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Application of AI to Improve the Library Visitor Experience

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ABSTRACT

Artificial intelligence technology is widely considered a catalyst for transforming the role of libraries in the digital era. This study aims to examine and analyze the application of AI technology in the library context and provide strategic recommendations for the development of AI-based library services that can optimally improve the library visitor experience. The study used a systematic literature review approach. From the results of the search and selection of articles through Google Scholar, there were 36 articles that met the criteria for further analysis. The results show that there are seven themes that can be raised as a basis for effective AI implementation in improving library services and user experience, namely: Library transformation, the role and benefits of AI technology in library services, the implementation of AI in various aspects of library services, the use of AI to personalize library services, the impact of AI on library operational efficiency, AI-based collaboration and knowledge sharing models between libraries, and challenges in implementing AI in libraries. Based on the results of the synthesis, it can be reported that AI is able to transform libraries through cataloging automation, service personalization, 24/7 interactive chatbots, and intelligent recommendation systems that improve operational efficiency and user satisfaction (smart search). AI can help librarians analyze visit data to understand user interest trends. The potential of AI creates a more engaging, efficient and meaningful visiting experience, although the implementation of AI in libraries faces challenges related to data privacy, infrastructure, and the readiness of library human resources.

Keywords: *Artificial Intelligence; Library Visitor Experience; Systematic Literature Review*

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1. INTRODUCTION

Advances in information technology have brought significant changes in various sectors of life, including in the field of libraries (Atika & Sayekti, 2023). Information technology is widely regarded as a catalyst for the transformation of libraries from book managers to dynamic and interactive centers of information and knowledge, which must be able to adapt to the increasingly complex and diverse needs of users (Onunka et al., 2023) . One of the most promising technological innovations with great potential to improve library service quality is the application of artificial *intelligence* (AI) (Tupan, 2024). AI is a technology capable of automating data and information processing, equipped with the ability to read, analyze, and provide adaptive responses according to user needs, embodying the AI implementation strategy in digital libraries (Panda & Chakravarty, 2022) .

AI technology has developed rapidly and been widely applied to various fields, including libraries, to accelerate the collection management process, improve the accuracy of information searches, and provide more personalized and interactive services to visitors (Restiana & Sayekti, 2023). Various studies indicate that AI has begun to be adopted in various aspects of library services, ranging from collection management and information retrieval to direct interaction with users through chatbots and service robots (Sentiana et al., 2024). Technologies such as *natural language processing* (NLP), *machine learning* (ML), and recommendation systems have been proven to help improve library operational efficiency and enrich the user experience with more personalized and faster services (Setiawan et al., 2023).

For example, AI enables digital libraries to automatically index and catalog collections, validate search results based on relevant topics and keywords, and provide recommendations for books or information sources that match visitors' preferences (Application of Artificial Intelligence in the Digital Library of the University of Jambi). In addition, AI also plays a crucial role in improving the accessibility of library services, including for people with disabilities, through technologies such as screen readers and voice recognition (Hermanto & Masriyatun, 2024). Thus, AI not only improves operational efficiency but also expands the reach of library services to various user groups.

The use of AI in libraries also includes the development of chatbots that can provide information services quickly and responsively, thereby effectively reducing visitor waiting times and improving service satisfaction (Sentiana et al., 2024). These chatbots can answer general questions, assist in the collection search process, and provide guidance on the use of library facilities (Kaushal & Yadav, 2022) . On the other hand, AI-based recommendation systems enable libraries to offer personalized suggestions for relevant books or information sources based on analysis of users' search history and preferences (Alomran & Basha, 2024) . This directly has a positive impact on enhancing the visitor experience by making information searches more efficient and enjoyable.

Furthermore, the role of AI in supporting the research cycle and scientific communication is becoming increasingly important, especially in academic library environments (Yaroshenko & Iaroshenko, 2023) . AI-based tools are now widely used for faster and more comprehensive literature reviews, large-scale data analysis in disciplines such as digital humanities, and even assisting in drafting and disseminating research results (Tosi, 2025) . Libraries play a strategic role in providing access to these tools and organizing AI literacy training to ensure researchers can use them ethically and effectively, while understanding their limitations and potential biases (Saeidnia, 2023) .

