JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 7 • November 2026

AWARENESS AND PERCEPTIONS OF ARTIFICIAL INTELLIGENCE AND AI POWERED CHAT-BOTS AMONG LIBRARY PROFESSIONALS OF ACADEMIC LIBRARIES IN PAKISTAN

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DOI: https://doi.org/10.5281/zenodo.23972346

Keywords
Artificial Intelligence, AI-Powered Chat-bots, Academic Libraries, Library Professionals, Decision Making, Individual and Organizational Performance, Capacity, Capability.

Article History
Received: 05 August 2026
Accepted: 19 October 2026
Published: 05 November 2026

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Abstract
The integration of Artificial Intelligence (AI), particularly AI-powered chat-bots, is transforming modern academic libraries and influencing the professional practices of library professionals. This study investigates the awareness and perceptions of AI-powered chat-bots among library professionals in academic libraries across Pakistan, focusing on five constructs: Decision Making, Individual and Organizational Performance, Creativity Capacity, and Capability. A quantitative research approach was adopted, and data were collected through Google Forms and social media platforms from library professionals, including library staff members, assistant librarians, deputy librarians, and chief librarians working in twelve universities across Pakistan. A total of 450 questionnaires were distributed, of which 415 responses were received and 400 valid responses were retained for analysis. The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) and Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that AI-powered chat-bots positively influence library professionals' Capability, Capacity, Decision Making, and Individual and Organizational Performance. However, the findings also indicate that AI-powered chat-bots negatively influence creativity. This study contributes to the understanding of AI adoption in Pakistan's academic libraries by highlighting its implications for the four specified constructs. The findings provide valuable insights for academic library administrators and library professionals regarding the integration of AI-powered chat-bots into contemporary library practices.

1- Introduction
Artificial Intelligence (AI) has emerged as a transformative technology in contemporary Library and Information Science, influencing the development, management, and delivery of academic library services. The integration of AI-powered technologies into modern libraries is creating new opportunities for information

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access, knowledge management, and professional activities. Among these technologies, AI-powered chat-bots have gained considerable attention because of their ability to interact with users through natural language, respond to information queries, assist in information retrieval, and provide automated reference assistance. These applications are increasingly relevant to academic libraries, where library professionals are responsible for supporting teaching, learning, research, and scholarly communication. The integration of AI-powered chat-bots into academic library environments represents an important development in the modernization of library services and professional practices. The growing integration of AI into academic libraries has also attracted research attention in Pakistan. Jabeen (2025) examined the readiness of Pakistani academic libraries for adopting AI and related technologies using survey responses from 171 librarians and interviews with 13 chief librarians. The study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) and highlighted the importance of institutional preparedness for AI integration in academic libraries. The findings emphasized the need for appropriate policies, procedures, personnel preparedness, and technological infrastructure to facilitate the adoption of AI technologies. This research provides an important foundation for understanding the development of AI-supported academic libraries in Pakistan and demonstrates the increasing relevance of AI in contemporary Library and Information Science.

Similarly, Hussain and Khan (2025) investigated the acceptance of Artificial Intelligence among academic librarians in Islamabad, Pakistan, using the Technology Acceptance Model. Their study analyzed responses from 212 librarians and demonstrated that AI has considerable potential to influence academic library practices. The findings indicated that librarians increasingly recognize the relevance of AI technologies within their professional environment, while the study also identified the need for greater awareness and understanding of AI applications. This research contributes to the growing Pakistani literature on AI in academic libraries and highlights the importance of examining library professionals' perceptions of emerging AI technologies. Furthermore, Ali et al. (2025) investigated factors influencing the intention of academic librarians in Pakistani universities to use AI tools. Their study surveyed 245 university library professionals and analyzed the collected data using SPSS, confirmatory factor analysis, and structural equation modeling. The findings demonstrated that AI adoption was associated with positive professional and institutional outcomes, including improved library service quality. The researchers also emphasized the importance of developing appropriate AI training programs and institutional guidelines to support the effective integration of AI into academic library practices. Their findings provide further evidence of the growing importance of AI technologies in Pakistan's university libraries and establish a foundation for investigating AI's relationship with professional activities and performance.

Recent research has also examined the practical application of AI-powered chat-bots in Pakistani university libraries. Shahzad et al. (2026) investigated the impact of ChatGPT on reference services among 127 professional librarians working in 79 university libraries in Punjab, Pakistan. The study employed a quantitative research design and statistical analysis through SPSS. The findings revealed that ChatGPT positively contributed to reference services by facilitating efficient responses to users' information needs. However, the study also identified challenges associated with AI implementation, including inaccurate responses, privacy concerns, ethical considerations, and dependence on third-party technologies. This research demonstrates the increasing relevance of AI-powered chat-bots in Pakistani academic libraries and highlights the importance of examining their broader implications for library

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professionals. Although these studies have significantly contributed to understanding AI readiness, acceptance, adoption, and chatbot applications in Pakistani academic libraries, further empirical investigation is required to examine AI-powered chat-bots in relation to Creativity, Decision Making, Capacity, Capability, and Individual and Organizational Performance. These five constructs represent important dimensions for understanding the professional and institutional implications of AI integration in modern libraries. In particular, understanding how AI-powered chat-bots relate to library professionals' Decision Making can provide insights into their contribution to professional decisions and library-related activities. Similarly, examining Capacity and Capability can help explain their relevance to the execution of professional responsibilities, while Individual and Organizational Performance can provide an understanding of their broader contribution to professional and institutional outcomes. Investigating these relationships within Pakistani academic libraries can extend existing research beyond general AI adoption and provide a more comprehensive understanding of AI-supported library practices. In this context, the present study examines the awareness and perceptions of Artificial Intelligence and AI-powered chat-bots among library professionals working in academic libraries across Pakistan. Data were collected from library professionals, including library staff members, assistant librarians, deputy librarians, and chief librarians working in ten universities across Pakistan. A total of 450 questionnaires were distributed through Google Forms and social media platforms, resulting in 415 returned responses, of which 400 were considered valid for analysis. The study employs a quantitative research approach, utilizing SPSS for preliminary statistical analysis and PLS-SEM for examining the proposed relationships. Specifically, the research investigates the relationship of AI-powered chat-bots with Decision Making, Capacity, Capability, and Individual and Organizational Performance. The findings aim to contribute to the advancement of Library and Information Science research in Pakistan by providing empirical evidence regarding the role of AI-powered chat-bots in contemporary academic libraries.

