ARTIFICIAL INTELLIGENCE FOR DECISION MAKING BY LIBRARY MANAGERS: A PAKISTANI PERSPECTIVE

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ABSTRACT

This study examines the use of Artificial Intelligence (AI) for decision-making in Pakistani university libraries, highlighting challenges such as limited adoption, infrastructural deficiencies, funding constraints, and lack of expertise. Using a mixed-methods approach, it identifies ethical concerns like data privacy and job displacement while emphasizing AI's potential to enhance efficiency and resource management.Recommendations include targeted training, ethical frameworks, partnerships, and localized research. The study addresses a key gap by offering insights to modernize Pakistani libraries, enabling them to meet academic and user needs through data-driven decision-making.

INTRODUCTION

In 1955, J. McCarthy devised the term"Artificial Intelligence" while drafting a research proposal for the Dartmouth Summer Research Conference. (Pettey, 2018). Since then, no universally accepted definition of AI has emerged. It is often described as the incorporation of human-like intelligence into machines. For example, Tredinnick (2017) defines AI as "a cluster of technology and approaches to computing focused on the ability of computers to make flexible, rational decisions in response to unpredictable environmental conditions." Similarly, Png and Helskyaho (2022) define AI as "systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect."AI holds significant potential to transform various fields, including library management. Omame and Alex-Nmecha (2020) note that AI could revolutionize library operations, such as how items are categorized, organized, and how librarians interact with patrons. As one of the emerging technological trends, AI impacts a wide array of disciplines, including medicine, surgery, automotive, aviation, business, industry, education, and related fields. Technological advancements are enhancing both the technical and user services of libraries (Ali, Naeem, & Bhatti, 2020; Arlitsch & Newell, 2017). By utilizing AI tools effectively, libraries not only modernize their services but also establish a unique role within their institutions. For university libraries to fully benefit from AI, they must adopt and implement relevant tools. According to Ajani, Tella, Salawu, and Abdullahi (2022), the application of AI in university libraries can significantly enhance operational efficiency, especially in reference services. AI can also assist libraries in organizing, storing, and retrieving information, which helps them manage digital holdings more effectively. AI can be implemented in libraries through technologies such as robotics, chatbots, natural language processing, big data analytics, and text data mining. Its impact spans both technical and user services. In technical

services, AI supports the management of metadata, user data, and resource usage through tools like big data and text mining. In user services, AI facilitates advancements in information retrieval and user interaction through chatbots, robotics, pattern recognition, and natural language processing.

