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Exploring the AI Literacy Proficiency of College Librarians in Pakistan: A Quantitative Study

Fozia Bano

Librarian, Federal Urdu University of Arts, Sciences, & Technology, Karachi

Dr. Naweed e Sehar

Asst. Professor, Department of Library & Information Science, University of Karachi

Kamaluddeen Isa El-Kalash

Systems Librarian, Federal University of Education Kontagora, Niger State- Nigeria

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Abstract

College libraries are undergoing professional transformation caused by Artificial Intelligence which also affects everyday life through disruptive changes. College librarians need to comprehend AI principles along with its applications and ethical considerations because AI has become fundamental to operational library systems. Research demonstrates a shortage of information regarding college librarian generative AI abilities and their experience with AI technologies alongside their required training for AI understanding. The existing knowledge gap regarding AI literacy in College Librarians working within Sindh Province, Pakistan is studied through this assessment. A quantitative survey design used Google Forms to gather data through questionnaires from 198 college librarians employed in Sindh Province in Pakistan. A survey examined the librarian's extend of AI knowledge together with their practical knowledge of tools and determined their current training needs alongside their opinions about AI's ethical issues. The results received analysis through descriptive statistics. The research findings show college library professionals in Sindh understand AI basics well but do not possess at-level technical skills to fully utilize AI tools for library service delivery. According to the research conclusions the authors present recommendations for extensive training and education programs focused on AI to help librarians learn essential capabilities necessary for operational integration of AI technology and service quality enhancement.

Keywords: Artificial Intelligence, Literacy, College Librarians, Pakistan.

Introduction

Artificial Intelligence (AI) has greatly and rapidly been transforming the field of Information and Communication Technologies (ICTs), reshaping professional practices across diverse sectors. The profound impact of many AI tools on our daily interactions has made a foundational understanding of AI concepts and applications, including their implications and ethical considerations, increasingly essential for professionals across various fields. In libraries, AI is revolutionizing operations, management, and information dissemination, as noted by Cox and Tzoc (2023), positioning it as a vital area of proficiency for library professionals.

Within this evolving landscape, college librarians—being key facilitators of information access and literacy—face new expectations regarding AI literacy. Said differently, as AI applications gain traction in library functions, college librarians must navigate the complexities of generative AI, its potential to optimize library operations, and the ethical issues it introduces. However, despite the growing significance of AI literacy and its application, limited research exists on college librarians' proficiency in AI, their familiarity with AI technologies relevant to library services, and their training needs to effectively integrate AI into their work. Hence, this study seeks to address this knowledge gap by assessing the AI literacy levels of college librarians in Pakistan. Through an examination of their knowledge, practical experience, and perceived training needs, this research aims to provide insights into librarians' readiness to engage with AI technologies and the support necessary to enhance their AI competencies.

Literature Review

Machine and computer systems apply artificial intelligence (AI) to reproduce human learning capabilities as well as

reasoning functions and problem-solving skills. Recent literature attributes the invention of the AI terminology to McCarthy (1955) when he started exploring computer systems that would simulate human capabilities. UNESCO (2022) defines AI through its simulated capabilities of human intelligence, including perception, learning, and creative work processes. JISC (2022) explains that AI functions as "theories and techniques developed to enable computer systems to execute activities that need human intelligence to perform them." The synthesis of these descriptions shows that AI exists as a diverse scientific discipline that focuses on granting computing systems human-like processing methods.

The understanding of AI has emerged as a new doctrine that academic fields define differently. Chandra et al. (2024) define AI literacy as the ability to understand AI systems and their processes together with the competence to evaluate output results while handling ethical problems. AI literacy stands within the domain of digital literacy, as Lo (2024) explains, involving mastering AI tools alongside the assessment of social consequences. Webber, Pinski, and Baum (2023) explain that AI literacy requires social and technical capabilities needed to operate between humans and AI systems; however, Laupichler et al. (2023) define AI literacy through fundamental AI understanding without programming expertise.

Academic libraries need AI-literate staff at this moment, as higher education institutions rapidly adopt artificial intelligence technology due to the digital disruption caused by the pandemic (Lo, 2024). Anderson and Rainie (2017), along with Bundy (2017), demonstrate that digital-era workers need AI literacy to address management problems while taking part in AI governance processes.

