

## Assessing AI-Powered Library Professionals: Implications for Management in Developing Essential 21st-Century Skills

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**Abstract:** The study aimed to investigate the AI competencies (cognitive, behavioural, and normative) of library professionals, ethical issues associated with AI literacy, and essential knowledge areas, as well as to check the difference in participants' opinions based on demographic variables. This is a quantitative study based on a self-developed questionnaire. The data was collected from library professionals working in the libraries of Islamabad, Pakistan Universities using Google Forms. A total of 104 responses were recorded, and 96 were valid responses. The total HEC-recognized universities are 23. The results highlighted that library professionals in Islamabad, Pakistan, have limited cognitive, behavioural, and normative AI competencies. They were aware of AI tools that can be used to enhance library operations, yet they haven't implemented or integrated any AI tool. Ethical awareness was also lacking, with professionals struggling to assess AI reliability and address privacy concerns. They were dissatisfied with the AI training they attended, which suggests a need to plan customized training programs. Inferential analysis showed no significant differences in AI literacy based on demographic variables. This study is of its nature; no study has investigated the AI literacy skills of library professionals in Islamabad, Pakistan. This study will add to librarianship, social sciences, and AI literacy literature. This study is limited in terms of its population as the data is collected from randomly and conveniently available library professionals in Islamabad, Pakistan, university librarians.

**Keywords:** AI-powered Librarian, Artificial Intelligence, Librarians and AI Literacy; AI Competencies, User Engagement and User Satisfaction; Natural Language Processing; ChatGPT and AI technologies.

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### 1. Introduction

Very few sectors have not been affected by the application of AI technologies. This development has led to the revolution of many processes and services worldwide. For a long time, libraries have worked hard to augment dry efficiency and foster services offering unparalleled access and personalization, transforming the conventional library system. Some traditional library services are changing because AI has started to automate basic functions [1]. Basic tasks, such as catalogue and collection classification or information search and retrieval, all enhance the effectiveness and order of the library system. This allows for a greater opportunity for librarians to engage in more stimulating work [23]; [29]; [9]. Implementing artificial intelligence technology has created an experience unique to each user due to machine learning models that analyze user information-seeking

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behaviours and provide personalized suggestions. This increases user engagement and satisfaction [12]; [4]. The Otaka AI system can aid libraries in performing data analytic functions, as it does. AI does at least know how better than existing systems, responds to user's queries in real-time and undertakes a proactive understanding of their requirements at a deeper level [13]; [25]. The foremost integration of AI technologies is in translation, speech synthesis, and navigation systems capable of transforming content information into a form easier for the challenged and the disabled to comprehend. Users are now receiving assistance from AI-powered virtual chatbots designed using natural language processing, and they help answer systems and other library function queries [12]. All these alterations will, in the long run, trigger shifts in the functions and competencies of the library and information service centres that have already been manifested due to AI. That has, let's say, added relevance to such technology. Such professional responsibility will have ethical ramifications, which include the use of AI, issues with data privacy, and, more importantly, the greater socio-ethical value of inclusivity and accessibility [5]. It is for this reason that promoting AI literacy is a way to contribute to effective professional development for specialists in the field of libraries [31]; [30]; [26].

Trained proficiency in AI usage in Library and Information Science (LIS) and developing curriculum practices are what the literature suggests and what most current studies entail. Contact among practitioners, learners, faculty members, and even ICT staff is useful in drafting AI literacy modules in academic libraries since it is bound to promote safe AI use [8]; [18]. Hanson et al. [13] and Lo [20] stressed the point of teaching new skills via training sessions rather than assuming interns come in with skills. Deshen & Aharony [10] focus on energetic AI acceptance and proactive utilization among librarians and on utilising ChatGPT and other AI tools in library services, respectively.

The conclusion that can be derived from the research is that while the challenges of AI utilization in libraries are real, the advantages are greater because services are delivered more effectively, students must be educated on information literacy, and fewer personnel are needed to accomplish more. To fully accommodate and resource patrons, intelligent librarians will have to adopt these technologies [6]. This document highlights the expanding roles of librarians in modern life in the context of developing technologies. It focuses on learning AI and machine learning for better user engagement, automating monotonous work, and building more complex, ethically balanced, and user-friendly modern library systems and services. Khan and Ullah [17] discuss the modern IoT and AI technologies Librarians use.

