from the perspectives of working librarians.	Hu et al. (2022)	
	Ethics in human–AI teaming: principles and perspectives.	Pflanzer et al. (2023)	
	A review of artificial intelligence applications in libraries in Southeast Asia: where are we now?	Xu and Loo (2025)	
	The use of artificial intelligence in university libraries in Türkiye: Practices, and perspectives of library directors	Çakmak and Eroğlu (2024)	
	Exploring the integration of AI in library services: Perspectives and considerations	Patra et al. (2025)	

generated. The analysis of each article's content helped to answer the research questions of this study. The analysis and answers to these questions are presented in the following sections of this paper.

3.1. Current level of AI skills and competencies among librarians in libraries operating in the context of the fifth industrial revolution (5IR)

Librarians in the context of the Fifth Industrial Revolution (5IR) are facing a transition where the integration of Artificial Intelligence (AI) skills and competencies is becoming increasingly important. Several studies shed light on the current level of AI skills among librarians and provide insights into their competencies in this evolving landscape. Librarians globally exhibit a growing awareness of AI's potential in enhancing library services. In India, a study by Patra et al. (2025) found that a significant majority of library professionals recognize the benefits of AI tools like ChatGPT in improving customer service (86.67%) and research assistance (58.67%). Similarly, Alam et al. (2024) reported that Zambian librarians possess a solid understanding of AI fundamentals and hold positive attitudes toward its integration into library services. These findings suggest a foundational readiness among librarians to embrace AI technologies. A study by Samah et al. (2021) revealed that Malaysian research-support librarians exhibit competencies at a medium level, indicating a baseline understanding of AI technologies (Samah et al., 2021). Similarly, Ali et al. (2020) highlighted that librarians are aware of AI tools and technologies, suggesting a foundational knowledge of AI within the librarian community (Ali et al., 2020). However, a recent survey indicated that while nearly 80% of research librarians are exploring the use of AI and machine learning, only about 5% are currently leveraging the technology (Research Planning & Review Committee, 2022).

The study by Çakmak and Eroğlu (2024) examined the use of AI in university libraries in Türkiye. The perspectives of 43 university library directors revealed that improvements are needed in budget and technical infrastructure, human resources and training, data management, and ethical use to implement AI applications effectively. Similarly, Molaudzi and Ngulube (2025) found that public academic libraries in South Africa lacked clear strategies for adopting AI innovations, with many librarians possessing excellent computer literacy but lacking specific AI training. This highlights a gap between general digital skills and specialized AI competencies.

In Zambia, Alam et al. (2024) reported a solid understanding of AI fundamentals among librarians and positive attitudes toward AI's potential benefits. However, challenges such as the need for enhanced AI expertise, resistance to change, and budgetary constraints were acknowledged. Gamage and Tammaro (2025) observed that in Sri Lanka, while academic and research

libraries have implemented basic automation, public and school libraries lag significantly behind in digital transformation, with limited exploration of emerging technologies like AI.

Xu and Loo (2025) reviewed AI implementations within library settings across Southeast Asia, finding that most libraries are in the decision and implementation stages of utilizing AI technologies. However, these implementations are not yet comprehensive, with projects still in trial stages. Shahzad et al. (2024) found a significant positive impact of AI adoption on the implementation of smart library services, with behavioral intention motivating librarians to adopt AI tools. This underscores the importance of strategic planning and ethical considerations in AI integration.

Patra et al. (2025) conducted a study focusing on the integration of AI language models like ChatGPT within library contexts. Their findings indicate a high level of optimism among library professionals, with 86.67% acknowledging the enhancement of customer service and 58.67% recognizing improvements in research assistance due to AI tools. However, concerns about privacy (65%) and ethical implications (60%) persist. Despite these concerns, only 8% of participants feared job displacement, and a significant 57% supported the integration of ChatGPT into next-generation library services. This suggests a general openness to AI adoption, albeit tempered by ethical and privacy considerations.

