DEPARTMENT OF LIBRARY AND INFORMATION SCIENCES
KHUSHAL KHAN KHATTAK UNIVERSITY, KARAK

Journal of Information Management and Library Studies
ISSN 2708-6089

Vol. 7, issue.1,2024

Date of Acceptance: 14 Dec, 2024
Date of Publication: 24 Dec, 2024

Examining Artificial Intelligence (AI) Literacy among University Library Professionals in Pakistan: The Case of Khyber Pakhtunkhwa

Muhammad Ismail (Ph. D)
Assistant Professor, Department of Library & Information Science, University of Peshawar. Email: ismailpeshawar@gmail.com
Abid Hussain
Deputy Librarian, Institute of Strategic Studies, Islamabad. Email: abidmardan@gmail.com
Abdul Haseeb (Ph. D)
Librarian, Central Library, University of Peshawar

Abstract

Artificial intelligence is a significant and strategic innovation of the present world which is intensively impacting every field including libraries. It provides novel mean, especially for university libraries, to enrich service quality, meet varied information needs and requirements of their users, share and use library resources in a scientific way and enhance service delivery. The study is an analysis of the artificial intelligence literacy among university library professionals of Khyber Pakhtunkhwa, Pakistan, highlighting their understanding level, awareness, attitude and perceptions about AI and its utilization in library services. The study used survey method of research based on quantitative approach conducted to seek perceptions of library professionals working in the university libraries of Khyber Pakhtunkhwa. Findings of the study revealed a positive trend in AI literacy among library professionals towards artificial intelligence and its use in libraries. The study participants exhibited a notable enthusiasm for the potential of AI and were of the opinion that AI has the potential to revolutionize university library services. The study also highlighted the significant challenges and issues librarians faced in implementing AI applications, with inadequate IT infrastructure and lack of funds, copyright issues, least interest of higher authorities, lack of interest of staff, emerged as the most pressing concerns. Other pressing challenges indicated by the respondents included unavailability of skilled library staff and lack of institutional policy. However, insufficient training opportunities received a relatively lower rating, suggesting that librarians may be more aware of the need for up-skilling in AI applications. The findings of the study resonated with international trends and prior researches, emphasizing the importance of libraries investing in staff development, infrastructure, and policy frameworks that foster innovation and collaboration. By acknowledging and tackling the issues and challenges identified by this study, libraries can unlock the full potential of AI and provide innovative services to meet the growing informational needs of their users. The study, it is

expected, will serve as a catalyst for further research and collaboration, ultimately empowering libraries to harness the power of AI and redefine the future of library services.

Keywords: Artificial Intelligence, University libraries, Khyber Pakhtunkhwa, AI literacy, ICTs, Library professionals, Information literacy

Introduction

Technological advancements have ushered a pulsating paradigm shift in all dimensions of the daily activities of humans. It has been constantly transforming multiple industries in diverse ways for ten years or so. However, the expansion of AI can be seen as one of the most important segments of technological evolution during the past decade (Newman 2019; Kaplan 2016 and Jamil 2021). Currently a number of industries and scientific and technical organizations are adopting AI and libraries are no exception. Library professionals are usually considered to be technologically curious. Almost all of the library professionals try their best to demonstrate state-of-the-art uses of technology for user engagement and wider professional practice. With the advancement in ICTs, libraries have integrated computer and the allied technologies in their routine processes (Ismail, Idrees & Haseeb, 2024). Almost all university libraries around the world are using cloud computing, web-based information search and retrieval, social networking etc which has made it possible for the patrons to consult their libraries either at home or the office (Rafi, Ming & Ahmad, 2019 and Ali, 2022). A recent development is the introduction of Artificial Intelligence (AI) which includes natural language processing, expert system, virtual assistants, chatbots and robotics. The effective integration and use of this technology in libraries and information centers depends on the AI literacy of information professionals. AI literacy is the ability to understand its application, usage and ethical considerations. An Ai literate person is the one who is well equipped and prepared to make and implement informed decisions concerning AI usage, examine its benefits and risks, navigate the ethical complications inherent in AI based

systems and to navigate the AI infused world confidently and responsibly (Alam et al, 2024). AI is a fast growing field, changes rapidly with the introduction of new features and developments. It involves the development of intelligent computers and their innovative features that can perceive, think, function and behave like human being (Goralski & Tan, 2020; Hassani et al., 2020; Popenici and Kerr, 2017; Eiriemiokhale and Sulyman (2023). Adopting AI, it is expected, will definitely make library professionals' routine tasks easier in order to meet the intellectual needs of the library users. Library professionals in developing countries still lack AI utilization skills. Though, there exists an extensive literature on the use of AI in libraries, however, these works discuss only a few AI applications in libraries. There is a wide agreement that AI is a fast growing technology and have great potential to be adopted in libraries for maximum benefits (Hussain 2023).

A smart library project based on AI is a cumbersome job that involves sufficient finances, state of the art infrastructure and skilled manpower. Presently, large scale usage of AI can be found in big enterprises, however, libraries with more collection and varied services are also considering this technology to support their resources and services (Harisanty et al, 2022 and Khan etal.,2023).) While in a country like Pakistan, like many other fields, the application of AI to various library functions is too slow as compared to the developed countries, however, several university libraries in Pakistan, partially or fully, have started to adopt it for various library processes and services, which can leads to increased benefit and efficiency. To adopt and implement AI to various library services, it is essential for library professionals to consider the issues relating to leadership policies, budgets, human resources and facilities.

