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Librarian Insights on AI Adoption in Indonesian Libraries

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Abstract

Artificial intelligence (AI) is increasingly shaping library services through automation, metadata enrichment, user interaction, information retrieval, and data-driven service planning. This study examines AI adoption among Indonesian library professionals by focusing on awareness, perceived competencies, implementation factors, adopted tools, and ethical concerns. A quantitative descriptive survey was conducted with 101 library professionals in Indonesia. The questionnaire captured demographic characteristics, basic AI awareness, perceived AI-related skills, organizational and technical factors influencing implementation, adopted AI tools, and ethical issues associated with AI-based library services. The analysis used frequencies, percentages, weighted means, standard deviations, rankings, reliability testing, item-validity assessment, and cross-tabulation based on the finalized respondent-level dataset. The results show high awareness of AI and strong willingness to participate in AI-related training. However, respondents reported mostly beginner-to-novice proficiency in advanced competencies such as programming, machine learning, information architecture, and user experience design. User privacy, institutional support, human resources, managerial support, and AI tool reliability emerged as dominant implementation factors. Chatbots and automatic metadata creation were the most frequently adopted tools, followed by text and data mining, recommendation systems, image recognition, and OCR. Ethical concerns were concentrated around privacy and security, accountability, transparency, bias, intellectual freedom, and employment impact. The study contributes an empirical baseline for understanding AI adoption readiness in Indonesian libraries and offers practical implications for training, governance, infrastructure planning, and responsible AI implementation in developing information-service contexts and institutional decision-making processes.

Keywords: artificial intelligence, library, librarian, AI tools, indonesian library

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1. Introduction

The 21st century has been marked by significant technological advancements, with artificial intelligence (AI) emerging as a transformative force reshaping societal structures and professional practices. AI's rapid development, characterized by enhanced capabilities and widespread accessibility, has permeated various domains, including library sciences. Studies such as those by Bellman [1], Charniak and McDermott [2], and more recent works by Goralski and Tan [3] and Xu et al. [4] emphasize AI's pivotal role in fostering sustainable development across sectors. In the context of Industry 4.0, as noted by Araújo et al. [5] and Peres et al. [6], [7], AI has driven operational advancements, mirroring its impact on library sciences, where it is being integrated into tasks such as data management and user engagement. Zhang and Lu [8] further highlight AI's continuous evolution, aligning with the growing demands of the digital age in library services.

The integration of AI in libraries introduces innovative approaches to service delivery, user engagement, and information management. Research covering 2011 to 2020, conducted using PRISMA guidelines, provides a systematic review of AI implementation in libraries [9]. The utility of AI during the COVID-19 pandemic, particularly through chatbot applications, has been documented [10]-[13]. Furthermore, studies explore the broader implications of AI adoption, including equality, diversity, and inclusion [14], [15], while also examining the challenges of partnerships, infrastructure needs, and regulatory frameworks [16], [17], [18].

In the Indonesian context, AI adoption in libraries reflects the interplay of technological advancements and the nation's unique cultural and operational dynamics. Harisanty et al. [9] examine AI awareness among Indonesian library professionals, identifying benefits, infrastructure requirements, and challenges. Barsha and Munshi [16] highlight the resource limitations and skills

gaps that influence AI integration in developing nations like Indonesia. Meanwhile, Hussain [19] and Hayani et al. [20] discuss AI's potential to improve decision-making in library services while addressing barriers to implementation.

Existing studies have established that AI can support cataloging, reference services, user engagement, and decision-making in libraries. However, three gaps remain in the Indonesian context. First, prior work has discussed AI adoption mostly from conceptual or literature-review perspectives, while empirical evidence from Indonesian library professionals remains limited. Second, few studies connect awareness, perceived competency, implementation factors, adopted AI tools, and ethical concerns within a single descriptive framework. Third, the professional implications of AI are often described generally, whereas Indonesian librarians' views on readiness, governance, and employment impact require more specific evidence.

Accordingly, this study addresses the following research questions: RQ1: What is the level of basic AI awareness among Indonesian library professionals? RQ2: How do respondents perceive their AI-related competencies? RQ3: What factors are perceived to influence AI implementation in libraries? RQ4: What AI tools are currently adopted in Indonesian libraries? RQ5: What ethical issues are considered most important in AI-based library services?

