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Adoption Intention of Library Practitioners Towards the Integration of Artificial Intelligence in Medical College Libraries of Pakistan

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ABSTRACT

The integration of AI into library systems heralds a sea change in global information management and service delivery. It remains largely unexamined in the context of Pakistan's medical college libraries. This study explores the adoption intention of library practitioners regarding AI integration in the libraries of Pakistani medical and dental colleges. Having taken a quantitative research design, this paper presents data from 148 library professionals working in various public and private medical institutions using an adapted, validated questionnaire. SPSS-27 was used for descriptive and inferential statistical analysis, and overall, it indicated that librarians have shown positive attitudes and readiness toward the adoption of AI. Respondents showed strong agreement on AI being useful for enhancing user experience, operational efficiency, and alignment with the professional role of librarians. A high level of enthusiasm was reflected from mean values ranging from 3.5 to 4.05 for acquiring AI competencies and implementing AI-driven innovation. On the other side, practical issues such as limited opportunities for training, integration challenges, and affordability have been named as the most crucial issues. Findings indicate a proactive yet cautious outlook regarding institutional support, capacity building, and investment in infrastructure to assure successful AI implementation. This paper concludes that for effective, ethical, and sustainable AI integration, strengthening librarians' technical preparedness and policy frameworks will be crucial in Pakistan's medical libraries. It advocates for suitable training targeted at librarians, increased funding, and coordination among libraries, academia, and technology experts for accelerated AI readiness in the health sciences information sector.

Keywords: *Artificial Intelligence, Adoption Intention, Medical Libraries, Librarians, Pakistan, Technological Readiness*

INTRODUCTION

The fourth industrial revolution has a very significant effect on rapid technological transformation and organizational activities are profoundly changing. The advent of AI is disrupting and transforming the entire education and industry landscape (Shahroom & Hussain, 2018; Tella & Ajani, 2022). AI infuses modern society, and it has revolutionized commercial and intelligent automation processes (Gursoy et al., 2019). Because of its exponential nature, business and organizations globally are adopting uses of this technology to harvest the best advantages. AI is usually regarded as essential to future economic development. As per one estimate (Jacques et al., 2018), more than 70 % of organizations are likely to adopt at least one device of AI technology and might create an additional US$13 trillion of economic activity by the year 2030, increasing global GDP by approximately 1.2 % annually. Because of the dynamic nature of this field, there is no universal agreement on any one definition of AI (Elsevier, 2018; NCB, 2018). Artificial intelligence (AI) refers to machines that mimic human reasoning, decision-making, learning and social skills (CILIP, 2021). Holmes et al (2019) assert that AI can be conceptualized as computer programs that carry out tasks

that ordinarily require human intelligence. Towards the end, AI is imagined as "a collection of technology and strategies for computing directed toward the power of computers to make adaptive rational choices in reaction to uncertain environmental contingencies" (Tredinnick, 2017). In short, AI refers to the simulation of human intelligence processes by computers and the emphasis has been on conceptual framework modelling which is used in human problem-solving.

Artificial intelligence (AI) is a revolutionary force across the scientific disciplines outside of computer science, greatly improving efficiency, precision, and decision-making. In medicine, AI aids diagnostics and individualized medicine with sophisticated data analysis and predictive modeling (Topol, 2019). In finance, AI algorithms detect fraud, evaluate risk, and automate trade (Bussmann et al., 2021). Similarly, in education, AI facilitates adaptive learning systems that tailor content to individual student needs (Holmes et al., 2021). Moreover, AI is revolutionizing agriculture by enhancing crop management and predicting crops through machine learning and computer vision (Kamilaris & Prenafeta-Boldú, 2018). These applications demonstrate AI's expansive influence and potential to reshape industries by automating complex tasks and providing data-driven understandings.

