Evidence Based Library and Information Practice

Organizational Readiness to Adopt Artificial Intelligence in the Library and Information Sector of Pakistan

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Résumé de l'article

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Methods – A theoretical framework combining the technology-organization-environment (TOE) framework and the Technology Readiness Index (TRI) guided this qualitative study. Interviews were conducted with 27 senior representatives, including library managers and registrars, from 27 universities across four provinces and the capital city, Islamabad. A systematic approach was employed to analyze the data.

Results – The findings indicate that the concept of AI adoption in Pakistani university libraries is new. The library and information sector of Pakistan is slow in adopting AI, which could have implications for its future competitiveness, despite the push for AI adoption by university librarians and administrators. The readiness for AI adoption in this sector is influenced by factors such as organizational technological practices, financial resources, university size, and data management and protection concerns.

Conclusion – Library managers and researchers can implement the TOE framework and TRI scale to facilitate AI adoption in a manner that is relevant to library and information settings in Pakistan as well as other parts of the world. Our research indicates that most adoptions are still in their nascent phases, and numerous library managers feel uneasy due to either uncertainties about the precise benefits AI can bring to their libraries or a lack of knowledge and skills for its effective implementation. To manage the networks of internal and external stakeholders essential for successful AI adoption, universities should consider appointing individuals with a specialized knowledge of AI within their libraries.

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Research Article

Organizational Readiness to Adopt Artificial Intelligence in the Library and Information Sector of Pakistan

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Abstract

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Introduction

Artificial intelligence impacts a wide range of industries. Recent studies have explored AI applications in such areas as information systems, marketing, and exhibitions (Collins et al., 2021; Davenport et al., 2020; Hradecky et al., 2022). The library sector is also embracing this trend, as it recognizes the potential of AI in revolutionizing library services and management (Harisanty et al., in press).

The goal of this study is to determine whether organizations in Pakistan are ready to utilize AI in the library sector. This study aims to understand the existing state of AI adoption from the viewpoint of library managers and administrators and investigate important elements on organizational readiness to use AI. Due to its exploratory nature, this study utilized a qualitative research design. It incorporated the technology-organization-environment (TOE) framework and the Technology Readiness Index (TRI), both of which have been previously employed in quantitative research concerning technology adoption readiness (Dewi et al., 2018; Hradecky et al., 2022). This study represents a novel application of these frameworks by employing qualitative methods and focusing specifically on libraries.

This exploratory research study aims to make three distinct contributions to the existing literature. Firstly, it addresses the existing gap in sector-specific research concerning the readiness of organizations in the library sector to adopt AI. Remarkably, there has been a significant lack of attention given to decision-makers' and managers' perspectives on AI adoption within the broader library field in Pakistan. The

appropriateness of employing an exploratory approach in this study allows for theoretical exploration within an empirical context (Elman et al., 2020). This is especially relevant given the early stage of AI research in the social sciences overall, as well as in the specific domains of business and library management research. Secondly, this study, which focuses on organizational preparedness, intends to fill a gap in the literature by examining decision-makers' assessments of AI and their desire to adopt it. Finally, the study seeks to qualitatively investigate the synthesis of the TOE and TRI frameworks. Through this empirical exploration, the study aims to enhance our understanding of organizational readiness for adopting new technologies by emphasizing the intricate and context-dependent nature of this phenomenon. By focusing on the situated and contextual complexities, the study aims to advance our knowledge in this area.

The projected outcomes of this study are expected to contribute to the development of best practices for effectively preparing librarians for adopting AI in library and information centres. This study seeks to elicit the key elements that influence policy makers and librarians regarding the adoption of AI technologies in libraries of Pakistan.

Literature Review

Artificial Intelligence in Librarianship

The term "artificial intelligence" was introduced to replace the analogue concept of "cybernetics." George Boole, Allen Newell, and Herbert Simon were early innovators of AI as an experimental endeavor (Kumar, 2004, as cited in Mogali, 2014). According to Asemi and Asemi (2018), the idea of implementing AI systems in libraries originated in 1990; these intelligent library systems provide knowledge-based services to both library staff and patrons. The exploration of AI in libraries by library and information scientists, as well as academics, has been a long-standing pursuit. The American Library Association's Center for the Future of Libraries recognizes the significance of emerging AI for library systems (Andrews et al., 2021). Now, training programs designed to equip librarians with the skills necessary for working with AI and related technologies are needed, coupled with a thorough examination of the evolving role of librarians in this new era (Yoon et al., 2022).

With the ability to access services anytime, anywhere, libraries are transitioning their services to AI. For libraries, AI opens up a wide range of intriguing options that could lower technology costs and improve performance and capacity for various types of automation activities (Tella, in press). The implementation of AI in library systems encompasses a wide range of areas, such as descriptive cataloging, subject indexing, reference services, technical services, shelf reading, collection development, and information retrieval systems, among others. These applications have advanced beyond natural language processing (NLP) and knowledge-based services (Omame & Alex-Nmecha, 2020). There is significant untapped potential for enhancing existing information systems through the integration of AI technologies. Recent research efforts have primarily concentrated on enhancing the technology related to book gripping, precise localization, and enhancing human-robot interaction in the context of librarian robots (Asemi et al., 2021).

There are many new technical innovations in library settings that are still in the research and development stages, but there are also cases where these developing technologies have already been used and their effects seen. AI tools will likely have a great impact on librarianship (Cox, 2023). Librarians must be ready to design, implement, and assess improvements that expand services to users as new technologies develop (Andrews et al., 2021). AI and other emerging technologies have the potential to

impact the accessibility of library resources, enhance document delivery services, and improve user experiences (Bolt, 2014; Collins et al., 2021). For example, the application of AI and big data analytics enables efficient collection management and facilitates data-driven marketing decisions (Crawford & Syme, 2018). ChatGPT, as an AI-based tool, possesses significant potential to drive advancements in academia and librarianship, ushering in both potentially challenging and exhilarating new avenues (Lund & Wang, 2023). AI is also used in online reference assistance (Vijayakumar & Sheshadri, 2019) and as an online chatbot (Andrews et al., 2021). An AI-based smart and intelligent library system is perceived to offer several benefits, including privacy protection, knowledge creation and dissemination, inclusivity, the development of a seamless interface between library users and AI-generated information, promotion of social justice, and facilitation of machine-based scholarly communications (Bourg, 2017). Mogali (2014) notes that the use of AI in libraries is becoming more widespread and useful in areas including collection development, automation, and technical document processing; it is anticipated that effective AI-based library expert systems will considerably aid library and information science (LIS) professionals in the near future.