In addition, AI can also significantly help librarians manage collections more effectively through the automation of cataloging and classification processes (Pinar & Cox, 2025) . *Machine learning* (ML) technology is capable of recognizing patterns in collection data and automatically categorizing books

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or documents according to applicable classification standards (Allam et al., 2025) . This practice not only speeds up the collection management process, but also minimizes the potential for human error that may occur in the manual indexing process (Setiawan et al., 2023). Thus, librarians can focus more on direct services to visitors and the development of information literacy programs.

Modern libraries have also begun integrating AI with other technologies such as the Internet of Things (IoT) and robotics to create smart libraries (Asemi et al., 2021) . This technology enables self-service, such as automatic book borrowing and returning using RFID integrated with AI systems, as well as the use of service robots that can help visitors find collections or provide information in real-time (Zhuang, 2021) . These service robots can interact with visitors using natural language, thereby enhancing comfort and more personalized interactions in the library environment (Panda & Chakravarty, 2022) .

However, the implementation of AI also presents a series of challenges that need to be carefully considered and addressed, such as the need for adequate technological infrastructure, the readiness of human resources with relevant competencies, and issues related to user privacy and data security (Setiawan et al., 2023). Therefore, libraries must design comprehensive AI implementation strategies, including staff training and policy development that supports the ethical and safe use of technology. With the right approach, AI can be a very effective tool to support the transformation of libraries into smarter institutions that are more responsive to the needs of visitors.

Overall, the integration of AI technology into library services is a strategic step that can significantly improve service quality and visitor experience. AI not only speeds up administrative processes and collection management, but also enriches interactions between visitors and libraries through more personalized and adaptive services. As such, proactive libraries that adopt and integrate AI technology will be better equipped to meet the demands of the digital age, which requires speed, accuracy, and convenience in accessing information and knowledge.

The purpose of this study is to examine and analyze various forms of AI technology application in the context of libraries, identify the benefits and challenges faced in its implementation, and provide strategic recommendations for the development of AI-based library services that can optimally enhance the visitor experience. Thus, this article is expected to serve as a reference for library managers, researchers, and technology developers in their efforts to design and implement innovative, ethical, and sustainable AI solutions in the library environment.

Based on this background and study, this article will discuss in depth how AI technology can be effectively applied to improve the library visitor experience, while also providing an overview of the potential for future library service development, towards a smarter, more personalized ecosystem that is adaptive to the information needs of the community. The explicit research question is:

1. How can the application of Artificial Intelligence (AI) contribute to improving the library visitor experience in the digital age?
2. What are the strategic themes that emerge from the application of AI in various aspects of library services?

2. RESEARCH METHOD

This study uses the *systematic literature review* (SLR) method to examine and analyze the application of artificial intelligence (AI) technology in improving the library visitor experience. This method was chosen because it allows for the search and collection of data from various relevant and

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reliable scientific sources, thereby providing a comprehensive overview of the development, application, and challenges of AI implementation in libraries.

The SLR process was carried out through several main stages, namely:

1. Identifying and selecting literature.
   Data collection was conducted by searching the literature through the Google Scholar platform, which provides access to journal articles, conference proceedings, and research reports related to AI in the field of libraries. The search keywords used included: "*Artificial Intelligence*," "*AI in libraries*," "*library services*," "*digital* library," "*user experience in libraries*," and other related variations to ensure broad and relevant literature coverage.
2. Inclusion and exclusion criteria.
   The selected literature was limited to publications from the last 10 years (2015-2025) that discussed the direct implementation of AI in the context of library services and visitor experience. Based on the data collection results, the number of articles that met the criteria and were used as units of analysis was 36 articles related to the application of AI to improve the library visitor experience.
3. Screening and coding process
   The data were analyzed using *thematic analysis* techniques, with the stages of initial coding (open coding), categorization (*axial coding*), and discovery of main themes (*selecting coding*).
4. Validation and Synthesis
   The analysis results were compared across sources to ensure consistency and validity of the findings, then synthesized into the main strategic themes of AI implementation in libraries.

With this approach, the study is expected to produce a systematic and comprehensive summary of the development of AI technology to enhance the visitor experience of libraries, while providing a strong scientific basis for the development of effective AI implementation strategies to improve library services and user experience.

3. RESULTS AND DISCUSSION

Data collection

From the 36 articles synthesized, seven themes were identified that can be used as a basis for effective AI implementation in improving library services and user experience . The seven themes and sources of the synthesized articles are listed in Table 1.