Moreover, Lund et al. (2020) found that there is a growing interest and optimism among librarians toward AI, positioning them as early adopters of AI technologies (Lund et al., 2020). This aligns with the notion that academic libraries are ready to delve deeper into AI applications, potentially warranting further funding for AI initiatives (Lund et al., 2020). Furthermore, the study by Ali et al. (2024) on the application of artificial intelligence in university libraries of Pakistan emphasizes the potential benefits of AI for librarians supporting researchers with systematic reviews. This suggests that librarians can leverage AI tools to enhance their skills and competencies in providing efficient services, aligning with the theme of empowering librarians with AI skills.

While there is recognition of the importance of AI skills among librarians, there is a gap in studies focusing on librarians' soft skills and competencies in the age of AI (Subaveerapandiyan et al., 2023). This indicates a need for more research to understand the holistic skill set required for librarians to navigate the complexities of AI integration in libraries. In light of these findings, it is evident that librarians possess a foundational understanding of AI technologies, but there is room for growth and development in leveraging AI tools to their full potential. Libraries may benefit from targeted training programs and resources to enhance librarians' AI competencies and ensure they are well-equipped to navigate the challenges and opportunities presented by the 5IR.

3.2. Specific AI skills and competencies necessary for librarians to utilize emerging technologies in library services

Librarians today are increasingly required to possess specific AI skills and competencies to effectively utilize emerging technologies in library services. Several studies highlight the importance of librarians acquiring AI skills to enhance library operations and user experiences. The integration of AI in libraries presents opportunities for personalized learning experiences, efficient resource management, and global collaboration (Ali et al., 2024; Amzat & Adewojo, 2023).

Despite positive attitudes, there exists a variability in AI competencies among librarians. In South Africa, Molaudzi and Ngulube (2025) observed that while librarians demonstrate excellent computer literacy, many lack specific training in AI applications. This gap highlights the need for targeted professional development programs to enhance AI competencies. In Sri Lanka, Gamage and Tammaro (2025) noted that the adoption of AI technologies is uneven, with academic and research libraries implementing basic automation, whereas public and school libraries lag significantly behind in digital transformation efforts.

In the context of empowering librarians with AI skills and competencies in the libraries of the Fifth Industrial Revolution (5IR), systematic literature reviews have been conducted to analyze the current status of research related to librarians' competencies and skills. For instance, Aryanto et al. (2020) focused on knowledge management systems related to librarian competencies and skills, while Khrushch (2023) analyzed the competencies of library specialists and their influence on the formation of innovative media space. These studies highlight the importance of understanding the competencies required for librarians to adapt to technological advancements like AI in library settings.

Additionally, the work by Cox and Mazumdar (2024) provides a conceptual exploration of artificial intelligence for librarians from a strategic perspective, which can be valuable in understanding how AI may impact librarianship as a profession. Moreover, the study by Vera-Rivera et al. (2021) on defining and measuring microservice granularity through a literature overview showcases the importance of research trends and gaps identification, which can be relevant when exploring AI competencies for librarians in the 5IR libraries.

Librarians need to be proficient in AI to guide users in utilizing library resources effectively (Intahchomphoo & Gundersen, 2020). AI technologies have the potential to enhance core library services such as acquisitions, cataloging, classification, information retrieval, and library systems (Harisanty et al., 2024). Librarians are encouraged to continuously learn and develop in-demand skills to function in the digital environment of

academic libraries and provide efficient information services (Subaveerapandiyan et al., 2023). Additionally, librarians working on AI projects should be skilled in validating dataset quality and locating datasets for AI research teams (Diseiye et al., 2023).