Considerable focus has been placed on conceptualizing the notion of a smart library, leading scientists and professionals to design systems that can think and make decisions in place of human librarians (Cox et al., 2019). Chatbots—referred to as digital assistants, virtual agents, or intelligent agents—are software applications capable of mimicking intelligent dialogue. They can engage in conversations using text, speech, or even embody a physical representation (Asemi & Asemi, 2018). An endeavor is underway to create an Innovative Conceptual Framework for Artificial Intelligence Library Services (AI-LSICF), which involves integrating AI applications and functionalities into the elements of the digital transformation framework (Okunlaya et al., 2022). The practical uses of AI in different areas of libraries, including cataloguing and classification of documents, collection development, documentation, and automation of library material, continue to advance (Mogali, 2014). It is anticipated that LIS professionals and administrators will consider the adoption of AI in Pakistan and greatly benefit from the implementation of efficient AI-based library systems in the near future.

Technology-Organization-Environment (TOE) Framework and the Technology Readiness Index (TRI)

To evaluate the readiness of librarians and administrators to adopt AI, we developed a theoretical framework that integrates the technology-organization-environment (TOE) framework and the Technology Readiness Index (TRI). The TOE framework was created to describe the elements that influence organizational decision-making around the use of technology (Tornatzky & Fleischer, 1990). To examine organizational adoption and implementation of technological innovations, the framework combines technological, organizational, and environmental elements. The TOE framework has undergone extensive theoretical and empirical examination, making it widely utilized in various sectors including information technology (IT), manufacturing, healthcare, hospitality, and financial services (Aboelmaged, 2014; Wang et al., 2016).

The technological dimension investigates the internal and external equipment, processes, and practices within the organization. The technology infrastructure, which significantly influences technology adoption by reducing costs, comprises hardware, software, and networking technologies within the existing environment (Bhattacherjee & Hikmet, 2008). The organizational component focuses on the company's size, structure, communication, and decision-making, along with its assets (Aboelmaged, 2014). Top management support involves leaders who possess the authority to make critical decisions and create a positive environment that fosters innovation (Chaubey & Sahoo, 2021). The environmental

dimension relates to the external business environment, encompassing factors such as competitors, suppliers, customers, and regulatory subjects (Oliveira & Martins, 2011).

The rationale behind using the TOE framework instead of established technology acceptance theories like the Unified Theory of Acceptance and Use of Technology (UTAUT) or the Technology Acceptance Model (TAM) is based on the findings of previous studies (Hradecky et al., 2022). Gholami et al. (2018) found that the integrated model of TAM and TOE is a promising approach for recognizing the key factors that influence the adoption of mobile technology in a library setting. Singeh et al. (2020) used the TOE model in assessing factors that contribute to the successful implementation of digital libraries. The TOE model was also employed to evaluate the readiness of Malaysian libraries for big data analytics (Salman et al., 2022).

One notable reason for selecting the TOE framework over other theories and models is its specific emphasis on technological acceptance within the context of the academic library in an organization, aligning well with the organizational focus of this study. This sets it apart from alternative theories and models. Second, in addition to considering technology adoption, the TOE framework also incorporates the dimensions of organization and environment. These dimensions encompass the organization's financial and physical resources, services, and the greater academic environment. Since this study concentrates on assessing an organization's readiness to adopt AI in libraries, examining the three dimensions of TOE offers a comprehensive understanding of the various factors influencing a library's inclination towards AI utilization.

Parasuraman (2000) first introduced the Technology Readiness Index (TRI), which measures people's propensity to embrace and use new technologies for accomplishing goals in home, in life, and at work. The TRI has found application in various industries, such as e-tailing, e-banking, and e-services (Wiese & Humbani, 2020). The TRI measures decision-makers' conscious willingness and mental state at the time they make decisions (Jiang & Johnston, 2010). In contrast to other theories that primarily focus on general perceptions or usage, our approach places specific emphasis on the four dimensions of the TRI: optimism, innovativeness, discomfort, and insecurity. By utilizing these dimensions, we establish a framework to analyze the drivers and barriers that influence the mindset of decision-makers when it comes to adopting AI (Hradecky et al., 2022). The combination of the TOE and TRI frameworks offers a robust model to explore how the availability of AI artifacts, organizational resources, and external factors collectively serve as influential elements that impact and potentially constrain an organization's decision-making process in relation to AI adoption in the academic libraries of Pakistan.

The TOE model was selected for its strong track record of reliability and validity, which has been documented in previous studies (Kalema & Mokgadi, 2017; Motau & Kalema, 2016). Strengths of the TOE framework include its comprehensive perspective, customization, and interdisciplinary approach; its weaknesses are its complexity, limited focus on human factors, and static nature. Positive aspects of the TRI are its global benchmarking and simplicity, whereas simplistic metrics, limited scope, influence of data quality (i.e., poor data quality can lead to inaccurate conclusions and unreliable results), and static measurement (i.e., the evaluation or measurement being performed on the TOE is done at a fixed point in time, without considering dynamic changes or variations over time) are its weaknesses. In the library context, Salman et al. (2022) divided the TOE framework into four distinct domains: Library Technology Capabilities, Library Characteristics, Library Environment Characteristics, and Big Data Analytics Readiness. Within the Library Technology Capabilities domain, subcategories are Information Communication Technology (ICT) infrastructure, security, reliability, and data scalability. The Library Characteristics domain comprises five variables, including management support, magnitude, budgeting,

strategies, and talent. Operational acceptance and cultural variables serve as key metrics for assessing Library Environment Characteristics. The significance of this framework can also be understood by examining earlier research (e.g., Aboelmaged et al., in press; Baharuddin et al., 2018; Chen et al., 2018; Gitonga et al., 2023; Lengoatha & Seymour, 2020; Mustafa & Noorhidawati, 2020; Singeh et al., 2020; Sözüer & Pınar, 2016; Yakubu et al., 2023).