Table1 . *Literature theme categorization*

No	Theme	Author and Year
1.	Library Transformation in the Digital Age	Bifakhlina, 2024
2.	The Role and Benefits of AI Technology in Library Services	Setiawan et al., 2023 Ronsumbre et al., 2023 Aliwijaya & Suyono, 2023 Prasetio & Winanda, 2023 Abdurokhim & Nafisah, 2023
3.	Implementation of AI in Various Aspects of Library Services	Sentiana et al., 2024 Yusuf, 2024

		Atika & Sayekti, 2023
4.	The Use of AI for Personalizing Library Services	Cox & Mazumdar, 2024 Saputra & Ilhami, 2024 Gajbhiye, 2024 Syaharuddin et al., 2024 Oyelude, 2021
5.	The Impact of AI on Library Operational Efficiency	Molaudzi & Ngulube, 2025 Aminu, 2024 Ram, 2024 Tijani et al., 2024 Narendra et al., 2025 Kesuma et al., 2024 Ahmed et al., 2025 Das & Islam, 2021 Tijani et al., 2024 Bubinger & Dinneen, 2021 Paul & Chauhan, 2024
6.	AI-Based Collaboration and Knowledge Sharing Model Among Libraries	Ngulube & Vincent Mosha, 2024 Olan et al., 2022 Kim et al., 2025 Raman et al., 2024 Tabbakh et al., 2024 Greif et al., 2024
7.	Challenges in Implementing AI in Libraries	Boateng, 2025 Raup et al., 2022 Hidayat et al., 2024 Setiawan et al., 2023 Pawar, 2024

Library Transformation in the Digital Age

Libraries in the digital age have undergone significant transformation with the advent of artificial intelligence (AI) technology. This transformation has not only changed the way libraries operate, but also the way visitors interact with information. Digital libraries have emerged as a solution to the limitations of traditional libraries, such as restricted physical access, operating hours, and management efficiency. The application of AI in digital libraries aims to improve accessibility, service efficiency, and visitor experience (Saharudin et al., 2024).

One of the main aspects of this transformation is the role of AI in helping librarians reduce manual work and speed up collection management (Saharudin et al., 2024). With automation in activities such as cataloging, data processing, selection, classification, and indexing of collection materials, librarians can focus more on creative and strategic tasks. This supports the development of more innovative services and strengthens the interaction between librarians and users (Bifakhlina, 2024). Students and library users also enjoy the benefits of AI. Easy access to digital collections has led to an increase in library visitors (Saharudin et al., 2024). This technology facilitates information retrieval and

collection management. In addition, AI-based recommendation systems provide a more personalized and relevant user experience (Saharudin et al., 2024).

AI also enables the automation of various functions, from procurement and classification to circulation and reference services (Sentiana et al., 2024). The result is a faster and more efficient work process. Fast and personalized services can also be provided through applications such as chatbots and voice recognition systems. Thus, AI integration creates a library environment that is more adaptive and responsive to user needs. The strategy for implementing AI in improving the availability and accessibility of digital libraries includes collection management, personalized recommendation systems, and data security integration (Yusuf, 2024). Digital libraries play an important role in providing knowledge and information to the public. By implementing effective strategies, digital libraries can meet the information needs of modern society.

AI-based information services in libraries also include the use of chatbots and platforms such as Scispace (Sentiana et al., 2024). *Chatbots* can interact with users and answer their questions, while Scispace facilitates the understanding of scientific articles by providing various languages. This greatly helps librarians in obtaining scientific reading materials from various sources and languages.

Although AI brings many benefits, librarians are still required to master information technology skills, data analysis, and AI-based service development (Bifakhlina, 2024). Librarians need to adapt to technological changes and utilize AI to improve their services. The role of AI-literate librarians is also increasingly vital as part of library promotion strategies in higher education libraries in the era of the Fourth Industrial Revolution (Setyawan et al., 2023).

By continuing to innovate and utilize AI technology, libraries can maintain their existence in the digital age and continue to provide relevant and useful services to the community. The transformation of libraries in the digital age is an ongoing process, and AI will continue to play an important role in shaping the future of libraries. This shows that the transformation of libraries through the implementation of AI has changed the way visitors interact, obtain information, and utilize library services. The digitization of collections and the development of online-based services have made access to information sources faster, easier, and more flexible.

