

Review Article

Role and Applications of Artificial Intelligence in Modern Libraries: Challenges and Future Prospects in the Digital Age

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Abstract

Libraries around the world are being transformed with Artificial Intelligence. AI has had a major impact on libraries ability to provide services more effectively, more accurately, and more widely than previously thought possible. AI encompasses a variety of technologies used by libraries, such as machine learning, chatbots, natural language processing, robotics, and recommendation systems. This enables libraries to provide readers with more efficient, accurate, and accessible ways to access information, and helps librarians develop book catalogs. This study explores the use of AI in libraries, assesses the impact of AI on library operations and services, identifies challenges in implementing AI in libraries and explores the future of intelligent libraries. Methodologically, this research used a descriptive, analytical approach based on an extensive literature review of books, peer-reviewed articles, conference proceedings, scholarly publications and relevant websites related to AI and library and information science. In addition to increasing efficiency of the library system as an entity, the use of chatbot technology for engaging with library users on a personal level will also greatly improve user experiences by making it easier for them to engage with library operations as well as providing them with personalized services. Finally, throughout the course of this paper, the concluded that AI has changed the way many people perceive libraries as they become more intelligent and give users new and better access to information while keeping them as a priority in how they are being serviced. In order for libraries to successfully implement and continuously utilize AI solutions, there is a need for overcoming existing technological and organizational structures.

Keywords

Artificial Intelligence, Modern Libraries, Library Services, Digital Libraries, User Experience

1. Introduction

AI is changing how libraries work in today's world and how users get their information. Libraries are now using chatbots, machine learning, robotics, and recommendation systems to improve customer satisfaction [5]. By providing dynamic, user friendly libraries with the ability to manage large volumes of digital data effectively and efficiently, AI

will continue to help libraries remain relevant in today's digital era, notwithstanding challenges such as privacy issues, high implementation costs, lack of infrastructure, and insufficiently skilled workforce. There are many barriers to the successful uses of AI technology in libraries [7], but regardless of the barriers, all libraries are trying to integrate AI in

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order to meet current trends. Future applications of AI in libraries are predicted to lead to the development of intelligent and smart libraries. The introduction of AI to library systems is expected to lead to the development of knowledge driven, automated, and intelligent library systems [8]. Some of the ways that AI Technology can help libraries manage their digital resources include creating cataloguing automatically, finding and extracting data from various data sources, and providing users with timely, correct access to library services in a personalized manner [9]. Libraries have also started using AI to provide helpful environments to their users. Libraries are interactive facilities that have lots of digital information for their clients [10].

2. Artificial Intelligence

- 1) Artificial Intelligence (AI) is an area within the larger discipline of Computer Science which gives computers and/or computer systems the ability to do things that would normally require the ability to think and reason like a human [1].
- 2) Artificial Intelligence can be defined as the ability of a computer to use human-like intelligence through the use of Machine Learning, Natural Language Processing, Robotics and Expert Systems [3].
- 3) Artificial Intelligence is a very advanced technology that helps automate processes, process large amounts of data and generate intelligent solutions to assist in improving efficiency, accuracy, and overall customer satisfaction in many areas such as libraries, education, healthcare and business [4].

3. Statement of Problem

Libraries today have a number of difficulties to manage digital as well as other records and provide users, with information services, that are fast, accurate, and personalized. One such issue libraries are experiencing today is that traditional systems do not always provide automation, effective tools for retrieving information from their collections, or the ability to continually provide users with support, thus affecting their quality in service and operational efficiency. Although Artificial Intelligence provides advanced methods to manage today's libraries, many are still having difficulty adopting AI technologies due to the lack of adequate technology infrastructure, high costs, barriers to using AI technology, and a lack of qualified staff to use AI technology.

4. Review of Literature

Phugnar, (2025) In this article we discuss how libraries today are beginning to utilize AI and how AI is being used in many different ways to improve library service efficiency, automate processes, and improve user experiences. This article

will also provide examples of different AI solutions currently being used to improve customer satisfaction and the overall effectiveness of libraries. Additionally, this article will provide discussion about some of the common roadblocks related to using AI, including privacy concerns, costs associated with implementation, and ethical implications of using AI. [11]

Mondal, (2025) This paper on AI in the information technology library environment will examine how AI is enhancing library services, increasing user experience and improving operation efficiency through the use of chatbots, smart libraries, robotic automation and other AI technologies to improve user experience and operation efficiency. The paper explores both the advantages and disadvantages of using AI technologies (e.g., increased accessibility reduced work effort high cost technical limitations), while at the same time, demonstrating how AI has become a powerful tool to affect libraries and modern information service in the future.