Methods

This exploratory study, which aimed to collect data from library managers and administrators about the organizational readiness to adopt artificial intelligence in the library and information sector of Pakistan, was suited for qualitative research. Qualitative research in library systems holds significance as it enables the capture of detailed insights into how things work at a specific level of granularity. It allows researchers to represent the complexities of real-world situations that cannot be easily reproduced, thereby reinforcing its seminal position in the field (Wynn & Hult, 2019).

Due to the widespread nature of the target population, all interviews in this study were conducted online. Online interviews offer several advantages, particularly in overcoming geographical distance, time constraints, and the associated costs of traveling for in-person interviews (Mann & Stewart, 2000). Conducting interviews online eliminates the need for physical presence, allowing for greater flexibility and convenience for both the researcher and the participants. It also facilitates the inclusion of participants from diverse locations, making it easier to reach a broader and more representative sample. In this study, a purposive sampling technique was employed. The participants selected for the study held senior management positions in academic libraries of Pakistan. Participants with seniority were selected to enhance the trustworthiness of the findings. These participants were chosen based on their substantial and comparable experience in library management, which ensured that the insights gathered would be reliable and meaningful. By focusing on participants with senior management positions, the study aimed to capture valuable perspectives and insights from individuals who have a deep understanding of library operations and can provide relevant and informed insights into the research topic.

The size of an organization plays a crucial role in technology adoption. Larger organizations tend to have greater adoption potential, as they possess more resources, skills, and experience to support the implementation and utilization of new technologies. Their size often provides them with a competitive advantage in terms of financial capabilities, infrastructure, and human resources, which can facilitate successful technology adoption. Moreover, larger organizations are generally more resilient and better equipped to handle potential challenges or failures that may arise during the adoption process (Matta et al., 2012).

Consequently, all the participants selected from library and information centres in this study represent organizations that have a history of more than 25 years and possess large libraries. Marshall et al. (2013) recommends that qualitative case studies have sample sizes ranging from 15–30 participants, and contemporary qualitative research (Hoopes et al., 2016; Vasileiou et al., 2018) on the adoption of technology in contexts related to the service sector confirm this figure. Some studies have used much smaller sample sizes, but few fall outside this range (Eze et al., 2019; Soares et al., 2021; Sox et al., 2014). The sample for this study consisted of 27 interviews including 17 senior library managers from academic libraries and 10 administrators at universities across the country (Table 1).

Table 1

Details about Participants

Participant	Organization Type	Role	Geographic Zone
(P1)	Public Sector University	Chief Librarian	Islamabad
(P2)	Private Sector University	Library Director	Islamabad
(P3)	Public Sector University	Chief Librarian	Punjab
(P4)	Public Sector University	Librarian	Punjab
(P5)	Public Sector University	Library Manager	Punjab
(P6)	Private Sector University	Information Executive	Punjab
(P7)	Medical College	Senior Librarian	Sindh
(P8)	Public Sector University	Chief Librarian	Sindh
(P9)	Engineering University	Librarian	Sindh
(P10)	Private University	Director of Information	Sindh
(P11)	Agricultural University	Librarian	Sindh
(P12)	Agricultural University	Chief Librarian	Khyber Pakhtunkhwa
(P13)	Public Sector University	Librarian	Khyber Pakhtunkhwa
(P14)	Engineering University	Librarian	Khyber Pakhtunkhwa
(P15)	Private University	Library Manager	Punjab
(P16)	Public Sector University	Chief Librarian	Balochistan
(P17)	Public Sector University	Library Manager	Azad & Jammu Kashmir
(P18)	Public Sector University	Registrar	Islamabad
(P19)	Public Sector University	Registrar	Punjab
(P20)	Private Sector University	Registrar	Punjab
(P21)	Engineering University	Registrar	Sindh
(P22)	Medical University	Registrar	Sindh
(P23)	Institute of Management Sciences	Registrar	Khyber Pakhtunkhwa
(P24)	Public Sector University	Registrar	Khyber Pakhtunkhwa
(P25)	Public Sector University	Registrar	Balochistan
(P26)	Public Sector University	Registrar	Azad & Jammu Kashmir
(P27)	Private Sector University	Registrar	Islamabad

After transcribing the interviews, we conducted a reflexive thematic analysis as outlined in Braun and Clarke (2021). During the familiarization stage, the transcripts were scrutinized with the research objectives in mind, aiming to pinpoint any data gaps or limitations while also identifying emerging patterns within the data (Lewis et al., 2018). We implemented two rounds of coding. In the initial round, a blend of provisional and open coding techniques was utilized. The provisional coding process was guided by the theoretical framework, utilizing essential terms and concepts as a foundational reference point (Miles & Huberman, 1994). Subsequently, a phase of manual open coding was undertaken to enable the emergence of additional codes through an inductive process. In the second round of coding, we employed axial coding following the strategic data assembly approach, as outlined by Thornberg and Charmaz (2014). Our aim was to uncover connections between the codes to create thematic elements for analysis. During this coding phase, our primary focus was on synthesizing the relationship between the TRI and TOE frameworks, with a specific emphasis on investigating the four readiness elements of the TRI across the three dimensions of the TOE framework. Following two rounds of coding, the themes

were systematically arranged within the three dimensions of the TOE model. These organized themes serve as the structural foundation of our findings.

Results

In response to the query "What do you think of when I mention artificial intelligence in the library context?" the respondents were of the view that the development of computer systems or computers that think, behave, and actually challenge human intelligence is the ultimate promise of AI in libraries, and this clearly has significant consequences for librarianship.

Technological Parameters

Connectivity

Internet connection speed is the basic tool required for AI adoption and implementation (Brown, 2021; Collins et al., 2021). The availability of 5G internet connection provides an opportunity for AI adoption in libraries. Participants (P6) from Punjab, (P18) from Islamabad, and (P23) from Khyber Pakhtunkhwa are of the view that, "Our libraries will implement 5G internet connections as and when Government launch it." A majority of the respondents have claimed 4G connections are sufficient for the smooth implementation of modern technologies in library and information centres. They are of the view, "We are now one step closer to implementing AI and the Internet of Things and other innovative technologies. Thus, having a solid IT infrastructure is crucial." The adoption of AI is closely coupled to other components of the Internet of Things (IoT) ecosystem and is highly dependent on the technological capabilities that support autonomous networks (Bello & Zeadally, 2019).