The novelty of this study lies in its integrated empirical profile of AI adoption readiness in Indonesian libraries. The study provides descriptive evidence on librarian awareness and competencies. It also ranks implementation and ethical factors that should guide institutional planning and offers practical implications for training, governance, and responsible AI deployment in library services.

2. Literature Review

This section provides a comprehensive literature review, analyzing the diverse roles of Artificial Intelligence (AI) in library science. Subsection 2.1, AI in Library Research, examines the integration of various AI technologies and tools into library services, detailing their transformative effects on operational processes and user engagement. Subsection 2.2, AI Tools for Libraries, focuses on academic studies that investigate the implementation of AI in library settings, addressing its challenges, impacts, and practical applications. Subsection 2.3, AI in Indonesian Libraries, narrows the focus to the adoption of AI in Indonesian libraries, exploring the specific cultural, ethical, and technological challenges, as well as opportunities unique to this context. This review provides a foundational understanding of AI's current and potential applications in libraries, serving as a basis for the detailed

examination of AI adoption in Indonesian libraries presented in subsequent sections.

2.1. AI in Library Research

The 21st century has been marked by significant technological advancements, with Artificial Intelligence (AI) emerging as a key driver of societal and professional transformations. Foundational works by Bellman [1], Charniak and McDermott [2], Goralski and Tan [3], and Xu et al. [4] underscore AI's critical role in advancing sustainable development and scientific research, demonstrating its far-reaching impact across diverse sectors, including library science.

AI's integration into Industry 4.0, as discussed by Peres et al. [6], highlights its transformative effects on operational efficiency and innovation, paralleling its adoption in library science. Within libraries, AI technologies facilitate automation of routine tasks, advanced data analysis, and enhanced user interactions through tools like personalized recommendations and chatbots, fundamentally altering traditional library operations.

Zhang and Lu [8] analyze AI's current state and prospects, highlighting its dynamic growth and continuous evolution. This progress is mirrored in the evolving landscape of library services, where libraries increasingly adapt to the demands of the digital age. Research by Harisanty et al. [9], Tega and David [21], and Olufunmilayo et al. [22] explores the awareness and readiness of library professionals for AI integration. These studies identify both opportunities and challenges, emphasizing the need for targeted skill development and infrastructure enhancement to effectively harness AI's capabilities.

Further contributions by Cox [14], Cox and Mazumdar [23], and Asemi et al. [15] seek to clarify AI's definitions, technologies, and applications in library operations, stressing the importance of equity, diversity, and inclusion in its implementation. Reviews by Barsha and Munshi [16], Cox [24], and Wójcik [17] provide comprehensive insights into the prospects and challenges of AI in library services, addressing key factors such as collaborative partnerships, infrastructure investments, and data protection frameworks. These works collectively underscore the transformative potential of AI in library science, while also identifying critical areas for future focus and development.

2.2. AI Tools for Libraries

The profound impact of AI in libraries is evident in a systematic literature review spanning 2011 to 2020 by Harisanty et al. [9]. This review, conducted following PRISMA guidelines and drawing from sources such as the SCOPUS database and Google Scholar, explores AI's extensive implementation in library functions.

Libraries increasingly use AI for classification, cataloging, management, referencing, information services, and information literacy. Despite these advancements, the review identifies significant challenges in achieving inclusive implementation and highlights a research gap concerning AI's practical applications in libraries. It emphasizes the need for more comprehensive studies to examine AI's role in supporting library services while recognizing its potential for further development.

The introduction of AI chatbots into library services demonstrates their versatility and benefits, particularly during disruptive periods like the COVID-19 pandemic. Verma [13] and Lund and Wang [25] discuss the impact of AI-based chatbots, such as ChatGPT, on streamlining library management and enhancing user interactions. Sanji et al. [12] analyze the intelligent capabilities of chatbots, showing how they improve operational efficiency and engagement. Ehrenpreis and DeLooper [11] focus on the real-world implementation of chatbots on library websites, highlighting their practicality and user advantages. Bagchi [10] explores the design of library chatbots using open-source AI, underscoring the feasibility of cost-effective and customizable solutions for library services. Collectively, these studies illustrate how AI chatbots are transforming library services by improving access to information and enhancing user experiences, both during crises and in routine operations.