Artificial intelligence (AI) is increasingly becoming a critical component in contemporary libraries as it supports information retrieval, automates tasks, and enhances user experiences. AI systems can help with cataloging and the creation of metadata to make library collections more available and well-organized (Kern, 2020). Chatbots and virtual assistants are utilized for offering 24/7 reference services, assisting users with library resources and services without direct human intervention (Anwar et al., 2021). In addition, AI can enable individualized recommendations by users' reading history and search patterns, similar to commercial sites (Singh & Mahajan, 2020). Such innovations make libraries more capable of catering to patrons' changing demands and streamlining resource management, making them dynamic tech-enabled knowledge centers. Artificial intelligence (AI) may assist libraries in updating and expanding their services and in promoting their relevance in the contemporary digital environment. According to ExLibris (nd), libraries have the ability to utilize the practical benefits of artificial intelligence for their own goals, including streamlining workflows, enhancing operational efficiency, and creating new services. Library professionals have traditionally reacted to emerging technological innovations that bring innovations in the librarian profession (Hervieux & Wheatley, 2021). AI has transformed businesses and is now an essential library tool (Cox, 2023; Folorunso & Momoh, 2020). The use of AI technology in libraries could potentially enable library materials to be recreated virtually. This reinvention can help the library expand its search for new ways to meet client needs and support scholarly endeavors by anyone from anywhere. AI is capable of creating unlimited access to a growing range of full-text online materials, making it possible for libraries to provide services beyond the traditional (Okunlaya et al., 2022). Yet, with the emergence of AI, library functions will become increasingly complex, and library professionals in the future may require more sophisticated, critical, innovative, and creative thinking, coupled with emotional engagement (American Library Association, 2019; Huang, 2022).

Since libraries are the backbone of every health care center and institution, it is a need of the day to extend modern and intelligent library facilities to the health care professionals and medical students. One such innovative technology that can transform the library system of health care center and medical colleges is artificial intelligence. This research is a try to analyze the adoption intention related to AI adoption in Pakistan's medical libraries. The outcome of this research will act as a guide map for the decision makers and top brass of the health department in applying this nascent technology in medical institutions of Pakistan in the future.

Scholarship reports uneven but growing positive intention among librarians toward adopting Artificial Intelligence (AI), with the majority acknowledging its probable value in efficiency, discovery, and service innovation, although some concern about skills gaps, funding constraints, infrastructural requirements, and

organizational or ethical issues prevails (Li, 2024). Surveys using diffusion and acceptance models indicate that the perceived usefulness and positive attitudes have high predictive power towards the adoption of AI, with ease of use being a weaker predictor in certain situations (Orubebe, 2024). On the other hand, it is indicated through research that awareness of AI is moderate but levels of direct exposure and preparedness are low, reflecting the necessity for professional development as well as regulation to address this disparity (Lo, 2024). Evidence also indicates that while there exists wide support for the benefits of AI like improved information searching and job automation the implementation of AI is still hindered by major issues such as inadequate administrative backing, exorbitant implementation fees, and possible legal or ethical concerns. Adoption of AI in libraries ultimately depends on librarians' readiness, experience, and access to quality technology resources (Li, 2024). The AI adoption readiness in this industry is also influenced by organizational technological habits, funds, size of the university, as well as data protection and management issues (Jan, 2024).

Medical libraries in Pakistan provide specialized information resources for medical professionals, researchers, and medical students. These libraries contain vast collections of medical literature, such as textbooks, journals, research papers, and multimedia devices. They are very important in serving medical institutions, conducting research, and ensuring evidence-based healthcare practices in the country.

Health science libraries in Pakistan are comprehensive in nature, covering not only medical sciences but also pharmacy, nursing, and allied health sciences. They are important hubs of knowledge sharing that provide healthcare professionals and learners with access to varied research materials. Through the provision of current information, encouraging teamwork, and enhancing ongoing learning, they contribute significantly to improving health sciences education and practice (Haq & Ullah, 2014).

Purpose of the Study

The aim of this study is to examine and analyze the adoption intention of artificial intelligence (AI) in medical libraries in Pakistan. It will evaluate the current level of AI adoption in the libraries and how successful it has been in improving library services, information retrieval, and managing resources. Moreover, the study explores the transformative impact of AI in library operations, user interaction, and other areas of medical research and study. By solving ethical, technological, budgetary, and human resource issues in AI adoption, this research intends to achieve inclusive findings and viable solutions to enable successful AI adoption in medical libraries with a perspective towards enhancing medical knowledge and enhancing healthcare services in Pakistan.

LITERATURE REVIEW

According to Bruce (1994), literature review is an integral part of every research because it offers context and support for the study being done. A literature review needs to be well structured and pertinent to the subject of research, according to Taylor (2025). it must to provide a concise synopsis of the readers' prior knowledge as well as ignorance. It also highlights the argumentative issues and specific questions that need further research.

Obiano et al. (2022) revealed that academic libraries experience certain challenges in adopting AI, such as lack of needed AI tools, inadequate planning etc. Nazir et al. (2023) found that technological challenges like cost, budgets, technology adoption, research and development, cost-benefit analysis, collaborations, bureaucratic structures, and ICT readiness are the issues that were faced by public sector organizations.(Asemi et al., 2020) found that the current information systems have a high potential to be improved by integration with AI technologies.