AI in Libraries

The theoretical concepts for AI integration in libraries extend over a long period, although practical uses emerged recently. Academic research covering Artificial Intelligence began fifty years ago, yet actual usage in libraries continues to be scarce, according to Lund et al. (2020). Academic institutions must teach their members about AI because it creates necessary groundwork to successfully integrate this technology into their service delivery model (Alam et al., 2024). Nigerian academic librarians, according to Abayomi et al. (2024), understand AI functions yet worry about eventual job loss, so AI literacy programs would help mitigate these anxieties. According to Lo (2024), U.S. workers and librarians exhibit a moderate understanding of AI yet have restricted practical AI exposure and demonstrate major deficiencies in ethical handling of AI systems. Alam et al. (2024) documented identical observations among Zambian librarians despite their fundamental knowledge of AI, as they experienced hindrances in library applications of AI.

Adetayo (2023) explains how AI-based chatbots boost academic libraries by helping users but face problems with inaccurate outputs and concerns about job replacement. Andersdotter (2023) conducted a self-efficacy test with Swedish librarians about their AI literacy, which demonstrated better AI understanding as well as optimistic views about accessibility improvements but also highlighted their media-related uncertainty.

A research study by Asim et al. (2023) analyzed how Google Assistant and RFID systems help Pakistani university libraries improve their operational efficiency. Ajani et al. (2022) focused on Nigerian librarians' understanding and willingness to use AI but revealed problems with electricity supplies, budget constraints, and insufficient training. This

research provides evidence about fundamental financial constraints that affect developing nation librarians across infrastructure systems.

AI Literacy and Training Needs

Librarians need a complete understanding of AI because they serve as the main professional guides for both information control and user assistance. According to Lo (2024), librarians require thorough training coupled with moral protocols that will enable them to use AI successfully. Alam et al. (2024) reveal that Zambian librarians have an optimistic perspective even though they lack AI literacy competence. Swedish librarians developed improved AI literacy skills by participating in group-based training on AI applications, according to Andersdotter (2023). Libraries must build collaboration networks between computer science departments and launch AI research facilities since AI tools, including big data analysis and natural language processing, are expanding (Ali et al., 2020).

Global and Regional Perspectives on AI in Libraries

Research into AI technologies in libraries demonstrates that librarians across the globe have different degrees of preparedness and self-assurance when utilizing artificial intelligence in their services. The benefits of AI remain in sight for Nigerian librarians, while their ability to adopt AI is hindered by limited infrastructure, according to Ajani et al. (2022). Farag et al. (2021) found that Saudi Arabian library staff demonstrated a lack of AI understanding even though they perceived its value. Weijia (2022) established that library AI readiness depends on effective leadership competency alongside experience since institutions should support both AI exploration and employee training programs.

This research reveals that North American librarians have favorable opinions about AI while simultaneously

requesting additional training opportunities, according to Yoon et al. (2022). Echedom and Okuonghae (2021) evaluated the benefits and obstacles facing African university libraries when implementing AI, explaining that inadequate infrastructure and insufficient training were major barriers. The researchers identify the need for government agencies and institutional bodies to establish partnerships for overcoming these obstacles.

AI Applications and the Future of Libraries

Modern developments in artificial intelligence technology will create new possibilities for improving library service functions. Subaveerapandiyan (2023) emphasized how AI delivers benefits for optimizing information retrieval and enhancing both automated nominal tasks and personalized user interactions in libraries. AI technology provides user care through efficient chatbots and intelligent systems that aid in inventory reorganization and recommendation systems. Based on Wood and Evans (2018), several researchers claim that AI technology, including IBM Watson, will alter how users discover resources and request help in libraries. This transformation requires strong training efforts together with a complete comprehension of AI capabilities.

Literature sources indicate that librarians must develop AI literacy skills to successfully integrate AI technology into their operations. AI's effective deployment requires proper training and institutional backing alongside ethical policies to manage its capabilities and minimize associated risks. Libraries need to provide their personnel with both essential skills and comprehensive knowledge to meet the needs of this changing technological environment, which is becoming more widely available.