This transformation not only improves the efficiency of information searches, but also enriches the visitor experience through easy navigation, self-service, and interactive digital spaces. In addition, the integration of technologies such as library applications, automated lending systems, and online catalogs (OPAC) also encourages user satisfaction because they can enjoy services that are more personalized, responsive, and tailored to their needs. At the same time, the existence of digital platforms and library social media expands the interaction between librarians and users, creating a more dynamic, participatory, and sustainable two-way relationship. Thus, digital transformation not only renews the service system but also strengthens the value of user experience, satisfaction, and engagement in a modern digital library ecosystem.

The Role and Benefits of AI Technology in Library Services

The use of AI in library services can help speed up data management processes, reduce errors, and assist librarians in providing better, faster, and more efficient solutions. In addition, it can help librarians provide new services to library users, such as faster and more accurate searches, and a variety of interactive applications. The concept of artificial intelligence relates to the study of modeling, describing, and applying intelligence to a set of computer technologies that can be used to articulate human needs and desires. Artificial intelligence has great potential to improve library services and meet

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the needs of library users (Setiawan et al., 2023). One of the main benefits of AI is its ability to provide personalized feedback, allowing users to better understand their progress and identify areas that require more attention (Ronsumbre et al., 2023).

The use of artificial intelligence in libraries has great potential to improve services and meet the needs of visitors. Although there are challenges that must be overcome, the proper implementation of artificial intelligence can help libraries provide better and more efficient services to visitors. Library services that utilize technology result in faster and easier processes. On the other hand, the development of these services using technology has unlimited opportunities. Artificial intelligence as a scientific concept in creating technology that resembles human behavior enables its application for the development of libraries. This utilization has an impact on virtual libraries, chatbots, book shelving machines and robots, OPAC and library assistants, and library system analytics (Aliwijaya & Suyono, 2023).

One concrete example of the application of artificial intelligence in libraries is through the Online Public Access Catalog (OPAC) system. OPAC allows library users to search and access library collections electronically. With the help of artificial intelligence, OPAC can provide search results that are more efficient and relevant to the needs of library users. Through OPAC, library users can search for books, journals, and other materials more easily and quickly (Prasetio & Winanda, 2023). AI can also be used to automatically answer user questions, both through online platforms and face-to-face, as well as provide accurate information about library collections and resources. Then there are AI-powered chatbots that enable 24/7 virtual reference services, ensuring that customers have access to timely support regardless of location or time zone.

Chatbot applications have also provided information accessibility and offered fast, accurate, and relevant alternatives for interacting with library users' questions (Abdurokhim & Nafisah, 2023). The role of AI can be an opportunity to facilitate human work in various sectors. However, the application of AI is not intended to replace the tasks and responsibilities of individuals in their respective fields. Innovations and concepts developed in artificial intelligence are created by experts in their respective fields, ensuring that human labor remains essential and drives the successful implementation of AI across various sectors, including libraries (Setiawan et al., 2023).

The role and benefits of AI technology in library services directly contribute to improving the visitor experience. Through the application of AI, libraries are able to provide more personalized, faster, and smarter services, such as reading recommendations tailored to user interests, semantic intelligence-based information search systems, and virtual assistants who are ready to help at any time. AI technology not only facilitates access to information sources, but also creates more intuitive and enjoyable interactions for visitors. Thus, the application of AI makes libraries more relevant, efficient, and user-oriented, thereby significantly improving the visitor experience in terms of comfort, satisfaction, and engagement, making library services more participatory.

Implementation of AI in Various Aspects of Library Services

The implementation of AI technology in library services has revolutionized the way libraries operate and interact with their visitors. In the context of rapid digital transformation, AI offers innovative solutions to overcome various traditional challenges in information management, while significantly improving the quality of user experience. Various studies from universities in Indonesia show that AI not only speeds up library administrative processes, but also enriches services with personalization, interactivity, and ease of access that were previously difficult to achieve.