Identifying research gaps is a crucial preliminary step in undertaking any study, especially within the realm of knowing the status, impact and challenges Artificial Intelligence (AI) in medical libraries. While a

considerable body of research has explored various facets of AI in library settings, such as examining librarian readiness, perception, and awareness of AI, as well as the application of AI tools and the challenges associated with their implementation, there exists a conspicuous dearth of international research specifically focused on AI in medical libraries.

Jan et al. (2024) established that the idea of AI adoption in Pakistani universities' libraries is quite unknown. Pakistan's library and information science community still falls behind in integrating AI, which may jeopardize its competitiveness in the future, even with the initiatives of university administrators and librarians to encourage the adoption of AI. While artificial intelligence has tremendous potential to transform academic libraries, several issues have pulled back its adoption and utilization on a large scale.

In another research, (Jan et al., 2024) interviewed five Pakistani university libraries of today to explore AI services and came to the conclusion that the adoption of AI was slow owing to scarce human resources and financial constraints. The second main factor preventing AI-based technologies from being adopted in university libraries is resistance to change (Hussain, 2023).

There was minimal or no application of AI observed in Kwara State university libraries, Nigeria. The study also found that AI had not been applied by Kwara State, Nigeria, as anticipated in the running of libraries (Moustapha, 2023).

While interest among researchers in the majority of fields and vocations continues to increase regarding the utilization and application of AI, people in the majority of organizations, governments, and societies have extremely different perceptions around using and deploying these technologies (Kelly, 2023) (Massis, 2018).

Ma et al. (2020) (Ma, 2020) reported that Nigerian libraries are poised to adopt AI for improved service delivery processes. Sufficient financial resources were required in adopting AI in university libraries. Sufficient power supply should also be present for maintaining AI in university libraries.

(Balleste, 2002) had posited that the majority of librarians do not show the readiness to adopt AI due to insufficient technical assistance (Massis, 2018) stated that librarians have different views about incorporating AI into university libraries. The librarians feared the use of the AI fearing loss of jobs and their positions and roles. The majority of the librarians are open to implementing AI in library systems and services to facilitate academia (Wood, 2018). The technology factor looks at the external and internal tools, procedures, and practices of the organization. Hardware, software, and networking technologies form the technological infrastructure, which lowers costs and is important in the adoption of existing technology environment (Bhattacherjee & Hikmet, 2008).

The scarcity of comprehensive studies on this topic is particularly evident when considering the global context. Even more concerning is the scarcity of research in this domain within the libraries of Pakistan. The current state of research in Pakistan on Artificial intelligence’s adoption intension of librarians in medical libraries is notably insufficient, representing a substantial gap in knowledge and understanding. This deficiency underscores the need for a concerted effort to address this void through targeted research initiatives that can contribute significantly to both the global discourse on AI in libraries and, more specifically, the unique challenges and opportunities faced by medical libraries in Pakistan. A renewed emphasis on conducting in-depth studies in this area, tailored to the specific context of Pakistan, is imperative to bridge this research gap and advance our comprehension of the potential applications and implications of AI in medical libraries settings.

Based on review of related literature, it is crucial to investigate the current state of AI adoption in the medical libraries of Pakistan, understand the factors influencing the intention to adopt AI technologies, and identify the ethical issues that may arise from such integration. Understanding these aspects is essential for

guiding policymakers, library administrators, and other stakeholders in making informed decisions about the future of AI in medical libraries, ensuring that the integration of AI is both effective and ethically sound. This study seeks to address these critical concerns by exploring the status, adoption intention, and ethical issues associated with AI integration in the medical libraries of Pakistan.

The implementation of AI in library systems encompasses a wide range of areas, such as descriptive cataloging, subject indexing, reference services, technical services, shelf reading, collection development, and information retrieval systems, among others. These applications have advanced beyond natural language processing (NLP) and knowledge-based services (Omame & Alex-Nmecha, 2020). There is significant untapped potential for enhancing existing information systems through the integration of AI technologies. Recent research efforts have primarily concentrated on enhancing the technology related to book gripping, precise localization, and enhancing human-robot interaction in the context of librarian robots (Asemi et al., 2021).

Statement of the Problem

Artificial Intelligence (AI) is revolutionizing library services across the globe by enhancing information retrieval, automation, and delivery of services. Nevertheless, in Pakistan, particularly in medical college libraries, AI integration is limited and unexplored. The libraries play a crucial role in facilitating medical education and research, but most are still dependent on conventional methods that minimize efficiency and innovation.