Aamri & Osman, (2022) This research looks at how Artificial Intelligence (AI) can improve library services and knowledge management. There are different types of AI (like Expert Systems, Robots, and Automated Search Engines) that libraries can implement that enhance both their technical and administrative functions. There are also some barriers to the implementation of the technology in libraries such as, lack of skilled personnel lack of infrastructure and lack of awareness of the benefits of AI. This study demonstrates that, provided that AI is effectively implemented and managed, it has a significant potential to enhance productivity, improve support for library users, and increase the efficiency of the information retrieval processes in libraries. [2]

Bhoye, H. (2025) This article outlines the transformation of traditional library services through the new technology of AI. This technology helps improve user satisfaction, accuracy, and efficiency in the delivery of library services. Examples of how AI is used to achieve these goals are listed in this article to include chat bots, digital libraries, smart search engines, automatic cataloguing systems and personalized recommendations. While there are many positive aspects to using AI in libraries, such as the ability to save time, receive quicker access to information and receive an improved customer experience, there will be significant barriers to overcome when implementing AI systems in libraries, including the high cost of technology, lack of qualified staff to manage AI systems and issues related to privacy of data.

Gajbhiye, (2024) The article reviews the influence of Artificial Intelligence on Library Services, highlights how AI technologies are enhancing Information Retrieval, Digital Preservation, Personalized Recommendations, and Virtual Assistance noting that AI assists libraries in being more efficient; more user-friendly more accessible, by automating routine tasks and enhancing the User Experience. Other challenges addressed in this paper include Algorithmic Bias; Issues of Privacy High Implementation Costs and the Need for Skilled Professionals.

Olusegun Oyetola et al., (2023) In the article, there was a

discussion of how important Artificial Intelligence will be in enhancing the provision of modern library services in Nigeria; also mentioned was the way new technologies, e.g. chatbots, robots, RFID, and machine learning, will help create faster and more intelligent library operations and services that are more user-friendly. Academic libraries in Nigeria continue to experience a number of challenges related to funding, poor infrastructure, and limited awareness of AI adoption therefore, to remain relevant to their current and future users, libraries must choose to embrace AI and provide enhanced digital library services to their users.

Enang, Uduak U., Babangida U. Dangani, (2023) This paper a number of methods were identified for using AI to improve the way libraries provide users with easy access to information, how the library can provide greater support for research, and how quickly they provide access to the information users want and need. Other issues addressed in the report are: the ethical and social implications of AI, the use of AI in relation to the protection of individuals' personal information and training users/teachers regarding the effective use of AI in the academic library's service. [6]

Sonawane et al., (2024) According to this article, Artificial intelligence technologies are being used to improve universities' libraries as it enables universities to automate their catalogue systems, classify books and other resources, manage library resources, and support users. Technologies such as BERT, RNN, LSTM, chatbot systems, OCR and predictive analytics were identified in this paper as being useful for providing library services faster, more accurately and in a personalised manner. [12]

Isiaka et al., (2024) The research has reviewed the understanding and views giving to concepts of artificial intelligence Technologies and their ability to enhance the functionality of libraries within Kwara State, Nigeria. Through a number of examples of AI applications, including chatbots, robots, expert systems, and face recognition, AI was mentioned as an improvement for cataloguing Reference services Security and Automation of library routines. The findings also described some of the challenges faced by librarians when it comes to the implementation of AI tools, including inadequate funding, limited internet connectivity, high maintenance costs associated with AI integration and ultimately fears of job loss because of AI usage.

5. Objective

- 1) To examine the concept and applications of AI in modern library systems.
- 2) To identify the various AI technologies used in libraries,

such as chatbots, machine learning, robotics, and recommendation systems.

- 3) To study the impact of AI on library services, information retrieval, cataloguing, and user support.
- 4) To analyse how AI improves efficiency, accuracy, and automation in library management.
- 5) To explore the role of AI in enhancing user experience and personalized library services.
- 6) To assess the future prospects of AI in academic, public, and digital libraries.

6. Scope of the Study

This is a study that discusses how Artificial Intelligence (AI) can affect the service offered by libraries today. It looks closely at how AI can help libraries enhance library services, improve day-to-day library operations, and improve user experiences in libraries through various AI technologies such as Machine Learning, Chatbots, Robotics, Recommendation Systems, and Natural Language Processing in Academic, Public and Digital Libraries.