The use of AI in libraries across different parts of the world has had positive results due to the automation of sorting, extracting information, and delivering recommendations, which improve efficiency and customization. Machine learning enhances users' engagement since other relevant services are provided. Furthermore, advanced AI tools like virtual chatbots and translation automation increase the level of information exchange to make it more comprehensive. However, adopting AI tools also means that certain ethical risks have to be evaluated, such as the possibility of data misuse and ensuring diversity. This advice has to be implemented, and the action plans stay with the librarians' heads so that they are trained, workshoped, and collaborated with specialists on AI literacy. Likewise, as technology develops, libraries must evolve with it, and so, to a degree, will the librarian's role.

### **1.1. Problem statement**

As AI increasingly integrates into library services, library professionals must possess the skills to navigate the evolving digital landscape. AI literacy is vital for enhancing service delivery, improving user engagement, and addressing ethical considerations. However, there is an urgent need to develop professional competencies through a multi-faceted approach, which includes curriculum enhancement, continuous learning, and hands-on training. This study aims to assess the current levels of AI literacy among library professionals by exploring their understanding of AI-related concepts, ethical concerns, and challenges in implementation. The findings will provide valuable insights to inform the development of AI-focused educational programs and training initiatives in Library and Information Science (LIS), ensuring that professionals are well-prepared for the future of library services.

### **1.2. Objectives of Research**

The objectives of this study were to:

- Develop a framework for AI literacy tailored to the evolving roles of library and information professionals.
- Identify best practices for implementing AI-driven tools and technologies in library services to improve efficiency and user engagement.
- Examine the role of AI in enhancing information access, retrieval, and management in modern library environments.
- Assess the impact of AI literacy on librarians' ability to support digital scholarship and data-driven decision-making.
- Provide recommendations for designing AI-focused professional development programs to ensure continuous skill enhancement among library staff.

### 1.3. Research Questions

- What framework can be developed to enhance AI literacy among library professionals?
- How can AI-driven tools be effectively integrated into library services to optimize efficiency and user engagement?
- What is the role of AI in improving information access, retrieval, and management in libraries?
- How does AI literacy impact librarians' ability to support digital scholarship and data-driven decision-making?
- What strategies can be employed to design effective AI-focused professional development programs for library staff?

## 2. Literature Review

Artificial Intelligence (AI) has recently developed tremendously due to its application and adoption in many industries. The libraries are also in touch with these changes, embracing AI-based tools and technologies. This situation raises the critical need for AI literacy among library and information practitioners. They also need to develop these AI literacy skills while strengthening empathy, critical thinking, ethical judgement, and creativity to meet the professional skill requirements, which is the balance between humanistic skills and technology.

AI literacy is the ability to understand people's interactions with AI systems and engage in personally responsible actions within the bounds of the technologies used. It allows for effective and responsible engagement and interaction with various AI tools and systems [33]; [11]. Three noteworthy antecedents can be identified because of AI literacy: cognitive, behavioural, and normative gaps. Knowing the features of AI, its characteristics and the processing and algorithm impacts is included in the cognitive competencies [16]; [27]. The behavioural competencies align with user efficacy [32], including application and creation [3]. These considerations include ethical and threat appraisal aspects [3]; [14]; [32].

Under preparation for the practitioners of tomorrow is how they accommodate AI infusion on their existing models of education on librarianship. For now, attention is elsewhere on identifying various skills that AI will impact. However, there is a growing need for more systematic syllabi formulation in LIS to integrate these transformative technologies in the future [7]; [32]; [19]. More focus is needed on the work of university librarians and other partners in policymaking on how AI literacy will be taught in higher education libraries [8]. Zhou & Schofield [34] have pointed out some factors that influence librarians' acceptance of AI technology, including social factors, positive emotions towards AI, and hedonic motivation, which were also factors in building AI literacy among librarians.

Evaluation and reasoning skills enable an individual to think, which, in turn, is fundamentally linked to AI literacy. All AI-proficient information professionals should know how to measure the tool's strengths and weaknesses. Literacy also enables Information Specialists to strategically understand the implications of AI technologies and creatively address them within their work environment [2]. Knowing the characteristics of changeable AI, time frames can be short. Hence, these technologies and curriculum structures need more innovative ideas. It should promote expanding the concept of learning in the later stages of life. All information professionals are encouraged to constantly learn to keep track of the changes in AI and best practices [15]; [22].