The development of artificial intelligence in the last few years has drawn a lot of criticism. For instance, International Business Machines Corporation (IBM CEO) Ginni Rometty claims that artificial intelligence (AI) technologies are "technology to augment human intelligence"(Garcia-Murillo & MacInnes, 2023). Generally speaking, we envision a society in which humans and machines work together to improve humankind and enable it to achieve its greatest potential. However, Bill Gates has stated that artificial intelligence poses a threat to humanity, and Stephen Hawking has stated that "the development of full artificial intelligence could spell the end of the human race"(Cellan-Jones, 2014; Rawlinson, 2015). Prominent academics' contrasting opinions highlight the need for more research on how to reduce AI's harmful effects and how humans can coexist with it. AI lacks a widely agreed-upon definition. It is commonly known as a machine's capacity for experience-based learning, adaptability to novel inputs, and human-like task performance. In the 1950s, artificial intelligence (AI) and AI systems were initially used (Duan, Edwards, & Dwivedi, 2019). AI has since gone through ups and downs, or "AI springs" and "AI winters." As a result, after years of promise and hope, (Davenport & Bean, 2018)AI is starting to make a significant impact in major corporations (Davenport & Bean, 2018). According to reports, businesses are using AI-enabled solutions at a faster rate(Miller, 2018), and AI is revolutionizing the corporate world (Daugherty & Wilson, 2018). The latest generation of AI systems has significantly decreased the cost of creating predictions and enhanced an organization's capacity to use data for forecasting(Agrawal, Gans, & Goldfarb, 2018). AI is ranked as the top strategic technology in Gartner's 2018 technology trend report (Pettey, 2018)Through 2025, the success of digital projects will be determined by the application of AI to improve decision-making in libraries, reimagine business models and ecosystems, and transform the customer experience. businesses. 59% of firms, according to the Gartner poll, are currently gathering data to develop their AI strategy, while the remaining organizations have already advanced in piloting or implementing AI solutions(Pettey, 2018) . Whit Andrews, states that organizations utilizing the new generation of AI systems "will find that AI faces the usual obstacles to progress of any unproven and unfamiliar technology." Yet, enterprise architecture and technology innovation leaders starting pilots and more formal AI efforts can learn a lot from early AI projects(Pettey, 2018). Libraries can find strategic and useful instructions on how to leverage AI from a variety of sources, resources, including white papers, reports, and articles in prestigious periodicals etc. These resources are produced by top technology vendors. Nevertheless, it seems that there aren't many scholarly research articles that take a rigorous, academically grounded approach to analyze how the new generation of AI is used and what its effects are from the standpoint of technological application. Furthermore, despite the abundance of comprehensive publications, a large portion of contemporary academic work appears unaware of the events that occurred between 1970 and 2000. In addition to identifying research opportunities for information systems (IS) researchers, this research position paper seeks to comprehend the difficulties involved in using and evaluating the new generation of AI-based systems for decision making in libraries of Pakistan. Subsequently, the topic of AI for decision making is covered, with a focus on the special challenges pertaining to the integration and interaction of AI methods to supplement or replace human decision makers in Libraries. In order to further the field's understanding of AI's application to decision-making in the Big Data era for libraries in Pakistan, this study also provides conceptual and methodological research suggestions for library and information science scholars. The purpose of this research position paper is to recognize research possibilities for information systems (IS) researchers and to comprehend the difficulties involved in using and evaluating the next generation of AI-based systems for decision making in libraries of Pakistan. This study goes

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over using AI for decision making generally as well as the special problems with integrating and interacting AI techniques to either complement or replace human decision makers in libraries. The article presents different research ideas for library and information science academics to consider in order to further the field's understanding of how AI might be used for decision-making in the Big Data era for libraries. Since even a single sentence can be very interesting, as we will see in a moment, we felt that even the pieces from the second group were worth included in the counts as a measure of the subject's visibility. While other kinds of publications—particularly review papers—may discuss AI approaches, it's frequently unclear whether those other papers describe systems that have already been constructed, are now being produced, or are just hypothetical systems that might exist in the future. The utilization of expert systems facilitates decision-making and increases productivity for library workers in addition to assisting with fundamental library operations(Guliciuc, Montano, Dreve, & Miron, 2017).

The topic of AI for decision making is covered, with a focus on the special challenges pertaining to the integration and interaction of AI methods to supplement or replace human decision makers. In order to further the field's understanding of AI's application to decision-making in the libraries of Pakistan, this study provides few methodological research suggestions for library and information science scholars.

Extensive literature has been published on awareness, perception, tools, applications, readiness and challenges of Artificial Intelligence. But literature is totally quiet on Artificial Intelligence for decision making in libraries of Pakistan.

Literature Review

The literature review serves as a fundamental component of any research endeavor, offering essential direction for situating the study within the framework of existing research. This section seeks to highlight and summarize recent publications pertinent to the topic.

According to Bruce (1994:217-229), literature reviews are an integral part of very research thesis because they offer 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). Second, it ought to provide a succinct synopsis of the readers' prior knowledge as well as ignorance. Thirdly, it ought to highlight the contentious issues and specific questions that need further research. The following are listed as justifications for reviewing the literature by Leedy (1993;87-88): "The review can reveal data sources the researcher is aware of; the review can suggest ways of solving problems the researcher may encounter; the review may help the researcher to know new ideas and new approaches.