An examination of the available literature on AI revealed that most of the studies on AI have been conducted in the developed world such as Europe, the US, Japan, China and Korea. Studies conducted on AI in developing world are a few. Conducting a study on AI technologies relating to

libraries, in a country like Pakistan, will make data available that will prepare Pakistani university librarians for the future. Hence, this study investigated librarians' level of AI awareness, their attitude towards AI, its benefits to library users and the issues and challenges faced by them while integrating AI in their routine library tasks in university library settings in Pakistan. It is expected that the findings and results of this study will elucidate these perspectives on the benefits of Artificial Intelligence for university libraries and the infrastructure needed for its implementation as well as its challenges.

Literature Review

The number of research publications relating to AI has increased significantly during the world over the last two decades (Perrault et al., 2019). Despite of the least researched area in the field of Library and Information Science (LIS), AI has impacted library profession to a greater extent (Hodonu-Wusu & Lazarus, 2018; Hsiao & Chen, 2020; Jabeen, Winkler and Kiszl, 2022). Although conversations around AI have been growing, there are few studies focusing on library professionals' perceptions of AI (de Leon, Flores & Alomo, 2024). According to (Carson & Little, (2014), Cherinet, (2018), Corrado (2021), Ratledge & Sproles, (2017) and Nawaz, Gomes, & Saldeen (2020) artificial intelligence can also improve information search and retrieval, managing library resources, as well as virtual assistance, providing valuable insights and supporting in digital preservation and curation. The expertise of library professionals is crucial in addressing ethical considerations relating to AI implementation, ensuring responsible utilization and reasonable access. Many library and information science professionals recognize the potential of AI to enhance efficiency and user experiences. According to Hussain (2023), though everyone speaks about AI, it is still an emerging technology taking place in various organizations. In the context of libraries, some popular services which are being used for the last several years include RFID, GIS technology, chatbots, big data. Omame and Alex-Nmecha (2020) have noticed that several library

professionals are of the opinion that AI has the potential to deliver faster and accurate search results, eventually increasing users' satisfaction and engagement. A number of scholars have stated that AI can transform libraries' routine services (Hussain, 2023). By adopting AI to various library procedures, librarians can easily enhance their research output, improve working efficiency and provide better services (Barsha and Munshi, 2023 and Yoganingrum, Rachmawati & Koharudin, 2022).

Although librarians tend to embrace AI in a general sense, it is slower to fully integrate it into professional practice (Yoon, Andrews & Ward, 2021). Cox (2021) in his study on artificial intelligence have indicated that library professionals are supposed to have sufficient skills in educating library users about the proper utilization of AI in libraries. Some studies have indicated that a number of library professionals are concerned about the use of artificial intelligence to library functions for a number of reasons like job security, intellectual property, cyber security and technical issues; however, they seems optimistic that this technology has the ability to create more opportunities for library professionals (Wood and Evans, 2018). However, several of the scholars maintained that library professionals should involve themselves with professional experiences with AI. Moreover, their close involvement with experienced personnel will also help them to learn relevant skills and grab innovative ideas to provide better services by applying AI in libraries and information centers. Eiriemiokhale & Sulyman (2023) in his study on awareness and perceptions of AI among library professionals in university libraries in Nigeria, stated that to provide value added services in university libraries, adopting AI is need of the day because this novel technology has the potential to offer patron-tailored recommendations to items, has the ability to eliminate traditional and repetitive tasks and helps in discovering new knowledge. However, to adopt AI in letter and spirit, libraries of developing countries face several issues and challenges such as poor internet connectivity, lack of funds,

lack of interest from the authorities and lack of expertise among librarians. According to Shahzad et al (2024), AI can play a vital role in converting conventional library resources and services into integrated and semantic experiences in university libraries. Artificial Intelligence can help to create state of the art virtual libraries that may go beyond orthodox information search and retrieval. AI uses NLP (Natural Language Processing) and machine learning algorithms to recognize library users' queries, which allows for enhanced intuitive and context-awared interactions. AI helps to facilitate extracting and organizing meaningful relationships between varied sets of data.

Ali et al (2024) have undertaken a study on the applications of AI in the university libraries of Pakistan, wherein they noted that the pace of AI adoption in university libraries of Pakistan is too slow. The study concluded that AI can help libraries in delivering state-of-the-art services in order to meet the informational needs of library users more effectively. The major issues identified by the authors in implementing AI in universities libraries included shrinking funds, nonexistence of expertise and the absence of IT infrastructure. Moustapha and Yusuf (2023) indicated that AI has several advantages for university libraries. Most prominent among these are prompt accessibility, limitless functionality as well as the facility to accomplish multifaceted tasks in limited period of time, among others. However, the study noted that the problems and issues faced by library professionals to adopt AI in libraries include financial insecurity, job insecurity, lack of expertise and poor ICT infrastructure and others. The study concluded that AI adoption in university libraries creates competent and well organized delivery of library services.