Objectives

1. To assess the level of AI literacy among College

Librarians in Sindh province.

2. To examine the perceptions of College Librarians on Generative AI and its potential impact on library operations in Sindh province
3. To identify the knowledge gaps and determine the training needs of College Librarians for professional development in Sindh province.

Methodology

This study employed a quantitative, descriptive survey design to examine AI literacy skills among College Librarians in Sindh, Pakistan. The survey method was chosen to gather data on the self-perceived AI literacy, practical skills, training needs, and ethical viewpoints of College Librarians in the region. Two hundred and twenty six (226) College Librarians in Sindh were targeted, as identified through records provided by the College Librarians Association. From the total population of 198, 87 of them are females and 101 are males who completed the questionnaire, resulting in a response rate of approximately 74.4%. Data was collected using an online questionnaire distributed via Google Forms. The link to the survey was shared on WhatsApp groups specifically organized for College Librarians, as well as through direct contacts within professional colleagues. Respondents were given detailed instructions on completing the survey and were encouraged to participate voluntarily. The questionnaire that was used for the study was adapted from that of Lo (2024), tailoring it to fit the specific context of College Librarians in Sindh. The questionnaire included Likert-type scale items, along with a mix of open-ended, close-ended, and multiple-choice questions to capture a comprehensive range of responses. The questionnaire consisted of the four sections below:

- a. AI Knowledge and Understanding: Assessed librarians' awareness and conceptual understanding of artificial

intelligence.

- b. Practical Skills and Experience: Focused on librarians' hands-on experience with AI applications and tools relevant to library operations.
- c. Training Needs and Skill Gaps: Identified areas where librarians felt they required further training to enhance their AI literacy, and
- d. Ethical Perspectives on AI: Explored librarians' viewpoints on the ethical challenges posed by AI in libraries.

However, data were analyzed using descriptive statistics.

Research Questions

1. What is the Overall Level of AI Literacy among academic library staff?
2. What gaps exist in their AI literacy and how can these gaps be addressed through professional developments and training?
3. What is their perception of generative AI tools and what implication do they foresee for the library profession?

Figures and Tables

The respondents perceived their level of understanding of AI concepts & principles as moderate (42.4%). However, a significant portion (36.4%) of librarians considered themselves to have a low level of understanding, revealing an area for potential improvement. Similarly respondents rated their understanding of generative AI: 41 % indicated moderate level of knowledge, while 31.31 % indicated extremely knowledgeable. This suggests that while librarians are moderately knowledgeable, there is considerable scope for growth in their knowledge and implementation of AI in college libraries.

Table 1: Level of Understanding of AI Concepts & Principles

	Number of Respondents	Percentage of Respondents
High understanding	17	8.6%
Low understanding	72	36.4%
Moderate understanding	84	42.42%
Very high understanding	9	4.5 %
Very low understanding	16	8.08%
Total	198	100.0

Table 2: Understanding of Generative AI

	Number of Respondents	Percentage of Respondents
Extremely knowledgeable	25	12.62%
Moderately knowledgeable	81	41%
Not at all knowledgeable	14	7.07%
Slightly knowledgeable	62	31.31%
Very low knowledgeable	16	8%
Total	198	100%

Librarians utilize AI tools for multiple purposes, such as cataloging (37.37%), research assistance (32.3%), content creation (17.2%), and data analysis (13.13%) as indicated by proportions in table 3. They expressed a moderate level of trust, with 74 respondents (37.4%) in generative AI tools as

shown in table 4.

Table 3: Purpose of Use of AI

	Number of Respondents	Percentage of Respondents
Content creation (e.g., blog posts, social media updates)	34	17.2%
Research assistance (e.g., literature reviews, data synthesis)	64	32.3%
Data analysis or visualization	26	13.13%
Cataloging or metadata generation	74	37.37%
Total	198	100%

Table 4: Trustworthiness of Generative AI tools

	Number of Respondents	Percentage of Respondents
Extremely trustworthy	22	11.1%
Moderately trustworthy	74	37.4%
Not at all trustworthy	19	9.6%
Slightly trustworthy	47	23.7%
Very trustworthy	36	18.2%
Total	198	100%

In examining the challenges (table 5) in implementation of AI in colleges' libraries, librarians expressed their slight concern on staff resistance (55%), job displacement (38%): moderate concern on data privacy and security (40%), technical expertise (34%). While they were very concerned on obtaining adequate funding (31%), ethical dimensions (49%), intellectual property (34%), quality and accuracy of AI contents (38%), ensuring accessibility and inclusivity of AI tools (45%).