The AI tools positively impact both the technical and user services in the academic libraries of Pakistan(Ali, Naeem, & Bhatti, 2020). There was little or no adoption of AI in university libraries in Kwara State, Nigeria. The study also found that Kwara State, Nigeria, has not adopted AI for library services as expected (MOUSTAPHA, 2023). (Taylor, 2022) conducted a study on Bibliometric Study of Artificial Intelligence Use in Academic Libraries. The data was collected and sorted in an Excel workbook to examine. There was a separate Excel sheet for each research question. Libraries readily use AI in many areas including catalog searches, room reservations, and even robots to retrieve books and materials.

Muhammad Tanveer et al(Tanveer, Hassan, & Bhaumik, 2020) found that Artificial Intelligence (AI) has been applied to resources to improve skills giving teachers the time and freedom to provide understanding and adaptability and drive performance. Muhammad Asim et al.(Asim, Arif, Rafiq, & Ahmad, 2023) conducted an empirical study on Investigating applications of Artificial Intelligence in university libraries of Pakistan. This study was completed in two phases. In the first phase, quantitative data was collected from 237 university librarians from across Pakistan. In the second phase, 10 purposefully selected university librarians were interviewed. The results reveal that Pakistani university libraries are using limited AI-based library services including text-to-speech and speech-to-text

technologies, Google Assistant to search by voice command, Radio Frequency Identification (RFID) system for self- checkout, check-in, and security purposes, and intelligent data analysis for collection management. (Subaveerapandiyan, 2023) conducted study on Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library. The research methodology involved utilizing the Scopus database and identifying 66 relevant articles related to AI. The findings of this review indicate that AI can improve information retrieval, automate routine tasks, personalize user interactions, and provide innovative services. AI powered chatbots can effectively handle user inquiries and provide instant assistance, improving overall user satisfaction.

Asefeh et al (Asemi & Asemi, 2018) conducted a taxonomy study Artificial Intelligence (AI) application in Library Systems in Iran. This paper survey applications of AI in library and information science and introduce the potential of library system to apply AI techniques. The results showed that most developed Recommender Systems (RM) in library systems in Iran and Natural Language Processing (NLP) is the most undeveloped criterion. Solomon et al (Solomon Olusegun, Oladokun, Maxwell, & Akor, 2023) The column emphasizes that, academic libraries in Nigeria have not yet adopted and applied AI, in spite of the potential that it holds for libraries.

Andrew et al.(Cox, Pinfield, & Rutter, 2019) identified the impacts of AI on search and resource discovery, on scholarly publishing and on learning. He also revealed the challenges included libraries being left outside the focus of development, ethical concerns, intelligibility of decisions and data quality. Some threat to jobs was perceived.

(Ali et al., 2020) Identified that librarians were aware of AI technologies. Services based on Natural Language Processing (NLP) are used in libraries, e.g. Google Assistant, Voice Searching, and Google Translate. Pattern recognition methods, such as text data mining, are also used to retrieve library material and conduct online searching.

(Gürsen, Öncel, Plaisent, Benslimane, & Bernard) (2023). Found that computers might be able to imitate human behavior and artificial intelligence could analyze texts, make modelling the knowledge to help decision-making, reproduce a standard reasoning and use this information to make decisions and to produce knowledge thanks to machine learning.

Omame et al.(Omame & Alex-Nmecha, 2020) Found that ultimate promise of artificial intelligence in libraries is to develop computer systems or machines that think, behave, and in fact rival human intelligence, and this clearly has major implications on librarianship.

Ali et al. (Ali, Naeem, Bhatti, & Richardson, 2022) Identified that Artificial Intelligence is already slowly being introduced into Pakistani university libraries. While commenting on ways in which AI could help their libraries deliver more innovative services and better meet user needs, respondents expressed concern about the investment required in funding, time, and staff.

