# Enhancing Library Services with Artificial Intelligence: Innovations, Challenges, and Impacts

Kamiliya Iksana Hamam[1], Faisal Fahmi[1], Nor Erlissa Abd Aziz[2*], Siti Aishah Mokhtar[2], and Najatul Afiqah Mohd Affandi[2]

*[1]Faculty of Social Science and Political Science, Universitas Airlangga, Surabaya,
Indonesia
[2]Information Science Studies, Universiti Teknologi MARA Kelantan, Malaysia*

*Corresponding author's e-mail address: erlissa@uitm.edu.my*

## ARTICLE INFO

## ABSTRACT

The challenges faced in implementing artificial intelligence (AI) in both significant potentials to improve library operations, barriers such as financial constraints, lack of technical expertise, and concerns over data privacy and security hinder its full adoption. To address these issues, this study examines the innovations, challenges, and impacts of AI implementation in library services. A systematic literature review was conducted following PRISMA 2020 guidelines, with data collected from Scopus, ProQuest, and Web of Science databases. Five key studies were published between 2019 and 2024 were analyzed. The findings reveal that AI has greatly enhanced library operations through applications such as automated cataloging, virtual assistants for real-time user support, and IoT-based resources management systems. However, financial and technical challenges, as well as privacy concerns, continue to limit broader implementation. Despite these obstacles, AI adoption has improved operational efficiency and user satisfaction. To maximize AI's benefits, libraries require targeted strategies, including increased funding, staff training, and infrastructure development. Future research should focus on the ethical and sustainable use of AI to ensure widespread accessibility and responsible implementation.

## INTRODUCTION

Libraries have long been pillars of knowledge and centers of community engagement, evolving from mere repositories of books to dynamic spaces that foster learning, creativity, and innovation. In response to rapid technological advances, especially in the digital age, libraries continue to adapt to meet the changing demands of modern society. One of the most transformational drivers of this transition has been the rise of artificial intelligence (AI). This adaptation entails offering digital resources, virtual

services, and training in new technology. AI dramatically transforms the operational paradigm for libraries to run and provide services by processing vast amounts of data, learning from interactions, and delivering tailored experiences. (Bhui, 2024).

Currently, libraries can efficiently automate repetitive tasks such as resource acquisition, cataloging, and reference services. This enables librarians to focus on more complex tasks and assist users in finding relevant resources. Some libraries have effectively used AI-driven chatbots and virtual assistants that offer patrons immediate access to information and support (Shahzad, Khan, & Iqbal, 2024). This technology promotes operational efficiency through optimized information management and improved service delivery, while also considerably elevating the user experience (Mupaikwa, 2024).

In addition to improving operational efficiency, AI also significantly improves the inclusivity and accessibility of library services. A quantitative study by Aftab et al. (2024) found that 39% of respondents agreed that AI-based speech recognition systems can indeed help students with hearing impairments access the same educational content as other students, thereby significantly increasing inclusivity in the learning environment. This innovation plays a vital role in reducing barriers for diverse users and bridging the digital divide, especially in underserved communities. Furthermore, the integration of AI in library systems has paved the way for the development of smart libraries, where technology and human expertise combine to provide seamless and dynamic services (Syaaruddin & Ardyawin, 2024). AI-powered smart libraries can manage and organize vast collections of information, thereby improving accessibility and resource discovery for users. AI has the potential to fundamentally change the way libraries organize their collections, help users find relevant materials through intelligent recommendation algorithms and automated cataloging systems, and provide services to users that efficiently meet their information needs (Wheatley & Hervieux, 2020). These AI-powered tools not only improve resource management but also increase user engagement through real-time assistance. According to a study by Asim et al. (2023), 44.5% of libraries reported using text-to-speech and text-to-speech technologies to improve accessibility for users with disabilities, and 37% noted increased user engagement because voice command systems such as Google Assistant can improve access to information and operational efficiency.