Table 5: Potential Challenges

Challenges	1	2	3	4	5
Obtaining adequate funding and resources for AI implementation	26 %	18%	14%	31%	11%
Ethical concerns, such as bias and fairness	15%	12%	14%	49%	10%
Intellectual property and copyright issues	12%	23%	11%	34%	20%
Staff resistance	14%	55%	12%	4%	15%
Quality and accuracy of generated content	10%	19%	13%	38%	20%
Ensuring accessibility and inclusivity of AI tools for all users	9%	12%	10%	45%	24 %
Potential job displacement due to automation	15%	38%	20%	7%	20%
Data privacy and security	18%	18%	40%	10%	14%
Technical expertise and resource requirements	19%	17%	34%	7%	23%

1. Not at all concerned 2. Slightly concerned 3. Moderately concerned 4. Very concerned 5. Extremely concerned

Perceived Proficiency and Deficiency in AI Literacy

In examining their confidence level on various aspects of AI, table 6 indicates librarians were not at all confident on identify and resolve problems of AI tools and applications (33%). While, they were slightly confident in engaging in conversation (38%) and collaboration with colleagues about AI integration (33%). However, moderately confident on ethical implication of AI implementation and use (36%) as well as providing guidance to library users regarding AI resources and tools (32%).

Table 6: Confidence Level on Various Aspects of AI

	1	2	3	4	5
Ethical implication of AI implementation and use	15%	19%	36%	30%	-
Engaging in conversations regarding AI integration	10%	38%	32%	20%	-
Collaboration with colleagues on AI-related projects	19%	33%	28%	20%	-
Identify and resolve problems associated with AI tools and applications	33%	24%	17%	26%	-
Providing guidance to library users regarding AI resources and tools	12%	25%	32%	30%	1.0%

1 Not confident. 2. Slightly confident. 3. Moderately confident 4. Very confident. 5. Extremely confident

Training of Generative AI

In examining the training needs of librarians on generative AI, it was identified that only 21% of librarians reported having attended training programs. The nature of these training program included courses, conferences, and panel discussions (see table 7, 8). Librarians perceived their training needs in AI to include familiarity with AI tools and applications in libraries, a basic understanding of AI concepts & terminology, and providing guidance to library users about AI resources (see table 9). Their preferred modes of training are in-person workshops or seminars (30%), conference presentations or panel discussion (29%), online courses or webinars (25%) (see table 10). Training was rated as very important (39%) for librarians (see table 11).

Table 7: Training Program Attended

	Number of Respondents	Percentage of Respondents
No	177	89.39
Yes	21	11
Total	198	100%

Table 8: Nature of Training Attended

	Number of Respondents	Percentage of Respondents
Conference (basic information of AI tools that are helpful in library)	6	6%
Course/Free Course/training	10	10%
Panel discussion on AI for librarian	5	5%
Total	21	100%

Table 9: Perception of Librarians Regarding Areas for Training in AI

	Number of Respondents	Percentage of Respondents
Addressing privacy and data security concerns related to generative AI	16	8%
Advanced understanding of AI concepts and techniques	28	14.1%
Basic understanding of AI concepts and terminology	34	17.2%
Collaborating on AI-related projects	18	9.1%
Ethical considerations of AI in	12	6.1%

libraries		
Familiarity with AI tools and applications in libraries	52	26.3%
Providing guidance to library users about AI resources	38	19.2%
Total	198	100%

Table 10: Type of Training and Professional Development Opportunity

	Number of Respondents	Percentage of Respondents
Conference presentations or panel discussions	44	22.2%
In-person workshops or seminars	65	32.9%
Online courses or webinars	54	27.3%
Peer learning groups or communities of practice	14	7%
Self-paced learning modules	21	10.60%
Total	198	100%