This study aims to show how AI used with respect to library services, such as cataloguing, classification, information retrieval, reference service, and collection management will result in better customer service through increased efficiency, accuracy, and control over the automation of these services.

7. Limitation of the Study

The focus of this study is theoretical and applied types of Artificial Intelligence in libraries due to limitations of time and resources, it will not fully cover all forms of AI tools or detailed technical information. The rapid pace of development of AI technology, as well as limited capacity in small and rural libraries, may also limit the study's applicability and implementation.

8. Methodology

This research paper uses a combination of descriptive and analytical methodologies so that the researcher can analyse existing literature. The literature was in the form of books, journals, research articles, conference presentations, and scholarly websites that relate to the fields of AI and Library and Information Science. Once the research team had collected all of the necessary information, they then analysed the information that they had collected in order to better understand AI technology's uses, advantages, disadvantages, and potential growth in contemporary library systems.

9. Data Analysis and Interpretation

Table 1. Applications of AI in modern library.

Sr. No.	AI Concept and Applications in Modern Libraries	Description
1	Automated Cataloguing	AI helps libraries in faster and more accurate cataloguing and classification of books and digital resources.
2	Information Retrieval	AI-based search systems improve access to information by providing quick and relevant search results.
3	Chatbots and Virtual Assistance	Libraries use AI chatbots to answer user queries and provide 24/7 reference support services.
4	Recommendation Systems	AI recommends books, journals, and digital resources based on user interests and search history.
5	Digital Library Management	AI supports the organization and management of digital collections and electronic resources.
6	User Experience Enhancement	AI improves personalized services, making library systems more interactive and user-friendly.

The above table shows that artificial intelligence is a valuable asset to the contemporary library system as it aids in enhancement of library services and processes through automation of routine tasks such as cataloguing, retrieval of information, and management of collections resulting in greater ef-

ficiency and accuracy of our operations. In addition, AI assisted systems (i.e., chatbots, recommendation systems) can improve the delivery of user-support services, as well as provide users with a more customized experience when accessing library resources and information to help transform libraries into intelligent, up-to-date centres of information.

Table 2. AI technologies used in libraries.

Sr. No.	AI Technologies Used in Libraries	Application in Libraries
1	Chatbots	Provide instant responses to user queries and offer 24/7 virtual reference services.
2	Machine Learning	Helps in data analysis, user behaviour prediction, and improving search results.
3	Robotics	Assists in book shelving, inventory management, and automated circulation services.
4	Recommendation Systems	Suggests books, journals, and digital resources based on user interests and reading history.
5	Natural Language Processing (NLP)	Enables smart search systems, voice-based assistance, and language understanding.
6	Expert Systems	Supports decision-making in reference and information services.

This table illustrates some of the prominent AI technologies being utilized today in libraries and the various ways they are applied. By employing technologies including chatbots, machine learning, robotics, and recommendation systems, libraries can enhance the quality of service they provide to their users, automate mundane operations, and provide users with

greater access to information. According to the findings of this research, using these AI technologies in conjunction with one another will help libraries improve their ability to operate efficiently by providing faster and more personalized access to library services for their patrons.

Table 3. *Impact of AI on library services.*

Sr. No.	Areas of Library Services	Impact of AI in Libraries
1	Library Services	AI improves the speed, efficiency, and quality of library operations and services.
2	Information Retrieval	AI-based search systems provide faster, accurate, and relevant information to users.
3	Cataloguing and Classification	AI automates cataloguing processes, reducing manual work and improving accuracy.
4	User Support Services	Chatbots and virtual assistants provide quick responses and 24/7 assistance to users.
5	Digital Resource Management	AI helps organize and manage digital collections effectively.
6	Personalized Services	AI analyses user preferences to provide customized recommendations and services.

The Table 3 shows that, the use of AI technology is playing an important role in helping today's libraries run their operations and deliver services to users more effectively. AI enables libraries to improve their information retrieval processes, automate the management of library materials through cataloguing and classification systems, and increase their ability to

provide user-support services through virtual assistance and personalized services. The study also found that there is an increase in both the ability for libraries to provide information and the satisfaction of users with library services due to the increased use of technology.