Despite all of its advantages, the implementation of AI in libraries also faces some significant challenges, especially in developing regions. These barriers include lack of capital, inadequate infrastructure, and lack of technical expertise to support AI-driven systems. A recent study found that infrastructure and funding are two major barriers preventing libraries in developing countries from implementing AI technologies (Barsha & Munshi, 2023). Many libraries' inability to fully integrate AI into their programs exacerbates the digital divide. To overcome these barriers and ensure the smooth integration of AI-powered solutions in libraries, we need forward planning, staff education, and strict enforcement of data protection laws. To explore these issues, this study addresses the following research questions:

RQ1: What are the major studies on AI applications in library services from 2019 to 2024?
RQ2: What are the challenges and impacts of implementing AI in library services from an operational and technical perspective?
RQ3: How is AI driving innovation in library services?

By conducting a systematic literature review of key studies published over the past five years, this paper aims to provide insights into the innovations, challenges, and future directions for AI adoption in libraries. We aim to elucidate the impact of AI on the future of library services, pinpointing the advantages and obstacles that necessitate successful implementation.

## METHODOLOGY

To find answers to the research questions, this study conducted a comprehensive literature review. The technique followed the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta- Analysis) guidelines to guarantee transparency, replicability, and scientific rigor (Page et al., 2021). This was outlined in the search strategy, selection criteria, data collection and analysis. We've broken down each step into specifics below. Here are the specifics for each step:

### RESEARCH STRATEGY

This systematic literature review was conducted using three online databases, such as Scopus, ProQuest, and Web of Science (WoS). These databases were selected because of their international recognition and comprehensive collection of reviewed articles. We used boolean operators (and, or, and not) in the advanced search tool to further refine the results and find studies related to artificial intelligence (AI) in library services. According to (Lowe et al., 2020), boolean logic is an effective tool for accessing relevant studies in academic databases. We limited the search to articles published between 2019 and 2024 to focus on recent advances. We applied the following search strategy to the three databases:

**Scopus:** (TITLE-ABS-KEY ("Artificial Intelligence") AND TITLE-ABS-KEY ("Library Services") AND TITLE-ABS-KEY ("Innovation") AND TITLE-ABS-KEY ("Challenges") AND TITLE-ABS-KEY
("Impact")). Document type: article. Period: 2019–2024. English.
**ProQuest:** "Artificial Intelligence" AND "Library Services" AND "Innovation" AND "Challenges" AND "Impact". Document type: article. Period: 2019–2024. Language: English. Limitations: Full-text and peer-reviewed.
**Web Of Science:** ((ALL=("Artificial Intelligence" )) AND ALL=("Library Services" )) AND ALL=(Innovation)) AND ALL=(Challenge)) AND ALL=(Impact). Document type: article. Period: 2019–2024. Language: English.

To ensure the reliability and validity of the study, only peer-reviewed articles were considered, including original research and systematic reviews. In addition, only articles published in English were included. No restrictions were imposed on specific publication journals, allowing for comprehensive review coverage across disciplines.

### SELECTION CRITERIA

The search for relevant studies followed the inclusion and exclusion criteria outlined below. These criteria were designed to ensure that only peer reviewed studies that focused on the application of artificial intelligence (AI) in library services were included in the systematic review.

*Table 1. Inclusion and exclusion criteria*

| Inclusion | Exclusion |
|---|---|
| There are scholarly works that discuss the application of artificial intelligence in library services | Scholarly works do not discuss the application of artificial intelligence in library services |
| All scholarly work published in the past five years, from 2019 to 2024 | Scholarly works published before or following 2019 to 2024 |
| Scholarly work focusing on AI innovations, impacts, and implementation challenges in library services | Scholarly works are not relevant to the innovations, impacts, or implementation challenges of AI in library services |

## DATA COLLECTION AND ANALYSIS

The systematic literature review was conducted in four stages, following the Prisma 2020 guidelines. The first stage involved identifying relevant studies from the Scopus (n = 2), ProQuest (n = 11), and Web of Science (Wo) (n = 148) databases. We screened a total of 159 records based on title and abstract after removing duplicates (n = 2).