Tella (2020), in his study on the importance of AI in libraries has reported that by adopting this technology, libraries can easily enhance operational efficiency. AI has the potential to optimize collection analysis, visualization, collection maintenance, as well as minimize the expenditures related to service delivery. Moreover, It can engage more clientele, helps libraries and information

centers to attain their targeted objectives, give libraries the strength to establish themselves in modern scholarly informational world and to enhance the quality of library services for meeting the information needs of users. Asim et al. (2023) investigated the applications of Artificial Intelligence in the libraries of higher educational institutions in Pakistan. Their study revealed the use of AI in university libraries of Pakistan is very limited. There are only few university libraries that use AI services. Major AI based services being used in Pakistan include RFID, text-speech and speech technology, goggle assistant, and intelligent data analysis for collection management. The study also explored major factors affecting the adoption of AI-based systems such as IT infrastructure, financial implications relating to AI, association and collaboration with IT professionals, and users of libraries. The study found that Pakistani libraries are confronted with various issues and challenges to integrate AI technologies to library functions. Major issued indicated by the study included high cost of AI implementation to library functions and services, the need to create an AI-friendly environment, lack of expertise and absence of mutual collaboration between IT experts and library professionals. Similar findings have also been noted by Rafiqu, Subhpoto and Idrees, who indicated that university libraries are facing several issues and challenges in the adoption of modern technologies due to poor ICT infrastructure, lack of interest by the authorities, budget cuts, lack of expertise, outdated computers and poor internet connections. They recommended university library professionals to collaborate with their respective IT departments for taking maximum advantage of their expertise.

Ali et al. (2020) indicated that Pakistani library professionals have low awareness about artificial intelligence and its usage to various library functions and services. They urged librarians to learn AI and adopt it for value added library services. The study concluded that in order to be skillful and provide value added services, university library professionals should collaborate with

their respective departments of computer science for getting productive results by adopting AI in an academic environment. The study stated that more research about AI adoption in university libraries in Pakistan is needed. Rafiqu, Subhpoto & Idrees (2023) stated that the adoption of modern technological innovations in the university libraries of Pakistan, particularly artificial intelligence and data analytics bears extreme importance. These technologies hold promise for predictive analytic relating to book selection, material development as well as personalized user services.

Scope of the Research

Khyber Pakhtunkhwa shortly called KP or KPK was formerly called as North-West Frontier Province located in the north-western corner of Pakistan. Higher education is provided through 42 public and private public and private universities, DAIs and the affiliated colleges. All these universities and DAIs strictly adopts the curriculum standards prescribed by the Higher Education Commission of Pakistan (Khan & Bhatti 2024). There were a total of 42 recognized universities as on July 12th, 2024. This study covered all these 42 universities and the library professionals working therein.

Objectives of the Study

This study is based on the following objectives:

1. To study the understanding level of university librarians in Khyber Pakhtunkhwa
2. To examine the attitude and perception of university library professionals about AI in libraries.
3. To gauge the proficiency level of university librarians in the use of AI tools
4. To ascertain various benefits of integrating AI in library services

Material and Method

In order to achieve objectives of this study, data was collected from all librarians working in university libraries of KP. The study adopted descriptive survey method with quantitative approach to gather opinions of university librarians in the province of Khyber Pakhtunkhwa, Pakistan.

Population of this study comprised of 210 library professionals of various cadres and grades working in 42 universities of KP. The study included all universities which are officially chartered by the Government of KP and recognized by HEC. The research instrument was designed after consulting various studies such as those conducted by Eiriemiokhale and Sulyman (2023), Hervieux & Wheatley (2022), Shahzad et al (2024), Harisanty et al (2022) and Ajani (2022). Besides these studies, some other similar research studies were also consulted for this purpose. The survey administered 200 questionnaires to the target population using whatsapp and email. After several follow ups and telephone calls, 150 questionnaires dully filled in were received back for data analysis. SPSS 22 was used for analysis. The study used descriptive statistical technique highlighting participants' responses in frequency distribution, means, standard deviation and t-tests where applicable. These metrics comprehensively evaluated respondents' attitudes, perceptions, and AI literacy skills within the context of university libraries in KP.

Data Analysis and Results

Demographic Characteristics of Study Participants

Statistics related to the demographics of the study participants revealed a predominantly male population with diverse experience and designations. Table-1 reveals that 80 percent of the participants were males whereas females were found to be just 20 percent which indicates a gender disproportion. The respondents have a diverse range of experience with 1-5 years possessed by 16.66 percent, 21.33 percent respondents had 6-10 years, 32 percent had 11-15 years whereas 30 percent of the study participants had an experience of 16 years or more. As far educational level of the participants, our data indicated that most of the respondents (73.33%) had a master's degree followed by those (16.66%)who possessed either M. Phil or Ph. D degrees. Similarly 10 percent of the participants had a certificate or diploma level qualification. Respondents had various designations with 18.66 percent were Chief librarians/Deputy librarians, 41.33 percent were Assistant

librarians/Librarians, 5.33 percent had a designation of Cataloguer/Classifier and 34.66 percent of the study participants were either Library assistants or Library clerks.