Table 4. *AI Functions in Library Management.*

Sr. No.	AI Functions in Library Management	Improvement through AI
1	Automated Cataloguing	Reduces manual work and increases speed in organizing library resources.
2	Data Accuracy	AI minimizes human errors in classification, indexing, and record management.
3	Information Processing	AI processes large amounts of data quickly and efficiently.
4	Automated Circulation Services	Self-check-in and check-out systems improve service efficiency.
5	Collection Management	AI helps in tracking, updating, and managing library collections effectively.
6	Workflow Automation	Routine library tasks are automated, saving time and staff effort.

This table provides an overview of Increasing Library Management Efficiency with Artificial Intelligence. Establishing AI Technology in Libraries can help to Reduce Manual Tasks, Improve Accuracy, and Enhance Processes like Time Management and Resource Management Processes. This study

suggests using AI for Automation of Processes Has Increased Library Operational Performance, Saved Time, and Provided More Accurate and Efficient Services to Library Users.

Table 5. *Role of AI in enhancing user experience.*

Sr. No.	Role of AI in User Experience	Benefits for Library Users
1	Personalized Recommendations	AI suggests books, journals, and digital resources based on user interests and reading history.
2	Chatbots and Virtual Assistance	Provides instant responses and 24/7 support for user queries.
3	Smart Search Systems	AI improves search accuracy and helps users find relevant information quickly.
4	User Behaviour Analysis	AI studies user preferences to offer customized library services.

Sr. No.	Role of AI in User Experience	Benefits for Library Users
5	Digital Access Services	AI enables easy access to e-books, databases, and digital collections.
6	Interactive Library Services	AI makes library systems more user-friendly and engaging.

It can be concluded from the data shown above that artificial intelligence has quite an impact on providing users with better experiences through personalized library service. By utilizing various types of artificial intelligence, libraries are able to increase the ease with which their customers can find information (i.e., recommendations, chatbots, smart search

tools, etc.). In this case, the evidence shows that artificial intelligence enhances user satisfaction by providing library services that are customized to the individual user and provide a level of interactivity and convenience above what would normally be expected.

Table 6. Future Prospects of AI in Libraries.

Sr. No.	Future Prospects of AI in Libraries	Expected Developments
1	Smart Libraries	AI will help transform traditional libraries into fully automated and intelligent information centers.
2	Advanced Information Retrieval	Future AI systems will provide faster, more accurate, and personalized search results.
3	Virtual Library Assistants	AI-powered chatbots and assistants will offer continuous user support and guidance.
4	Improved Digital Library Services	AI will enhance the management and accessibility of digital resources and online databases.
5	Automation of Routine Tasks	More library operations such as cataloguing, circulation, and inventory management will become automated.
6	Enhanced User Experience	AI will provide more personalized and interactive services based on user needs and preferences.

The future of AI in libraries (academic, public, and online) is outlined in this table. According to this study, AI may lead to improved automation like capabilities, digital services and more personalized access to information. Libraries will become more efficient and user-friendly because of the advancement of AI technology over time. AI could potentially facilitate the transformation of libraries into intelligent knowledge centres (i.e., Smart Libraries) offering sophisticated, seamless ways to deliver and use information.

10. Findings

- 1) The study results indicate that AI has provided the ability to create contemporary library services that are capable of being delivered in a faster, higher quality, more convenient way.
- 2) Libraries are using different types of AI technologies (e.g., machine learning, chatbots, robotics, recommendation systems, and natural language processing) to improve overall effectiveness and quality of library services.
- 3) Automation of cataloguing/classification systems reduces the manual workload of library staff, enhances the accuracy of library data, and virtually eliminates human error in library records.
- 4) AI enhanced information retrieval systems allowed for rapid retrieval of relevant information in a simple manner via the implementation of intelligent search functions. Chatbots and virtual assistants provided Library staff with 24/7 access to external sources in order to respond instantly to both user needs and reference requests.
- 5) Recommendation systems allowed Libraries to create and deliver personalized recommendations for various forms of Materials (i.e., books, journals, digital material) according to the user's individual interests and previous reading habits.
- 6) There were also benefits related to the management of Digital Libraries using Artificial Intelligence, since the organization of resources and databases became much easier for Library staff than the traditional methods of organization.