Additionally, bibliometric analyses provide insights into the growth and collaboration networks in AI research within libraries. Jyoti et al. [26] map the literature on AI applications in libraries, revealing trends in research growth and collaboration. Yu et al. [27] contrast this by conducting a bibliometric analysis of COVID-19 publications, offering thematic insights into AI's rapid development during the pandemic. Moral-Muñoz et al. [28] complement these findings by reviewing bibliometric analysis tools used in AI research. Together, these studies underscore the diversity and expansion of AI tools in libraries, reflecting their increasing adoption, collaborative potential, and significant impact on library operations and user services.

2.3. AI in Indonesian Libraries

In Indonesian libraries, the rapid advancement of AI technologies offers both significant opportunities and considerable challenges. Harisanty et al. [9] conducted a systematic literature review assessing AI adoption in Indonesian academic libraries, emphasizing the need for adequate infrastructure and addressing barriers to implementation. Similarly, Barsha and Munshi [16] explore the broader context of AI adoption in developing countries, including Indonesia, identifying potential benefits such as improved information access, enhanced

efficiency, and better user experiences. However, they also highlight challenges such as inadequate infrastructure, limited resources, a lack of skilled personnel, weak data privacy regulations, a pronounced digital divide, and the high costs associated with AI deployment. These findings underscore the importance of a balanced approach that recognizes both AI's transformative potential and the structural hurdles to be addressed.

Hussain [19] underscores AI's capacity to enhance library services while identifying critical barriers to its integration, including funding limitations, librarians' attitudes, and technical skill gaps. The study also highlights cost-effective AI applications that could positively impact library operations, offering practical pathways for adoption.

Hayani et al. [20] examine the transformative role of AI within the framework of the industrial era 4.0, emphasizing the relevance of big data, automation, and digital economy patterns in library contexts. Their case study at IAIN Lhokseumawe underscores the need for librarians to develop IT and analytical skills to effectively utilize AI and improve user access to integrated library information systems. These insights collectively point to the necessity for Indonesian libraries to adopt AI solutions tailored to their unique challenges, focusing on both operational improvements and the evolving role of librarians in the digital age.

Taken together, the reviewed literature indicates that AI adoption in libraries depends not only on technological availability but also on institutional readiness, professional competencies, data governance, and ethical safeguards. This study extends these discussions by examining how Indonesian library professionals perceive these dimensions empirically rather than treating AI adoption solely as a conceptual or technological issue.

3. Research Method

This section outlines the systematic approach utilized to examine the integration of Artificial Intelligence (AI) in libraries. This section comprises four key components: Research Design, Sample Selection, Survey Questionnaire, and Ethical Considerations. The Research Design explains the overarching framework and strategies guiding the study's execution. Sample Selection describes the criteria and processes used to identify libraries and participants, ensuring a representative and relevant sample. The Survey Questionnaire details the data collection tool, including its design, structure, and development to gather comprehensive and relevant information. Finally, Ethical Considerations addresses the adherence to ethical standards and protocols throughout the research,

ensuring the study's integrity and compliance with established ethical guidelines.

3.1. Research Design

This study employed a quantitative descriptive research design to examine AI adoption readiness among Indonesian library professionals. A structured survey was used as the main data collection instrument. The study did not test causal hypotheses; instead, it summarized response distributions, ranked perceived competencies and implementation factors, and interpreted the results in relation to prior AI-in-library studies.

3.2. Sample Selection

This study used a stratified purposive sampling approach. The main strata considered were institutional affiliation and professional role, including respondents from higher education institutions, government agencies, and school libraries, as well as service, processing, reference, research, managerial, and administrative positions. The term stratified random sampling was avoided in the revised manuscript because a complete national sampling frame of Indonesian librarians was not available. Therefore, the findings should be interpreted as exploratory and descriptive rather than nationally representative.

3.3. Survey Questionnaire

The survey instrument was structured into five sections to capture sociodemographic characteristics, AI awareness, perceived competencies, implementation factors, adopted tools, and ethical concerns. The items were aligned with the literature on AI adoption, AI competencies, and ethical issues in library services.

- Part 1 collected sociodemographic information using five questions to understand the background of the respondents.
- Part 2 evaluated the respondents' basic understanding of AI through ten questions.
- Part 3 assessed perceived knowledge and expertise in AI technologies and their library applications using a single question with ten items rated on a five-point Likert scale, ranging from "Beginner" to "Expert."
- Part 4 explored perspectives on AI in library contexts and key influencing factors through one question and ten items, rated on a scale from "Strongly Disagree (1)" to "Strongly Agree (5)."
- Part 5 examined AI tools, services, and ethical considerations with one question and six items rated on a scale from "No Concern (1)" to "High Concern (5)."