(Memela, 2023) Indicated that Artificial Intelligence is the progression of computer systems that are capable of executing tasks that normally require human intelligence, such as decision making, object detection, solving complex problems and so on.

Fatima et al. (2023) examined that AI significantly facilitates the management of hospitals to vigilantly assess employees' productivity and accurately analyze employees' characteristics, such as attitude, emotion and behavior, the study has considered beneficial and harmful perspectives of AI in the workplace.

Obiano et al. (Obiano, Onuoha, Adeoye, Nwosu, & Motunrayo, 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.

Shaheen et al.(Shaheen & Khurshid, 2023). Originated that there was a positive attitude toward AI use in libraries. However, concerns were raised regarding such decisions' privacy and ethical ramifications.

Oseji et al. (Oseji, Adekoya, & Sani)(2023) found that effective integration of artificial intelligence into library and information workflow in developing economies demands formulation of effective policy, due consultations, adequate funding, involvement of expatriates, consistent training and retraining, partnership, consistent awareness, steady power supply and robust ICT facilities.

Asemi et al.(Asemi, Ko, & Nowkarizi, 2020) found that the current information systems have a high potential to be improved by integration with AI technologies.

Gap identification

The study highlights challenges in AI adoption in Pakistani university libraries but lacks a comparative analysis with global trends and detailed exploration of specific AI applications. It also overlooks user perspectives, strategies for sustainable implementation, opportunities for interdisciplinary collaboration, and localized solutions for ethical concerns like data privacy and job displacement. Addressing these gaps could provide more actionable insights for modernizing libraries and enhancing their services through AI.

Identifying research gaps is a crucial preliminary step in undertaking any study, especially within the realm of Artificial Intelligence (AI) for decision-making in 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 for decision-making in libraries.

The paucity of comprehensive studies on this topic is particularly glaring 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 AI for decision-making in 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 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 for decision-making in library settings.

Objectives of the study.
The paper aims to identify the challenges associated with the use and impact of revitalised AI based systems for decision making and offer a set of research propositions for information systems (IS) researchers.

The main theme of this paper is to understand the challenges associated with the use and impact of AI based systems for decision making in university libraries of Pakistan and to identify research opportunities for library and Information Science researchers.

Methodology.
Mixed method research approach
The study was composed of both the methods of data collection i.e Quantitative and Qualitative approaches. A survey approach was used, where a questionnaire was developed to collect data from the librarians. There were three main variables, these variables were further divided into 9 questions. Prior to dispatching questionnaire for data collection, it was thoroughly reviewed and sent to the experts for reviewing and scrutinizing. Second approach was qualitative where data from librarians was collection through was ntal elements and the variables influencing acceptance and use is necessary in order to study a unique phenomenon. AI for decision making in libraries is a new technology that needs to be implemented in an organization with cutting-edge technical infrastructure and skilled labor.

Furthermore, the paucity of available literature—particularly in the Pakistani context—prompted us to use a mixed methodologies approach in order to thoroughly examine the issue under investigation at the national level. A phenomenon

can be examined from several angles and a more comprehensive knowledge can be obtained by integrating qualitative and quantitative methodologies (Creswell & Clark, 2017; Tashakkori & Teddlie, 2010). Therefore, using an explanatory sequential mixed-methods approach (Creswell & Clark, 2011), a structured questionnaire and a semi-structured interview with the chosen experts were used to gather information about the viewpoints of Pakistani university librarians about their stance pertaining to the usage of AI for decision making in libraries of Pakistan.

Population
The population for this study includes university libraries in Pakistan, specifically focusing on library professionals, decision-makers, and stakeholders involved in the adoption and implementation of Artificial Intelligence (AI) technologies. This encompasses university library staff such as librarians, IT professionals, and administrators who are responsible for managing library systems and making decisions about resource allocation, service improvements, and technology integration. Additionally, the study considers the perspectives of academic researchers, policymakers, and higher education institutions that play a role in supporting the technological advancement of libraries in Pakistan. Data collection may involve surveys, interviews, and focus groups with these key groups to gather comprehensive insights into AI adoption in the library context.