The most notable AI concepts and technologies that should be incorporated within the LIS syllabus are generative AI tools, machine learning, data analytics, AI literacy, and algorithms. The curriculum should capture the uses of AI tools like ChatGPT, Gemini, and Bard, which are important for the metadata, cataloguing, and information retrieval activities going on in the libraries. Having experience with these tools will assist the learners in applying them in the creation of bibliographic records and in enhancing library services [28]. Works on machine learning technologies and data analytics span important processes such as resource classification, clustering, and visualization. These acquired skills will improve the competitiveness in big data management and library operations and services [21]. Foundational knowledge of AI literacy, including algorithms, data processing, and machine learning, is also important in helping learners solve problems using AI tools and the technology's impacts and applications [24]. Ullah et al. also discuss challenges in delivering modern library services due to the lack of AI technologies [29].

Incorporating AI in libraries has revealed a crucial factor: library and information specialists must be proficient in AI. AI literacy is multidisciplinary; therefore, The AI component in a Library and Information Science (LIS) program is essential for developing future librarians. However, advanced curricula and intentional instructional methods must be planned and executed to fulfil this goal. Professionals must always possess the skills to think critically, reason, and learn to manage AI tools and their impacts appropriately. Moreover, integrating generative AI, machine learning, and data mining into the curriculum will increase the possibilities for librarians concerning metadata, cataloguing, and big data analysis. With these artificial intelligence technologies in libraries comes a great need and opportunity for efficient and proper continuing education for librarians in providing modernized library services.

### 3. Research Methodology

The survey method was used to evaluate the need for AI literacy among library professionals in Islamabad, Pakistan. The study primarily focused on a diverse sample of library professionals from Higher Education Commission (HEC) recognized universities in Islamabad. A questionnaire was developed to measure various aspects of AI literacy, including behavioural, cognitive, and normative competencies. It consisted mainly of closed-ended questions and Likert scale items designed to collect demographic information and assess participants' attitudes, skills, and knowledge regarding the application of AI in library services. The online survey was distributed through researcher contacts and social media groups. Participants were encouraged to share the survey link within their professional networks, facilitating data collection. Ninety-six valid responses were obtained from library professionals across university libraries in Islamabad. The researchers contacted 15 to 20 library professionals for feedback for the pre-testing phase. An electronic version of the questionnaire was developed, and data was gathered from library professionals at university libraries in Islamabad through email. Social media platforms such as Facebook and WhatsApp were also used for data collection. Data was analysed using Statistical Product and Service Solutions (SPSS) software, version 23, and Microsoft Excel. Finally, tables were created to describe and present the study's findings.

### 4. Data Analysis

The data analysis was conducted using SPSS software, and various analysis was performed, which included descriptive statistics to summarize demographic information and pattern of response, an independent sample T-test to compare variables between different groups such as male vs female and an ANOVA test to analyse the difference in variables across various library types, educational levels, experience-based and age groups. For demographic variables, participants were asked about their age, education, experience, and the type of library they work in. Table 1 elaborates that most library professionals were aged 45-54 and possess work experience of 16 and more than 16 years. 54 male and 42 female library professionals participated in the study. In the same way, a majority of professionals had a master's degree and worked in university libraries.

**Table 1: Demographics of Participants**

Age	Frequency	Percentage
18-24	0	0.0
25-34	10	11.6
35-44	41	38.4
45-54	33	36.0
55 and above	12	14.0
Total	96	100.0
<b>Gender</b>		
Male	54	55.8
Female	42	44.2
Total	96	100.0
<b>Experience in years</b>		
0-5	7	8.1
6-10	8	9.3
11-15	28	20.9
16 and above	53	61.6
Total	96	100.0
<b>Education</b>		
Bachelors	19	22.1
Masters	54	51.2
PhDs	23	26.7
Total	96	100.0

#### 4.1. Current level of AI literacy (Cognitive competencies)

The results (Table 2) elaborate that librarians possess limited AI literacy regarding cognitive competencies. Most participants (51.2%) could not explain the basic principles of AI to others, and only 24.4% strongly agreed that they could explain AI principles to others ( $M=2.59$ ,  $SD=1.74$ ). Similarly, a significant portion presumed they could not differentiate various AI technologies, and around 30% agreed with their skills of differentiating various technologies ( $M=2.67$ ,  $SD=1.55$ ). The majority were unfamiliar with AI tools used in libraries (38.4%), and they did not possess the ability to identify AI applications in the library services (39.5%), with a mean score of 2.85. Last but not least, Understanding the limitations of AI had the highest level

of disagreement, with 50% strongly disagreeing (M=2.48, SD=1.62). The overall mean score exhibited that respondents possess an average level of AI literacy, which suggests that there is a need for AI-focused training programs.