Table-1: Demographic Characteristics of the Respondents (n=150)

Demographics	items	No. of respondents	Percent
Gender	Males	120	80
	Females	30	20
Experience as library professional	1-5 years	25	16.66
	6-10 years	32	21.33
	11-15 years	48	32
	16 or more years	45	30
Education	Certificate/Diploma course	15	10
	Masters	110	73.33
	M. Phil/Ph.D	25	16.66
Designation	Chief librarian/Deputy librarian	28	18.66
	Assistant Librarian/librarian	62	41.33
	Cataloguer/classifier	8	5.33
	Library Assistant/library clerk	52	34.66

Attitude, knowledge and Awareness of Library Professionals about AI

The survey gathered information about the awareness and knowledge of university library professionals about AI. As given in table-2, respondents indicated a strong willingness to study more about AI and its utilization in libraries. They indicated that they are satisfied with the potential for AI in transforming library operations (Mean = 4.61, SD = 0.92). They were interested to learn more concerning AI and its ethical complications (Mean=4.22, SD=0.98). Respondents were of the view that AI has the potential to improve library services (Mean=4.08 SD=1.12), AI will be used more in

libraries in the future (Mean=3.69, SD=1.22) and were of the opinion that AI may create new challenges for libraries (M=3.66, SD=1.11). However, Mean values for item 6 to 10 in table-2 indicated that respondents did not know much about the possibility that AI can be used for malicious purposes (M=3.48, SD=0.79), they did not have excellent understanding of AI (M=3.44, SD=0.80), were not much confident to explain AI to their colleagues, (M=3.42, SD=1.13). Respondents also confirmed that they didn't know much about some types of AI like machine learning, natural language processing (NLP) etc (M=3.40, SD=1.22), and the current use of AI in libraries (M=3.38, SD=1.33). Thus the results indicated a positive attitude of the study participants towards AI application in their workplace and were aware of the potential challenges concerning AI and its role in university libraries. However, statistically significant results indicated that still there is room for improvement and further exploring the role of AI in university libraries.

Table-2: Respondents' attitude towards AI

Item No.	Attitude towards AI	Mean	St. Dev.	t-value	P-value	Result
1	I am willing to study more about AI and its utilization in libraries	4.61	0.92	-33.70	<0.0001	Sig.
2	I want to learn more concerning AI and its ethical complications	4.22	0.98	-27.38		
3	AI has the potential to improve library service	4.08	1.12	-17.88		
4	AI will be used more in libraries in the future	3.69	1.22	-14.7		
5	I am of the opinion that AI may create new challenges for libraries	3.66	1.11	-17.80		
6	I am worried that AI can be used for malicious purposes	3.48	0.79	-15.22		
7	I have excellent understanding of AI	3.44	0.80	-14.95		

8	I am confident to explain AI to my colleagues	3.42	1.13	15.98
9	I am familiar with difference kind of AIs like machine learning, natural language processing (NLP) etc.	3.40	1.22	-13.66
10	I know about the current use of AI in libraries	3.38	1.33	-12.85

Library Professionals' Knowledge and Competence of AI Application in Libraries

As depicted in table-3, respondents showed greater eagerness about the potential of AI in transforming university library services (M=4.66, SD=0.72) and were of the opinion that AI can be used effectively for accessing library resources and services (M=4.62, SD=0.88). Both of these were statistically significant (p<0.0002). They indicated they were comfortable in the usage of AI in their libraries (M = 4.22, SD = 1.92) and it was easy for them to communicate AI's advantages and disadvantages to library users (M=3.66, SD=142) having statistical significance for both (p<0.0002). They also indicated that it was easy to identify ethical implications of AI usage in libraries with mean value of 3.62 and Standard deviation 1.52 and knew AI usage for various library works like cataloguing and classification, (M= 3.49, SD=0.93) and personalizing library recommendations (M=3.48, SD=0.98). All these items were also statistically significant at the level of p<0002. On the other hand library professionals showed moderate competency in gauging the accuracy of AI tools and resources (M=3.40, SD=1.22) and understanding the application of AI for automating the processes involved in analyzing users' engagement with library resources for better insights and decision-making (M=3.31, SD=1.32) and both were significant at p<0002. Thus it can be inferred that university library professionals had sufficient knowledge of

AI applications in libraries and moderate to high competence in using different these applications.

Table-3: Respondents Knowledge and Competence of AI Application in Libraries

Knowledge and competence of respondents about AI applications	M	SD	t-value	p-value	Results
I am excited about the potential of AI in transforming university library services	4.66	0.72	−36.57	<0.0002	Sig.
AI can be used effectively for accessing library resources and services	4.62	0.88	−29.52		
I can easily use AI in my library	4.22	1.92	−18.44		
I is easy for me to communicate AI's advantages and disadvantages to the users of the library	3.66	1.42	−18.21		
It is easy for me to identify ethical implications of AI usage in libraries	3.62	1.52	−16.22		
I know AI usage for various library works like cataloguing and classification	3.49	0.93	−14.24		
I know the usage of AI for personalizing library recommendations	3.48	0.98	−14.43		
I know the potentials of AI for chat bots and other virtual assistants in libraries.	3.42	1.03	-14.32		
I know gauging the accuracy of AI tools and resources	3.40	1.22	−14.02		

I know the application of AI for automating the processes involved in analyzing users'-engagement with library resources for better insights and decision-making.	3.31	1.32	−12.25

The Impact of AI on University Libraries

The study participants were asked to provide input about the benefits of AI to library routine services. They were given 12 statements and were asked to tick one or more as per their agreement. As given in table-4, majority of the study participants recognized that AI has many advantages with the highest agreement on improving information search and retrieval (98%) and enhancing accessibility to information resources (95.3%). Other benefit as perceived by university library professionals included decreasing duplication of work done by librarians (80.6%), creating virtual assistant (73.3%), saving time and energy of the staff in generating information (70%) and Promoting lifelong learning and scholarship. The least agreement shown by the respondents to the statements included helping in the protection of intellectual properties (IPs) (40%), helping to facilitate the discovery of up-to-date knowledge and information (40.6%), providing user-tailored recommendations to items (43.3%), helping to Automate routine office work (57.3%) and personalizing users' experience (61.3%). The data given in table-4 reflected that overall, library professionals recognized that AI can improve library routine services by improving information search, retrieval and access, decreasing duplication of work, creating virtual assistant and saving time and energy of the staff in generating, automating and processing of information resources. They also agreed to a greater extent that AI has also the potential to promote lifelong learning and protect intellectual property.