The analysis used frequencies and percentages to describe response distributions. For ordinal items, weighted means, standard deviations, and rankings were

calculated using the finalized respondent-level dataset. Cross-tabulation was used to compare selected AI tool adoption patterns across institutional categories. Missing entries were handled using valid responses for each item, while the descriptive distributions reported in the figures follow the processed dataset used in the manuscript.

Instrument validity and reliability were examined using content validity, face validity, corrected item-total correlations, and Cronbach's alpha. Corrected item-total correlations were used as the item-validity indicator, with values above 0.30 interpreted as acceptable. Reliability was assessed for the multi-item scales measuring perceived AI competencies, implementation factors, and ethical concerns. The results are summarized in Table 1.

Table 1. Instrument validity and reliability test results

Construct	Items	Valid N	Cronbach alpha	Corrected item-total correlation range
Perceived AI competencies	10	98	0.980	0.836–0.932
Implementation factors	10	98	0.930	0.380–0.847
Ethical concerns	6	96	0.870	0.421–0.785

3.4. Ethical Considerations

Prior to participation, respondents were informed about the purpose of the study, the voluntary nature of participation, and the anonymous use of their responses. Informed consent was obtained before respondents completed the questionnaire. The survey did not collect personally identifying or sensitive personal information, and the aggregated results were used only for academic analysis. Therefore, the study was treated as minimal-risk survey research. Future studies involving identifiable respondents, institutional records, or behavioral data should obtain formal ethics approval before data collection.

4. Results and Discussion

This section presents the descriptive findings from the survey. The results are organized into sociodemographic characteristics, basic AI awareness, perceived AI-related competencies, implementation factors, adopted AI tools, ethical concerns, and a synthesis of the findings against prior literature. Frequencies, percentages, weighted means, standard deviations, and rankings are used to clarify the patterns in the aggregate responses.

4.1. Sociodemographic Distribution

This subsection analyzes the demographic characteristics of the study's participants, including factors such as gender, educational qualifications, professional designations, job descriptions, institutional affiliations, and years of work experience. This detailed examination provides a comprehensive overview of the participant pool, highlighting the diversity and varied backgrounds of the library professionals who contributed to the study. These insights form a foundation for understanding the perspectives and experiences shaping their views on AI integration in library settings.

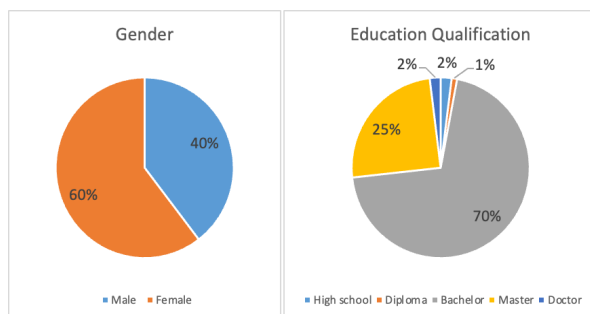


Figure 1. Gender and Education Qualification of Respondents

Figure 1 shows that the respondents consisted of 40 male and 61 female librarians. Most respondents held bachelor's degrees (71 respondents), followed by master's degrees (25 respondents), indicating that the sample was dominated by university-educated library professionals.

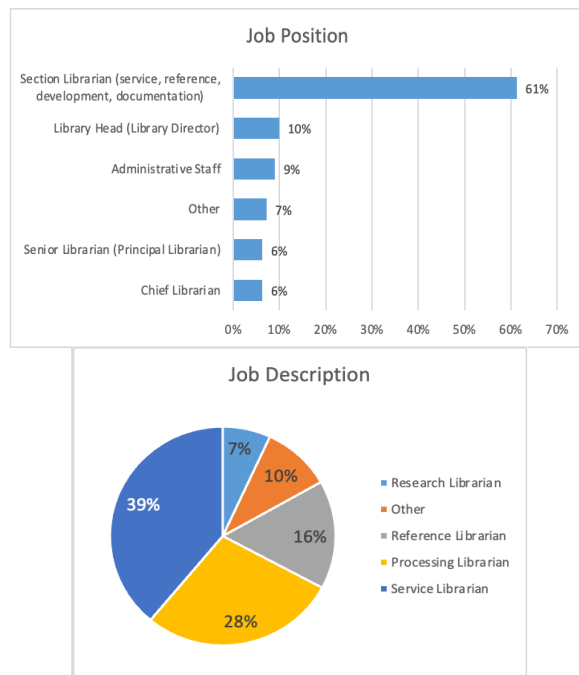


Figure 2. Job position and description of respondents

Figure 2 indicates that service librarians formed the largest job-description group (39%), followed by processing librarians (28%), reference librarians (16%), other roles (10%), and research librarians (7%).