**Table 2: AI Competencies Level (Cognitive competencies)**

Statement	SD	D	N	A	SA	Mean	SD
I can explain the basic principles of artificial intelligence to others.	54 (51.2%)	1 (1.2%)	8 (9.3%)	12 (14%)	21 (24.4%)	2.59	1.74
I understand the differences between various AI technologies (e.g., machine learning, natural language processing, gen AI)	44 (39.5%)	3 (3.5%)	21 (24.4%)	13 (15.1%)	15 (17.4%)	2.67	1.55
I am familiar with popular AI tools used in library services (e.g., ChatGPT, Gemini, etc.).	43 (38.4%)	2 (2.3%)	9 (10.5%)	12 (14%)	30 (34.9%)	3.05	1.77
I can identify potential applications of AI in libraries and information services.	44 (39.5%)	2 (2.3%)	15 (17.4%)	13 (15.1%)	22 (25.6%)	2.85	1.67
I understand the limitations of current AI technologies	53 (50%)	2 (2.3%)	13 (15.1%)	13 (15.1%)	15 (17.4%)	2.48	1.62

#### 4.2. Current Level of Behavioral Competencies

Secondly, behavioural competencies were measured to check library professionals' current level of AI literacy. The results (Table 3) show that most library professionals possess limited experience with using AI-based tools to complete their tasks. Most participants (70%) disagreed that they have experience using AI tools for bibliographic records (M=2.23, SD=1.29). In terms of using AI-powered data analytics for library operations, 32.6% strongly disagreed, and 18.6% disagreed, which confirms that they have limited practical application (M=2.52), the majority (50%) disagreed that they could use AI tools for information retrieval (M=2.57). In the same way, 50.1% showed reluctance or lack of familiarity with integrating AI tools into library services. The mean score below 3 indicates disagreement or lack of confidence among library professionals. Thus, the mean score given in Table 3 demonstrates a low level of AI behavioural competencies among library professionals. Standard deviations indicate some variation, but overall responses suggest that most professionals are not actively engaged in AI-driven library practices. Overall, professionals had less experience with AI tools with specific integration into library services such as data analytics or information retrieval.

**Table 3: Current level of AI literacy (Behavioral competencies)**

Statement	SD	D	N	A	SA	Mean	SD
I have experience using AI tools to create bibliographic records.	45 (40.7%)	18 (20.9%)	17 (19.8%)	10 (11.6%)	6 (7%)	2.23	1.29
I can use AI-powered data analytics tools to improve library operations.	38 (32.6%)	16 (18.6%)	19 (22.1%)	15 (17.4%)	8 (9.3%)	2.52	1.35
I am comfortable integrating AI tools into existing library services.	46 (41.9%)	7 (8.1%)	15 (17.4%)	14 (16.3%)	14 (16.3%)	2.57	1.55
I can use AI to enhance information retrieval processes in my library.	53 (50%)	7 (8.1%)	9 (10.5%)	16 (18.6%)	11 (12.8%)	2.36	1.54
I have designed AI-powered personalized learning experiences for library users.	42 (37.2%)	17 (19.8%)	18 (20.9%)	12 (14%)	7 (8.1%)	2.36	1.32

#### 4.3. Current level of AI literacy (Normative competencies)

Normative competencies of library professionals were also measured using a five-point Likert scale, and the results highlight that professionals possess limited awareness and understanding of AI-related ethical, privacy, and accountability concerns. More than 50% of participants disagreed and strongly disagreed with the statements that they could identify the biases in AI algorithms and were unaware of AI privacy policies (M=2.38, SD=1.30). Table 4 also elaborated that the majority could not evaluate the reliability or accuracy of AI tools. Similarly, the mean score for normative competencies remained under 3, which shows the low level of normative competencies among library professionals as they lack confidence in handling AI-related ethical and accountability issues.