One important aspect of AI implementation is the automation of collection management and cataloging. By utilizing machine learning algorithms and natural language processing (NLP), libraries can classify and index collections automatically and more accurately. This reduces the manual workload of librarians, allowing them to allocate time to more strategic services such as research guidance and information literacy. Research conducted by Amalia, Kurniawati, and Fahmi from Airlangga University shows that this automation improves the efficiency of collection management and speeds up the information search process, as well as improving collection management efficiency, making libraries more responsive to the needs of digital users. In addition, the use of AI platforms such as Scispace at the BRIN Library makes it easier for librarians to search and understand scientific literature in various languages and sources, expanding the scope of global information access (Sentiana et al., 2024).

AI also encourages personalization and interactivity in library services. AI-based recommendation systems that analyze user preferences and behavior can provide relevant reading suggestions tailored to individual needs. This not only increases visitor satisfaction, but also expands exploration of library collections that were previously less accessible. Research from the Darussalam Nganjuk Islamic College emphasizes that AI implementation strategies in digital libraries focus on improving access and availability of information through intelligent recommendation systems and personalized services (Yusuf, 2024). Thus, AI helps libraries transform into more adaptive and inclusive information centers.

Direct interaction with visitors has also seen significant progress thanks to the use of AI-based chatbots and virtual assistants. These chatbots are capable of providing real-time reference services, answering visitors' questions, and assisting with information searches without having to wait for direct assistance from librarians. One example is ChatbotWIDYA, developed at the CSOnline library, which has proven effective in providing satisfactory responses to users (Sentiana et al., 2024). In addition, the integration of AI chatbots such as Bing Chat enables more personalized and contextual interactions, providing relevant and up-to-date reference assistance according to user needs, as well as supporting dynamic academic dialogue. The use of these chatbots not only increases librarian productivity but also enriches the user experience with more responsive and easily accessible services.

Digital libraries and mobile services also benefit greatly from AI technology. Features such as speech-to-text make it easier to search for information through voice conversations, while robotics assist in the automatic retrieval and return of books. The Palimpsest journal mentions that AI-based humanoid robots can provide educational services, such as teaching coding and storytelling to children, making libraries an attractive interactive learning center for the younger generation (Atika & Sayekti, 2023). This innovation not only improves operational efficiency but also enriches the educational experience of visitors, especially the younger generation.

From the perspective of safety and comfort, AI is utilized to develop smart security systems, such as facial recognition and body temperature measurement, which are particularly relevant during the COVID-19 pandemic. This technology contributes to the safety of visitors and staff and speeds up the administrative process of entering the library (Atika & Sayekti, 2023). Thus, AI not only improves service quality but also creates a safe and comfortable library environment. However, the implementation of AI in libraries is not without challenges, particularly regarding staff training and user data privacy management. A study from Airlangga University shows that despite concerns about privacy and training needs, the acceptance of AI by library professionals is quite positive. They recognize that AI is an important tool for improving the efficiency and quality of library services in the future. Therefore,

the development of librarian capacity and data protection policies are crucial aspects of successful AI integration.

Overall, the application of AI in various aspects of library services has had a significant positive impact on improving the visitor experience. AI enables libraries to provide faster, more personalized, interactive, and secure services. By continuing to develop AI technology wisely and sustainably, libraries can remain relevant as centers of knowledge and innovation in the digital age, while meeting the increasingly complex and dynamic information needs of the community. Therefore, it can be emphasized that the implementation of AI, which makes library services smarter and more adaptive, will provide a more comfortable, engaging, and satisfying experience, making AI a key factor in transforming service quality and enhancing the value of the experience in digital libraries.

The Use of AI for Library Service Personalization

The use of AI for personalizing library services directly changes the interaction between library users and the collection, from what was originally a *one-size-fits-all* approach to a highly personalized and relevant experience. At the heart of this personalization is AI's ability to analyze large-scale user behavior data, such as borrowing history, search history, reading lists, and even resources viewed but not borrowed, to build dynamic preference profiles for all individuals (Cox & Mazumdar, 2024).

The presence of technology in libraries as a source of information can be supported by the application of artificial intelligence in the areas of collection services, natural language processing, speech recognition, computer vision, and robotics. The implementation of these various fields in libraries will enable these institutions to continue to develop dynamically, in line with preparations for implementing artificial intelligence within them. This includes the allocation of funds, adaptation to user needs, the availability of software and hardware, and support from an adequate network (Saputra & Ilhami, 2024).