Despite recognizing AI's potential benefits, many librarians face challenges such as lack of technical skills, inadequate infrastructure, ethical concerns, and insufficient institutional support. Moreover, little is known about the factors that shape librarians' intentions to adopt AI technologies in the Pakistani Medical College library context.

Thus, the purpose of this research is to explore the intention of adopting AI integration in Pakistan's medical college libraries. The study aims to examine the factors influencing librarians' adoption intentions to better understand the potential for AI implementation in these libraries.

Significance of the Study

This research is relevant because it offers insightful information on the willingness and preparedness of medical college libraries in Pakistan to implement Artificial Intelligence technologies. Through an understanding of the determinants of AI adoption, the research will guide library administrators, policy-makers, and learning institutions to formulate effective ways of incorporating AI into library services. The conclusions drawn will help improve information services, resource management, and user satisfaction at medical libraries, thereby enhancing the quality of medical education and research in Pakistan.

Objectives of the Study

The researcher has tried to achieve the following objective:

1. To assess the adoption intention of library practitioners for AI-technologies implementation in Pakistani medical libraries.

Research Question

The researcher has tried to achieve the following research question

1. What is the adoption intention of library practitioners toward the implementation of AI technologies in Pakistani medical libraries?

RESEARCH DESIGN AND METHODOLOGY

A well-structured research design and methodology are crucial components of any academic study, as they provide a systematic plan for collecting, analyzing, and interpreting data to answer research questions effectively. According to (Creswell 2018), research design serves as the blueprint that connects theoretical concepts with empirical data, ensuring internal validity and reliability. The methodology defines the procedures and techniques used to gather information, allowing for replication and verification of results (Kumar, 2019). Furthermore, Saunders, Lewis, and Thornhill (2019) emphasize that a clear methodological framework enhances the credibility and transparency of the research process, helping readers assess the study's rigor and trustworthiness. Properly chosen research designs and methods also ensure that the findings are aligned with the study's objectives, whether exploratory, descriptive, or explanatory (Bell, Bryman, & Harley, 2019). Thus, the integration of sound research design and methodology is essential for producing valid, reliable, and generalizable results that contribute meaningfully to academic knowledge.

This study has employed a quantitative research design since all the other similar research (Moustapha, 2023; Obiano, 2022; Shaheen, 2023) have employed the same. This study has also used a survey-based methodology to conduct the study. Medical librarians of Pakistan working in public and private Medical and Dental Colleges were targeted for data collection.

As per the Pakistan Medical & Dental Council (2024), there are 185 private and public medical colleges in the country. In addition, 148 medical and dental colleges library practitioners have responded and information is gathered from them through an adapted questionnaire. Since the population is controlled, so a census-based method has been employed and information is gathered from the entire population.

Data Collection Tool

An adapted questionnaire was used to obtain data from the respondents of the study (Jan, 2024). After preparing the draft questionnaire, it was sent to a panel of experts for validation. Moreover, a pilot study was conducted to check the reliability of the constructs of the questionnaire. The questionnaire mainly consisted of closed-ended questions with a five-point Likert scale.

The questionnaire then developed in Google form, and the online link was sent to respondents through WhatsApp groups, Email addresses etc. The data collected was analyzed by using Statistical Package for Social Sciences, version 27 (SPSS). In addition to this, the descriptive and inferential statistics were employed to interpret the data and infer conclusions.

Delimitations

This research study focused exclusively on the Medical and Dental Colleges of Pakistan. All the libraries attached to medical training institutes and allied medical training organizations were excluded from the study. The study was also delimited to the construct of adoption intention issues associated with the integration of artificial intelligence in medical college libraries of Pakistan. All other variables such as status, organizational readiness, impact, and challenges were not covered in this study.

RESULTS AND DISCUSSION

The **table 4.8** showed descriptive statistics for librarians' attitude, intentions, and preparedness for the implementation of Artificial Intelligence (AI) in library services. The data reflected a positive attitude with predominantly mean scores between 3.5 and 4.05 on the Likert scale, indicating agreement with the statements. The maximum mean value (4.05) was for the view that the usefulness of AI tools played an

important role in librarians' decisions to implement the technology, reflecting strong recognition of the potential of AI.

Equally, high means were found in responses to items on motivation based on AI's improvement of users' experience (3.95), convergence of AI with librarians' functions (3.97), and enhanced operational effectiveness (3.91), all pointing towards a future-oriented and user-oriented approach. Respondents also exhibited high personal initiative, as evidenced by their expressed desire to acquire the necessary AI competencies (3.87) and train their subordinates (3.89). Trust in AI technology (3.80), management support from libraries (3.87), and belief in intuitive AI interfaces (3.81) also supported adoption intentions.