**Table 4: Current level of AI literacy (Normative competencies)**

Statement	SD	D	N	A	SA	Mean	SD
I can identify potential biases in AI algorithms and their outputs.	41 (36%)	15 (17.4%)	23 (26.7%)	10 (11.6%)	7 (8.1%)	2.38	1.30
I am aware of the privacy implications of using AI in library services.	48 (44.2%)	4 (4.7%)	25 (29.1%)	12 (14%)	7 (8.1%)	2.37	1.38
I can critically evaluate the reliability and accuracy of AI-generated information.	43 (38.4%)	8 (9.3%)	22 (25.6%)	10 (11.6%)	13 (15.1%)	2.56	1.48
I understand the ethical considerations of using AI in information retrieval and dissemination.	51 (47.7%)	3 (3.5%)	14 (16.3%)	15 (17.4%)	13 (15.1%)	2.49	1.57
I can explain the concept of AI accountability to library users	52 (48.8%)		19 (22.1%)	14 (16.3%)	11 (12.8%)	2.44	1.53

#### 4.4. Essential AI Literacy Skills and Knowledge Areas

Library professionals were asked to share their perceptions about the essential AI literacy skill areas on a five-point Likert scale. The results in Table 5 show a varying level of participant's agreement with the statements. Most participants strongly disagreed (40.7%) that understanding AI algorithms and machine learning is crucial for LIS professionals (M=2.76, SD=1.65). Most participants agreed with the inclusion of AI tools in LIS education, with 36% strongly agreeing and 10.5% agreeing. It is important to mention that 40.7% strongly disagreed, showing that not all respondents consider practical AI training essential. However, the mean score of this statement showed that the majority agreed with the inclusion of AI tools in LIS education (M = 3.00, SD = 1.79). For knowledge of data management and analysis, participants gave mixed opinions, with around 45 per cent disagreeing.

In comparison, 46% agreed that data management and analysis are crucial for working with AI in libraries. There was a division in perception for critical thinking skills. Thus, both the statements about critical thinking skills for evaluating AI tools (M = 2.98, SD = 1.81) and knowledge of data management and analysis (M = 2.86, SD = 1.79) were acknowledged as crucial, but a significant number of respondents remained neutral or disagreed on their necessity. Understanding the Societal Impact of AI received a relatively balanced response, with 32.6% strongly agreeing and 12.8% agreeing that LIS professionals should understand AI's societal impact (M = 3.00, SD = 1.73).

**Table 5: Essential AI Literacy Skills**

Statement	SD	D	N	A	SA	Mean	SD
Understanding AI algorithms and machine learning principles is crucial for LIS professionals.	45 (40.7%)	3 (3.5%)	17 (19.8%)	10 (11.6%)	21 (24.4%)	2.76	1.65
Practical experience with AI tools should be a core component of LIS education.	45 (40.7%)	1 (1.2%)	10 (11.6%)	9 (10.5%)	31 (36%)	3.00	1.79
Data management and analysis knowledge is essential for working with AI in libraries.	49 (45.3%)		7 (8.1%)	14 (16.3%)	26 (30.2%)	2.86	1.79
Critical thinking skills for evaluating AI tools are vital for LIS professionals.	47 (43%)		7 (8.1%)	12 (14%)	30 (34.9%)	2.98	1.81
Understanding the societal impact of AI should be part of the LIS curriculum.	42 (37.2%)	3 (3.5%)	12 (14%)	11 (12.8%)	28 (32.6%)	3.00	1.73

#### 4.5. Effectiveness of Existing AI Literacy Training

Table 6 revealed library professionals' experiences with AI literacy training, with the majority showing dissatisfaction with the comprehensiveness of the training. A considerable number of respondents (37.2%) expressed strong disagreement, while another 17.4% disagreed regarding their participation in AI literacy training programs tailored for library professionals. Only 12.8% showed agreement, and just 8.1% strongly agreed, implying limited opportunities for AI training in the Library and Information Science (LIS) sector (M = 2.37, SD = 1.32). Moreover, many respondents (41.9%) remained neutral, reflecting uncertainty or indifference about the training's coverage of essential topics. In addition, 25.6% strongly disagreed, and 16.3% disagreed, indicating that a significant proportion felt the training lacked depth (M = 2.58, SD = 1.21). Similarly, 44.2% of participants maintained a neutral stance on whether the training effectively prepared them to use AI tools in practical scenarios, while 26.7% strongly disagreed and 14% disagreed. Notably, 31.4% expressed neutrality, yet 34.9% strongly disagreed, and 11.6% disagreed regarding the training's address of ethical issues surrounding AI.

Regarding confidence in applying the AI knowledge gained, 33.7% strongly disagreed, 8.1% disagreed, and 37.2% remained neutral. This highlights that many professionals do not feel sufficiently equipped to implement AI concepts in their work. These findings indicate that AI literacy training for LIS professionals is either insufficient or lacks accessibility for many respondents. Even among those who have undergone training, there is a notable lack of confidence and dissatisfaction concerning the comprehensiveness of what was provided. The mean scores across all statements fall below 3.0, suggesting low to moderate effectiveness of AI training programs.