Digital literacy forms the foundational layer of AI readiness among librarians. According to Hamad et al. (2024), a positive correlation exists between librarians' digital competencies and the level of smart information services provided by academic libraries in Jordan. This relationship suggests that librarians with advanced digital skills are more likely to implement and support AI-driven services effectively. These digital competencies include proficiency in data management, familiarity with digital platforms, and basic programming or system troubleshooting skills that are becoming prerequisites in modern library environments. Similarly, Kalbande et al. (2024) emphasize the importance of technical competencies in AI integration. Their findings highlight that librarians must understand data analytics, automation, and machine learning fundamentals to manage AI-powered tools such as chatbots, recommender systems, and semantic search engines. These technical proficiencies go beyond traditional computer literacy and require sustained, targeted training and support from institutions.

The capacity to critically assess and interpret outputs generated by AI tools is becoming increasingly important. As libraries adopt AI to facilitate advanced information retrieval and resource recommendation, Kalbande et al. (2024) identify analytical skills as central to librarians' evolving responsibilities. These include the ability to interpret algorithmic outputs, assess the relevance and bias of AI-generated information, and tailor services to user needs accordingly. Cox (2024) adds that AI will reshape the roles of data specialists and information literacy trainers by embedding analytical decision-making within everyday operations. Library staff will need to work alongside AI tools, continuously evaluating their effectiveness and adjusting their use to align with pedagogical and service goals.

Ethical competency is another indispensable skill, especially as AI systems handle increasingly sensitive user data. Kalbande et al. (2024) and Miltenoff (2024) stress the need for librarians to be adept in areas such as data privacy, algorithmic transparency, copyright, and intellectual property rights. As custodians of information, librarians must ensure that AI applications uphold privacy standards and adhere to ethical principles, particularly in data collection, processing, and dissemination. Miltenoff (2024) underscores librarians' potential to lead campus-wide efforts in AI literacy, especially in guiding users and institutional stakeholders through the complex ethical terrain surrounding AI technologies.

Librarians must also possess strong pedagogical skills to educate users on AI usage. Akakpo (2024) advocates for librarians to guide students in developing digital and information literacy competencies that incorporate AI awareness. Librarians should be trained not only in AI technologies but also in methods for effectively communicating their implications to diverse user groups, from undergraduate students to faculty researchers.

As Akakpo (2024) and Miltenoff (2024) argue, librarians are uniquely positioned to deliver AI literacy because of their established roles in teaching information and media literacy. However, their effectiveness hinges on acquiring the metacognitive skills necessary to explain complex AI functions, such as how generative models like ChatGPT retrieve, generate, and prioritize information.

Across all studies, there is a consensus that the development of AI competencies among librarians cannot occur in isolation. Hamad et al. (2024) and Kalbande et al. (2024) highlight infrastructural and institutional barriers, such as insufficient training programs, lack of AI strategies, and limited funding, as impediments to skill development. Without institutional frameworks to support ongoing education, many librarians, especially in developing countries, struggle to transition from traditional roles to those involving advanced technological engagement.

Cox (2024) further observes that AI's impact may be uneven globally, with librarians in the Global South potentially facing greater resource constraints. Thus, equitable access to AI-related training and tools must be prioritized to avoid widening skill gaps across regions

Furthermore, the literature emphasizes that librarians should consider the implications of AI implementation, including technology and facilities, librarian proficiency in AI, and leadership roles in AI initiatives (Tang & Zhang, 2023). Librarians are seen as information navigators in the digital age and must cultivate digital literacy skills to adapt to emerging technologies. The application of AI in libraries is not only a technological development but also a strategic choice to enhance library services. It is safe to say that librarians must equip themselves with AI skills and competencies in order to leverage emerging technologies effectively in library services. By addressing challenges, providing training, and staying updated on AI advancements, librarians can enhance user experiences, improve operational efficiency, and stay relevant in the evolving digital landscape of libraries.