- 7) The results indicate that the implementation of Artificial Intelligence into Library service delivery has built user satisfaction by providing more efficient, personalized, and accessible delivery of Library Services.
- 8) AI also provided efficiency gains in Library staff workload through the automation of routine tasks; this greatly improved Library staff performance and service delivery to all users.
- 9) The results demonstrate the potential for the future use of Artificial Intelligence in the transformation of traditional libraries to smart and intelligent libraries.
- 10) The study identified a number of challenges associated with the implementation of AI, specifically high implementation costs, lack of infrastructure to support AI, privacy concerns related to AI, and staff shortages of trained professionals capable of implementing AI technology into Library systems.

11. Conclusion

AI has risen to be an important part in the transformation of today's library operations & services. The study concluded that library use AI through chatbots, machine learning, robots, & recommendation systems in order to improve library productivity & accuracy, automation of library systems, customer satisfaction. AI based solutions help to improve the management of digital resources within the library, enhance the speed at which patrons are served, assist with automated cataloguing of resources, & provide patrons with enhanced access & interaction with library resources. According to the results from the study, artificial intelligence can help reduce the amount of manual work required to run libraries, thereby increasing the quality of library management overall. There are a number of significant barriers for libraries looking to incorporate AI, including funding, inadequate infrastructure, privacy and security-related issues, and a shortage of appropriately qualified personnel for using and managing AI within libraries. However, all of these barriers are only a hindrance to the future potential of AI in libraries which will create smart/intelligent knowledge centres.

Abbreviations

AI	Artificial Intelligence
NLP	Natural Language Processing

Author Contributions

Ganesh Krishna Wani: Conceptualization, Formal Analysis, Methodology, Resources

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Russell, S. J., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson.
<https://www.amazon.com/Artificial-Intelligence-A-Modern-Approach/dp/0134610997>
- [2] Al-Aamri, J., & Osman, N. E. (2022). The Role of Artificial Intelligence Abilities in Library Services. *The International Arab Journal of Information Technology*, 19(3A), 566-573.
<https://doi.org/10.34028/iajit/19/3A/16>
- [3] Sarker, I. H. (2022) AI-Based Modeling: Techniques, Applications and Research Issues towards Automation, Intelligent and Smart Systems. *SN Computer Science*, 3, Article No. 158. <https://doi.org/10.1007/s42979-022-01043-x>
- [4] Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., & Wright, R. (2023). Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International journal of information management*, 71, 102642.
- [5] Bhoje, H. (2025). The Role of Artificial Intelligence in Modern Library Services. *International Journal of Science and Research (IJSR)*, 15(2), 27-37.
<https://doi.org/10.58532/nbennurtech4>
- [6] Enang, Uduak U., Babangida U. Dangani, H. A. M. (2023). Artificial Intelligence and User Experience: An Integrated Review of Benefits and Challenges in Academic Libraries. 131-137.
- [7] Gajbhiye, C. K. (2024). Impact of Artificial Intelligence (AI) in Library Services. *International Journal For Multidisciplinary Research*, 6(3), 1-13.
<https://doi.org/10.36948/ijfmr.2024.v06i03.22452>
- [8] Isiaka, A. O., Olarongbe, S. A., Sulyman, M. O., Aremu, B. A., & Saba-Jibril, S. (2024). Perceived awareness and usefulness of artificial intelligence technology for efficient library operations in university libraries in Kwara State, Nigeria. *Journal of Library Services and Technologies*, 6(1), 120-134.
<https://doi.org/10.47524/jlst.v6i1.121>
- [9] Mondal, D. (2025). Artificial Intelligence (AI): A Transformative Force, Redefining the Landscape of Modern Libraries. *INQUEST-Peer-Reviewed Multidisciplinary Online Research Journal*, 3(1), 15-23.
- [10] Olusegun Oyetola, S., Oladokun, B. D., Ezinne Maxwell, C., & Obotu Akor, S. (2023). Artificial intelligence in the library: gauging the potential application and implications for contemporary library services in Nigeria. *Data and Metadata*, 2, 36. <https://doi.org/10.56294/dm202336>
- [11] Phugnar, P. (2025). ROLE OF ARTIFICIAL INTELLIGENCE IN MODERN LIBRARIES. *ShodhKosh: Journal of Visual and Performing Arts*, 17(4), 589-603.
<https://doi.org/10.34883/PI.2025.17.4.009>
- [12] Sonawane, A., Shekhar, A., Murab, S. A., Pansare, R. B., Satonkar, V. H., & Jha, V. K. S. (2024). The Role of Artificial Intelligence in Streamlining University Library Operations. *Library Progress International*, 44(1), 51-66.