Data Collection And Analysis
Data collection for this study involves a mixed-methods approach, combining both qualitative and quantitative techniques to gather comprehensive insights into AI adoption in university libraries in Pakistan. Surveys will be distributed to library professionals, administrators, and decision-makers to collect quantitative data on the extent of AI use, challenges, and benefits. In-depth interviews and focus group discussions will be conducted to gather qualitative data, exploring the ethical concerns, infrastructural issues, and organizational readiness for AI integration. The collected data will be analyzed using statistical methods for the survey results and thematic analysis for the qualitative data to identify patterns, key issues, and recommendations for improving AI adoption in Pakistani university libraries.

Delimitations
The delimitations of this study are focused on university libraries in Pakistan, specifically targeting library professionals, administrators, and decision-makers involved in the adoption and implementation of Artificial Intelligence (AI). The study excludes non-university libraries, public libraries, and other educational institutions that may also use AI but are outside the scope of this research. Additionally, it concentrates on the technological and operational challenges within the university library context, leaving out broader systemic or national-level factors that could influence AI adoption across different sectors. These boundaries are set to ensure a focused examination of AI use in higher education libraries in Pakistan.

Discussion
This study investigates the application and challenges of Artificial Intelligence (AI) for decision- making in Pakistani university libraries, an area previously underexplored. The research highlights a mixed-methods approach that effectively integrates quantitative and qualitative data, offering a nuanced understanding of librarians' perspectives, readiness, and the challenges they face regarding AI integration.
The findings suggest that while AI tools are being employed in some library functions—such as cataloging, resource management, and user services—adoption remains limited. Pakistani university libraries primarily use basic AI technologies like chatbots, text-to-speech, and RFID systems, which is consistent with global trends but lags behind advanced implementations in developed countries. This disparity underscores systemic challenges such as insufficient funding, inadequate infrastructure, and lack of skilled personnel, which hinder the adoption of more sophisticated AI solutions.

Ethical concerns, including data privacy, accountability, and the transparency of AI-driven decisions, also emerged as critical issues, echoing similar concerns raised globally. Additionally, librarians expressed apprehensions about the potential displacement of human expertise, emphasizing the need for AI to augment rather than replace human roles.

From a decision-making perspective, AI's potential to enhance efficiency, improve resource allocation, and provide data-driven insights for policy-making is evident. However, the study emphasizes the importance of equipping libraries with robust technical infrastructure and investing in capacity building to fully leverage AI's capabilities. Furthermore, the lack of context-specific studies on AI in Pakistani libraries points to the need for localized research and policy frameworks that address unique cultural, institutional, and resource-related challenges.

Conclusion

The study concludes that while AI holds significant promise for revolutionizing decision-making in libraries, its implementation in Pakistani university libraries is still at a nascent stage. Addressing barriers such as limited funding, infrastructural inadequacies, and skill deficits is essential to realizing AI's full potential. Equally important is fostering a research-driven approach to AI adoption, ensuring that it aligns with ethical considerations and enhances librarians' roles rather than replacing them.

To advance the application of AI in library decision-making, this study recommends:

Developing comprehensive training programs for librarians to build AI-related skills.

Establishing clear ethical guidelines to address concerns regarding data privacy and algorithmic transparency.

Encouraging partnerships between libraries, academic institutions, and AI developers to create tailored AI solutions.

Conducting further empirical research to explore context-specific applications of AI in libraries, with a particular focus on decision-making processes.

By addressing these challenges and leveraging AI strategically, Pakistani university libraries can transition into modern, data-driven institutions capable of meeting diverse user needs and contributing to the broader academic ecosystem.

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