Respondents were well aware of the importance of technical support by the organization for adoption of AI in libraries (Hradecky et al., 2022). Seven organizations were using and creating networking systems at the same time. Participant (P27) was making investments in their system, while Participant (P18)'s organization opted to use a contractor company for the same purposes. Participant (P12)'s university initiated a significant project five years ago to revamp their facility management. Additionally, Participant (P22) reported having a high-speed internet connection four years ago. The respondents from these various libraries are highly enthusiastic about the implementation of AI in their respective institutions.

Lack of Awareness About AI and Discomforts

Organizational adoption of AI is also impacted by technological practices and a lack of knowledge. Many participants felt overawed by the prospect of adopting AI and lacked clarity regarding how it functions and how, specifically, it would benefit their library systems. For instance, Participant (P15) made the following observation:

> "As a manager, you are unsure about just where to apply AI technology. You obviously understand how the library system works. It is challenging to match the AI technology on your "unique" library object, though. I don't fully understand all the things that technology can accomplish for me as a library manager. Library managers are open to AI, but they are not yet able to fully use its potential. Additionally, it causes other and financial insecurities."

The discomfort is caused by a lack of confidence in the deployment of AI and numerous mistakes in AI pilot tests (Parasuraman, 2000). Participants agreed that there is a need for training programs to improve employees' ability to use AI efficiently in order to deal with the discomfort of AI adoption.

Organizational Dimensions

Perceptions about AI

This study demonstrates that library professionals are generally optimistic and curious about the adoption and use of AI. The majority of our participants have an intention of using AI in their libraries. Most participants concurred that AI will be gradually adopted in the library and is expected to be useful. According to Participant (P16), a chief librarian, AI can have a significant impact on how libraries and library managers are perceived: "AI not only surpasses its designated scope by performing all intended functions, but also has a positive external impact on promoting the library or library managers." Respondents also expressed agreement that AI technology will enhance visitor experiences, expedite decision-making processes, reduce costs, and replace time-consuming tasks (Davenport et al., 2020; Makridakis, 2017).

Organizational Size and Financial Resources

Participants stated that their readiness for adopting AI is significantly influenced by organizational size and financial resources. The majority of participants believed that larger universities would adopt new technologies, including AI, sooner and with greater financial resources. Participants from larger and established universities intend to adopt and create their own AI platforms instead of utilizing contractors. On the other hand, individuals from smaller and more newly established universities also show a strong desire to incorporate modern technology, particularly AI, if required by human resources and as funding permits. In terms of adopting AI, Participant (P13), a librarian from a public sector university in Khyber Pakhtunkhwa, assessed the advantages and disadvantages of small and large university libraries:

> "Smaller institutions have an edge in agility, faster responsiveness, and more risk taking; on the other side, they lack cash. Larger players have resources in both money and people. Not usually, but at least in terms of numbers, very slow decision-making. As a result, both sides have advantages and drawbacks. However, I do believe there is a chance for new players to obtain a competitive edge."

Strategic Plan of the Organization

One of the main barriers to the adoption of AI in university libraries, according to our participants, is the lack of vision, planning, and proactivity of the university and library administrators. According to many participants in our interviews, the library and information sector as a whole is not very progressive in embracing new technologies. Participant (P5) stated:

> "Established IT departments would be beneficial to organizations. According to my observations, this is not a typical practice. IT departments frequently lack the time and resources necessary for the development and deployment of new technologies due to their overwhelming digital commitments."

Senior management has the authority to decide whether to adopt new technology and foster an environment that is conducive to innovation (Premkumar & Roberts, 1999). Most top management may experience insecurity towards the adoption of AI due to the possible harm and disruption that AI could

cause to current organizational structures and activities (Parasuraman & Colby, 2015). Although their library has a three-year business plan, Participant (P9) revealed that AI is not included in this strategy. The existing organizational culture "is not ready to drive digital business models," according to Participant (P18), a registrar.

According to our investigation, some universities are planning to create adoption strategies after seeing the potential of AI. As part of a five-year AI strategy, Participant (P8), a chief librarian, is focusing on creating an AI-powered marketplace and migrating their library catalogue to directories; in 2022, a sizeable amount of funds was proposed for this initiative. Participant (P21), a registrar, plans to recruit a futurist to help them create their strategic plan for 2025, and they identified AI as one of the industry's disruptors and game-changers. Participant (P20), a registrar from a public sector university in Punjab, was of the view that they have been preparing themselves for the adoption since 2016:

> "We started with cleansing our vast amount of data. Our company bought a data management system, which we then connected with our current management system. As a result, we can help recommend services that our library customers need from us more accurately."

From a financial standpoint, AI is primarily viewed as a tool for cost reduction (Davenport et al., 2020). Participant (P25), a registrar from a university in Balochistan, lamented that, "The top management lacks the know-how to effectively implement AI in practical situations," but he still was hopeful that the IT department could cooperate with and persuade the management board. Participant (P26), a registrar, was unable to envisage AI as a tool for cost-cutting in the next few years.

Environmental Dimensions

Data Management and Privacy

University libraries are interconnected with university management and policymakers. The significant data demands of AI systems make it imperative for lawmakers to be involved, prioritizing the protection of their constituents. Moreover, the university's administrators possess the authority to endorse and facilitate the development of innovative and emerging technologies (Hradecky et al., 2022). Participant (P21) responded that, "Examining the matter from a different perspective, university authorities pursue their distinct agendas. Consequently, if the adoption of new technology aligns with their objectives, they are more inclined to allocate funding and support the proposal's implementation." The challenges of data management and privacy concerns in the context of library management and operations were known to our participants. When considering privacy concerns from the viewpoint of library users, Participant (P17), a library manager, expressed unease about the current level of AI readiness. He emphasized that library patrons might be hesitant to embrace facial recognition technology. Moreover, the organization would need to employ a specialist to ensure secure data management after its use and transactions. Participant (P14) positively narrated his point of view:

> "We concentrate on data collection as it is what we need to do. Our library maintains a database of its users, and based on their actions, we can suggest networking opportunities to them, for example via push notifications. AI algorithms possess remarkable capabilities with such data. They can rapidly analyze, evaluate, and predict users' desires, needs, and future actions."