In the second stage, after reading titles and abstracts, 144 articles were excluded due to irrelevance to the study focus. In the third stage, the remaining 17 reports were assessed for eligibility through a full-text review. In this phase, we assessed 17 reports and excluded 11 articles due to their lack of focus on innovation, challenges, or impacts of AI in library services. We excluded one article due to its lack of peer review.

During the final stage, the systematic review included a total of 5 articles that met all the inclusion criteria and were relevant to answering the research questions. The Prisma flow diagram (Figure 1) illustrates the process.
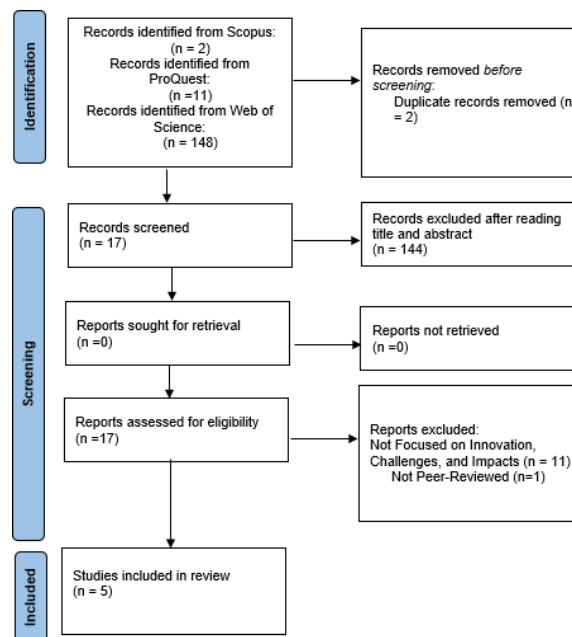


*Figure 1. PRISMA diagram*

**SUMMARY OF SELECTED STUDIES**

The table below provides a summary of the selected articles based on year, author, title, and type of library the study focused on:

*Table 2. Summary of Selected Studies.*

| No | Year | Author | Title | Library Type |
|---|---|---|---|---|
| 1 | 2023 | Emiri CLN, Oguchukwu T | Adoption and Utilisation of Artificial Intelligence by Librarians in Southern Nigeria | University Libraries |
| 2 | 2020 | Lysiak, L | 21st Century Innovation: Librarians, Trend -watching and the warning signs of Fads | Public Libraries |
| 3 | 2024 | Okunlaya, R.O., Abdullah, N.S., & Alias, R.A. (2023) | Artificial Intelligence Investing in Academic Libraries: Reality and Challenges | Academic Libraries |
| 4 | 2023 | Subaveerapandiyan | Application of Artificial Intelligence (AI) in Libraries and Its Impact on Library Operation Review | Public Libraries |
| 5 | 2022 | Khan, A. U., Zhang, Z., Sohail, R.C., & Rafique, W. | Factors fostering the success of IoT services in academic libraries: A study built to enhance the library performance. | Academic Libraries |

**RESULTS AND DISCUSSION**

The results of this systematic literature review focus on the answers to the three research questions posed in this study. Five primary studies have been selected, each examining different aspects of AI applications in library services, particularly in academic and public libraries in different regions. The formulated research questions (RQs) structure the presentation of the review's findings in this section.

RQ1: What are the major studies on the application of AI in library services from 2019 to 2024?

To answer RQ1, this review identified five major studies published between 2019 and 2024 that explored various AI applications in library services. Five major studies published between 2019 and 2024. The table below summarizes the AI applications from each of the studies discussed.