In terms of position, section librarians were the largest group (61%), followed by library heads, administrative staff, chief librarians, senior librarians, and other positions. This confirms that the sample included both operational and managerial perspectives.

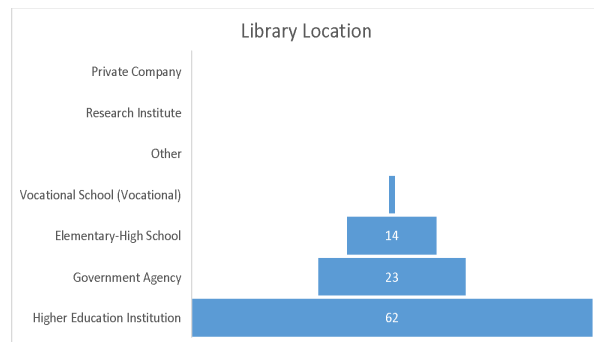


Figure 3. The workplace of respondents

Figure 3 shows that most respondents worked in higher education institutions (62 respondents), followed by government agencies (23 respondents) and elementary-high schools (14 respondents).

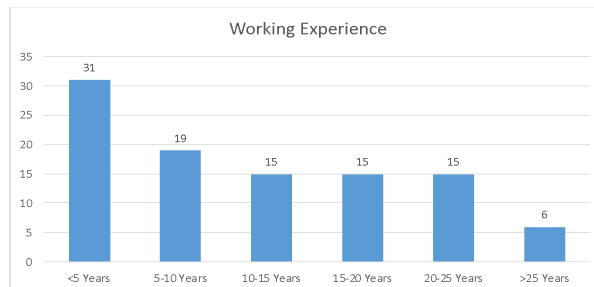


Figure 4. Working experience of respondents

Figure 4 shows a broad range of professional experience: 31 respondents had less than 5 years of experience, 19 had 5–10 years, 45 were distributed across the 10–25 year categories, and 6 had more than 25 years of experience.

4.2. Basic Understanding of AI

Figure 5 shows high AI awareness and acceptance among respondents. Almost all respondents were familiar with AI use in libraries, all respondents were willing to participate in AI-related training, and most viewed AI as a supportive tool rather than a replacement for human intelligence. Respondents also emphasized transparency, explainability, and accountability as requirements for AI applications in libraries.