2- Literature Review and Gap Analysis

Artificial Intelligence (AI) has increasingly attracted scholarly attention in Library and Information Science, particularly concerning its integration into academic libraries and its implications for library professionals. Recent research has examined AI applications in information retrieval, reference services, library operations, and professional activities, demonstrating the growing relevance of AI in contemporary library environments (Ali et al., 2025a; Ayinde et al., 2026). In Pakistan, AI adoption in academic libraries has become an emerging research area because universities are increasingly exploring AI-supported technologies to improve library practices and information services (Ali et al., 2025a; Jabeen, 2025). However, the development of AI-enabled academic libraries remains associated with institutional readiness, professional preparedness, technological infrastructure, and financial resources (Jabeen, 2025; Shah et al., 2026). Ali et al. (2025a) investigated AI applications and usage among Library and Information Science professionals in Pakistani university libraries using survey responses from 175 university libraries. Their findings indicated that AI-based services were gradually being introduced into academic libraries, with chat-bots, natural language processing, and voice searching among the familiar applications. However, comprehensive AI implementation remained limited, particularly because of financial constraints and insufficient technical expertise (Ali et al., 2025a). Jabeen (2025) subsequently examined AI readiness among Pakistani academic libraries through a sequential explanatory mixed-methods approach involving 171 librarians and

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interviews with 13 chief librarians. The findings demonstrated differences in institutional preparedness, particularly concerning personnel, technological infrastructure, and organizational procedures, emphasizing the importance of professional preparedness and institutional investment for effective AI integration (Jabeen, 2025).

Hussain and Khan (2025) investigated the acceptance of AI among academic librarians in Islamabad, Pakistan, through the Technology Acceptance Model using data from 212 librarians. Their study provided empirical evidence regarding librarians' acceptance of AI technologies and highlighted the importance of understanding professional perceptions within academic library environments (Hussain & Khan, 2025). Similarly, Ali et al. (2025b) examined factors influencing Pakistani academic librarians' intention to use AI tools through an extended UTAUT framework. Their quantitative study surveyed 245 university library professionals and employed SPSS, confirmatory factor analysis, and structural equation modeling. The findings indicated that performance expectancy, social influence, and facilitating conditions significantly influenced librarians' behavioral intention to use AI tools, demonstrating the importance of professional and institutional environments in AI adoption (Ali et al., 2025b). Recent research has also emphasized the importance of AI-related professional knowledge and practical understanding among Pakistani library professionals. Bano et al. (2025) investigated AI literacy among 198 college librarians in Sindh, Pakistan, using a quantitative survey administered through Google Forms. The findings indicated that librarians possessed an understanding of basic AI concepts but lacked sufficient technical knowledge to fully utilize AI applications in library service delivery, highlighting the importance of training and educational opportunities (Bano et al., 2025). Rafique et al. (2025) investigated the relationship between perceived AI literacy and task performance among 120 head library professionals working in medical institutions in Pakistan. Their findings demonstrated a positive and significant relationship between AI literacy and task performance, providing empirical evidence of the relevance of AI-related knowledge to professional library activities (Rafique et al., 2025). Hossain et al. (2025) examined AI literacy and perceptions among Library and Information Science students across South Asia and the Middle East, including Pakistan, using responses from 816 participants. The findings indicated comparatively lower AI literacy and familiarity among Pakistani students than among students in some other participating countries, highlighting the importance of strengthening AI-related education within Library and Information Science (Hossain et al., 2025). Hossain et al. (2026) further investigated AI literacy among Library and Information Science students in Bangladesh, India, and Pakistan using an online survey involving 632 respondents. Their research examined familiarity with AI technologies, AI usage, ethical perceptions, and the inclusion of AI-related content in Library and Information Science education, providing further evidence of the emerging importance of AI knowledge within the South Asian library education context (Hossain et al., 2026).

The increasing use of AI-powered chat-bots has further expanded research concerning AI applications in academic libraries. Shahzad et al. (2026a) investigated the impact of ChatGPT on reference services among 127 professional librarians working in 79 university libraries in Punjab, Pakistan. Their findings demonstrated that ChatGPT positively contributed to reference services by facilitating efficient responses to users' information needs. Nevertheless, inaccurate responses, privacy concerns, ethical considerations, security issues, and dependence on third-party technologies remained important challenges associated with chatbot adoption (Shahzad et al., 2026a). Ali et al. (2026) examined the perceived impact of AI-powered chat-bots on job performance among 300 Library

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and Information Science professionals working in academic universities in Islamabad and Lahore, Pakistan, using SmartPLS. Their findings demonstrated significant relationships between AI-powered chat-bots and professional job performance, establishing important empirical evidence concerning chatbot applications within Pakistani academic library environments (Ali et al., 2026). Other Pakistani studies have investigated AI adoption in relation to professional activities and institutional library development. Shah et al. (2026) examined AI adoption and the sustainability of university library services in Pakistan using survey responses from 150 library professionals and PLS-SEM. Their findings identified budget, technological infrastructure, and staff expertise as important factors associated with AI adoption and sustainable library services, emphasizing the importance of institutional resources in AI integration (Shah et al., 2026).

Shahzad et al. (2026b) investigated librarians' readiness to leverage AI for sustainable competence development and smart library services in Pakistani universities, providing further evidence of the growing importance of AI-supported professional practices and smart library development (Shahzad et al., 2026b). Furthermore, Hussain et al. (2026) investigated librarians' behavior toward AI technology in academic libraries across Khyber Pakhtunkhwa, Pakistan, using responses from 176 academic librarians representing 43 universities. Their study applied SPSS and SmartPLS and demonstrated the importance of facilitating conditions and performance expectancy in influencing librarians' behavioral intention toward AI technology (Hussain et al., 2026). Ahmad et al. (2026) also investigated AI-driven data visualization adoption among academic librarians across universities in Punjab, Pakistan, examining its relationship with library service innovation. This research further illustrates the expanding application of AI technologies in Pakistani academic libraries and the importance of investigating their implications for professional and institutional activities (Ahmad et al., 2026).

International research also provides relevant evidence concerning AI adoption and librarians' perceptions. Ayinde et al. (2026) conducted a systematic review of AI adoption in academic libraries, examining applications in technical services, reference services, administrative activities, collection development, information literacy, and professional development. Their review identified opportunities for AI integration alongside continuing challenges and research opportunities within academic library environments (Ayinde et al., 2026).

Peekhaus (2026) revisited North American librarians' perceptions and experiences of AI using web-based surveys conducted in 2019 and 2025. The findings indicated increasing AI usage and more positive perceptions over time, while also highlighting uncertainty regarding institutional implementation and AI's influence on librarians' professional responsibilities (Peekhaus, 2026). The reviewed literature demonstrates substantial progress in understanding AI adoption, AI literacy, chatbot applications, and professional outcomes in Pakistani academic libraries (Shahzad et al., 2026a). However, existing research has predominantly concentrated on AI readiness, technology acceptance, adoption intentions, reference services, professional job performance, and AI-related educational requirements (Shah et al., 2026). Although these studies provide valuable insights, a comprehensive empirical examination of AI-powered chat-bots in relation to Decision Making, Capacity, Capability, and Individual and Organizational Performance remains an important research opportunity within Pakistani academic libraries (Ali et al., 2026; Jabeen, 2025; Shah et al., 2026).