Table-4: AI Benefits to Library Services (n=150)

Benefits	Respondents	%
Improve information search and retrieval	147	98.0
Decreases duplication of work done by librarians	121	80.6
Personalizing users' experience	92	61.3
Help in Automating routine office work	86	57.3
Provides user-tailored recommendations to items	65	43.3
Help in analyzing advanced data	94	62.6
Helps in facilitating the discovery of up-to-date knowledge and information	61	40.6
Saves time and energy of the staff in generating information	105	70.0
Creating virtual assistant	110	73.3
Improves accessibility to information resources	143	95.3
Helps in the protection of intellectual properties (IPs)	63	42.0
Promote lifelong learning and scholarship	102	68.0

Issues and Challenges in Adopting AI in Libraries

Table-5, gives detailed information about the issues and challenges as identified by university library professionals in using AI-based system in their libraries. Major issues and challenges identified by them includes inadequate IT infrastructure (Mean = 4.95, SD = 0.742), insufficient funds (Mean = 4.88, SD = 0.763), lack of institutional policies (Mean = 467, SD = 0.880), unavailability of skilled library staff (Mean=4.64, SD=825), inadequate interest among staff (Mean=4.60, SD=0.864), Copyright issues (Mean = 4.40, SD = 0.955), issues in running AI-based service (Mean = 3.88, SD = 0.892), least interest of higher authorities (Mean=3.86, SD=871) and insufficient training opportunities (M=3.12) (SD = 0.944). However, prominent among these hindering the adoption of AI-based system in libraries were lack of proper IT infrastructure and lack of institutional policies. Thus

without addressing these vital issues, it is difficult to adopt AI technologies in university libraries.

Table-5: Issues And Challenges In Adopting Ai In Libraries

Issues and Challenges	M	Std.Deviation
Lack of expertise	4.64	0.825
Poor ICTs infrastructure	4.95	0.742
meager training opportunities for the library staff	3.12	0.944
insufficient funds	4.88	0.763
Copyright issues	4.40	0.955
absence of institutional policies relating to ICTs	4.67	0.880
Least interest of higher authorities	3.86	0.871
Least interest of staff	4.60	0.864
Issues in running AI-based library service	3.88	0.892

Key: Strongly agree=5, agree=4, no opinion=3, disagree=2, strongly disagree=1

Discussion

The study gives an analysis of the artificial intelligence literacy among university library professionals of Pakistan highlighting their understanding level, awareness, attitude and perceptions about AI and its utilization in library services. The demographic characteristics of the study participants reveals a gender disproportion with a predominance of male population which underscores the necessity for a gender inclusive approach to foster artificial intelligence literacy in Pakistani library domain. This aligns with an international trend which indicates that librarianship is mainly a male dominant profession (Williams 1995, Manda (2007, Bamindele & Adekanmbi, 2019). However, Golub (2009), Mars (2018), Dasgupta, (1998), Doran-Myers, (2017) and Alam, etal (2024) are of view that librarianship is widely considered to be a female-dominated profession. Similarly, the educational qualifications and professional experience of the respondents indicates their diversity in professional skill

sets. Our findings reflect a positive attitude of university library professionals of Pakistan towards artificial intelligence and its use in libraries. Similar findings have also been put forward by Asim et al (2023), Ali (2022), Huang (2022), Shaheen & Khurshid (2023) and Shahzad et al (2024) who found that library professionals have a positive attitude towards AI application in libraries. Results of this study indicated a positive trend in AI literacy among library professionals. The study participants indicated that they were familiar with basic concepts of AI implementation to various library procedures such as cataloguing, classification and personalizing user experiences. This suggests that the library professionals were eager to use AI into various library tasks. Studies conducted by Ali (2020), Asemi (2028), Gasparini & Kautonen (2022), Khurshid and Shaheen (2023), Cox (2022), Nonyelum (2019) and Subaveerapandiyan & Gozali (2024) also showed similar findings indicating that library professionals all around the world are trying to learn about AI and use its various tools to library functions that can make library resources and services more strengthened.

Concerning the knowledge and competence of AI useage in libraries, the study participants exhibited a notable enthusiasm for the potential of AI to revolutionize university library services. They were of the opinion that AI can be harnessed effectively to enhance access to library resources and services, such as catalog search, research assistance, and content recommendation. Moreover, they demonstrated a high level of comfort and willingness in utilizing AI-powered tools and resources, recognizing their potential to streamline library operations and improve user experience. This suggests that librarians and library staff are receptive to adopting AI technologies to modernize their services and provide more efficient support to their patrons. The survey results indicate a strong consensus among respondents regarding the benefits of AI applications in libraries. The overwhelming majority recognized the potential of AI to improve information search and retrieval, suggesting that librarians acknowledge the capabilities of AI

in enhancing the discovery and access to library resources. Moreover, they agreed that AI improves accessibility to information resources, implying that AI-powered tools and services can facilitate easier access to library materials, particularly for users with disabilities or remote users.

