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Digital Library Transformation in Supporting Information Literacy in the Era of Artificial Intelligence

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ABSTRACT

This study aims to describe the transformation of digital libraries in supporting information literacy in the era of artificial intelligence (AI). The research method used is descriptive qualitative, involving 10 informants consisting of librarians, lecturers, and students as active users of digital libraries. Data were collected through in-depth interviews, observation, and documentation, then analyzed using the Miles & Huberman model through the stages of data reduction, data presentation, and drawing conclusions. The results show that digital libraries have transformed through the application of AI, such as intelligent search systems, chatbots, and automatic source recommendations. This transformation has been proven to support the improvement of user information literacy, especially in the skills of accessing, evaluating, and utilizing academic information. However, challenges that arise include limited infrastructure, resistance from some users, and the need to improve librarians' competencies in mastering AI-based technology. These findings confirm that digital libraries play a vital role in strengthening information literacy in the digital era, while also demanding a sustainable development strategy.

INTRODUCTION

The development of artificial intelligence (AI) has become one of the main drivers of transformation in various areas of life, including in the management and provision of digital library services (Setyawan et al., 2025). AI technology not only enables automation in data processing and information provision, but also brings innovations in the form of intelligent recommendation systems, user service chatbots, and more accurate information needs analysis so that libraries can provide more personalized, efficient, and relevant services to their users.

Digital libraries in the era of technological transformation are no longer limited to their traditional role as providers and stores of information, but have evolved into active facilitators of information literacy (Vitriana, 2024). Through the use of intelligent recommendation

systems, interactive service chatbots, and AI-based search features, libraries can help users find relevant information sources, improve digital literacy skills, and create more personalized and adaptive learning experiences.

Information literacy is one of the key competencies in the era of digital data flooding, where users are required to not only be able to access information, but also to sort, evaluate, and utilize it critically and responsibly (Okunlaya et al., 2022). This ability is becoming increasingly important given the rapid flow of information that is not always valid, so information literacy plays a foundation in preventing misinformation, supporting informed decision-making, and improving the quality of learning and research in academic settings and the wider community (Rusdiyanti et al., 2023).

Students and academics in the digital era are required to have more complex information literacy skills, not only limited to the ability to search for and access knowledge sources, but also to analyze the credibility, relevance, and reliability of the information obtained (Darmawan et al., 2025). This is crucial to prevent them from falling prey to misinformation and irrelevant information, while also ensuring that learning, research, and scientific publications are based on valid and accountable data.

The transformation of digital libraries through the integration of artificial intelligence (AI) opens up new opportunities for improving service quality, such as automating collection management, providing more accurate recommendation systems, and user interaction through intelligent chatbots (Wajdi & Hajiri, 2024). However, behind these opportunities, there are also a number of challenges that need to be anticipated, including the readiness of technological infrastructure, the ability and adaptability of librarians in mastering new digital skills, and the active participation of users in utilizing AI-based services. Thus, the success of digital library transformation is determined not only by the availability of technology, but also by the synergy between technical aspects, human resources, and a culture of digital literacy in the academic environment.

Previous research has tended to focus on the technical aspects of digital library management or strategies for improving information literacy separately, resulting in limited studies linking the two. To date, there has been little research specifically examining how artificial intelligence (AI)-based digital library transformation can play a role in supporting student information literacy. Furthermore, qualitative studies exploring the perceptions and direct experiences of stakeholders, such as librarians, lecturers, and students, regarding the use of AI technology in library services are also rare (Aprilia, 2024). These limitations indicate a research gap that needs to be filled to provide a more comprehensive understanding of AI integration in developing information literacy in academic settings.

The novelty of this research lies in its attempt to provide a new perspective on the integration of artificial intelligence (AI) in the transformation of digital libraries as a strategic tool to support information literacy. This research not only emphasizes technical aspects but also presents an analysis based on the direct experiences of library users and managers, resulting in a more contextual and applicable understanding. Furthermore, this research fills a gap in previous studies by connecting three aspects simultaneously: digital transformation, information literacy, and the use of AI technology, thus providing both scientific and practical contributions to the development of library services in the digital era.

The purpose of this study is to describe how the transformation of digital libraries plays a role in supporting information literacy in the era of artificial intelligence (AI). This study also aims to identify various strategies used by digital libraries to improve users' information literacy skills, while analyzing the perceptions and direct experiences of librarians, lecturers, and students regarding the use of AI technology in library services. Thus, this study is expected to provide a comprehensive overview of the contribution of AI integration to the development of information literacy in academic environments.

METHODOLOGY

This study uses a descriptive qualitative approach with the aim of describing the transformation of digital libraries in supporting information literacy in the era of artificial intelligence (Arta, 2025). The research location was a digital library within a university environment. The research informants consisted of 10 individuals, consisting of 3 librarians/digital library managers as key informants, 2 lecturers who use digital services, and 5 students from various study programs who actively utilize digital library services. The inclusion criteria in this study were individuals directly involved in the management and utilization of digital library services, whether as managers, educators, or active users. The exclusion criteria were individuals who had never used digital library services or were not involved in information literacy activities within the university environment. Data were collected through in-depth interviews, observations, and documentation studies, then analyzed using the Miles & Huberman model which includes data reduction (Deterding & Waters, 2021), data presentation, and drawing conclusions. Data validity is maintained through triangulation of sources and methods, member checks, and peer discussions (Qomaruddin & Sa'diyah, 2024).