COVID-19 as a Catalyst for Profound Transformation

The library sector has been heavily impacted by COVID-19 as an environmental concern (Hradecky et al., 2022). Participant (P19) is of the view that participants saw the epidemic as a force of transformation to adopt AI despite its destructive effects: "The pandemic's effects have demonstrated the necessity of going more digital and developing fresh strategies for making library contents accessible to users." To enhance socially remote working practices, participants have recognized the pressing need for digitization and the upskilling of employees in digital competencies. As mentioned by Participant (P14), their organization recently embraced new technology to align with the changes in the library landscape brought about by COVID-19. Significant investments were made in virtual meetings, virtual reality, and augmented reality.

Discussion

Theoretical Implications

The theoretical synthesis (Figure 1) of the technology-organization-environment (TOE) framework and the Technology Readiness Index (TRI) used in this research has shed light on the context for AI adoption in the library sector. This theoretical lens offers a novel perspective for understanding the application of AI in this domain. While the TOE framework has been widely used (Aboelmaged, 2014; Hradecky et al., 2022; Oliveira & Martins, 2011; Y. Wang et al., 2008; Y.-S. Wang et al., 2016; Zhao et al., 2016), this study is an addition to the existing theory in the context of Pakistani libraries. The model used in the current study offers a framework applicable to diverse service industries, where interactions between internal and external TOE components are similar. It is crucial for influential decision-makers to consider the implementation of AI in customer-facing businesses. The model efficiently demonstrates how TOE dimensions affect TRI factors, which have been thoroughly investigated by numerous research projects (Aboelmaged, M. G., 2014; Ahmad, H. et al., 2020).

The three TOE elements determine the readiness for AI adoptions as well as the decision-making process for adopting AI in libraries of Pakistan. On one hand, certain factors present specific challenges that result in discomfort (e.g., lack of confidence in new technology) and insecurity (e.g., data management concerns). On the other hand, there are factors that foster innovation and optimism (e.g., facilities with improved connectivity and perceived AI benefits). Conversely, some factors act as double-edged swords (e.g., library size and COVID-19 impacts), simultaneously deterring and encouraging AI adoption in libraries.

We suggest three potential directions for future research, accompanied by corresponding propositions that can guide these investigations. The first avenue involves recognizing the significant influence of the IoT ecosystem's affordances on the effectiveness of AI functionality.
The potential for incorporating AI into routine jobs has considerably increased due to advancements in high-speed internet infrastructure, complex network systems, and emerging technologies. It is crucial to look into how these workflow integrations might function as drivers of AI adoption. Since AI implementation is relatively new in the library sector, the level of confidence and familiarity with emerging technological practices has a significant impact on librarians' feelings of readiness for adoption. Our research indicates that most adoptions are still in their initial phases, and numerous library managers feel uneasy due to either uncertainties about the precise benefits AI can bring to their libraries or a lack of knowledge and skills for its effective implementation.

In future research, it would be beneficial to conduct a comparative study between the positive perceptions of AI and the actual experiences of AI implementations. Special attention should be given to areas such as AI competence and the existing infrastructure. Such an investigation would provide valuable insights into the factors that contribute to favorable outcomes of AI adoption readiness.

Practical Implications

For library managers and administrators in Pakistani universities, as well as those working in large library systems, the findings from this study are quite relevant. Universities can use the method employed in this study to evaluate and strengthen their adoption of AI. The TRI elements in the model represent the psychological factors influencing personnel, while each TOE element creates concrete linkages in the operation of the library. Additionally, the model may be used holistically by library professionals to assess whether their facilities are prepared to adopt AI-powered technologies into their services.

The lack of a concrete intention to adopt AI in Pakistani libraries and information centres is a significant practical implication of this study. Libraries in the universities of Pakistan should either create specific AI adoption strategies or include these factors in their overall strategic planning for two reasons. Firstly, when compared to other easy-to-deploy technologies, AI requires significantly more attention and resources due to its higher level of complexity (Lokuge et al., 2019). Despite library and information centres' experience in incorporating previous technological advancements into their systems and practices, this study highlights the complex interaction of technological and non-technological elements. Consequently, it underscores the necessity of employing a strategic approach to effectively tackle these challenges when implementing AI. Secondly, AI technology operates within a complex regulatory space, involving multiple stakeholders with interests in its regulation and application. To navigate this space effectively, university library systems must adopt a strategic approach that takes into account the perspectives of these stakeholders. Effectively handling intricate stakeholder relationships can prove challenging, particularly due to the demands of AI's nature and regulations, which necessitate establishing connections between library professionals and administrators. To manage the networks of internal and external stakeholders essential for a successful AI adoption, organizations should consider appointing individuals with a specialized knowledge of AI within the context of libraries, especially if they possess sufficient resources.

Limitations and Future Research Directions

Certain limitations have been found during the course of this study. First, conducting virtual interviews can present challenges in capturing nuanced data from posture, body language, gestures, facial expressions, and voice tone. Second, due to the relatively recent adoption of AI in libraries, participants' responses tended to be abstract and lacked concrete evidence. Additional research should be conducted on the readiness of other organizations for the adoption of AI in their respective libraries. More settings can benefit from the applications of the TOE (technology-organization-environment) framework and the TRI (Technology Readiness Index) scale. Research should examine the decision-making process for AI adoption within various organizations. Further research on the readiness of libraries concerning AI adoption should be conducted in different geographical contexts or within smaller universities of Pakistan.

Conclusion

The primary objective of this study was to assess the organizational preparedness for AI adoption in university libraries across Pakistan. The findings indicate that while most participants have not encountered AI in their institutions, their comprehension of its application remains limited and cautious. These results align with previous studies, suggesting that technology adoption, especially in the context of AI, is relatively recent and progressing slowly in this area. The progress of digitalization in university libraries is significantly delayed, and their technology infrastructure is not well suited for adoption of AI in libraries. Although AI has the potential to increase productivity, cut costs, and improve user experiences, most organizations don't have a clear plan on how to put it into practice. This is surprising, considering the recent surge in technology adoption within the libraries, largely driven by the COVID-19 pandemic. Additionally, we found that the degree to which technical practices are trusted, available funding, university size, and data management and security concerns might either encourage or hinder the preparedness of AI adoption in university libraries.