*Table 3. Presents the AI application from each study*

| No | Author | AI Application |
|---|---|---|
| 1 | Emiri CLN & Oguchukwu T. (2023) | AI for security scanning, cataloguing and reference services |
| 2 | Lysiak L. (2020) | AI-driven Virtual and Augmented Reality (VAR) tools for user engagement and learning |
| 3 | Farag H.A., Maffouz S.N., & Alhajri S. (2023) | Virtual assistants improved the user experience by providing real-time assistance, reducing staff workload |
| 4 | Subaveerapandiyan (2023) | AI used for intelligent chatbots, smart libraries, and robots in library services |
| 5 | Khan, A. U., Zhang, Z., Sohail, R.C, (2022) | AI and IoT combine to manage resources and provide personalized recommendation |

Table 3 summarizes studies that demonstrate the application of AI in various types of libraries across various geographical regions. Each study highlights a particular aspect of how AI is contributing to improving library operations and services. The first study by Emiri et al. (2023) examined how university libraries in Nigeria have adopted AI technologies, and the most popular was the use of security scanning equipment, which was purchased to scan visitors and customers at university library entry or exit points and at critical service locations. Other AI-based equipment automates cataloging tasks, such as listing books or other information sources, and also aids in reference services, such as assisting users in finding the sources or information they require. However, technologies to automate cataloging tasks are still relatively limited.

Next, a study by Lysiak (2020) focused on how public libraries can adopt 21st-century trends, such as the implementation of virtual and augmented reality (VAR) systems in libraries. Various activities, including virtual field trips, have adopted VAR. VAR may be an emerging trend with substantial potential to enhance user engagement and learning in library environments, as the use of virtual reality technology can provide a more interactive and engaging learning experience.

Similarly, a study focusing on Saudi academic libraries by Farag H. A., Mahfouz S. N., and Alhajri S. (2023) highlighted how their libraries have adopted AI technology to support various library functions. These AI applications include speech-to-text and text-to-speech conversion programs to assist users with disabilities, especially the blind. In addition, libraries are also using AI technology in language indexing, automated book storage and retrieval systems (ASRS), chatbots to answer user queries in real time, and optical character recognition (OCR) programs that help convert PDF documents into digital text, and the Gemi system helps researchers find and understand references by providing content summaries. These technologies help libraries improve their operational efficiency and the quality of their digital services. In addition, libraries in Saudi Arabia are also using AI to automatically manage bibliographies, provide references based on user needs, and utilize AI systems in document classification.

The study by Subaveerapandiyan (2023) provides a broader overview of AI applications in public libraries, focusing on the use of intelligent chatbots, smart libraries, and robots. AI-based chatbots are now helping libraries handle user interactions by providing instant assistance and automating routine queries. This, in turn, improves the user experience and allows staff to focus on more complex tasks. The study suggests that the increasing use of AI in public libraries is creating more efficient and personalized library services for users.

Lastly, the study by Khan et al. (2022) also explored the integration of AI with IoT in academic libraries in China to improve user services and experiences. IoT enables real-time updates on resource

availability, inventory management, and RFID theft prevention. These smart libraries also integrate digital shelves, smart lighting, and environmental sensors to maintain the condition of collections. IoT also facilitates automated reminders and personalized recommendations, meaning the system uses technology to provide personalized recommendations to users, such as book or resource recommendations based on individual preferences, and automates routine tasks, thereby improving operational efficiency and workflow.

In addition to these worldwide examples, Indonesian libraries have incorporated AI-based advances. Disperpusip (Library and Archives Service) in East Java has introduced an AI-powered library material processing system that reduces cataloging and classification time from three to four hours to 20-30 minutes. The University of Indonesia (UI) Library used deep learning-based OCR to process, translate, and transcribe old documents in traditional Chinese script. This technology not only speeds up manuscript processing but also allows users to more easily access previously difficult-to-understand collection content.

These findings demonstrate that AI is causing substantial changes in library services, ranging from work automation to the delivery of more personalized and inclusive services. However, obstacles like as insufficient funding, inadequate infrastructure, and data privacy concerns must continue to be addressed. In Indonesia, the use of AI in libraries shows considerable promise, yet its scale remains limited.