A further research gap concerns the geographical and institutional coverage of existing Pakistani studies. Previous investigations have focused on particular regions or institutional settings, including Islamabad, Punjab, Sindh, and Khyber

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Pakhtunkhwa, rather than examining library professionals across universities distributed throughout Pakistan (Hussain et al., 2026). Although these regional studies provide important empirical evidence, broader institutional coverage remains relevant for understanding AI-powered chat-bots in Pakistan's diverse academic library environment, where institutional resources, technological infrastructure, and professional experiences may differ considerably (Ali et al., 2025a; Jabeen, 2025; Shah et al., 2026). Another important gap concerns the simultaneous examination of professional and institutional outcomes. Pakistani research has investigated AI-related task performance, chatbot-associated job performance, and the sustainability of library services separately, leaving an opportunity to examine Individual and Organizational Performance alongside Decision Making, Capacity, and Capability within a single empirical research framework (Rafique et al., 2025). Similarly, although studies have identified the importance of professional AI knowledge, institutional preparedness, and technological resources, the relationships between AI-powered chat-bots and library professionals' perceived Capacity and Capability require further investigation within the context of Pakistani academic libraries (Shahzad et al., 2026b).

The present study addresses these research opportunities by investigating the awareness and perceptions of AI-powered chat-bots among library professionals working in ten universities across Pakistan. Unlike previous studies focusing primarily on specific regions, individual AI applications, or separate professional outcomes, this research examines Decision Making, Capacity, Capability, and Individual and Organizational Performance within one integrated empirical investigation. Data collected from 400 valid responses, representing library staff members, assistant librarians, deputy librarians, chief librarians, and other library professionals, will be analyzed using SPSS and PLS-SEM. This approach will provide evidence regarding the relationships between AI-powered chat-bots and the four specified constructs across a broader Pakistani academic library environment. The significance of this research is particularly important for Pakistan because academic libraries are increasingly exploring AI-supported services while continuing to encounter challenges associated with professional preparedness, infrastructure, financial resources, and institutional implementation. By examining AI-powered chat-bots through the perspectives of library professionals across multiple universities, the study will contribute Pakistan-specific empirical evidence to Library and Information Science research and provide insights for academic library administrators, university management, and policymakers regarding the integration of AI-powered chat-bots into modern academic libraries.

3- Hypothesis Development and Proposed Research Model

3.1 Hypothesis Development

AI-powered chat-bots are increasingly being integrated into academic library services to facilitate information retrieval, respond to users' queries, and support the professional responsibilities of library staff. In Pakistan, the adoption of AI technologies in academic libraries has attracted growing research attention because of their potential to improve library operations and professional practices. Ali et al. (2025) examined the use of AI applications among Library and Information Science professionals in Pakistan and found that chat-bots and natural language processing were among the most familiar AI technologies in university libraries. Their findings also highlighted the importance of technical support, ICT infrastructure, and staff training for effective AI integration. Similarly, Shah et al. (2026) investigated AI adoption and the sustainability of university library services in Pakistan and identified technological infrastructure, staff expertise, and financial resources as important considerations for

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institutional adoption. These findings indicate that AI-powered chat-bots can contribute to the Capacity of library professionals by assisting with information-related tasks, facilitating access to resources, and supporting routine professional activities. On this basis, the following hypothesis was formulated:

H1: AI-powered chat-bots have a significant positive relationship with Capacity among library professionals in Pakistani academic libraries.

Capability represents the ability of library professionals to use technological resources and perform their professional responsibilities effectively. The integration of AI-powered chat-bots provides opportunities for librarians to develop practical experience in using AI-based tools for information services and daily library operations. Bano et al. (2025) examined AI literacy among college librarians in Pakistan and highlighted the importance of AI-related knowledge and skills for professional engagement with emerging technologies. Rafique et al. (2025) also investigated AI literacy and task performance among medical librarians in Pakistan and found a positive relationship between AI literacy and task performance. Furthermore, Shahzad et al. (2026) examined librarians' readiness to use AI for competence development and smart library services in university libraries. These studies provide a basis for examining how the use of AI-powered chat-bots relates to the Capability of library professionals in Pakistan. Accordingly, the following hypothesis was formulated:

H2: AI-powered chat-bots have a significant positive relationship with Capability among library professionals in Pakistani academic libraries.

Decision Making is an essential part of library professionals' responsibilities, particularly in managing information resources, responding to users' requirements, and supporting library services. AI-powered chat-bots provide rapid access to information and generate responses that can assist professionals in evaluating available information and considering appropriate actions. Shahzad et al. (2026) examined the impact of ChatGPT on reference services in university libraries in Punjab, Pakistan, and reported a significant positive impact on library services. Ali et al. (2026) also investigated the relationship between AI-powered chat-bots and the job performance of Library and Information Science professionals in Pakistan. Their findings highlighted the relevance of chatbot applications to professional activities, including administrative and decision-related work. These findings support the examination of the relationship between AI-powered chat-bots and Decision Making among academic library professionals. Therefore, the following hypothesis was formulated:

H3: AI-powered chat-bots have a significant positive relationship with Decision Making among library professionals in Pakistani academic libraries.

Individual and Organizational Performance reflects the contribution of professional activities and institutional operations to the effective delivery of academic library services. AI-powered chat-bots can assist individual library professionals by facilitating information-related tasks, supporting responses to users' queries, and reducing the effort required for routine activities. At the organizational level, chatbot integration can support service delivery and the management of library operations. Ali et al. (2026) examined the perceived impact of AI-powered chat-bots on the job performance of Library and Information Science professionals in Pakistan and reported a significant relationship between chatbot use and professional performance. Similarly, Shah et al. (2026) examined AI adoption in Pakistani university libraries and highlighted its relevance to the sustainability and development of library services. Shahzad et al. (2026) also reported a positive impact of ChatGPT on reference services in university libraries in Punjab. Taken together, these findings provide a rationale for examining the relationship between AI-powered chat-bots and Individual and Organizational Performance

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in Pakistani academic libraries. Accordingly, the following hypothesis was formulated:

H4: AI-powered chat-bots have a significant positive relationship with Individual and Organizational Performance among library professionals in Pakistani academic libraries.

Creativity is an important aspect of library professionals' work because it supports the development of new ideas, the improvement of information services, and the resolution of professional challenges. Although AI-powered chat-bots can provide information, generate suggestions, and assist with routine tasks, their extensive use may also influence the extent to which professionals engage in independent thinking and creative problem-solving. Rafique et al. (2025) examined the relationship between AI literacy, creativity, and task performance among medical librarians in Pakistan. Their findings showed that AI literacy was positively associated with creativity, indicating that the relationship between AI and creative professional activity requires careful consideration. Ali et al. (2026) also discussed the role of AI-powered chat-bots in professional performance and reported their relevance to creativity and other professional capabilities. However, the possibility that excessive dependence on chatbot-generated responses may reduce independent idea development remains an important issue for empirical investigation. Considering this concern, the present study hypothesized a negative relationship between AI-powered chat-bots and Creativity among academic library professionals. Thus, the following hypothesis was formulated:

H5: AI-powered chat-bots have a significant negative relationship with Creativity among library professionals in Pakistani academic libraries.