**Table 6:** Effectiveness of Existing AI Literacy Training

Statement	SD	D	N	A	SA	Mean	SD
I have participated in AI literacy training programs specifically designed for library professionals.	42 (37.2%)	15 (17.4%)	21 (24.4%)	11 (12.8%)	7 (8.1%)	2.37	1.32
The AI literacy training I received was comprehensive and covered all necessary aspects.	32 (25.6%)	14 (16.3%)	36 (41.9%)	6 (7%)	8 (9.3%)	2.58	1.21
The training effectively prepared me to use AI tools in my daily work.	33 (26.7%)	12 (14%)	38 (44.2%)	7 (8.1%)	6 (7%)	2.55	1.17
The training addressed ethical considerations of AI use in libraries.	40 (34.9%)	10 (11.6%)	27 (31.4%)	11 (12.8%)	8 (9.3%)	2.50	1.33
I feel confident applying the knowledge gained from AI literacy training in my professional practice.	39 (33.7%)	7 (8.1%)	32 (37.2%)	1 (12.8%)	7 (8.1%)	2.53	1.29

#### 4.6. Ethical Considerations and Challenges

Table 7 highlights critical ethical concerns and challenges surrounding AI implementation in library services. A notable 38.4% of respondents strongly disagreed, and 5.8% disagreed, that they are worried about privacy breaches associated with AI, resulting in a mean score of 2.66 (SD = 1.54), which indicates moderate concern. Concerns about AI amplifying biases in information retrieval are significant, with 32.6% strongly disagreeing and 7% disagreeing. This reflects a need for greater awareness, as many LIS professionals recognize these risks while others remain indifferent. Transparency in AI tools is a pressing challenge, with 38.4% strongly disagreeing and 7% disagreeing regarding difficulties in this area. Additionally, many feel low confidence in handling AI ethics—27.9% reported neutrality, while only 16.3% agreed and 10.5% strongly agreed, indicated by a mean score of 2.07 (SD = 1.38). A strong consensus exists on the need for clear ethical guidelines for AI use in libraries, with 38.4% strongly agreeing and 14% agreeing. However, 8.1% remained neutral, and 38.4% strongly disagreed. These findings underscore that privacy, bias, and transparency are vital concerns, but many library professionals feel unprepared to address these ethical challenges effectively. Prioritizing the establishment of ethical frameworks is crucial as AI technologies evolve.

**Table 7:** Ethical Considerations and Challenges

Statement	SD	D	N	A	SA	Mean	SD
I am concerned about potential privacy breaches when using AI in library services.	43 (38.4%)	5 (5.8%)	22 (25.6%)	10 (11.6%)	16 (18.6%)	2.66	1.54
I worry about the potential for AI to perpetuate or amplify biases in information retrieval.	38 (32.6%)	6 (7%)	19 (22.1%)	12 (14%)	21 (24.4%)	2.91	1.58
I find ensuring transparency when using AI-powered tools in library services challenging.	43 (38.4%)	6 (7%)	25 (29.1%)	13 (15.1%)	9 (10.5%)	2.13	1.37
I am confident in my ability to address ethical issues related to AI use in libraries.	45 (40.7%)	4 (4.7%)	24 (27.9%)	14 (16.3%)	9 (10.5)	2.07	1.38
I believe there should be clear guidelines for the ethical use of AI in library and information services.	43 (38.4%)	1 (1.2%)	7 (8.1%)	12 (14%)	33 (38.4%)	2.70	1.87

#### 4.7. Inferential Statistics- Independent Sample T-test

An Independent sample t-test was employed to check the difference of opinion among male and female library professionals. Table 8 explains the results of the independent sample t-test, which clearly shows no statistically significant difference between

male and female library professionals. A difference in the mean value is recorded. Still, the p-values for all variables exceed the significance threshold of  $p < .05$ . Thus, these results suggest that gender is not a determining factor in AI literacy development among library professionals.