The use of artificial intelligence in library services provides a great opportunity to transform and improve the quality, efficiency, and accessibility of library services. Artificial intelligence can improve data search, offer recommendation systems tailored to user preferences, provide virtual assistants, support data analysis, and assist in digital preservation. The application of artificial intelligence can also accelerate and improve library operational efficiency, in addition to expanding access for users with various needs (Gajbhiye, 2024).

More than just recommendations, AI-based personalization also extends to optimizing the information retrieval process. Machine learning algorithms can adjust and reorganize search results based on user profiles (Sowmiya et al., 2024). For example, a search using the keyword "mercantilism" will yield different results for an economics undergraduate student than for a history researcher. For students, the system may prioritize introductory textbooks and survey articles, while for researchers, the system will highlight digital archives, specialist scientific journals, and the latest writings. This kind of personalization makes the research process more efficient and effective, because AI directly filters the information that is most relevant to the needs and skill level of the user (Syaharuddin et al., 2024).

In addition, AI enables libraries to provide proactive and adaptive services. The system can automatically send personalized notifications to users, such as notifications about new book acquisitions by their favorite authors, newly published articles that match their research topics, or even library workshops that are relevant to their field of study (Oyelude, 2021). This level of personalization significantly increases user engagement and transforms the image of libraries from mere resource providers to active partners in their users' intellectual and learning journeys.

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AI enables service customization through understanding data about user preferences and behavior, allowing libraries to provide more relevant collection recommendations and a better experience for visitors. However, developing AI-focused innovations in libraries requires strong collaboration between librarians and information technology specialists. Several challenges, such as workforce readiness, infrastructure, and ethical and privacy issues, must also be addressed. Overall, the use of AI has been shown to improve the quality, effectiveness, and scope of library services. To remain relevant in the digital age, libraries must continue to adapt and utilize developments in AI technology to meet the expectations and needs of current and future visitors (Atika & Sayekti, 2023). The use of AI for personalization has been proven to increase user satisfaction and user experience because it allows each individual to obtain services, recommendations, and access to information that suits their needs, interests, and personal preferences.

The Impact of AI on Library Operational Efficiency

The implementation of AI technology in public and academic library operations has been shown to significantly improve efficiency, especially in routine tasks such as cataloging and metadata processing. Research by Molaudzi & Ngulube (2025) found that although most libraries do not yet have a mature AI strategy, the use of AI-based library management systems can speed up the cataloging process and reduce human error. This is consistent with Aminu's (2024) findings, which show that AI can cut staff time by up to 80% in administrative tasks, allowing for the allocation of human resources to more valuable strategic activities.

Furthermore, AI is also changing the paradigm of reference services and book searches. Ram (2024) notes that NLP-based search systems and virtual chatbots help users find sources more accurately and quickly, increasing user satisfaction. 's findings 2024) , support this by demonstrating the application of AI in virtual assistants and recommendation systems that can enhance the user experience while streamlining collection management.

AI enables the automation of various administrative and technical tasks, such as collection management, document grouping, and circulation data processing, which previously required a lot of time and effort from humans. With technologies such as chatbots that use Natural Language Processing (NLP), libraries can provide information services and assistance directly 24 hours a day, contributing to increased user satisfaction and experience. Machine learning algorithms can examine patterns of collection usage and user behavior to predict trends in information needs, which helps libraries in collection development and data-driven decision making (Narendra et al., 2025).

AI enables more efficient collection management, from real-time monitoring of collection usage to analysis of borrowing data for better decision making. AI-based search systems, such as OPAC integrated with machine learning and natural language processing, are able to provide more relevant and personalized search results according to user needs (Kesuma et al., 2024). The collection decision-making aspect also benefits. Ahmed et al. (2025) report that AI can perform usage data analysis, circulation trends, and demographic needs to help librarians make more targeted collection decisions. Similarly, Das & Islam (2021) found that the use of machine learning in libraries has largely focused on automation and trend analysis, although most research is still theoretical.

However, the adoption of AI in libraries is not without challenges. Factors such as lack of infrastructure, implementation costs, and staff training limitations are major obstacles, as described by Tijani et al. (2024) and Das & Islam (2021). In addition, ethical issues such as algorithm bias, data security,

and user privacy also arise as important considerations. Bubinger & Dinneen (2021) emphasize the need for an ethical approach in designing, evaluating, and implementing AI in libraries.