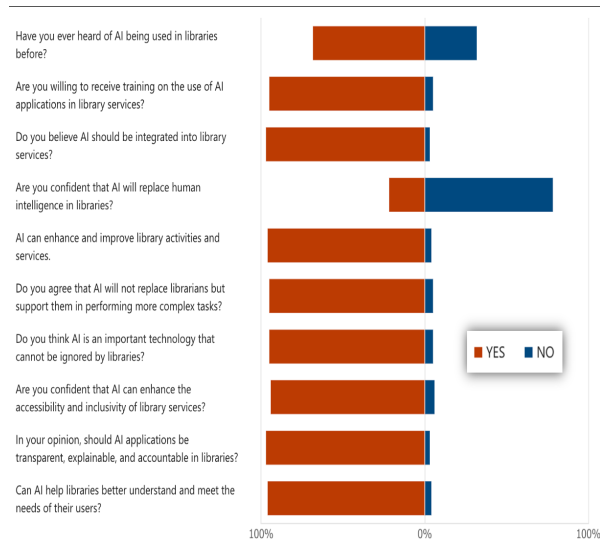


Figure 5. Basic understanding of AI

4.3. Perceived AI-Related Competencies

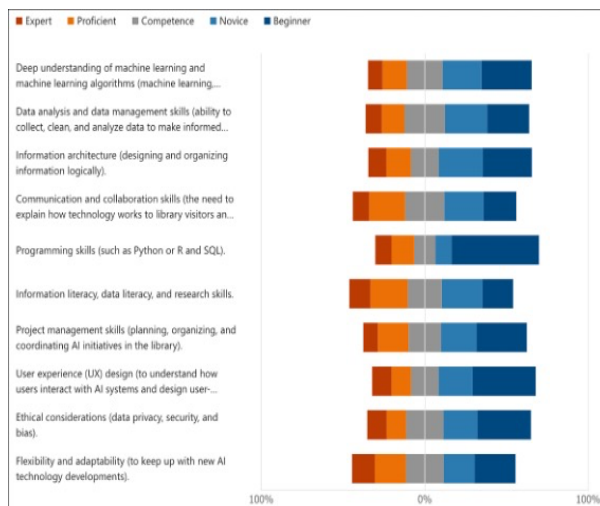


Figure 6. Perceived knowledge and expertise in AI technologies

Figures 6 and 7 indicate that respondents were concentrated at the beginner and novice levels across most AI-related competencies. Higher levels of proficiency were less common, showing that AI

awareness has not yet been matched by advanced technical capability.

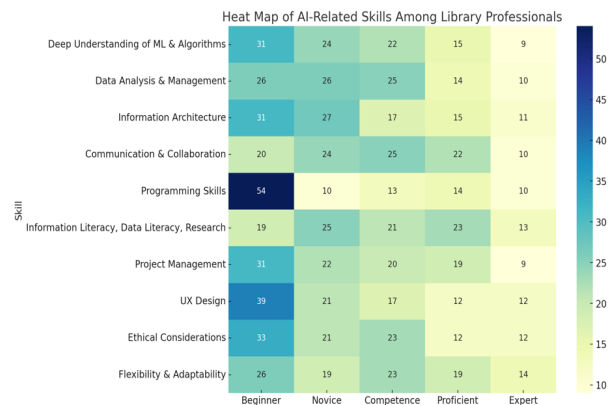


Figure 7. Heat map analysis of AI skill proficiency

The clearest competency gap appeared in programming, where 54 respondents selected the beginner level. Other relatively weak areas included user experience design, information architecture, machine learning, project management, and ethical considerations.

Overall, the competency profile suggests the need for structured professional development that combines conceptual AI literacy, data skills, programming foundations, ethical governance, and practical AI tool use.

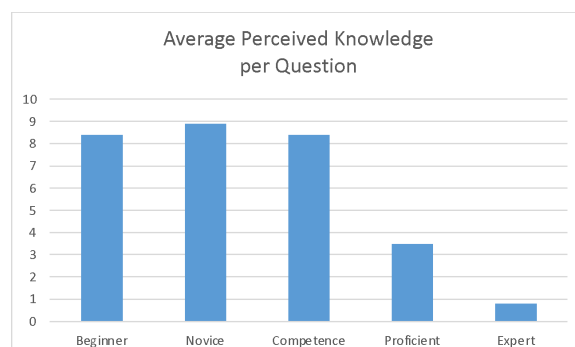


Figure 8. Average Perceived Knowledge per Question

Table 2. Cross-tabulated proficiency counts and descriptive statistics for AI-related competencies								
Competency	Beg.	Nov.	Comp.	Prof.	Exp.	Mean	SD	Rank
Machine learning and algorithms	31	24	22	15	9	2.48	1.31	8
Data analysis and management	26	26	25	14	10	2.56	1.28	4
Information architecture	31	27	17	15	11	2.49	1.35	7
Communication and collaboration	20	24	25	22	10	2.78	1.27	2
Programming	54	10	13	14	10	2.17	1.45	10
Information/data literacy and research	19	25	21	23	13	2.86	1.32	1
Project management	31	22	20	19	9	2.53	1.34	5
User experience design	39	21	17	12	12	2.38	1.41	9
Ethical considerations	33	21	23	12	12	2.50	1.37	6
Flexibility and adaptability	26	19	23	19	14	2.76	1.39	3

Table 2 summarizes item-level proficiency counts and weighted descriptive statistics. The highest-ranked competencies were information/data/research literacy, communication and collaboration, and flexibility and adaptability. Programming remained the lowest-ranked competency, confirming a specific technical-skills gap among respondents.