**Table 8:** Independent Sample T-test

Variables	Male N=48		Female N=38		t	p
	M	SD	M	SD		
CCC	2.67	1.41	2.80	1.41	-.419	.676
CBC	2.40	1.22	2.41	1.13	-.009	.993
CNC	2.49	1.22	2.38	1.24	.398	.691
EAIL	2.88	1.42	2.96	1.36	-.263	.793
AILTER	2.47	1.10	2.55	1.11	-.340	.735
Ethical Con	2.69	1.21	2.81	1.15	-.481	.632

Note. Value is significant  $p < .05$

#### 4.8. Inferential Statistics- ANOVA

One way was to check the difference of opinion based on age, experience, education and type of library they work in. The results in Table 9 show no statistically significant difference in the perception of participants based on various age groups, as all p-values exceed the conventional threshold of 0.05. Thus, it can be concluded that age doesn't affect the perception of library professionals. However, a variation in the mean values is recorded for ethical consideration as the age group (35-44) reported a higher mean value (M = 2.96, SD = 1.29).

**Table 9:** Anova Test for Age Groups

Variables	25-34		35-44		45-54		54 & above		t	p
	M	SD	M	SD	M	SD	M	SD		
CCC	2.68	1.17	2.88	1.62	2.71	1.32	2.40	1.36	.338	.798
CBC	2.18	1.05	2.49	1.37	2.29	1.14	2.70	0.86	.508	.678
CNC	2.56	1.06	2.55	1.38	2.41	1.21	2.16	1.01	.317	.813
EAIL	2.84	1.33	3.01	1.55	2.95	1.33	2.65	1.30	.207	.891
AILTER	2.22	0.93	2.49	1.25	2.66	1.12	2.35	0.72	.512	.675
Ethical Con	2.46	0.93	2.96	1.29	2.79	1.20	2.30	0.92	1.12	.343

Note. Value is significant  $p < .05$

Next, there were four groups of experiences, and the results (Table 10) again indicate no statistically significant difference across experience levels. However, a slight variation in the mean values across various experience-based groups is observed.

**Table 10:** Anova Test for Experience

Variables	0-5		6-10		11-15		15 & above		t	p
	M	SD	M	SD	M	SD	M	SD		
CCC	2.48	1.22	2.85	1.13	2.56	1.55	2.79	1.45	.202	.895
CBC	2.31	1.06	1.90	0.88	2.17	1.32	2.58	1.17	1.14	.336
CNC	2.51	1.01	2.37	1.16	2.17	1.21	2.55	1.27	.441	.724
EAIL	3.14	0.93	3.15	2.02	2.47	1.42	3.00	1.33	.797	.499
AILTER	2.51	0.82	1.75	0.81	2.38	1.35	2.66	1.05	1.71	.171
Ethical Con	2.60	0.98	3.05	0.86	2.52	1.32	2.79	1.21	.449	.719

Note. Value is significant  $p < .05$

Furthermore, the difference in perception based on different educational levels was observed using one-way ANOVA. The results in Table 11 also indicate no statistically significant difference in professionals' perceptions based on different educational levels. However, the mean value shows that Bachelor's degree holders (M = 3.28, SD = 1.26) reported slightly higher ethical

conduct perceptions compared to Master’s (M = 2.54, SD = 1.11) and PhD holders (M = 2.69, SD = 1.16), the result is not statistically significant.

**Table 11:** ANOVA for Education Levels

Variables	Bachelor		Master		PhDs		t	p
	M	SD	M	SD	M	SD		
CCC	2.93	1.58	2.59	1.28	2.81	1.53	.455	.636
CBC	2.45	1.46	2.38	1.06	2.42	1.19	.026	.974
CNC	2.26	1.44	2.49	1.12	2.52	1.26	.281	.756
EAIL	3.21	1.64	2.95	1.24	2.62	1.44	.967	.384
AILTER	2.59	1.53	2.48	0.89	2.47	1.09	.067	.935
Ethical Con	3.28	1.26	2.54	1.11	2.69	1.16	2.75	.070

Note. Value is significant  $p < .05$

Last but not least, the difference in the perception of librarians working in different work environments such as university/college libraries, school or special libraries was observed. Table 12 highlighted no statistically significant differences in workplace climate perceptions based on institutional type, as all p-values exceed 0.05. This suggests that working in a university/college, school, or special institution does not significantly alter perceptions of library professionals.