This study has made significant contributions to the existing literature by addressing the lack of library-related research on AI adoption preparedness in libraries, particularly in the context of university libraries. By bridging this gap in the existing knowledge, this research has also generated valuable insights applicable to other parts of the library sector with similar topography. Additionally, this model can be used to assess the organization preparedness for AI adoption in different library settings. This research adds to the limited body of knowledge on library-level AI adoption by exploring how decision-makers assess various factors and their willingness to adopt AI. Lastly, through an empirical investigation of the integration of the TOE framework and the TRI scale, this study highlights the intricate and context-dependent nature of understanding organizational readiness for adopting new technologies.

Authors Contributions

Saeed Ullah Jan: Conceptualization, Methodology, Writing – original draft, Formal analysis **Muhammad Sajjad Ali Khan:** Visualization, Interview-Investigation, Formal analysis **Ali Saeed Khan:** Validation, Literature search, Writing – review & editing.

References

Aboelmaged, M., Mouakket, S., & Ali, I. (in press). A scientometric analysis of digital library adoption over the past 30 years: Models, trends, and research directions. *Journal of Librarianship and Information Science*. https://doi.org/10.1177/09610006231161143

Aboelmaged, M. G. (2014). Predicting e-readiness at firm-level: An analysis of technological, organizational and environmental (TOE) effects on e-maintenance readiness in manufacturing firms. *International Journal of Information Management*, *34*(5), 639–651. https://doi.org/10.1016/j.ijinfomgt.2014.05.002

Ahmad, H., Butt, A. H., Khan, A., Shafique, M. N., & Nawaz, Z. (2020). Reluctance to acceptance: Factors affecting e-payment adoption in Pakistan (The integration of TRI and TAM). *SMART Journal of Business Management Studies*, *16*(2), 49-59. http://dx.doi.org/10.5958/2321-2012.2020.00016.0

Andrews, J. E., Ward, H., & Yoon, J. (2021). UTAUT as a model for understanding intention to adopt AI and related technologies among librarians. *The Journal of Academic Librarianship*, *47*(6), Article 102437. https://doi.org/10.1016/j.acalib.2021.102437

Asemi, A., & Asemi, A. (2018). Artificial intelligence (AI) application in library systems in Iran: A taxonomy study. *Library Philosophy and Practice*. https://digitalcommons.unl.edu/libphilprac/1840

Asemi, A., Ko, A., & Nowkarizi, M. (2021). Intelligent libraries: A review on expert systems, artificial intelligence, and robot. *Library Hi Tech*, *39*(2), 412–434. https://doi.org/10.1108/lht-02-2020-0038

Baharuddin, M. F., Izhar, T. A. T., & Shoid, M. S. M. (2018). Adoption of open source software (OSS) and organization performance in the library. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 285–297. https://doi.org/10.6007/ijarbss/v8-i9/4591

Bello, O., & Zeadally, S. (2019). Toward efficient smartification of the Internet of Things (IoT) services. *Future Generation Computer Systems*, *92*, 663–673. https://doi.org/10.1016/j.future.2017.09.083

Bhattacherjee, A., & Hikmet, N. (2008). Reconceptualizing organizational support and its effect on information technology usage: Evidence from the health care sector. *Journal of Computer Information Systems*, *48*(4), 69-76. https://doi/abs/10.1080/08874417.2008.11646036

Bolt, N. (2014). *Libraries from now on: Imagining the future of libraries: ALA Summit on the Future of Libraries – Report to ALA membership*. American Library Association. https://www.ala.org/tools/sites/ala.org.tools/files/content/LibraryoftheFuture/LibrariesFromNowOn_ALASummitOnTheFutureofLibraries_FinalReport.pdf

Bourg, C. (2017, March 16). What happens to libraries and librarians when machines can read all the books? *Feral Librarian*. https://chrisbourg.wordpress.com/2017/03/16/what-happens-to-libraries-and-librarians-when-machines-can-read-all-the-books/

Braun, V., & Clarke, V. (2021). Can I use TA? Should I use TA? Should I *not* use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches. *Counselling and Psychotherapy Research*, *21*(1), 37–47. https://doi.org/10.1002/capr.12360

Brown, T. (2021). The future of events will be hybrid. In V. Ziakas, V. Antchak, & D. Getz (Eds.), *Crisis management and recovery for events: Impacts and strategies* (pp. 142–164). Goodfellow Publishers. http://dx.doi.org/10.23912/9781911635901-4815

Chaubey, A., & Sahoo, C. K. (2021). Assimilation of business intelligence: The effect of external pressures and top leaders commitment during pandemic crisis. *International Journal of Information Management*, *59*, 102344. https://doi.org/10.1016/j.ijinfomgt.2021.102344

Chen, J., Smadi, D., Zhang, X., & Xie, Z. (2018, March 25–28). *An investigation of cyberinfrastructure adoption in university libraries* [Poster presentation]. iConference 2018, Sheffield, England, UK. https://www.ideals.illinois.edu/items/106330

Collins, C., Dennehy, D., Conboy, K., & Mikalef, P. (2021). Artificial intelligence in information systems research: A systematic literature review and research agenda. *International Journal of Information Management*, *60*, Article 102383. https://doi.org/10.1016/j.ijinfomgt.2021.102383

Cox, A. (2023). How artificial intelligence might change academic library work: Applying the competencies literature and the theory of the professions. *Journal of the Association for Information Science and Technology*, *74*(3), 367–380. https://doi.org/10.1002/asi.24635

Cox, A. M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*, *37*(3), 418–435. https://doi.org/10.1108/LHT-08-2018-0105

Crawford, S., & Syme, F. (2018). Enhancing collection development with big data analytics. *Public Library Quarterly*, *37*(4), 387–393. https://doi.org/10.1080/01616846.2018.1514922

Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, *48*, 24–42. https://doi.org/10.1007/s11747-019-00696-0

Dewi, M. A. A., Hidayanto, A. N., Purwandari, B., Kosandi, M., & Budi, N. F. A. (2018). Smart city readiness model based on technology-organization-environment (TOE) framework and its effect on adoption decision. In M. Tanabu & D. Senoo (Eds.), *Pacific Asia Conference on Information Systems (PACIS) 2018 proceedings*. Association for Information Systems. https://aisel.aisnet.org/pacis2018/268/

Elman, C., Gerring, J., & Mahoney, J. (Eds.). (2020). *The production of knowledge: Enhancing progress in social science*. Cambridge University Press.