A study by Prasetio and Winanda (2023) also reveals how artificial intelligence (AI) has brought significant changes to library services in Indonesia, particularly at the UIN Raden Fatah Library. One example of AI application is through the Online Public Access Catalogue (OPAC) system, which allows users to search and access library collections electronically. With the help of intelligent algorithms, OPAC can analyze users' search patterns and provide recommendations for library materials relevant to their needs. Additionally, this system also enhances the operational efficiency of the library by monitoring book stock, sending notifications regarding restocking needs, and optimizing the placement of library materials on shelves.This study highlights that AI not only enhances the accessibility of library collections but also provides a more personalized user experience by understanding individual preferences and interests. Thus, the application of AI at the UIN Raden Fatah Library strengthens the library's position as an innovative knowledge center in the digital era.

The reviewed studies indicate a growing adoption of AI in academic and public libraries worldwide. The main applications include those that can help librarians and users, such as automation of cataloging tasks, user engagement tools such as VAR, chatbots for real-time assistance, and IoT integration for resource management. The above studies provide an overview of how different types of libraries are currently starting to focus on developing AI in their libraries. This provides a basis for further exploration of the challenges and innovations associated with AI adoption in libraries, which will be discussed in RQ2 and RQ3.

RQ2: What are the challenges and impacts of implementing ai in library services from an operational and technical perspective?

This research question focuses on identifying the challenges that libraries face when implementing AI technologies and the operational and technical impacts of AI adoption. The reviewed studies reveal various barriers, including financial constraints, lack of technical expertise, and concerns about data privacy. Despite these challenges, AI technologies have also enhanced operational efficiency and transformed how libraries manage resources and interact with users. The following table outlines the key challenges identified in the selected studies.

*Table 4. Challenges in AI implementation in library services.*

| Challenges | Number of Studies | Impact on Library |
|---|---|---|
| Financial constraints | 3 | Lack of funding leads to delayed AI adoption, hindering service improvements. |
| Lack of technical expertise | 3 | The underutilization of AI tools due to a lack of skilled personnel is affecting efficiency. |
| Infrastructure limitations | 3 | Inability to implement advanced AI technologies, stalling innovation. |
| Data privacy concerns | 2 | Libraries face challenges in ensuring compliance with data security standards. |

The reviewed studies revealed several operational and technical challenges faced by libraries in implementing AI, despite significant positive impacts on service efficiency and user engagement. Financial constraints are one of the most common challenges, as observed by Emiri et al. (2023), who highlighted the major challenges faced by university libraries in Nigeria in acquiring technology and infrastructure for AI implementation. These libraries continue to struggle to secure adequate funding to invest in AI systems in their libraries. Other AI technologies, such as robots, chatbots, facial recognition, touch recognition, RFID technology, humanoids, AI classification tools, machine-readable catalogs, and AI smart features, are often not available, despite their potential to help libraries in Nigeria grow further. Lack of funding, inadequate infrastructure, and inadequate electricity supply also pose significant challenges to the use of AI in libraries. Furthermore, a lack of technical expertise and training among staff is a problem, making it difficult for libraries to fully utilize and maintain AI systems. However, despite these challenges, the introduction of AI-based technologies such as security scanning tools and simple automated cataloging has reduced library staff's manual workload, allowing them to focus on more complex tasks like providing reference services, ultimately improving service delivery.

Similarly, a study by Lysiak (2020) highlighted the high cost of implementing advanced ai technologies such as virtual and augmented reality (var) in public libraries. Var systems also require significant financial investment to acquire and maintain, which is a major barrier to widespread adoption. Accessibility is another significant obstacle; the design of var systems often fails to accommodate users with disabilities, potentially leading to the exclusion of certain user groups. Therefore, technical and operational barriers limit the implementation of var technology, which has the potential to improve library services, and librarians lack the expertise to implement it, thereby reducing the opportunity for optimal var implementation in libraries.