3.3. Key challenges faced by librarians in acquiring and applying AI skills and competencies in 5IR libraries

Librarians in libraries transitioning to the Fifth Industrial Revolution (5IR) face several key challenges when acquiring and applying AI skills and

competencies. These challenges stem from various factors such as the technical complexity of implementing AI, the need for significant resources, and the requirement for new skills and competencies (Amzat & Adewojo, 2023). However, challenges such as funding, technical skills, and librarian attitudes hinder the full utilization of AI in library services (Ngoaketsi, 2021). To address these challenges, libraries must develop plans, policies, and provide training to librarians with the necessary AI skills (Akinola, 2023)Academic libraries, in particular, are confronted with challenges related to funding and the lack of technological skills necessary for successful AI implementation (Ali et al., 2020). Moreover, the application of AI in libraries, especially in developing countries, presents practical challenges that need to be addressed to ensure successful integration (Barsha & Munshi, 2024).

One significant challenge faced by librarians is the need to develop new competencies to navigate the changing landscape of libraries influenced by AI technologies (Aslam, 2022). Librarians must adapt to evolving sociotechnical challenges and update their core professional competencies to align with the demands of the digital age (Hu et al., 2022). Additionally, the implementation of AI in library services requires practical solutions to overcome challenges specific to developing countries (Barsha & Munshi, 2024).

Institutional support and infrastructure play critical roles in facilitating AI integration. Çakmak and Eroğlu (2024) identified challenges in Turkish university libraries, including inadequate budgets, insufficient technical infrastructure, and a lack of comprehensive training programs, all of which hinder the effective implementation of AI applications. Similarly, Xu and Loo (2025) highlighted that in Southeast Asia, many libraries are in the initial stages of AI adoption, facing obstacles such as resource constraints, maintenance issues, and staff reluctance.

Furthermore, the ethical implications of AI in libraries pose a challenge that librarians must address. The integration of AI into library services also raises ethical and privacy considerations. Patra et al. (2025) reported that a significant proportion of library professionals express concerns about privacy (65%) and ethical implications (60%) associated with AI tools. These concerns underscore the necessity for developing ethical guidelines and frameworks to govern AI usage in libraries. Maintaining the quality of data, ensuring the intelligibility of decisions made by AI systems, and addressing ethical concerns are crucial aspects that librarians need to consider when integrating AI technologies (Borgohain et al., 2024). The reliability and ethical use of AI systems present challenges that require careful consideration and competence in navigating these complex issues (Pflanzer et al., 2023).

4. Conclusion

This study has brought to light the critical need to empower librarians with artificial intelligence (AI) skills and competencies in the evolving trend of the Fifth Industrial Revolution (5IR). As a result, the findings affirm that while there is a growing awareness and foundational understanding of AI among librarians globally, a significant gap still exists in terms of advanced competencies and practical application in library services. Most librarians demonstrate medium-level proficiency, with notable disparities across regions and library types. While academic and research libraries in some countries are actively exploring AI tools, public and school libraries remain under-resourced and underprepared, thereby heightening the risk of exclusion.

Furthermore, the study identified a set of specific AI-related skills that are essential for modern librarianship, including technical competencies in data analytics, machine learning, automation, and ethical AI usage, as well as soft skills such as critical thinking, digital literacy, ethical reasoning, and instructional capabilities. These competencies are no longer optional but fundamental for librarians to remain relevant and effective in guiding users through AI-enabled services and resources.

However, librarians face multifaceted challenges in acquiring and applying these skills. These include inadequate institutional support, insufficient funding, limited training opportunities, resistance to change, and infrastructural deficiencies, particularly pronounced in developing regions. Ethical concerns, such as privacy, data protection, and algorithmic bias, further complicate the integration of AI into library services. The findings also emphasize that without deliberate and inclusive strategies, these gaps could widen, leading to unequal access to library innovation and information services, thereby contradicting the core tenet of "leaving no one behind." In response, the study indicates the need for strategic investments in continuous professional development, institutional AI-readiness frameworks, and cross-sector collaborations to ensure equitable access to AI tools and training. Empowering librarians with relevant AI skills is not only vital for personal and professional growth but also imperative for building resilient, inclusive, and future-ready libraries in the age of 5IR.

5. Recommendations

Based on the findings discussed in this paper, the following recommendations were proposed:

1. Library management should establish structured professional development programs to train librarians in specific AI competencies,

such as data analytics, automation, and ethical AI use. This includes providing access to certified AI courses, workshops, and on-the-job training that align with emerging technological demands in library services.