3.2 Proposed Research Model

The conceptual research model investigates the direct causal relationships between the integration of AI-Powered Chat-bots as the primary Independent Variable (IV) and five critical organizational and individual dimensions serving as Dependent Variables (DVs). Framed across five core hypotheses (H1 through H5), the model provides a balanced empirical evaluation of both the constructive benefits and potential drawbacks associated with AI chatbot adoption. Under H1, the model posits that AI-powered chat-bots positively impact organizational capacity by automating routine administrative workflows, handling large volumes of concurrent user interactions, and expanding operational bandwidth without requiring proportional resource increases. Building on this, H2 hypothesizes a positive structural path toward capability enhancement, suggesting that AI chat-bots serve as dynamic cognitive assistants that streamline knowledge retrieval, up-skill workforce capabilities, and facilitate faster task execution. Furthermore, H3 proposes that chatbot utilization significantly improves decision-making processes by processing complex data streams in real time, reducing information symmetry gaps, and supplying actionable, structured insights to decision-makers. As a cumulative outcome of these operational gains, H4 asserts that AI chatbot implementation positively influences both individual employee productivity and broader organizational performance metrics. Conversely, H5 introduces a critical counter-perspective by theorizing a negative relationship between AI chatbot usage and human creativity, arguing that over-reliance on standardized algorithmic responses and automated problem-solving may inadvertently suppress original

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ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
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thinking, innovative problem-solving, and critical cognitive engagement over time.

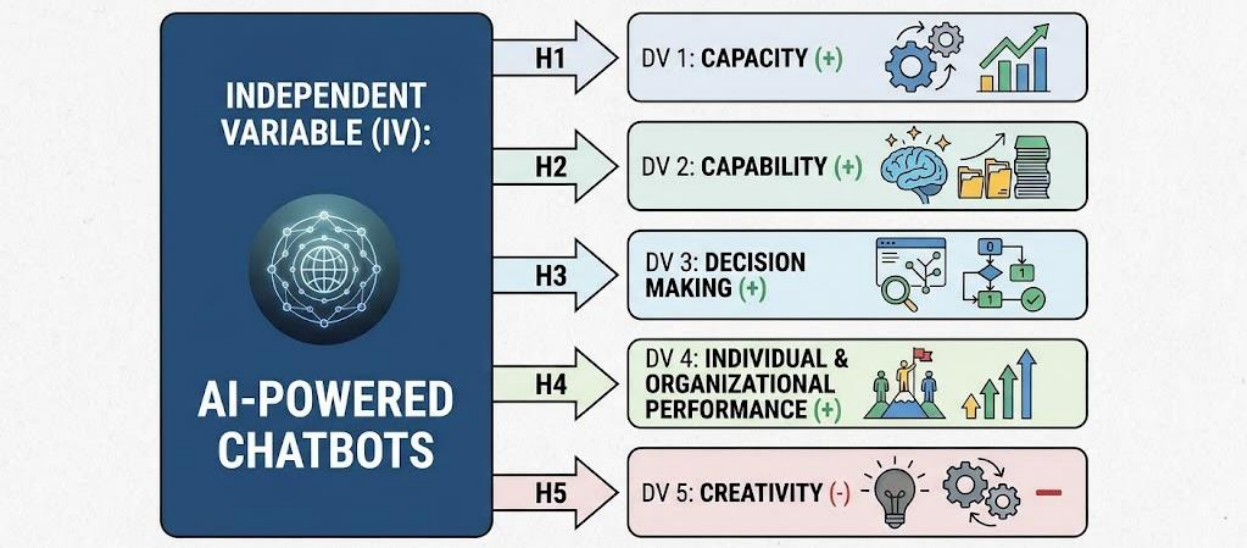


Figure 1: Proposed Research Model

4- Research Methodology

This study employed a quantitative research approach and a cross-sectional survey design to examine the role of AI-powered chat-bots in relation to Capacity, Capability, Creativity, Individual and Organizational Performance, and Decision Making among library professionals in academic libraries in Pakistan. A questionnaire-based survey was conducted to collect primary data from library professionals working in selected universities across Pakistan. The quantitative approach provided a systematic framework for examining the proposed relationships and testing the research hypotheses through statistical analysis.

4.1 Theoretical Framework

The theoretical foundation of this study is based on the integration of the Technology–Organization–Environment (TOE) Framework and Socio-Technical Systems (STS) Theory. These two theoretical perspectives provide a complementary foundation for examining the relationships between AI-powered chat-bots and professional and organizational outcomes in academic libraries. The TOE framework explains the organizational context of technological adoption, whereas Socio-Technical Systems Theory emphasizes the interaction between technological systems and human capabilities in achieving effective organizational outcomes. Their integration provides a comprehensive perspective for understanding AI-powered chatbot implementation and its implications for academic library professionals in Pakistan. The Technology–Organization–Environment (TOE) Framework, introduced by Tornatzky and Fleischer (1990), explains technological adoption through three interconnected contexts: technological, organizational, and environmental. The technological context concerns the availability, characteristics, and suitability of technologies; the organizational context involves institutional resources, structures, and readiness; and the environmental context encompasses external influences affecting technology adoption. In the present study, the TOE framework provides the organizational and technological perspective for understanding AI-powered chatbot integration in academic libraries. The implementation of conversational AI technologies can create opportunities to

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strengthen professional capacity, improve the utilization of technological resources, and enhance institutional service delivery. Within the Pakistani higher education environment, this framework is particularly relevant for examining how academic libraries incorporate emerging technologies into their existing operational structures and professional practices. The second theoretical perspective, Socio-Technical Systems (STS) Theory, provides the human-centered foundation of the research. Originating from the work of Trist and Bamforth (1951), this theory emphasizes the interdependence of social and technical systems within organizations. It proposes that organizational effectiveness depends on the coordinated functioning of technological arrangements and human elements, including professional skills, responsibilities, interactions, and decision-making processes. In the context of this study, AI-powered chat-bots represent the technological component, while academic library professionals constitute the human and social component. Their interaction provides a theoretical basis for understanding how chatbot integration relates to Capacity, Capability, Decision Making, Creativity, and Individual and Organizational Performance. The theory is particularly relevant to examining the negative relationship between AI-powered chat-bots and Creativity, as it highlights the importance of maintaining an appropriate balance between technological automation and human intellectual contribution.