**Table 12:** ANOVA for Types of Libraries

Variables	Uni/College		School		Special		t	p
	M	SD	M	SD	M	SD		
CCC	2.72	1.43	2.70	1.38	2.82	1.60	.024	.976
CBC	2.41	1.16	2.32	1.22	2.66	1.22	.294	.746
CNC	2.51	1.19	2.32	1.21	2.57	1.51	.266	.767
EAIL	3.02	1.42	2.76	1.27	2.93	1.71	.320	.727
AILTER	2.47	1.07	2.61	1.13	2.31	1.23	.279	.757
Ethical Con	2.74	1.23	2.77	1.14	2.68	1.14	.020	.981

## 5. Discussion

The study aimed to investigate the current level of AI literacy among library professionals from Islamabad, Pakistan. A quantitative research approach was employed to collect data using a close-ended questionnaire. The results revealed that library professionals possess limited AI literacy, specifically cognitive competencies. The results highlighted that library professionals struggle with AI principles, differentiating AI technologies, and integrating AI applications to enhance library services. This result aligns with the existing literature, highlighting that AI literacy includes the understanding or features of AI, processing and influence of algorithms [3]. They are familiar with AI tools that can be used in library settings to enhance the efficiency of library services. However, awareness alone is insufficient; professionals need in-depth training to assess and integrate AI technologies into their work [29]. For behavioural competencies, most library professionals were found to have minimal experience using AI tools for their daily tasks, AI-driven bibliographic records, data analysis, and information retrieval. They were found to lack confidence in integrating AI into routine library operations, which shows a gap between practical and theoretical knowledge [32]. Overall, this suggests that library professionals were not actively involved in AI-based practices, which means there is a need for skills-building initiatives.

Next, there were normative competencies, which mainly deal with ethical awareness and accountability issues for using AI tools, were also found to be low among library professionals. Professionals highlighted that they could not understand AI algorithms and evaluate AI tools’ reliability. The limited awareness of these issues reflects findings from [3], who argue that normative competencies, such as understanding ethical implications and evaluating AI threats, are vital components of AI literacy. The limited awareness of AI-related privacy policies and ethical considerations suggests a pressing need for training programs that address these concerns. Thus, the results for normative competencies suggest the need for tailored interventions to discuss AI implementation in libraries and information centres. Library professionals suggested that it is important to inculcate AI literacy, such as data management, AI algorithms, critical thinking, etc., in LIS programs, as AI education is very important for professionals. Therefore, professionals must learn AI to improve library services [18]; [8] also recommended embedding AI literacy in the curricula to prepare librarians for AI tools’ challenges and opportunities.

The data also highlight dissatisfaction with current AI literacy training programs. Even professionals who participated in AI training programs believed they were insufficient, and many others reported having little access to it. The lack of confidence in realistically using AI knowledge further emphasized the necessity for thorough and easily available AI literacy programs designed for LIS professionals. Another major issue was the difficulties and ethical issues surrounding the application of AI. Transparency problems, biases in AI-powered systems, and privacy violations were noted as major obstacles. The necessity for explicit ethical guidelines and regulations to enable responsible AI integration in libraries was emphasized by the many experts who voiced concerns about how to handle ethical dilemmas linked to AI.

Independent sample t-tests and one-way ANOVAs were employed to check the differences in the perceptions of library professionals based on their demographic information. The inferential statistics results revealed no significant difference in library professionals' AI literacy based on any demographical variable. These results indicate a systemic need for capacity-building efforts across the LIS sector. In conclusion, the study summarized an urgent need for tailored AI interventions for library professionals. Addressing the existing literacy gaps is imperative to ensure that library professionals can integrate AI tools into library services for better and improved service provision.

## 6. Conclusion

The study's findings showed that library professionals' degree of AI literacy has been moderate regarding cognitive, behavioural, and normative levels. Everyone knows AI is significant, yet few have practical experience or confidence in AI applications. Furthermore, the results highlight the case for widespread and accessible AI literacy training services. Hence, libraries require explicit guidelines for the ethical adoption of AI, as maintaining lasting and far-reaching ethical changes remains challenging. Inferential statistical analyses show that gender, age, experience, education and type of employment do not influence AI literacy significantly. Essential that appropriate strategies to address these challenges are put in place so that library professionals acquire critical AI skills through targeted AI education and policy making.

### 6.1. Theoretical and Practical Implications

As a theoretical implication, this study is a unique addition to librarianship, artificial intelligence, and social sciences literature. This study has investigated the influence of demographic variables. However, the influence of other variables, such as organizational support, institutional culture, and access to resources, can also be checked. For practical implications, this study suggests a need for tailored intervention of AI training programs for professionals to enhance their learning. Secondly, libraries must adopt ethical guidelines for the fair use of AI-based tools. Finally, AI education should be prioritized in professional development plans, with collaborative efforts to create sustainable, scalable solutions. Addressing these gaps will enable library professionals to use AI effectively and responsibly.

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