2. Library schools and training institutions should revise their curricula to incorporate AI-based content, focusing on both technical and ethical competencies. Courses should prepare future librarians to critically evaluate, implement, and teach AI tools in diverse library environments, especially in underserved and underfunded regions.
3. Professional bodies such as the Nigerian Library Association (NLA) and international counterparts should develop guidelines and competency frameworks for AI literacy among librarians. These associations should also facilitate cross-border collaborations, knowledge sharing, and advocacy to ensure equitable access to AI learning resources and tools.
4. The National Universities Commission should create and enforce policies that promote AI readiness in libraries. This includes funding for AI infrastructure, grants for library innovation, and the inclusion of AI literacy as a core component in the training curriculum of library science education.

6. Implications of the study

The findings of this study have significant implications for both policy and practice in the field of librarianship. On a policy level, the study indicates the urgent need for governments, educational authorities, and regulatory bodies to prioritize the development of comprehensive policies that integrate AI literacy and competencies into the strategic vision for library and information services. The current disparities in AI proficiency among librarians, as revealed by the study, highlight a critical policy gap that, if left unaddressed, may perpetuate digital inequalities and hinder libraries from effectively fulfilling their roles in information access, learning, and innovation. Policymakers must recognize librarians as key enablers of digital transformation and ensure that national education and digital strategies explicitly include provisions for librarian training, infrastructure support, and continuous professional development in AI-related areas.

From a practical standpoint, the study's findings emphasize the necessity for library institutions and their leadership to adopt deliberate and inclusive approaches to capacity building. The limited but growing AI awareness among librarians, combined with gaps in technical expertise and ethical understanding, points to a pressing need for the reconfiguration of staff development programs. Library management must embed AI competencies into routine professional training and create supportive environments that

encourage experimentation with and application of AI tools. Furthermore, the study reveals that without institutional frameworks that promote AI integration, such as adequate funding, supportive policies, and collaborative initiatives, many libraries, especially in developing contexts, may fall behind in delivering innovative and equitable services.

Additionally, the study's findings have implications for the design and delivery of library and information science (LIS) education. Training institutions must proactively revise their curricula to reflect the evolving technological landscape, ensuring that graduates are not only digitally literate but also AI-competent. This includes fostering metacognitive, ethical, and technical skills required to navigate AI-driven environments. The study also suggests that LIS educators and professional bodies must collaborate to develop standardized AI competency frameworks that can guide curriculum development, inform practice, and support lifelong learning among library professionals. Ultimately, the study affirms that empowering librarians with AI skills is essential not only for enhancing library services but also for ensuring inclusivity and equity in the digital transformation journey. Without clear policies and practical interventions, the promise of the 5IR in library settings may remain unrealized, leaving both practitioners and the communities they serve at a disadvantage.

7. Limitations of the study

While this study provides significant contributions to the empowerment of librarians with AI skills and competencies in the context of the Fifth Industrial Revolution (5IR), it is not without limitations. First, the study is based solely on a systematic literature review, which inherently depends on the availability, scope, and quality of existing published research. As such, the findings are limited to the interpretations and perspectives presented in the selected articles and may not fully capture the real-time experiences or evolving practices of librarians in various regions, particularly in underrepresented or developing countries. Second, the srudy focused on articles published between 2020 and 2025, which may have excluded earlier foundational studies or the most recent publications not yet indexed in the databases used (Google Scholar, Springer, and Emerald). Third, the study did not include empirical data from primary sources such as surveys, interviews, or focus group discussions with librarians, which could have provided deeper contextual understanding and more nuanced insights into the practical realities faced by practitioners. Additionally, there may have been language bias, as only English-language publications were considered, potentially excluding relevant research published in other languages. These limitations suggest that while the study offers a comprehensive overview of existing literature, further empirical research is needed to validate and expand upon its findings.

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