Table 11: Perception on Importance of AI Training

	Number of Respondents	Percentage of Respondents
Extremely important	46	23.2%
Moderately important	23	11.6%
Not at all important	32	16.2%
Slightly important	21	10.60%
Very important	76	38.4%
Total	198	100.0

In examining their perception regarding the implementation of Generative AI in libraries(see table 12), (50%) of respondents reported that Generative AI has the potential to improve library services and that investing in the

implementation of AI tools is very significant, as indicated by 54% of respondents. However, 55% of respondents are not ready at all to adopt generative AI in next few months. They believe that AI tools and application will have a significant impact on academic libraries, with 48% agreeing. Additionally, 46 % of respondents consider it very important to address potential ethical and privacy issues associated with AI tools.

Table 12: Perception Regarding Implementation of Generative AI in Library Services

	1	2	3	4	5
To what extent do you agree or disagree with the statement "I believe that generative AI tools have the potential to enhance library services and operations" 1= Strongly Disagree, 5= Strongly Agree	10%	8%	10%	50%	22%
How significant do you perceive the investment in exploring and implementing generative AI tools for your library? 1= Not at all Significant, 5= Extremely Significant	10%	14%	20%	54%	2%
In your opinion, how ready is your library to adopt generative AI tools and applications in next few months? 1= Not at all Ready, 5= Extremely Ready	55%	24%	12%	6%	3%
To what extent do you think generative AI tools and applications will have a significant impact on academic	4%	7%	23%	48%	18%

libraries in future? 1= No Impact,
5= Complete Impact

How important do you think for your library to confront the possible ethical and privacy issues associated with the use of generative AI tools and applications? 1= Not at all important, 5= Extremely important

5%	16%	23%	46%	11%
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Discussion

This study investigated the current status of AI literacy among college librarians by examining their familiarity, competence, and preferred application of AI tools in college libraries through a comprehensive survey and also identify gaps in their knowledge of AI.

This study found that librarians in public sector colleges of Sindh perceived themselves as moderately AI literate. However, a significant portion demonstrate a low level of understanding of AI concepts & principles. This indicates their level is between moderate and below moderate with strong possibility for growth in knowledge and AI implementation within college libraries.

Librarians have a basic understanding of AI. The reliance on text generation and video generation tools for research assistance, content creation, and cataloging and data analysis indicates a promise for AI integration to library operations. Librarian's moderate level of trust in Generative AI suggest concerns about accuracy, reliability and ethical implications of these tools. Overall, these findings highlighted a need for further AI education and training among librarians to maximize the benefits of AI for library operations.

Librarians demonstrated a moderate confidence in understanding the ethical implications of AI and guiding users on AI resources, but lower confidence in collaboration with colleagues and technical challenges. This gap between awareness of AI's impact and preparedness for implementation indicates a need for sharing their experiences, developing collective strategies, enhancing their technical skills through training and focusing on practical application.

Librarians' low participation in AI training programs indicates a knowledge and skills gap hindering effective AI integration in college libraries. Librarians rated AI training as highly important prioritizing training on AI tools, application, concepts and user guidance on AI resources. Preferred training modes include in-person, conferences and online courses offering multifaceted training approach to skill enhancement.

Librarians expressed their concerns about human centered, technological and resource challenges, including staff resistance, ethical consideration, inclusivity and accessibility, job displacement, technical expertise, data privacy and security, quality and accuracy of AI contents intellectual property and adequate funding in implementation of AI in college libraries. These challenges necessitate careful planning, investment in staff training and commitment to address practical and ethical challenges.

Conclusion

This study explored the AI literacy levels among college librarians in Sindh, Pakistan, revealing moderate knowledge. Concerns about the accuracy, reliability, and ethics of generative AI tools were also noted.

Librarians showed moderate confidence in understanding AI's ethical implications but lacked

confidence in technical collaboration and problem-solving. Low participation in AI training programs highlighted a knowledge gap that hinders effective AI adoption in libraries. The study also identified challenges including staff resistance, ethical issues, and the need for technical expertise and funding.

Addressing these gaps through comprehensive training programs is essential for equipping librarians to effectively integrate AI into library operations, ensuring they can navigate the evolving technological landscape and enhance their professional development

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