According to Farag et al. (2023), the main challenges in Saudi Arabian academic libraries are a lack of physical equipment for technology development, low awareness of the potential of AI among library staff, and a lack of skilled librarians in AI willing to work in libraries. The use of AI-powered virtual assistants and OCR programs in Saudi academic libraries also raises concerns about data privacy, especially since these systems handle sensitive user queries and large amounts of digital information. Ensuring data security and privacy compliance is critical when dealing with AI-powered systems. In addition, libraries face challenges in securing the infrastructure and investment needed to make the most of AI. Due to these challenges, operational impacts arise, including the inability to meet changing user needs due to inadequate AI integration, thus hampering the library's ability to provide advanced technology-based services.

Subaveerapandiyan (2023) also identifies challenges related to limited technical expertise and financial constraints in public libraries. Many public libraries lack the trained staff needed to effectively manage AI systems, limiting the full potential of technologies such as chatbots and robots. Additionally, budget constraints hinder the acquisition of cutting-edge AI tools that can improve service delivery. These constraints impact the potential of AI to improve library services.

The last one, by Khan et al. (2022), discusses the technical challenges of integrating AI with the Internet of Things (IoT) in Chinese academic libraries. These key challenges include the need for a robust digital infrastructure to support real-time updates and more personalized services. Additionally, connecting AI with existing library systems can be challenging, and data security issues may arise due to AI's automatic collection, storage, and analysis of user data. As a result, while AI has the potential to simplify routine tasks and make user interactions more personalized, lack of staff preparation and training, as well as privacy concerns, are slowing down the adoption of this technology.

RQ3: How is AI driving innovation in library services?

AI has been a key driver of innovation in library services, transforming how libraries operate and interact with users. The reviewed studies show that AI has enabled libraries to adopt new technologies and streamline services in ways that were not possible before. The following is a summary of the key innovations brought about by AI, as identified in the selected studies:

*Table 5. The innovation of AI in library service and its benefits*

| Author | AI Innovation | Benefits to Libraries | Benefits to Users |
|---|---|---|---|
| Emiri CLN & Ogochukwu T. (2023) | AI for cataloging and security scanning | Automates cataloging, reduces manual workload, enhances security | The library offers faster access to resources and improved safety. |
| Lysiak L. (2020) | AI-driven Virtual and Augmented Reality (VAR) | Introduced interactive and immersive learning tools | It engages users with immersive learning experiences, especially younger users. |
| Farag H. A., Mahfouz S. N., & Alhajri S. (2023) | AI-powered virtual assistants | It automates routine tasks, freeing staff for more complex work. | The system provides instant real-time assistance, thereby improving user satisfaction. |
| Subaveerapandiyan (2023) | AI-based chatbots and robots | Streamlines user queries, allowing quicker responses | The library offers faster service and better access to information. |
| Khan A. U., Zhang Z., Sohail R. C. (2022) | AI + IoT integration for resource management | Automates resource tracking, improves library maintenance | Personalized recommendations, enhanced overall user experience |

The above review shows that AI innovations, such as virtual assistants, chatbots, and IoT-based resource management, are driving significant changes in library services. Emiri et al. (2023) discuss how AI for security and cataloging in a Nigerian university library has improved operational efficiency, freeing staff to focus on more complex tasks while users benefit from faster access to resources. Lysiak (2020) highlights how VAR technology in public libraries has created immersive learning environments, offering new opportunities for user engagement.

Farag et al. (2023) and Subaveerapandiyan (2023) both show that AI-powered virtual assistants and chatbots are changing the way libraries handle user queries and manage routine tasks, resulting in improved service delivery and user satisfaction. Finally, Khan et al. (2022) show how the integration of AI and IoT in a Chinese academic library has resulted in automated resource management and personalized services, improving the overall user experience. Finally, AI innovations have revolutionized library operations and user experiences. While operational efficiency has improved significantly, libraries are also providing more personalized services. However, challenges such as data privacy, technical integration, and infrastructure limitations remain barriers to full-scale AI adoption.