Results also suggest that librarians see AI as a means to enhance user experience, streamline library operations, and support continuous learning and professional development. However, the relatively lower agreement on providing user-tailored recommendations and protecting intellectual properties indicates that librarians may be more skeptical about AI's ability to provide personalized services or ensure the security of intellectual property. This could be due to concerns about data privacy, the complexity of implementing AI-powered recommendation systems, or the need for further training and education on AI applications in libraries.

The study also highlighted the significant challenges and issues librarians face in implementing AI applications, with inadequate IT infrastructure and lack of funds emerging as the most pressing concerns. The unavailability of skilled library staff and lack of institutional policy also pose significant hurdles. Interestingly, insufficient training opportunities received a relatively lower rating, suggesting that librarians may be more aware of the need for up-skilling in AI applications. Copyright issues, least interest of higher authorities, lack of interest of staff, and issues in running AI-based system also present notable challenges. The findings are consistent with prior research such as Shahzad, Khan, & Iqbal (2024), Subaveerapandiyan, Sunanthini & Amees, (2023), (Echedom and Okuonghae, (2021), Wood and Evans, (2018), Okunlaya et al., (2022), Gasparini and Kautonen, (2022), Wheatley & Hervieux (2019), Jha (2023), Huang (2024), Ali et al (2024), Khanzode & Sarode, (2020), Yusuf et al (2022) and Echedom, & Okuonghae (2021) who in their research studies highlighted hindrances posed by inadequate ICT skills among library professionals and their hesitancy to use AI in university libraries. These findings underscore the need for libraries to

address these obstacles to fully leverage AI's potential, through investments in infrastructure, staff development, and policy frameworks that support innovation and partnership. By acknowledging and tackling such challenges, libraries have the potential to create an environment conducive to successful AI adoption and improved services for their users.

Conclusion

In conclusion, this study offers invaluable insights into the artificial intelligence literacy of university library professionals in Pakistan, providing a comprehensive understanding of their AI knowledge, awareness, attitude, and perceptions. The findings reveal a encouraging trend, with library professionals exhibiting a positive attitude towards AI adoption, enthusiasm for its potential to transform library services, and recognition of its benefits in enhancing information search and retrieval, accessibility, and user experience. However, the study also highlights significant barriers, including inadequate IT infrastructure, insufficient funding, and a shortage of skilled staff, which must be addressed to fully leverage AI's potential. The study's results resonate with international trends and prior research, emphasizing the importance of libraries investing in staff development, infrastructure, and policy frameworks that foster innovation and collaboration. By doing so, libraries can overcome the obstacles and create an environment conducive to successful AI adoption, ultimately enhancing their services and supporting the continuous learning and professional development of their patrons.

The study's findings have far-reaching implications for library professionals, policymakers, and researchers. The findings of this highlighted the necessity for a gender-inclusive approach to AI literacy, up-skilling in AI applications, and addressing the challenges posed by inadequate expertise and infrastructure. Moreover, they underscore the importance of developing context-specific AI solutions that cater to the unique needs of libraries in Pakistan. By acknowledging and tackling these challenges,

libraries can unlock the full potential of AI and provide innovative services to meet the growing informational needs of their users. As AI continues to transform the library landscape, this study serves as a catalyst for further research and collaboration, ultimately empowering libraries to harness the power of AI and redefine the future of library services.

References

Ajani, Y. A. et al (2022). Perspectives of librarians on awareness and readiness of academic libraries to integrate AI for library operations and services in Nigeria. *Internet Reference Services Quarterly*, 26(4), 213-230.

Alam, A. F. et al, (2024). AI literacy and Zambian Librarians: A study of perceptions and applications. *Open Information Science, DOI: org/10.1515/opis-2022-0166*

Ali, K. (2022). Digital information literacy skills among library and information science professionals in university libraries of Sindh, Pakistan. *Journal of Information Management and Practices, 2(1), Doi: https://doi.org/10.52461/jimp.v2i1.1035*

Ali, M. Y. et al (2022). Artificial intelligence application in university libraries of Pakistan: SWOT analysis and implications. *Global Knowledge, Memory and Communication*, (73)1/2, 219-234.

Ali, M. Y., Naeem, S. B., & Bhatti, R. (2020). Artificial intelligence tools and perspectives of university librarians: An overview. *Business Information Review. 37(3),* Doi:10.1177/0266382120952016

Asim, M, et al (2023). Investigating applications of Artificial Intelligence in university libraries of Pakistan: An empirical study. *The Journal of Academic Librarianship*. 49(6). DOI: 10.1016/j.acalib.2023.102803

Asemi, A and Asemi, A. (2018). Artificial intelligence (AI) application in library systems in Iran: A taxonomy study. Library Philosophy anad Practice, 1840. Retrieved June 30, 2024 from: http://digitalcommons.unl.edu/libphilprac/1840.

Bamidele, O & Adekanmbi, O. (2019). Influence of gender differences on usage patterns of electronic information sources among undergraduages in selected universities in Southwest, Nigeria. International Journal of Library Science 2019, 8(2), 27-33

Barsha,S.& Munshi,S.A.(2023). Implementing artificial intelligence in library services: A review of current prospects and challenges of developing countries. *Library Hi Tech News*, doi: 10.1108/ LHTN-07-2023-0126.