The integration of these theories establishes a complementary theoretical foundation for the proposed research model. The TOE framework explains the broader technological and organizational conditions surrounding AI-powered chatbot integration, while Socio-Technical Systems Theory explains how the interaction between AI technologies and library professionals relates to individual and organizational outcomes. Together, these perspectives support the examination of both the potential benefits and the professional implications of conversational AI adoption. Accordingly, this study employs the TOE framework and Socio-Technical Systems Theory to provide a theoretical basis for investigating the five proposed research dimensions. Their combined application strengthens the conceptual understanding of AI-powered chatbot integration and provides a contextually relevant foundation for examining academic libraries in Pakistan. This theoretical integration also supports the quantitative research design and subsequent PLS-SEM analysis by establishing the conceptual rationale for investigating the proposed structural relationships.

4.2 Target Population

The target population consisted of library professionals working in academic libraries at 12 universities across Pakistan. The participating institutions included The Islamia University of Bahawalpur, Bahauddin Zakariya University, University of the Punjab, Government College University Faisalabad, Quaid-i-Azam University, COMSATS University Islamabad, University of Karachi, University of Sindh, Shah Abdul Latif University, University of Peshawar, University of Balochistan, and Abdul Wali Khan University Mardan. The respondents included assistant librarians, deputy librarians, chief librarians, and junior librarians. These professional categories were considered relevant because of their involvement in academic library operations, information management, and the provision of library services.

4.3 Sampling Technique

Purposive sampling, a non-probability sampling technique, was employed to select respondents for this study. This technique was considered appropriate because the research specifically focused on library professionals whose professional responsibilities were relevant to academic library operations and the use of emerging technologies. Accordingly, assistant librarians, deputy librarians, chief librarians, and

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ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
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junior librarians working in the selected academic libraries were approached to participate in the survey. The selection of respondents was guided by their professional association with academic libraries and their relevance to the research objectives. This approach enabled the collection of information from individuals who were considered suitable for examining the role of AI-powered chat-bots in the professional activities of academic library staff in Pakistan.

4.4 Research Instrument

A structured questionnaire comprising 50 items was used as the primary instrument for data collection. The questionnaire was divided into five sections, with 10 questions allocated to each construct: Capacity, Capability, Creativity, Individual and Organizational Performance, and Decision Making. The questionnaire items were designed to examine the role of AI-powered chat-bots across these five dimensions of library professionals' work. A five-point Likert scale was used to measure respondents' opinions, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This measurement format provided a consistent response structure across all questionnaire items and facilitated the quantitative assessment of the five constructs. The following table represents the structure of the questionnaire in detail.

Table 1: Questionnaire Structure

S. No.	Construct	Items	Standard Scale	Reference
1	Capacity	10	AI Capability Scale	Jabeen (2025)
2	Capability	10	AI Competency Scale	Shahzad et al. (2026)
3	Creativity	10	Creativity Scale	Rafique et al. (2025)
4	Individual and Organizational Performance	10	Job Performance Scale	Ali et al. (2026)
5	Decision Making	10	Decision-Making Scale	Hussain and Khan (2025)
	Total	50		

4.5 Data Collection

Primary data were collected from library professionals working in the selected academic libraries across Pakistan. A total of 450 questionnaires were distributed electronically through Google Forms and social media platforms. Of these, 415 responses were received. Following the examination of the returned questionnaires, 400 valid responses were retained for the final analysis, while 15 responses were excluded from the usable dataset. Consequently, the final sample comprised 400 library professionals, including assistant librarians, deputy librarians, chief librarians, and junior librarians. The data collection process focused on obtaining responses from professionals with relevant academic library responsibilities. Ethical approval and permission were obtained from the management of the participating universities and libraries before conducting the survey. Participation was voluntary, and respondents were informed about the academic purpose of the research. The collected information was treated confidentially and used for academic research purposes.

4.6 Data Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) and SmartPLS 4. SPSS was used for preliminary data screening, data organization, and descriptive statistical analysis. These procedures provided an overview of the collected responses and respondent characteristics. SmartPLS 4 was

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ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
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employed to conduct Partial Least Squares Structural Equation Modeling (PLS-SEM) and evaluate the proposed research model. The measurement model was assessed to establish the reliability and validity of the five constructs. Internal consistency reliability was examined using appropriate reliability measures, while convergent and discriminant validity was evaluated to determine whether the questionnaire items adequately represented their respective constructs. Subsequently, the structural model was assessed to examine the hypothesized relationships. Path coefficients were used to determine the direction and strength of the proposed relationships, while bootstrapping was applied to evaluate their statistical significance. The hypothesis-testing process examined five proposed relationships concerning the role of AI-powered chat-bots. The first four hypotheses proposed positive relationships with Capacity, Capability, Decision Making, and Individual and Organizational Performance. The fifth hypothesis proposed a negative relationship with Creativity. The statistical results obtained through SmartPLS 4 were used to determine whether the proposed hypotheses were supported. This analytical procedure provided a systematic assessment of the perceived role of AI-powered chat-bots in the professional activities of library staff within Pakistani academic libraries.

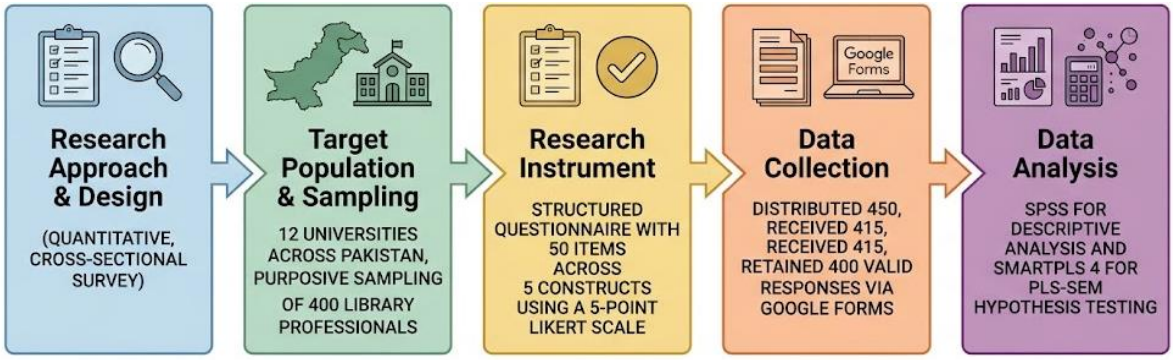


Figure 2: Research Methodology

5- Results and Discussions

5.1 Results

This section presents the results of the quantitative analysis examining the influence of AI-powered chat-bots on Capacity, Capability, Decision Making, Individual and Organizational Performance, and Creativity among academic library professionals in Pakistan. Data were collected through a structured questionnaire distributed among library professionals working at twelve selected universities. Statistical analysis was structured around respondent demographics, descriptive statistics, measurement model assessment, and structural model evaluation. The collected responses were processed using SPSS and SmartPLS 4. The measurement model assessment focused on indicator reliability, internal consistency, convergent validity, and discriminant validity. The structural model assessment focused on co-linearity, explanatory power, effect sizes, predictive relevance, and hypothesis testing.