Eze, S. C., Chinedu-Eze, V. C., Bello, A. O., Inegbedion, H., Nwanji, T., & Asamu, F. (2019). Mobile marketing technology adoption in service SMEs: A multi-perspective framework. *Journal of Science and Technology Policy Management*, *10*(3), 569–596. https://doi.org/10.1108/jstpm-11-2018-0105

Gholami, Z., Abdekhoda, M., & Gavgani, V. Z. (2018). Determinant factors in adopting mobile technology-based services by academic librarians. *DESIDOC Journal of Library & Information Technology*, *38*(4), 271–277. https://doi.org/10.14429/djlit.38.4.12676

Gitonga, F. N., Gichohi, P. M., & Gichoya, D. (2023). Technology responsive measures adopted by university libraries in Meru County, Kenya in addressing disruptive forces. *International Journal of Professional Practice*, *11*(4), 52–62. https://ijpp.kemu.ac.ke/ijpp/index.php/ijpp/article/view/341

Harisanty, D., Anna, N. E. V., Putri, T. E., Firdaus, A. A., & Noor Azizi, N. A. (in press). Leaders, practitioners and scientists' awareness of artificial intelligence in libraries: A pilot study. *Library Hi Tech*. https://doi.org/10.1108/lht-10-2021-0356

Hradecky, D., Kennell, J., Cai, W., & Davidson, R. (2022). Organizational readiness to adopt artificial intelligence in the exhibition sector in Western Europe. *International Journal of Information Management*, *65*, Article 102497. https://doi.org/10.1016/j.ijinfomgt.2022.102497

Hoopes, A. J., Gilmore, K., Cady, J., Akers, A. Y., & Ahrens, K. R. (2016). A qualitative study of factors that influence contraceptive choice among adolescent school-based health center patients. *Journal of pediatric and adolescent gynecology*, *29*(3), 259-264. https://doi.org/10.1016/j.jpag.2015.09.011

Jiang, Y., & Johnston, C. (2010). Parents' dilemmas in choosing empirically supported treatments for child ADHD. *The ADHD Report*, *18*(4), 5–9. https://doi.org/10.1521/adhd.2010.18.4.5

Kalema, B. M., & Mokgadi, M. (2017). Developing countries organizations' readiness for big data analytics. *Problems and Perspectives in Management*, *15*(1), 260–270. https://doi.org/10.21511/ppm.15(1-1).2017.13

Lengoatha, L., & Seymour, L. F. (2020). Determinant factors of intention to adopt blockchain technology across academic libraries. In *Proceedings of the South African Institute of Computer Scientists and Information Technologists (SAICSIT) '20* (pp. 244–250). Association for Computing Machinery. https://doi.org/10.1145/3410886.3410905

Lewis, M., Sycara, K., & Walker, P. (2018). The role of trust in human-robot interaction. In H. A. Abbass, J. Scholz, & D. J. Reid (Eds.), *Foundations of trusted autonomy* (pp. 135–159). Springer. https://doi.org/10.1007/978-3-319-64816-3_8

Lokuge, S., Sedera, D., Grover, V., & Xu, D. (2019). Organizational readiness for digital innovation: Development and empirical calibration of a construct. *Information & Management*, *56*(3), 445–461. https://doi.org/10.1016/j.im.2018.09.001

Lund, B. D., & Wang, T. (2023). Chatting about ChatGPT: How may AI and GPT impact academia and libraries? *Library Hi Tech News*, *40*(3), 26–29. https://doi.org/10.1108/LHTN-01-2023-0009

Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures*, *90*, 46-60. https://doi.org/10.1016/j.futures.2017.03.006

Mann, C., & Stewart, F. (2000). *Internet communication and qualitative research: A handbook for researching online*. Sage.

Marshall, B., Cardon, P., Poddar, A., & Fontenot, R. (2013). Does sample size matter in qualitative research? A review of qualitative interviews in IS research. *Journal of Computer Information Systems*, *54*(1), 11–22. https://doi.org/10.1080/08874417.2013.11645667

Matta, V., Koonce, D., & Jeyaraj, A. (2012). Initiation, experimentation, implementation of innovations: The case for Radio Frequency Identification systems. *International Journal of Information Management*, *32*(2), 164–174. https://doi.org/10.1016/j.ijinfomgt.2011.10.002

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Sage.

Mogali, S. S. (2014, February). *Artificial intelligence and its applications in libraries* [Paper presentation]. Bilingual International Conference on Information Technology: Yesterday, Today and Tomorrow, Delhi, India. https://www.researchgate.net/publication/287878456_Artificial_Intelligence_and_its_applications_in_Libraries

Motau, M., & Kalema, B. M. (2016). Big data analytics readiness: A South African public sector perspective. In *2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech)* (pp. 265–271). IEEE. https://doi.org/10.1109/EmergiTech.2016.7737350

Mustafa, A., & Noorhidawati, A. (2020). Adoption and implementation of evidence-based library acquisition of electronic resources. *Malaysian Journal of Library & Information Science*, *25*(1), 1-29. https://doi.org/10.22452/mjlis.vol25no1.1

Okunlaya, R. O., Syed Abdullah, N., & Alias, R. A. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library Hi Tech*, *40*(6), 1869–1892. https://doi.org/10.1108/lht-07-2021-0242

Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *Electronic Journal of Information Systems Evaluation*, *14*(1), 110–121. https://academic-publishing.org/index.php/ejise/article/view/389

Omame, I. M., & Alex-Nmecha, J. C. (2020). Artificial intelligence in libraries. In N. E. Osuigwe (Ed.), *Managing and adapting library information services for future users* (pp. 120–144). IGI Global.