Yet some practical issues seemed to temper enthusiasm. Lower mean scores were evident in the provision of training opportunities (3.39), ease of integration (3.64), and affordability (3.56), which implied infrastructural and resource issues persisted. Variances and standard deviations revealed some response variability, with the highest variance of 1.32 associated with the ease of integration, which might have been a reflection of varying experiences within institutions.

Overall, the statistics reflected a proactive but guardedly optimistic attitude among librarians, both presenting the promise and the pragmatic challenges of AI implementation in libraries.

Table: Descriptive Statistics on Librarians' Intention to Adopt Artificial Intelligence in Library Services

Statement	**Mean**	**SD**	**Variance**
I intend to get the required skills and competencies for adopting AI in my library.	3.87	0.99	0.99
Librarians are increasingly considering AI adoption to improve library services.	3.85	0.96	0.93
The ease of integrating AI into existing library systems influences librarians' adoption intentions.	3.64	1.14	1.32
I have prepared and educated my subordinates to adopt AI in my library, if the authority implemented the same.	3.89	1.06	1.13
The potential for AI to enhance user experience motivates librarians to explore its use.	3.95	1.09	1.18
Librarians' confidence in AI technology affects their willingness to adopt it.	3.8	1.11	1.25
The perceived usefulness of AI tools influences librarians' adoption decisions.	4.05	1.08	1.16
Support from library management plays a key role in librarians' intention to adopt AI.	3.87	1.09	1.20
Librarians are more likely to adopt AI if they perceive it as a tool that complements their roles.	3.97	1.118	1.25
Training opportunities for AI usage can increase librarians' willingness to adopt the technology.	3.39	1.14	1.3
The adoption of AI technologies will improve the efficiency of library operations.	3.91	1.05	1.10
The AI systems can be seamlessly integrated into the workflows of my library without extensive technical effort.	3.66	1.08	1.16
The user interface of AI tools in libraries is intuitive and easy to understand for both staff and users.	3.81	1.03	1.08

The potential cost associated with implementing AI technologies in my library is affordable.	3.56	1.13	1.28
Exploring the potential benefits of AI technologies for library services is in my top priority.	3.76	1.04	1.09

DISCUSSION AND CONCLUSION

The findings presented in Table 4.8 highlight that librarians generally hold a positive and forward-looking attitude toward the implementation of Artificial Intelligence (AI) in library services. The overall mean scores, ranging from 3.5 to 4.05, suggest that respondents largely agreed with the statements reflecting optimism about AI's potential benefits. The highest mean score (4.05) indicates that librarians strongly recognized the usefulness of AI tools in influencing their decision to adopt the technology. Similarly, their belief in AI's role in enhancing user experience, improving operational efficiency, and aligning with librarians' existing functions underscores a progressive mindset oriented toward innovation and service improvement. Furthermore, the willingness of librarians to acquire AI-related skills and train others reflects an encouraging sense of personal and professional initiative, indicating readiness to adapt to technological changes. However, the relatively lower mean scores related to training opportunities, ease of integration, and affordability point to existing challenges, particularly in institutional support and infrastructure. The noted variability in responses, especially concerning integration issues, suggests differences in institutional capacity and exposure to AI technologies. Overall, the discussion reveals a proactive yet cautious attitude among librarians—while they recognize and value AI's transformative potential, they remain aware of the practical barriers that may hinder its smooth and widespread implementation in library environments.

Suggestions for Future Directions

Based on these findings, several future recommendations can be proposed to strengthen librarians' readiness and capacity for effective AI implementation in library services. First, institutions should invest in structured training and professional development programs to equip librarians with the necessary technical skills and confidence to work with AI tools. Regular workshops, certification courses, and collaboration with technology experts could help bridge the existing knowledge and skill gaps. Second, library administrations and policymakers should allocate sufficient funding to improve the technological infrastructure and ensure the affordability of AI solutions. Establishing partnerships with AI developers or academic institutions could further support cost-effective integration and innovation. Additionally, libraries should develop clear strategies and policies that guide the ethical, sustainable, and user-centered use of AI technologies. Encouraging a culture of experimentation and continuous learning will also be crucial for overcoming resistance and promoting adaptation. Finally, further research should focus on evaluating the long-term impact of AI on library operations and user satisfaction, as well as identifying best practices that can serve as models for other institutions. Together, these measures can foster a more supportive environment for the successful and equitable adoption of AI in libraries.

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