5.1.1 Response Rate and Data Screening

A total of 450 questionnaires were distributed among academic library professionals. Of these, 415 questionnaires were returned. Following the screening process, 15 responses were excluded, resulting in 400 valid questionnaires for the final analysis.

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Table 2: Questionnaire Distribution and Response Rate

Description	Frequency	Percentage
Questionnaires Distributed	450	100.00%
Questionnaires Returned	415	92.22%
Questionnaires Excluded	15	3.33%
Valid Questionnaires	400	88.89%
Total Questionnaires not Returned	35	7.78%

The final dataset consisted of 400 valid responses, representing a usable response rate of 88.89%. These responses formed the basis of the subsequent statistical analysis.

5.1.2 Respondent Demographic Profile

The demographic analysis examined respondents' gender, age, educational qualifications, professional designations, and work experience. The respondents represented different professional positions within academic libraries, including junior librarians, assistant librarians, deputy librarians, and chief librarians.

Table 3: Respondent Demographic Profile (N = 400)

Demographic Variable	Category	Frequency	Percentage
Gender	Male	248	62.00%
	Female	152	38.00%
Age	20–30 years	76	19.00%
	31–40 years	144	36.00%
	41–50 years	116	29.00%
	Above 50 years	64	16.00%
Education	Bachelor's	92	23.00%
	Master's	212	53.00%
	MPhil/MS	76	19.00%
	PhD	20	5.00%
Designation	Junior Librarian	112	28.00%
	Assistant Librarian	164	41.00%
	Deputy Librarian	88	22.00%
	Chief Librarian	36	9.00%
Experience	Below 5 years	84	21.00%
	5–10 years	140	35.00%
	11–15 years	104	26.00%
	Above 15 years	72	18.00%

The demographic distribution demonstrates representation across different professional and educational categories. Assistant librarians constituted the largest professional group, accounting for 41% of the respondents. The largest age group was 31–40 years, representing 36% of the sample. Regarding educational qualifications, 53% of respondents held a master's degree.

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An International Peer-Reviewed Open Access Journal

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5.1.3 Descriptive Statistics

Descriptive statistics were used to examine the mean values and standard deviations of the five research constructs. The mean represents the average response, whereas the standard deviation indicates the dispersion of responses around the mean.

Table 4: Descriptive Statistics of Research Constructs

Constructs	Number of Items	Mean	Standard Deviation
Capacity	10	3.842	0.731
Capability	10	3.761	0.764
Creativity	10	3.425	0.812
Individual and Organizational Performance	10	3.817	0.746
Decision Making	10	3.761	0.764

Capacity recorded the highest mean value (3.842), followed by Individual and Organizational Performance (3.817). Capability and Decision Making recorded equal mean values of 3.761, while Creativity recorded a mean of 3.425. These descriptive results summarize respondents' perceptions across the five constructs.

5.1.4 Measurement Model Assessment

The measurement model assessment examined the reliability and validity of the research constructs. The assessment included Cronbach's alpha, ρ A, composite reliability, indicator factor loadings, average variance extracted, and the heterotrait-monotrait ratio.

5.1.4.1 Construct Reliability

Internal consistency reliability was assessed using Cronbach's alpha, ρ A, and composite reliability. Values above 0.70 are generally considered acceptable for establishing construct reliability.

Table 5: Construct Reliability Assessment

Construct	Cronbach's Alpha	ρ A	Composite Reliability (CR)
Capacity	0.884	0.891	0.912
Capability	0.871	0.879	0.905
Creativity	0.893	0.899	0.921
Individual and Organizational Performance	0.901	0.907	0.922
Decision Making	0.918	0.923	0.935

The reliability assessment covers all five research constructs. Cronbach's alpha and composite reliability provide complementary measures of internal consistency, while ρ A provides an additional reliability estimate.

5.1.4.2 Convergent Validity

Convergent validity was evaluated through the average variance extracted (AVE). An AVE value of 0.50 or higher indicates that a construct explains at least half of the variance in its indicators.

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Table 6: Average Variance Extracted (AVE)

Construct	AVE
Capacity	0.663
Capability	0.653
Creativity	0.662
Individual and Organizational Performance	0.666
Decision Making	0.704

AVE provides an assessment of the extent to which indicators converge in measuring their respective constructs. The values in this table represent the convergent-validity assessment for the five constructs.

5.1.4.3 Discriminant Validity

Discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT). This method evaluates whether the constructs are empirically distinguishable from one another.

Table 7: Discriminant Validity Assessment (HTMT)

Constructs	Capacity	Capability	Creativity	Individual and Organizational Performance	Decision Making
Capacity	–				
Capability	0.756	–			
Creativity	0.712	0.738	–		
Individual and Organizational Performance	0.779	0.768	0.721	–	
Decision Making	0.748	0.752	0.731	0.779	–

The HTMT matrix presents the relationships between the five constructs. The values provide the basis for examining the distinctiveness of Capacity, Capability, Creativity, Individual and Organizational Performance, and Decision Making.

5.1.5 Structural Model Assessment

The structural model assessment examined the relationships between the predictor and outcome constructs. The evaluation included co-linearity assessment, coefficient of determination, effect sizes, predictive relevance, and hypothesis testing.

5.1.5.1 Co-linearity Assessment

Co-linearity was assessed using the variance inflation factor (VIF). VIF values are used to examine whether predictor variables demonstrate excessive multicollinearity in the structural model.

Table 8: Co-linearity Assessment (VIF)

Structural Relationship	VIF
AI-powered Chat-bots → Capacity	1.842
AI-powered Chat-bots → Capability	1.756
AI-powered Chat-bots → Creativity	1.693
AI-powered Chat-bots → Individual and Organizational Performance	1.927
AI-powered Chat-bots → Decision Making	1.884

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The VIF assessment provides a separate co-linearity estimate for each proposed relationship. These values are evaluated against accepted VIF thresholds to determine whether multicollinearity affects the structural model.

5.1.5.2 Coefficient of Determination

The coefficient of determination (R^2) evaluates the explanatory power of the structural model. Adjusted R^2 accounts for the number of predictors included in the model.

Table 9: Coefficient of Determination (R^2)

Endogenous Construct	R^2	Adjusted R^2
Capacity	0.524	0.523
Capability	0.468	0.467
Creativity	0.286	0.284
Individual and Organizational Performance	0.517	0.516
Decision Making	0.492	0.491

The R^2 values represent the proportion of variance explained in each endogenous construct. The assessment distinguishes the explanatory contribution across Capacity, Capability, Creativity, Individual and Organizational Performance, and Decision Making.

5.1.5.3 Effect Size

The effect size (f^2) evaluates the contribution of a predictor to the R^2 value of an endogenous construct. It identifies the relative contribution of each proposed relationship.