4.4. Factors Influencing AI Implementation

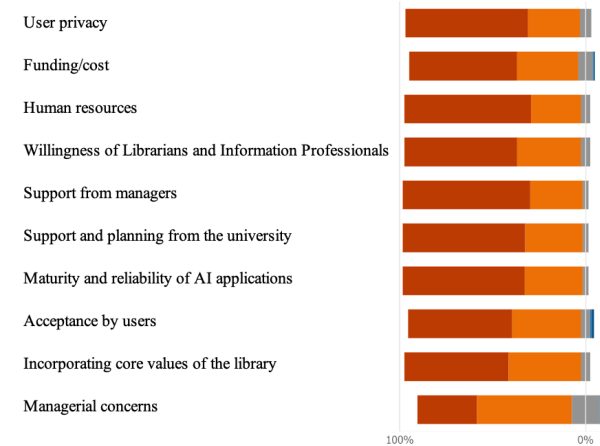


Figure 9. Influencing factors of AI tools implementation in the library

Figure 9 shows strong agreement that user privacy, funding, human resources, managerial support, institutional support, AI reliability, user acceptance, and library values influence AI implementation. User privacy, human resources, institutional support, and tool reliability were among the most consistently supported factors.

Managerial concerns showed the greatest variability, with more neutral responses than the other factors. This suggests that managerial priorities and perceived organizational risks require further internal alignment.

In summary, the implementation results indicate that successful AI adoption requires organizational readiness, data protection, professional capacity, funding, and reliable technology rather than technology availability alone.

Table 3 ranks implementation factors and ethical concerns using weighted means. Managerial support, human resources, institutional support and planning, and AI application maturity were among the strongest implementation factors. For ethical concerns, privacy and security, accountability, and transparency were ranked highest.

Table 3. Descriptive statistics and ranking of implementation factors and ethical concerns

Type	Item	N	Mean	SD	Rank
Implementation factor	Managerial support	100	4.65	0.54	1
Implementation factor	Human resources	101	4.62	0.58	2
Implementation factor	Institutional support and planning	101	4.62	0.55	3
Implementation factor	AI application maturity and reliability	100	4.62	0.55	4
Implementation factor	User privacy	101	4.60	0.60	5
Implementation factor	Librarian willingness	100	4.55	0.59	6
Implementation factor	Core library values	101	4.50	0.61	7
Implementation factor	Funding and cost	101	4.48	0.69	8
Implementation factor	User acceptance	101	4.46	0.73	9
Implementation factor	Managerial concerns	101	4.12	0.74	10
Ethical concern	Privacy and security	101	4.62	0.56	1
Ethical concern	Accountability	99	4.62	0.51	2
Ethical concern	Transparency and explanation	100	4.56	0.59	3
Ethical concern	Bias and discrimination	101	4.47	0.58	4
Ethical concern	Intellectual freedom	101	4.45	0.62	5
Ethical concern	Employment impact	97	4.26	0.67	6

4.5. Adopted AI Tools and Ethical Concerns

Figure 10 shows that chatbots were the most frequently adopted AI tool (44 respondents), followed by automatic metadata creation (33), text and data mining (24), recommendation systems (22), image recognition (21), OCR (19), knowledge graphs (16), voice recognition (15), NLP (11), and smart racks (7). Nine respondents indicated that AI tools had not yet been implemented or were not clearly available in their institutions.

These findings indicate that Indonesian libraries tend to adopt AI tools that provide direct service benefits or improve resource organization. Table 4 further shows that chatbot adoption was concentrated in higher education institutions, while automatic metadata generation was also visible across government and school/vocational libraries.

Table 4. Cross-tabulation of selected adopted AI tools by institution type

AI tool category	Higher education	Government	School/vocational	Other	Total
Chatbot	29	9	6	0	44
Automatic metadata generation	17	8	7	1	33
Text and data mining	16	5	3	0	24
Recommendation system	13	4	4	1	22
Image recognition	11	7	3	0	21
OCR	11	5	3	0	19
No AI tools / not implemented	7	2	0	0	9

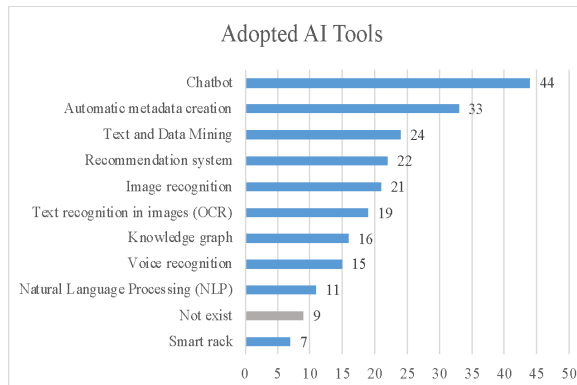


Figure 10. Adopted AI tools in Indonesian libraries

Figure 11 presents respondents' concerns about ethical issues in AI-based library services.