Table 1. Interview Instrument with Answer Indicators

Research Focus	Interview Questions	Informant	Expected Answer Indicator
AI-based digital library service transformation	How do you see changes in library services after the implementation of AI-based technology?	Librarian	There are significant changes in services (faster, more efficient, interactive, personal)
AI features used	What AI features are already being used in libraries (chatbots, recommendation systems, smart search)?	Librarian, Student, Lecturer	Mentioning real features: chatbot, automatic source recommendations, smart search, user analytics
Benefits of implementing AI	What are the main benefits of using AI in digital library services?	Librarian, Lecturer, Student	Faster access to information; increased information literacy; more effective research/writing

Challenges of AI implementation	What are the obstacles faced in operating or using AI-based library services?	Librarian, Lecturer, Student	Infrastructure limitations; user resistance; digital literacy gap; data security issues
Librarian competencies	What are the library strategies for improving librarians' skills related to AI technology?	Librarian	Training, workshops, collaboration, capacity building for librarians
Information literacy program	What forms of information literacy programs does the library implement to support students and lecturers?	Librarian	Literacy workshops, academic guidance, online guide content
Utilization of digital libraries	How often do you use AI-based digital library services in academic activities?	Lecturer, Student	Intensity of use (daily, weekly, infrequent); reasons for frequency of use
Impact on research and learning	Do AI services help improve the effectiveness of research, learning, or academic writing?	Lecturer, Student	Efficiency of literature search; relevance of search results; improvement of academic quality
Impact on information literacy	Does using an AI-based digital library help you understand, evaluate, and critically utilize academic information?	Students, Lecturers	Ability to sort valid sources; avoid misinformation; critical thinking skills improved

User perception	How do you respond to AI-based services implemented by digital libraries?	Lecturer, Student	Positive perception (easy, helpful); negative perception (complicated, unfamiliar)
Development expectations	In your opinion, what needs to be improved in AI-based digital library services in the future?	Librarian, Lecturer, Student	Infrastructure improvements; data security; AI feature enhancements; intensive mentoring

Source: 2025 Data Processing Results

This interview instrument was designed to gather information from three primary informant groups: librarians, lecturers, and students, based on the research focus on AI-based digital library transformation in supporting information literacy. Each research focus was accompanied by open-ended key questions to allow informants to elaborate on their experiences, perceptions, and challenges in depth.

Additionally, expected response indicators are included as analysis guidelines, allowing researchers to group responses into specific themes, such as benefits (fast access, increased literacy), challenges (limited infrastructure, user resistance), and expectations (feature enhancements, librarian training). Thus, this table serves not only as an interview guide but also as a reference for data reduction and thematic category development according to the Miles & Huberman model.

RESULTS AND DISCUSSION

Research results show that the transformation of digital library services through the application of artificial intelligence (AI) has brought significant changes to information access and provision. The integration of AI into search systems allows users to obtain information more quickly, relevantly, and personally, while the presence of chatbots helps address basic needs interactively. Furthermore, digital libraries are beginning to adopt automated learning resource recommendation features that adapt to users' academic needs.

These efforts not only enrich services but also strengthen the library's role in supporting information literacy, including through training in critical skills in evaluating digital sources, information literacy workshops, and the provision of online guide content facilitated by librarians. Students also experience improved skills in selecting valid academic sources, while lecturers find it easier to find the latest literature relevant to their research (Rahmah & M. Ramli, 2025).

On the other hand, this study also reveals user experiences and perceptions regarding the use of AI in digital libraries (Yudisman & Neldawati, 2025). Students found this technology very helpful in speeding up reference searches, while lecturers acknowledged its benefits in finding up-to-date literature (Hafizd et al., 2024). However, librarians highlighted challenges in the adaptation process, particularly related to big data management and information security issues. Other challenges include limited infrastructure, the digital literacy gap among some users, and the need to

improve librarian competency to operate AI-based technology. Furthermore, resistance from some lecturers and students to the use of automated systems remains, indicating the need for adaptation strategies and ongoing education to ensure optimal AI-based digital library transformation (Antonio et al., 2024).

The findings of this study indicate that the transformation of digital libraries based on artificial intelligence (AI) not only has an impact on improving service quality but also significantly strengthens the information literacy of students and lecturers. These results complement previous studies such as Vitriana (2024) and Setyawan et al. (2025) which emphasize the existence of libraries in the digital era, and Okunlaya et al. (2022) which developed a conceptual framework for AI services but did not discuss actual user experiences. Similarly, the study by Rusdiyanti et al. (2023) which highlighted information literacy to combat misinformation is still normative. Thus, this study enriches the literature by presenting empirical evidence that the application of AI (chatbots, recommendation systems, intelligent search) truly helps academics access, evaluate, and utilize academic information more effectively.