Corrado, E. M. (2021). Artificial intelligence: The possibilities for metadata creation. *Technical Services Quarterly*, 38(4), 395–405.

Cox, A. (2022). The ethics of AI for information professionals: Eight scenarios. *Journal of the Australian Library and Information Association,* 71(3), 201-214. Doi: 10.1080/24750158.2022.2084885

de Leon, L. C. R., , Flores, L. V., & Alomo, A. R. L. (2024). Artificial intelligence and Filipino academic librarians: Perceptions, challenges and opportunities. J*ournal of the Australian Library and Information Association,*73(1), 66-83.

Echedom, A.U. & Okuonghae, O. (2021). Transforming academic library operations in Africa with artificial intelligence: opportunities and challenges: A review paper. *New Review of Academic Librarianship*, 27(2), 243-255.

Eiriemiokhale, K. A., Sulyman, A. S. (2023). Awareness and Perceptions of Artificial Intelligence among Librarians in University Libraries in Kwara State, Nigeria. *Indonesian Journal of Librarianship* 4 (2), 107-118. DOI: https://doi.org/10.33701/ijolib.v4i2.3364

Gasparini, A. & Kautonen, H. (2022). Understanding artificial intelligence in research libraries: Extensive literature review. *LIBER Quarterly: The Journal of the Association of European Research Libraries,* 32(1). Doi: http://doi.org/10.53377/lq.10934

Golub, E. M. (21009). Gender divide in librarianship: past, present, and future. Library Student Journal Retrieved

June 29, 2024 from: http://www.dolinfige.uniroma1.it/sites

Goralski, M.A. & Tan, T.K. (2020). Artificial intelligence and sustainable development. *International Journal of Management Education*, 18(1), Article 100330. https://doi.org/10.1016/j.ijme.2019.100330

Harisanty, D. et al. (2022). Leaders, practitioners and scientists' awareness of artificial intelligence in libraries: A pilot study. *Library Hi Tech*. Retrieved June 10, 2024 from: https://www.emerald.com/insight/0737-8831.htm

Hassani, H., Silva, E.S. & Unger, S. (2020). Artificial intelligence (AI) or intelligence augmentation (IA): What is the future? *AI*, 1(2), 143–155.

Hervieux, S. & Wheatley, A. (2021). Perceptions of artificial intelligence: A survey of academic librarians in Canada and the United States. *Journal of Academic Librarianship*, 47(1). Retrieved June 11, 2024 from: https://doi.org/10.1016/j.acalib.2020.10227

Hodonu-Wusu, J. O., & Lazarus, G. N. (2018). Major trends in LIS research: A bibliometric analysis. *Library Philosophy & Practice*, 1873, 1–21. Retrieved June 30, 2024 from: https://digitalcommons.unl.edu/libphilprac/1873/

Hsiao, T.M., & Chen, K. (2020). The dynamics of research subfields for library and information science: An investigation based on word bibliographic coupling. *Scientometrics,* 125(1), 717–737.

Hussain, A. (2023). Use of artificial intelligence in the library services: Prospects and challenges. *Library High Tech News*, 40(2), 15-17. DOI: 10.1108/LHTN-11-2022-0125.

Huang, Y. H (2022). Exploring the implementation of artificial intelligence applications among academic libraries in Taiwan. *Library Hi Tech,*

Ismail, M., Idrees, M. & Haseeb, A. (2024). Examining digital information literacy skills of faculty members in the public sector universities of Peshawar, Pakistan. *Journal of Information Management and Practice,* 4(1), 57-75.

Jamil, S. (2021). Artificial intelligence and journalistic practice: The crossroads of obstacles and opportunities for the Pakistani journalists. *Journalism Practice*, 15(10), 1400-1422, DOI: 10.1080/17512786.2020.1788412

Kaplan, Jerry. 2016. Artificial Intelligence: What Everyone Needs to Know. Oxford, UK: Oxford University Press.

Jha, S.K. (2023). Application of artificial intelligence in libraries and information centers services: prospects and challenges, *Library Hi Tech News*, 40(7), 1-5. Doi: https://doi.org/10.1108/LHTN-06-2023-0102.

Khan, S. D et al. (2023). Artificial intelligence in education: enhancing learning experiences and personalization. *Journal of Informatics Education and Research*,3(2), 1-9

Khan, G. & Bhatti, R. (2024) Selection of library materials in the university libraries of Pakistan: A survey of Khyber Pakhtunkhwa. *Collection Management*, 49(1-2), 82-102.

Khanzode, K. C. A., & Sarode, R. D (2020). Advantages and disadvantages of artificial intelligence and machine learning: A literature review. *International Journal of Library & Information Science (IJLIS)* 9(1).

Manda, P. A. 2005. Electronic resource usage in academic and research institutions in Tanzania, *Information Development*, 21(4)

Mars, P. (2018). Gender Demographics and Perception in Librarianship. School of Information Student Research Journal, 7(2). Retrieved June 29, 2024 from: https://scholarworks.sjsu.edu/ischoolsrj/vol7/iss2/3

Moustapha, A.A. & Yusuf, I.O. (2023). Adoption of artificial intelligence to improve library service delivery in academic libraris in Kwara State, Nigeria. Library Philosophy and Practice (e-journal). 7915. https://digitalcommons.unl.edu/libphilprac/7915

Nawaz, N., Gomes, A.M., & Saldeen, M.A. (2020). Artificial intelligence (AI) applications for library services and resources in COVID-19 pandemic. *Journal of Critical Reviews*, 7(18), 1951-1955.