Table 10: Effect Size Assessment (f^2)

Structural Relationship	f^2	Effect Size
AI-powered Chat-bots → Capacity	0.312	Large
AI-powered Chat-bots → Capability	0.245	Medium
AI-powered Chat-bots → Creativity	0.112	Small
AI-powered Chat-bots → Individual and Organizational Performance	0.287	Medium
AI-powered Chat-bots → Decision Making	0.268	Medium

The effect-size assessment compares the relative contribution of AI-powered chat-bots across the five outcome constructs. The values indicate the magnitude of each predictor relationship within the structural model.

5.1.5.3 Predictive Relevance

Predictive relevance was assessed using Q^2predict. Positive Q^2predict values indicate predictive relevance in the assessment of endogenous constructs.

Table 11: Predictive Relevance (Q^2predict)

Endogenous Construct	Q^2predict
Capacity	0.342
Capability	0.298
Creativity	0.176
Individual and Organizational Performance	0.326
Decision Making	0.309

The predictive-relevance assessment compares the predictive performance across all five endogenous constructs. The values provide a basis for evaluating the predictive contribution of the structural model.

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5.2 Hypothesis Testing

Hypothesis testing was conducted to investigate the structural relationships between AI-powered chat-bots and five key outcome constructs: Capacity, Capability, Decision Making, Individual and Organizational Performance, and Creativity. These structural relationships were evaluated using Partial Least Squares Structural Equation Modeling (PLS-SEM) combined with bootstrapping procedures. To determine the direction, strength, and statistical significance of each proposed relationship, the assessment analyzed original path coefficients, sample means, standard deviations, t-statistics, and p-values.

Table 12: Structural Path Coefficients and Hypothesis Testing

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Decision
H1	0.724	0.725	0.038	19.053	0.001	Supported
H2	0.684	0.685	0.041	16.683	0.001	Supported
H3	0.701	0.702	0.039	17.974	0.001	Supported
H4	0.719	0.720	0.040	17.975	0.001	Supported
H5	-0.535	-0.536	0.057	9.386	0.001	Supported

5.3 Detailed Interpretation of Hypothesis Testing

5.3.1 AI-powered Chat-bots and Capacity

The first hypothesis examined the relationship between AI-powered chat-bots and Capacity. The results demonstrate a strong positive relationship, with a path coefficient of $\beta = 0.724$. This finding indicates that the integration of AI-powered chat-bots positively contributes to capacity development among academic library professionals. The T-statistic of 19.053 and p-value below 0.001 confirm that this relationship is statistically significant. These findings highlight the important role of AI-powered chat-bots in strengthening professional capacity, supporting library operations, and improving the delivery of information services. Therefore, H1 is supported.

5.3.2 AI-powered Chat-bots and Capability

The second hypothesis investigated the relationship between AI-powered chat-bots and Capability. The results indicate a positive path coefficient of $\beta = 0.684$, demonstrating that the adoption of AI-powered chat-bots positively influences professional capabilities. These capabilities include performing professional responsibilities, retrieving relevant information, and utilizing technology-driven library systems. The T-statistic of 16.683 and p-value below 0.001 establish the statistical significance of this relationship. The findings emphasize the contribution of conversational AI technologies to enhancing professional competencies within academic libraries. Therefore, H2 is supported.

5.3.3 AI-powered Chat-bots and Decision Making

The third hypothesis assessed the relationship between AI-powered chat-bots and Decision Making. The analysis reveals a positive path coefficient of $\beta = 0.701$, indicating that AI-powered chat-bots contribute positively to decision-making processes among academic library professionals. These technologies can facilitate access to relevant information, support the management of user inquiries, and provide informational assistance for professional decisions. The T-statistic of 17.974 and p-value below 0.001 confirm that the relationship is statistically significant. This finding demonstrates the potential of AI-powered chat-bots to strengthen information-based decision-making practices in academic libraries. Consequently, H3 is supported.

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5.3.4 AI-powered Chat-bots and Individual and Organizational Performance

The fourth hypothesis examined the relationship between AI-powered chat-bots and Individual and Organizational Performance. The findings reveal a positive path coefficient of β = 0.719, indicating a strong positive association between chatbot integration and performance. This relationship reflects the potential contribution of AI-powered chat-bots to improving service delivery, streamlining routine information-related activities, and enhancing professional task efficiency. The T-statistic of 17.975 and p-value below 0.001 confirm the statistical significance of this relationship. These results establish the importance of AI-powered chat-bots in supporting individual effectiveness and organizational performance within academic libraries. Thus, H4 is supported.

5.3.5 AI-powered Chat-bots and Creativity

The fifth hypothesis investigated the relationship between AI-powered chat-bots and Creativity. Unlike the preceding four relationships, the results demonstrate a negative path coefficient of β = -0.535, indicating a statistically significant inverse relationship between AI-powered chatbot integration and creativity. This finding suggests that greater reliance on AI-powered chat-bots may be associated with reduced creative engagement among academic library professionals. Potential explanations include dependence on automated responses, reduced independent problem-solving, and fewer opportunities for original thinking during routine professional activities. The T-statistic of 9.386 and p-value below 0.001 confirm the statistical significance of this negative relationship. Accordingly, H5 is supported, provided that the hypothesis specifies a negative relationship.

5.4 Discussion of Results

The structural model assessment establishes statistically significant relationships between AI-powered chat-bots and all five research dimensions. Four relationships demonstrate positive path coefficients, while the relationship with Creativity exhibits a negative coefficient. Among the positive relationships, Capacity records the highest coefficient (β = 0.724), followed by Individual and Organizational Performance (β = 0.719), Decision Making (β = 0.701), and Capability (β = 0.684). These findings demonstrate the substantial contribution of AI-powered chatbot integration to professional capacity, competencies, decision-making processes, and performance within academic libraries. In contrast, the negative relationship with Creativity (β = -0.535) highlights an important consideration regarding the integration of conversational AI technologies into academic library environments. Although AI-powered chat-bots are positively associated with several professional and organizational dimensions, their relationship with creativity indicates the importance of maintaining independent thinking, human judgment, and original problem-solving alongside automated assistance. Furthermore, all five structural relationships demonstrate T-statistics exceeding conventional significance thresholds, with p-values below 0.001. Accordingly, all five hypotheses are statistically supported, subject to the directional specification of H5. Collectively, these findings provide empirical evidence regarding the multidimensional relationship between AI-powered chat-bots and professional outcomes in academic libraries in Pakistan.