Furthermore, this study confirms that the challenges of implementing AI in digital libraries are not limited to technical aspects, as identified by Wajdi & Hajiri (2024), but also encompass cultural factors such as user resistance and the digital literacy gap. This expands on the findings of Antonio et al. (2024) who highlighted lecturers' resistance to digital technology in learning. By combining the perspectives of librarians, lecturers, and students, this study provides a more holistic understanding of how AI plays a role in supporting information literacy, while also highlighting the research's novelty in connecting technical aspects, information literacy, and user experience simultaneously.

AI-Based Digital Transformation

Research findings show that digital libraries no longer function solely as information repositories, but have transformed into intelligent platforms supported by artificial intelligence (AI) (Borgman et al., 2019). The integration of AI technology enables libraries to provide more interactive, adaptive, and personalized services, such as automated recommendation systems, context-based searches, and chatbots to support users' information needs (Alvansyah et al., 2025).

This change reflects a paradigm shift in libraries from merely being providers of digital collections to being strategic partners in developing information literacy (Igwe & Sulyman, 2022). This is in line with the global trend that positions libraries as centers of technology-based digital learning, where innovation is not only focused on storing and distributing information, but also on improving critical thinking skills, evaluating sources, and utilizing information ethically and productively in academic settings and the wider community.

Support for Information Literacy

The implementation of artificial intelligence (AI)-based services in digital libraries has been proven to have a positive impact on strengthening users' information literacy. Through intelligent search systems, automated recommendation features, and interactive chatbots, users can more easily access relevant information sources and understand how to utilize them appropriately. This convenience helps students, lecturers, and researchers streamline search time while also improving their ability to evaluate the validity and credibility of information (Husnaini & Madhani, 2024). Thus, digital libraries function not only as data providers, but also as facilitators of more critical and targeted

information literacy skills.

Furthermore, information literacy facilitated by digital libraries contributes significantly to preventing misinformation and improving academic quality (Adewojo et al., 2024). Students are able to select valid sources to support their scientific writing, lecturers can utilize the latest literature for research, and librarians play an active role in providing digital literacy education through workshops and online guide content. These efforts not only strengthen the academic ecosystem based on valid information but also equip the academic community with critical skills relevant to the era of digital information overload. Thus, AI-based digital libraries become a strategic instrument in supporting the creation of a healthy, critical, and productive academic culture.

Positive Perception but Needs Adaptation

The research results show that the majority of students and lecturers responded positively to the use of AI-based technology in digital library services. They considered the presence of intelligent features, such as recommendation systems and automatic searches, to be very helpful in accelerating access to relevant and up-to-date academic reference sources. This acceptance indicates that the academic community is quite open to integrating technology to support learning, research, and scientific writing activities (Granić & Marangunić, 2019).

However, this study also revealed significant challenges in terms of adaptation, particularly for librarians who are required to master new skills in operating and managing AI-based technology. Furthermore, limitations in digital infrastructure, such as internet networks, hardware, and information security systems, remain barriers that need to be addressed immediately to ensure optimal technology utilization. Therefore, despite positive user reception, the success of digital library transformation remains highly dependent on the readiness of human resources and adequate facility support.

Implications for Library Development

The implications of this research demonstrate the need to improve the capacity of human resources, particularly librarians, through ongoing training related to the use and management of AI-based technology. With adequate skills, librarians can play a role not only as digital collection managers but also as information literacy facilitators who adapt to technological developments. This is crucial so that the transformation of digital libraries goes beyond technical aspects and also encompasses improvements in service quality and academic relevance.

Furthermore, a collaborative strategy is needed between libraries, faculty, and technology developers to ensure the implementation of AI services aligns with the needs of the academic community. This collaboration could include developing more contextual search features, curriculum-based recommendation systems, and providing an integrated information literacy learning platform. This transformation also emphasizes the library's position as a digital information literacy agent in the era of artificial intelligence, not only supporting academic processes but also equipping users with critical skills to face the challenges of the global information flood (Okunlaya et al., 2022).

CONCLUSION

Digital libraries have undergone significant transformations by leveraging artificial intelligence (AI) technologies, such as intelligent search systems, chatbots, and automated source recommendations, making services more effective, efficient,

and adaptive to user needs. This transformation has been proven to contribute to improving information literacy, particularly among students, by helping them access, evaluate, and utilize information critically and responsibly.

Librarians play a crucial role as facilitators of digital literacy through training, workshops, and mentoring, despite still facing challenges in adapting to technology and limited competencies. User perceptions, both students and lecturers, are generally positive, as the presence of AI technology facilitates academic reference searches while enriching the learning and research process. However, several challenges remain to be addressed, particularly related to limited infrastructure, the digital literacy gap among some users, and the need for capacity building for librarians. Overall, this study confirms that digital libraries have the potential to become key agents in supporting information literacy in the era of artificial intelligence, provided that the transformation is accompanied by continuous development and strategic collaboration among stakeholders.

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