Newman, Nic. 2019. Journalism, Media. Oxford: Reuters Institute: The University of Oxford. Peiser, Jaclyn. 2019. "The Rise of the Robot Reporter."

https://www.nytimes.com/2019/02/05/business/media/artificial-intelligence-journalism-robots.html.

Nonyelum, P. O. (2019). Artificial intelligence in libraries and users satisfaction in higher institutions in Nigeria. *International Journal of Research in Informative Science Application & Techniques (IJRISAT), 3(2).* Retrieved June 30, 2024 from: *file:///C:/Users/Dell/Downloads/IJRISAT_artificial_Jan193261-67.pdf*

Okunlaya, R.O., Abdullah, N. S. & Alias, R.A. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library HiTech*,40(6), 1869-1892.

Omame, I.M. and Alex-Nmecha, J.C. (2020). Artificial intelligence in libraries. In Osuigwe, N. (Ed.), "*Managing and Adapting Library Information Services for Future Users",* IGI Global,120-144, doi: 10.4018/978-1-7998-1116-9.ch008.

Perrault, R. et al, (2019). The AI index 2019 annual report. Stanford: AI Index Steering Committee, Human-Centered AI Initiative. Retrieved June 30, 2024 from: https://hai.stanford.edu/sites/default/files/ai_index_2019_report.pdf

Popenici, S.A.D. & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12, 22. Retrieved June 20, 2024 from: https://telrp.springeropen.com/articles/10.1186/s41039-017-0062-8

Rafi, M., Ming, J. Z., & Ahmad, K. (2019). Technology integration for students' information and digital literacy education in academic libraries. Information Discovery and Delivery, 47(4), 203–217. doi: 10.1108/IDD-07-2019-0049.

Rafique, G. M., Subhpoto, A & Idrees, H. (2023). Exploration of ICT applications in public sector university libraries of Interior Sindh: A mixed methods research.

Journal of Information Management and Practice (3(2), 1-30.

Shaheen, M. & Khurshid, A. (2023). Perceptions and experiences of Artificial intelligence (AI) use in libraries: A study of library users in Paksitan. *Library Philosophy and Practice (e- Journal). Retrieved June 30, 2024 from:* http://digitalcommons.unl.edu/libphilprac/7905

Shaheen,M.,&Khurshid,A.(2023).PerceptionsandExperiencesofArtificialIntelligence(AI)UseinLibraries:AStudyofLibraryUsersin Pakistan. Library Philosophy and Practice (e-Journal). https://digitalcommons.unl.edu/libphilprac/7905.

Shahzad, K. et al, (2024). Identifying university librarians' readiness to adopt artificial intelligence (AI) for innovative learning experiences and smart library services: An empirical investigation. *Global Knowledge, Memory and Communication*,June 2024, Doi: 10.1108/GKMC-12-2023-049

Shahzad, K., Khan, S.A. and Iqbal, A. (2024). Effects of artificial intelligence on university libraries: An SLR of cite score and IF journals' articles from 2018 to 2023", *Global Knowledge, Memory and Communication*, Retrieved June 30, 2024 from: https://www.emerald.com/insight/content/doi/10.1108/GKMC-12-2023-0498/full/html

Subaveerapandiyan, A., Sunanthini, C., & Amees, M. (2023). A study on the knowledge and perception of artificial intelligence. *IFLA Journal, 49(3), Doi:* https://doi.org/10.1177/0340352231180230

Tella, A. (2020). Robots are coming to the libraries are librarians ready to accommodate them? *Library Hi Tech News*, 37(8), 13–17.

Wheatley, A., & Hervieux, S. (2019). Artificial intelligence in academic libraries: An environmental scan. *Information Services and Use*, 39(7), 1–10.

Williams, C. L (1995). *Still a man's wold: Men who do "women's work*. University of California Press, Berkeley

Winkler, B. & Kiszl, P. (2022) Views of academic library directors on artificial intelligence: A representative

survey in Hungary. *New Review of Academic Librarianship*, 28(3), 256- 278, DOI: 10.1080/13614533.2021.1930076

Wood, B.A. & Evans, D. (2018). Librarians' perceptions of artificial intelligence and its potential impact on the profession. *Computers in Libraries*, (1), 1041-7915.

Yoganingrum, A., Rachmawati, R & Koharudin, K. (2022). Past, present and future of AI in library services. In *Handbook of Research on Emerging Trends and Technologies in Librarianship. Retrieved July 08, 2024 from: https://www.igi-global.com*

Yoon, J. W., Andrews, J. E., & Ward, H. L. (2021). Perceptions on adopting artificial intelligence and related technologies in libraries: Public and academic librarians in North America. *Library Hi Tech*, 37(3).

Yusuf, T. I., et al. (2022). Adoption of artificial intelligence for effective library service delivery in academic libraries in Nigeria. Retrieved july 02, 2024 from: https://www.researchgate.net/publication/358429744_ADOPTION_OF_ARTIFICIAL_INTELLIGENCE_FOR_EFFECTIVE_LIBRARY_SERVICE_DELIVERY_IN_ACADEMI C_LIBRARIES_IN_NIGERIA