## CONCLUSION

This systematic literature review has identified the applications, challenges, and innovations of artificial intelligence (AI) in public and academic library services. The results reveal that AI has tremendous potential to transform library operations and enhance user engagement through technologies such as automation, virtual reality and augmented reality (VAR), chatbots, and Internet of Things (IoT) integration. These technologies can simplify routine tasks, reduce manual workload, and provide more personalized and efficient services to library users. For example, AI-based cataloging systems, AI-driven virtual assistants, and IoT-enabled resource management systems demonstrate how AI can revolutionize library services by creating a more dynamic and responsive operational framework.

Despite its clear advantages, AI adoption in libraries still faces significant challenges. Financial constraints remain a major barrier, as it is difficult to secure the necessary funding for AI implementation. In addition, the lack of technical expertise among library staff hinders the effective use and maintenance of AI technologies. Concerns about data privacy and security have also become significant issues, especially as libraries increasingly rely on AI to manage sensitive user information. For AI to fully transform library services, we must address these challenges.

Moving forward, it is critical for libraries to address these barriers by investing in infrastructure, providing adequate training for staff, and ensuring strict compliance with privacy and data security regulations. Libraries must find a balance between automation and human-centered services to maintain the personalized and community-oriented nature of library environments. By developing approaches that emphasize technological innovation and human expertise, libraries can maximize the benefits of AI for users and staff.

Further research could focus on exploring the ethical implications of future AI in library services, ensuring that AI integration is sustainable and accessible to all communities. This includes examining the long-term impact of AI on library staff roles, as automation can change traditional library workflows. Additionally, we should explore how libraries in low-resource settings can overcome financial and infrastructure barriers to successfully implement AI technologies. Ultimately, libraries, policymakers, and technology providers must collaborate to successfully integrate AI and reap its benefits for everyone.

## ACKNOWLEDGEMENT

## REFERENCES

Antara News Jawa Timur. (2023). *Disperpusip Jatim luncurkan sistem pengolahan bahan perpustakaan berbasis AI.* Accesed from https://jatim.antaranews.com/berita/842117/disperpusip-jatim-luncurkan-sistem-pengolahan-bahan-perpustakaan-berbasis-ai.

Asim, M., Arif, M., Rafiq, M., & Ahmad, R. (2023). Investigating applications of Artificial Intelligence in university libraries of Pakistan: An empirical study. *Journal of Academic Librarianship*, *49*(6). https://doi.org/10.1016/j.acalib.2023.102803

Barsha, S. and Munshi, S.A. (2024), "Implementing artificial intelligence in library services: a review of current prospects and challenges of developing countries", *Library Hi Tech News*, Vol. 41 No. 1, pp. 7-10. https://doi.org/10.1108/LHTN-07-2023-0126

Bhui, Dr. T. (2024). Transforming Libraries with Artificial Intelligence: A Comprehensive Exploration of Applications and Implications. *International Research Journal of Modernization in Engineering Technology and Science*. https://doi.org/10.56726/irjmets50628

Emiri, O. T., C.L.N. (2023). Adoption And Utilisation of Artificial Intelligence By Librarians In University Libraries In Southern Nigeria. *Library Philosophy and Practice,* 1-16.

Farag, H. A., Mahfouz, S. N., & Alhajri, S. (2021). Artificial intelligence investing in academic libraries: Reality and challenges. *Library Philosophy and Practice,*, 1-34.