Finally, AI helps expand the accessibility of library services, for example, for users with special needs. A study by Paul & Chauhan (2024) found that AI-powered assistant technologies such as *text-to-speech* and automatic navigation significantly increase user independence and efficiency in accessing library resources. This theme shows that AI has an impact on library operational efficiency. This efficiency makes services faster, more accurate, and more responsive, so that visitors not only find it easier to access information resources, but also enjoy a more comfortable, effective, and satisfying visit experience.

AI-Based Collaboration and *Knowledge Sharing* Model Between Libraries

AI-based collaboration models in the context of academic libraries have shown great potential in improving service quality and information accessibility. *Artificial intelligence* has the potential to transform cataloging operations, improve information access, and position academic libraries as key knowledge centers. Bibliometric research conducted by Scopus shows that 75% of AI-related publications in academic libraries are the result of collaborative research, indicating the high impact of the collaborative approach. This shows that collaboration between libraries in the implementation of AI is not only a trend but also a strategic necessity to optimize resources and improve service quality (Islam et al., 2025).

The implementation of AI technology in libraries requires a careful and structured approach. Academic libraries are increasingly integrating artificial intelligence (AI), but there is limited understanding of how AI can be "safely" integrated into their business models. The main challenges in AI-based library collaboration lie in system harmonization, data standardization, and the development of universal security protocols. An effective collaboration model requires a framework that enables interoperability between different AI systems, while maintaining data integrity and security (Ngulube & Vincent Mosha, 2024).

Knowledge sharing through AI platforms enables libraries to create significant added value for users. AI facilitates collaboration and knowledge sharing among library users, enabling more efficient and measurable knowledge exchange. AI systems can analyze collection usage patterns, user preferences, and research trends to optimize resource allocation and collaborative collection development. This creates synergies between libraries, allowing each institution to gain access to a broader spectrum of knowledge without having to invest significant resources individually.

The implementation of AI-based *knowledge sharing* in libraries cannot be separated from broader organizational aspects. The implementation of AI technology alone is not sufficient to improve organizational performance, so a holistic strategy that integrates technology, people, and processes is needed (Olan et al., 2022). A successful collaboration model requires synchronization between institutional policies, organizational culture, and technological infrastructure. Libraries need to develop a governance framework that enables cross-institutional collaboration while maintaining the autonomy and identity of each organization.

Partnerships between humans and AI in the context of library knowledge management open up opportunities to create unique value propositions. The emerging capabilities of artificial intelligence (AI) are likely to permeate almost all contours and activities of organizations, including knowledge management (Olan et al., 2022). In the context of interlibrary collaboration, AI can serve as a mediator

that facilitates the exchange of tacit knowledge into explicit knowledge that can be shared and utilized collectively. AI systems can identify knowledge gaps, recommend strategic collaborations, and optimize the distribution of expertise between institutions.

AI-based collaboration models also enable libraries to develop more sophisticated predictive services. By collectively analyzing usage data, library consortia can identify emerging trends, predict future collection needs, and proactively optimize resource allocation. Socially shared learning regulations and artificial intelligence offer opportunities to support socially shared regulations (Kim et al., 2025). This creates a collective competitive advantage that enables each consortium member to provide better services to their respective communities.

The *sustainability* aspect in AI-based collaboration models is an important consideration for the long term. The implementation of AI technology in libraries requires a *Green* AI approach that prioritizes environmental sustainability, where model optimization strategies and energy-efficient computing techniques are key to reducing carbon footprints (Raman et al., 2024). Research shows that collaboration between institutions in developing sustainable AI practices can optimize the use of computational resources through infrastructure sharing and the development of more efficient algorithms (Tabbakh et al., 2024). To ensure long-term sustainability, libraries need to integrate *sustainable computing* principles into their collaboration models, considering that AI model training processes can consume thousands *of megawatt* hours of electricity and generate hundreds of tons of carbon, requiring a governance framework that prioritizes energy efficiency and the use of renewable resources (Greif et al., 2024).

The implementation of AI-based collaboration and *knowledge sharing* models in libraries is a strategic investment that requires careful planning and ongoing commitment. The success of this model depends not only on the sophistication of the technology used, but also on the institution's ability to adapt, collaborate, and innovate continuously. With the right approach, AI-based collaboration models can catalyze the transformation of libraries into more dynamic, responsive, and impactful knowledge hubs for the academic community and the wider society. Thus, AI-based collaboration and knowledge sharing models between libraries can have a significant positive impact on improving the library visitor experience. Through AI integration, libraries can share data, resources, and knowledge more quickly and efficiently, giving visitors broader access to collections and services relevant to their needs. This smart collaboration not only enriches the quality of available information but also creates a more personalized, interactive, and high-value user experience.