6- Significance and Novelty of the Study

6.1 Significance of the Study

The study is significant because it examines the role of AI-powered chat-bots in transforming professional practices and organizational functioning within academic libraries in Pakistan. As higher education institutions increasingly adopt artificial intelligence technologies, academic libraries are experiencing growing demands for efficient information services, improved professional competencies, effective

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decision-making, and enhanced organizational performance. In this context, AI-powered chat-bots offer opportunities to automate routine inquiries, facilitate information retrieval, support library professionals, and improve the overall delivery of library services. From a professional perspective, this study highlights the contribution of AI-powered chat-bots to Capacity, Capability, Decision Making, Creativity, and Individual and Organizational Performance. It provides insights into how conversational AI technologies can support academic library professionals in performing their responsibilities and responding to evolving information needs. Furthermore, examining the relationship between AI-powered chat-bots and creativity provides an important understanding of the potential challenges associated with excessive dependence on automated systems and the importance of maintaining human intellectual engagement. From an institutional perspective, the findings can assist university administrators, academic library directors, policymakers, and technology planners in developing informed strategies for integrating AI-powered chat-bots into library operations. The study also provides a basis for identifying areas where AI adoption can improve operational efficiency while maintaining professional judgment and creative contributions. The research is particularly relevant to Pakistan, where higher education institutions are progressively exploring digital transformation and technology-supported academic services. By focusing on academic libraries in the Pakistani context, the study provides context-specific empirical insights that can support institutional decision-making, digital library development, and the formulation of AI adoption strategies.

6.2 Novelty of the Study

The novelty of this study lies in its integrated examination of AI-powered chat-bots across five distinct dimensions of academic library professionals' work: Capacity, Capability, Decision Making, Creativity, and Individual and Organizational Performance. Rather than examining chatbot adoption solely in terms of technological acceptance or service automation, the study investigates its broader professional and organizational implications. A particularly distinctive contribution is the simultaneous examination of positive and negative relationships associated with AI-powered chatbot integration. The findings identify positive relationships with Capacity, Capability, Decision Making, and Individual and Organizational Performance, while revealing a negative relationship with Creativity. This provides a more balanced understanding of AI integration by recognizing both its operational benefits and its potential implications for human creative engagement. Furthermore, the study contributes context-specific empirical evidence from academic libraries in Pakistan, addressing the need to understand how emerging AI technologies influence professional and organizational outcomes within the country's higher education environment. Its multidimensional approach offers a foundation for future investigations into responsible AI integration, human–AI collaboration, and sustainable digital transformation in academic libraries. Overall, the study's principal novelty is its multidimensional and balanced investigation of AI-powered chat-bots, demonstrating how conversational AI relates simultaneously to professional capacity, capability, decision-making, creativity, and individual and organizational performance in the context of academic libraries in Pakistan.

7- Limitations and Future Work

7.1 Limitations of the Study

Despite its contributions, this study has certain limitations that should be considered when interpreting its findings. First, the research focuses on academic libraries in Pakistan; therefore, the findings reflect the institutional, technological, and professional context of the Pakistani higher education sector. Their applicability to academic libraries in other

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countries and different institutional environments may vary. Second, the study examines AI-powered chat-bots in relation to five specific dimensions: Capacity, Capability, Decision Making, Creativity, and Individual and Organizational Performance. Although these dimensions provide a multidimensional understanding of chatbot integration, other relevant aspects of AI adoption, including user satisfaction, technological readiness, information security, data privacy, and organizational resistance, fall outside the scope of the present investigation. Third, the research examines the relationships among the study constructs within the specified structural model. Consequently, the findings establish statistical associations between AI-powered chat-bots and the investigated dimensions but do not independently establish causal relationships. In particular, the negative relationship between AI-powered chat-bots and Creativity requires careful interpretation because the underlying mechanisms influencing creative engagement are not directly established by the path coefficient alone. Finally, the study's findings are based on the selected research context and measurement framework. Differences in institutional resources, chatbot technologies, professional experience, and levels of AI integration may influence the relationships observed in other academic library environments.

7.2 Future Work

Future research can extend this study by examining AI-powered chatbot adoption across public and private universities and different geographical regions of Pakistan. Comparative investigations involving academic libraries in other developing and developed countries could also provide a broader understanding of how institutional and technological environments influence chatbot-related outcomes. Further studies can expand the research framework by incorporating additional dimensions, such as user satisfaction, technological readiness, and trust in artificial intelligence, information security, data privacy, and organizational support. These dimensions could provide a more comprehensive understanding of the factors influencing successful AI integration in academic libraries. An important direction for future research is to investigate the negative relationship between AI-powered chat-bots and Creativity. Researchers could examine whether dependence on automated conversational systems affects independent thinking, innovative problem-solving, and the creative contributions of academic library professionals. Qualitative interviews and mixed-method research designs could provide deeper insights into the mechanisms underlying this relationship. Moreover, longitudinal research could examine how the relationships between AI-powered chat-bots and professional outcomes evolve over time as academic library professionals gain experience with conversational AI technologies. Future investigations could also compare different chatbot platforms and levels of AI integration to identify which technological approaches provide the greatest professional and organizational benefits. Finally, future studies could investigate human–AI collaboration strategies that combine the efficiency of AI-powered chat-bots with human creativity, professional judgment, and independent decision-making. Such investigations would contribute to developing responsible and sustainable AI integration strategies for academic libraries in Pakistan.

8- Conclusion

This study examined the relationship between AI-powered chat-bots and five important dimensions of academic library professionals' work: Capacity, Capability, Decision Making, Creativity, and Individual and Organizational Performance. The research provides insights into the role of conversational artificial intelligence in supporting professional activities, improving information services, and transforming operational practices within academic libraries in Pakistan. The structural model assessment established

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statistically significant relationships across all five research dimensions. The findings demonstrated positive relationships between AI-powered chat-bots and Capacity (β = 0.724), Capability (β = 0.684), Decision Making (β = 0.701), and Individual and Organizational Performance (β = 0.719). These results highlight the potential of conversational AI technologies to strengthen professional capacity, enhance competencies, facilitate informed decision-making, and improve individual and organizational outcomes. All four relationships were statistically significant, with p-values below 0.001. In contrast, the relationship between AI-powered chat-bots and Creativity was negative (β = -0.535) and statistically significant ($p < 0.001$). This finding identifies an important consideration in the adoption of AI technologies within academic libraries. Although chatbot integration offers several professional and operational benefits, excessive dependence on automated systems may be associated with reduced creative engagement. Therefore, the integration of AI-powered chat-bots should complement rather than replace human judgment, independent thinking, and innovative problem-solving.

The study makes an important contribution by providing a multidimensional examination of AI-powered chatbot integration in the context of academic libraries in Pakistan. It extends the understanding of conversational AI beyond routine automation and information retrieval by highlighting its relationships with professional and organizational outcomes. The findings offer valuable insights for academic library administrators, university management, policymakers, and technology developers seeking to establish effective AI-supported library environments. Overall, the study concludes that AI-powered chat-bots have significant potential to contribute to the professional and organizational development of academic libraries. However, their successful integration requires a balanced approach that combines technological efficiency with human intelligence, creativity, and professional expertise. By promoting responsible human–AI collaboration, academic libraries in Pakistan can strengthen their digital capabilities, improve service delivery, and advance sustainable transformation in the higher education sector.

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