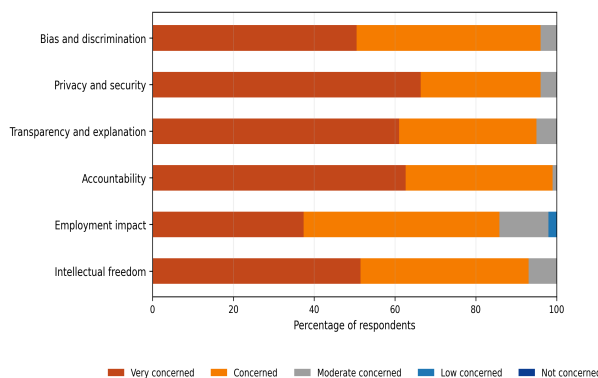


Figure 11. Concerned about ethical issues of AI in the library

The ethical concern results show that privacy and security, accountability, transparency and explanation, bias and discrimination, intellectual freedom, and employment impact were all viewed as important issues.

Employment impact showed more varied responses than privacy, bias, transparency, and accountability. This suggests that respondents do not view AI-related professional change in a single uniform way.

Overall, the survey highlights strong concerns about ethical issues such as bias, privacy, transparency, and accountability in AI-based library services. Compared with the other ethical dimensions, employment impact

and intellectual freedom show more varied response patterns, suggesting that librarians recognize both opportunities and risks in AI-enabled service transformation.

4.6. Discussion Synthesis

The findings are consistent with prior studies that describe AI as promising for library services but dependent on infrastructure, skills, and governance. The high level of awareness aligns with Harisanty et al. [9], while the beginner-to-novice competency pattern shows that awareness still needs to be translated into operational capability.

The frequent use of chatbots and automatic metadata creation supports earlier studies on conversational agents and metadata automation [10]–[13]. Lower adoption of NLP, voice recognition, and smart racks indicates that Indonesian libraries may still prioritize practical and visible service applications.

The implementation-factor ranking confirms that AI adoption is not only technical. User privacy, human resources, institutional support, and reliability are central conditions, consistent with prior arguments on infrastructure, data protection, and ethical design [16], [17], [19].

4.7. Limitations and Future Research

This study has several limitations. The sampling procedure was stratified purposive rather than fully random because a complete national sampling frame of Indonesian librarians was not available. Therefore, the findings should be interpreted as an empirical profile of the participating librarian community rather than a statistically generalizable estimate for all Indonesian libraries. Some subgroup sizes were also small, limiting the use of inferential cross-group comparisons.

Future research should expand the sample, include more balanced representation across institution types, and apply confirmatory factor analysis or structural modeling to test relationships among AI awareness, competency, organizational readiness, ethical concern, and actual AI adoption.

5. Conclusion

This study examined AI adoption readiness among Indonesian library professionals by analyzing awareness, perceived competencies, implementation factors, adopted tools, and ethical concerns. The results show that AI awareness and acceptance are high, but advanced competencies remain uneven. Programming, machine learning, user experience design, and information architecture require targeted capacity building.

The demographic profile indicates that respondents came mainly from higher education institutions, government agencies, and school libraries, with diverse professional roles. This diversity provides a useful descriptive profile of how Indonesian library professionals view AI adoption, although the findings should not be interpreted as nationally representative.

Implementation readiness is shaped by institutional and ethical dimensions. User privacy, institutional support, human resources, funding, and tool reliability were perceived as important conditions for successful AI deployment. Ethical concerns were concentrated around privacy and security, accountability, transparency, bias, intellectual freedom, and employment impact.

The study also shows that chatbots and automatic metadata creation are the most common AI tools currently adopted in Indonesian libraries. These tools represent practical entry points for AI-based service improvement, but broader adoption of more advanced applications requires stronger data governance and staff training.

The main contribution of this study is an integrated empirical profile of AI adoption readiness in Indonesian libraries. The findings can guide library managers in designing training programs, prioritizing governance safeguards, and aligning AI implementation with library values and user needs.

Future studies should use larger and more balanced datasets, include stronger inferential analysis, and examine how institutional policy, data governance, funding models, and staff development programs shape sustainable AI adoption in Indonesian libraries.

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Additional information. No additional information is available for this paper.

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