Parasuraman, A. (2000). Technology Readiness Index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Parasuraman, A., & Colby, C. L. (2015). An updated and streamlined Technology Readiness Index: TRI 2.0. *Journal of Service Research*, *18*(1), 59–74. https://doi.org/10.1177/1094670514539730

Premkumar, G., & Roberts, M. (1999). Adoption of new information technologies in rural small businesses. *Omega*, *27*(4), 467–484. https://doi.org/10.1016/s0305-0483(98)00071-1

Salman, M. S., Sani, M. K. J. A., & Sahid, N. Z. (2022). Assessing the big data analytics readiness based on technology-organization-environment (TOE) framework of Malaysian libraries: Descriptive analysis. *International Journal of Academic Research in Progressive Education and Development*, *11*(2), 1465–1484. https://doi.org/10.6007/ijarped/v11-i2/13903

Singeh, F. W., Abrizah, A., & Kiran, K. (2020). Bringing the digital library success factors into the realm of the technology-organization-environment framework. *The Electronic Library*, *38*(3), 659–675. https://doi.org/10.1108/el-08-2019-0187

Soares, A. L. V., Mendes-Filho, L., & Gretzel, U. (2021). Technology adoption in hotels: Applying institutional theory to tourism. *Tourism Review*, *76*(3), 669–680. https://doi.org/10.1108/tr-05-2019-0153

Sox, C. B., Crews, T. B., & Kline, S. F. (2014). Virtual and hybrid meetings for Generation X: Using the Delphi method to determine best practices, opportunities, and barriers. *Journal of Convention & Event Tourism*, *(15)*2, 150–169. https://doi.org/10.1080/15470148.2014.896231

Sözüer, A., & Pınar, İ. (2016). Teknoloji-organizasyon-çevre modeli perspektifinden kütüphane 2.0 [Library 2.0 through the perspective of technology-organization-environment framework]. *Türk Kütüphaneciliği* [*Turkish Librarianship*], *30*(1), 20–32. https://dergipark.org.tr/tr/pub/tk/issue/48657/618821

Tella, A. (in press). Adoption of a quadratic usage framework for predicting blockchain use intention from the perspective of librarians in Southwest Nigerian universities. *Journal of Librarianship and Information Science.* https://doi.org/10.1177/09610006231173690

Thornberg, R., & Charmaz, K. (2014). Grounded theory and theoretical coding. In U. Flick (Ed.), *The SAGE handbook of qualitative data analysis* (pp. 153–169). Sage. https://doi.org/10.4135/9781446282243

Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.

Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: Systematic analysis of qualitative health research over a 15-year period. *BMC medical research methodology*, *18*, 1-18. https://doi.org/10.1186/s12874-018-0594-7

Vijayakumar, S., & Sheshadri, K. N. (2019). Applications of artificial intelligence in academic libraries. *International Journal of Computer Sciences and Engineering*, *7*(16), 136–140. https://www.ijcseonline.org/pdf_spl_paper_view.php?paper_id=1294&26-IJCSE-NCCC-2019-69.pdf

Wang, Y., Meister, D., & Wang, Y. (2008). Relative advantage and perceived usefulness: The adoption of competing ICTs. In *Diffusion Interest Group in Information Technology (DIGIT) 2008 proceedings*. https://aisel.aisnet.org/digit2008/6/

Wang, Y.-S., Li, H.-T., Li, C.-R., & Zhang, D.-Z. (2016). Factors affecting hotels' adoption of mobile reservation systems: A technology-organization-environment framework. *Tourism Management*, *53*, 163–172. https://doi.org/10.1016/j.tourman.2015.09.021

Wiese, M., & Humbani, M. (2020). Exploring technology readiness for mobile payment app users. *The International Review of Retail, Distribution and Consumer Research*, *30*(2), 123–142. https://doi.org/10.1080/09593969.2019.1626260

Wynn, E., & Hult, H. V. (2019). *Qualitative and critical research in information systems and human-computer interaction: Divergent and convergent paths*. Now Publishers. https://doi.org/10.1561/9781680835571

Yakubu, A. S., Kassim, A. M., & Husin, M. H. (2023). Conceptualizing hybrid model for influencing intention to adopt cloud computing in North-Eastern Nigerian academic libraries. *The Journal of Academic Librarianship*, *49*(4), Article 102747. https://doi.org/10.1016/j.acalib.2023.102747

Yoon, J., Andrews, J. E., & Ward, H. L. (2022). Perceptions on adopting artificial intelligence and related technologies in libraries: Public and academic librarians in North America. *Library Hi Tech*, *40*(6), 1893–1915. https://doi.org/10.1108/lht-07-2021-0229

Zhao, Y., Deng, S., Gao, T., & Zhou, R. (2016). Research on user needs for mobile information services in Chinese university libraries: Comparison between existing user and potential users. *The Electronic Library*, *34*(4), 617–635. https://doi.org/10.1108/el-12-2014-0222

Appendix
Interview Questions

Section 1
Introduction to the research study; confirmation of participant information and consent.
General familiarization questions.

Section 2
1. What do you think of when I mention artificial intelligence in the library context?
2. How do you perceive artificial intelligence in general?
3. Thinking about adopting artificial intelligence: What are the benefits that you or your organization/university expect to gain by adopting AI?
4. What other technological innovations, excluding AI, has your library adopted in recent years? (Hardware, software, Wi-Fi connection, or similar.)
5. Do you consider your organization sufficiently technologically developed for adopting AI?
6. Where do you see the advantage or the disadvantage of your university's size for adopting artificial intelligence? Are you too small to adopt AI? Or would the AI adoption be easier if you were a larger entity?
7. What kind of influence does senior management in your university have over artificial intelligence adoption?
8. How do government policy and regulation influence your university's decision-making in adopting artificial intelligence?
9. What other external influences are there on adopting AI in the library of your university?
10. How could AI support employees and increase their productivity within the organization you represent?
11. Have you established any training program for your employees to improve their skills before adopting AI? If not, are you planning to do so?
12. Where do you see challenges in adopting AI for your employees?
13. What are the negative impacts that artificial intelligence could cause in your library?
14. Do you perceive any risks to your organization if your organization adopts AI?
15. Does your university have a strategy, or strategic perspective, for adopting artificial intelligence in the upcoming five years?
16. How, in your opinion, could AI impact your library services in the upcoming five years?
17. How does your library possess financial, human, and technological resources for adoption of AI?