Former, S. A. (n.d.). *Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library Operations Review*. https://orcid.org/0000-0002-2149-9897

G. S., C., & Mulimani, M. (2024). The Impact of Artificial Intelligence on Library and Information Science (LIS) Services. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4856459

Hussain, A. (2023). Use of artificial intelligence in the library services: prospects and challenges. In *Library Hi Tech News* (Vol. 40, Issue 2, pp. 15–17). Emerald Publishing. https://doi.org/10.1108/LHTN-11- 2022-0125

Javed Aftab, M., Amjad, F., Chaudhry, H., & Professor, A. (2024). Exploring the Role of AI-Driven Speech Recognition System in Supporting Inclusive Education for Hearing Impaired Students in Pakistan. *Annals of Human and Social Sciences*, *5*(3), 2790–6809. https://doi.org/10.35484/ahss.2024(5-III)43

Khan, A. U., Zhang, Z., Chohan, S. R., & Rafique, W. (2022). Factors fostering the success of IoT services in academic libraries: a study built to enhance the library performance. *Library Hi Tech*, *40*(6), 1976– 1995. https://doi.org/10.1108/LHT-06-2021-0179

Lowe, M. S., Stone, S. M., Maxson, B. K., Snajdr, E., & Miller, W. (2020). Boolean redux: Performance of advanced versus simple boolean searches and implications for upper-level instruction. *Journal of Academic Librarianship*, *46*(6). https://doi.org/10.1016/j.acalib.2020.102234

Lysiak, L. (2020). 21st Century Innovations: Librarians, Trend-Watching, and the Warning Signs of Fads.*Pennsylvania Libraries: Research & Practice*, *8*(2), 130–137. https://doi.org/10.5195/palrap.2020.232

Muhammadiyah Mataram, U., Ardyawin, I., Iswanto, D., Kunci, K., Buatan, K., Perpustakaan, A., & Perpustakaan, P. (2024). *Seminar Nasional LPPM UMMAT The Role of Artificial Intelligence in Optimizing Library Access and Services for Science and Technology in the Digital Age* (Vol. 3).

Mupaikwa, E. (2024). The Application of Artificial Intelligence for Reference Purposes in Academic Libraries. In I. Khamis (Ed.), Applications of Artificial Intelligence in Libraries (pp. 166 192). IGI Global. https://doi.org/10.4018/979-8-3693-1573-6.ch007

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ* (Vol. 372). BMJ Publishing Group. https://doi.org/10.1136/bmj.n71

Prasetio, A., & Winanda, T. (2023). Dampak Kecerdasan Buatan (Artificial Intelligence) Terhadap Pemustaka Dalam Mencari Informasi di UPT Perpustakaan Universitas Islam Negeri Raden Fatah. *Tadwin: Jurnal Ilmu Perpustakaan dan Informasi, 4*(1), 79–85. http://jurnal.radenfatah.ac.id/index.php/tadwin.

Praveenraj, D. D. W., Agarwal, K.& Kim, B.(2024).Artificial Intelligence Applications in Modern Library Services Library Progress International, 45(1), 1-11

Shahzad, K., Khan, S. A., & Iqbal, A. (2024). Identifying librarians' readiness to leverage artificial intelligence for sustainable competence development and smart library services: an empirical investigation from universities' librarians. *Global Knowledge, Memory and Communication*. https://doi.org/10.1108/GKMC-02-2024-0107

Subaveerapandiyan, A. Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library Operations Review (August 1, 2023). A, Subaveerapandiyan, "Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library Operations Review" (2023). Library Philosophy and Practice (e-journal). 7828. https://digitalcommons.unl.edu/libphilprac/7828

Universitas Indonesia. (2023). *Manfaatkan AI untuk olah naskah kuno, Perpustakaan UI raih juara 1 pada KPDI ke-15*. Accesed from https://www.ui.ac.id/manfaatkan-ai-untuk-olah-naskah-kuno-perpustakaan-ui-raih-juara-1-pada-kpdi-ke-15.

Wheatley, A., & Hervieux, S. (2020). Artificial intelligence in academic libraries: An environmental scan. *Information Services and Use*, *39*(4), 347–356. https://doi.org/10.3233/ISU-190065