Challenges in Implementing AI in Libraries

The implementation of artificial intelligence (AI) in libraries faces various complex and multidimensional challenges. One of the main issues is related to ethics and user data privacy. In the process of collecting and analyzing data to improve services, such as recommendation systems or chatbots, libraries must ensure that user data is well protected and that the use of AI complies with ethical norms and applicable data protection regulations. Strict and transparent privacy policies are essential to maintain user trust and avoid privacy violations. Yusuf (2024) emphasizes the importance of data privacy protection in AI-based services. Privacy and data security issues are another crucial challenge in the implementation of AI in libraries. One of the main concerns is the quality and credibility of the content produced, especially in academic environments where information integrity is very important. Boateng (2025) highlights the issue of credibility of content produced by AI systems in academic environments.

The implementation of artificial intelligence in libraries promises significant transformation in operations, services, and user experience. Raup et al. (2022) state that the application of AI requires a comprehensive and sustainable implementation strategy.

In addition, AI also presents the challenge of information *overload*. AI is capable of analyzing large amounts of data and generating predictions based on the patterns it finds, but this can lead to too much information that is irrelevant to decision makers. This can be confusing and hinder effective decision-making (Hidayat et al., 2024), Setiawan et al. (2023) and Hidayat et al. (2024) highlight another major obstacle: the readiness of adequate technological infrastructure. AI systems require sophisticated hardware and software as well as stable internet connectivity to manage large volumes of data efficiently. Many libraries, especially those with limited funds, face difficulties in building and maintaining this infrastructure, thereby hindering the integration of AI into library services.

The lack of competent human resources in the field of AI is another substantial challenge. The implementation of AI in academic libraries has many challenges, such as technical issues, ethical and legal concerns (Pawar, 2024).

This shows that the successful implementation of artificial intelligence in libraries depends not only on the availability of technology, but also on the readiness of human resources, ethical policies, and adequate supporting infrastructure. Therefore, a well-planned and collaborative strategy between library managers, policymakers, and technology experts is needed to ensure that the application of AI can run effectively, responsibly, and sustainably in order to improve the quality of services and the user experience of libraries in the future.

This study resulted in the mapping of seven strategic themes that represent the direction of AI implementation in libraries that are directly oriented towards user experience, rather than solely on technological aspects. The seven themes include library transformation in the digital era, the role and benefits of AI technology in library services, the implementation of AI in various aspects of library services, the use of AI for personalizing library services, the impact of AI on library operational efficiency, AI-based models of collaboration and *knowledge sharing* between libraries, and challenges in implementing AI in libraries. Through this mapping, the study confirms that the success of AI implementation is not only measured by the sophistication of the system, but also by the extent to which the technology is able to improve the comfort, engagement, and satisfaction of visitors in accessing, utilizing, and interacting with library services in a more intelligent and adaptive manner.

4. CONCLUSION

The application of artificial intelligence (AI) technology in libraries has had a tangible positive impact on improving the quality of library services, which in turn has directly improved the visitor experience. AI has played a significant role in transforming libraries from conventional spaces into interactive, adaptive, and efficient digital spaces. Findings from the discussion show that AI is capable of automating operational processes such as cataloging, information retrieval, and reference services, thereby reducing the manual workload of librarians and improving the accuracy and speed of services. In addition, AI technology enables personalized services based on user preferences and behavior, which has a deeper impact on user engagement and satisfaction. However, the implementation of AI still requires serious attention to issues of ethics, privacy, and human resource readiness in order to optimize its benefits in a sustainable manner.

This study is unique and makes a new contribution because it comprehensively examines the role of AI implementation in enhancing the library visitor experience through an approach that focuses

on service personalization, operational efficiency, and intelligent interactions between users and the library system. Unlike previous studies that only highlighted the technological aspects, this study presents a new perspective that places users as the focal point of AI innovation, emphasizing the strategic relationship between AI-based innovation and the improvement of *user experience* as an indicator of the success of library service transformation in the digital era.

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