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Application of Artificial Intelligence (AI) Tools and Software in Library Operations: A Study

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative technology across various sectors, including libraries and information centers. Modern libraries are increasingly adopting AI-based tools and software to improve efficiency, enhance user experience, and manage the growing volume of digital information. This paper examines the different type of AI tools and software/applications that are available across major library operations such as acquisition, cataloguing, circulation, reference services, information retrieval, digitization, and administration. The study highlights whether these tools are free or subscription-based and discusses their benefits and challenges. The study recommends that library professionals should be provided with regular training and skill-development programs, AI tools should be used to support, not replace, professional judgment and libraries should develop clear policies addressing data privacy, ethical use of AI, and transparency in AI-driven services so that AI significantly enhance library services by enabling automation, intelligent search, personalized services, and data-driven decision-making.

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KEYWORDS: Artificial Intelligence, Library Automation, AI in Libraries, Digital Libraries, Smart Libraries**.**

1. INTRODUCTION

Libraries have long played a pivotal role in the organization, preservation, and dissemination of knowledge. Traditionally, library operations such as acquisition, cataloguing, circulation, reference services, and preservation have relied heavily on manual and semi-automated processes. However, the exponential growth of information resources, increasing user expectations, and rapid technological advancements has placed significant pressure on libraries to adopt innovative solutions that enhance operational efficiency and service quality. In this context, artificial intelligence (AI) has emerged as a transformative technology capable of reshaping library operations and redefining the role of libraries in the digital age.

Artificial intelligence refers to the ability of computer systems to perform tasks that typically require human intelligence, including learning, reasoning, pattern recognition, and decision-making. In library environments, AI technologies such as machine learning, natural language processing, data analytics, and intelligent automation are increasingly being integrated into library management systems, discovery platforms, and digital repositories. These

technologies enable libraries to automate routine tasks, process large volumes of data efficiently, and deliver personalized services to users.

The application of AI in library operations extends across both technical and public service domains. In acquisition and collection development, AI-driven analytics assist librarians in forecasting user demand, optimizing budgets, and minimizing duplication of resources. In cataloguing and classification, AI tools facilitate automated metadata generation, subject indexing, and classification, thereby improving accuracy and consistency. Circulation services benefit from AI-enabled systems through predictive overdue alerts, RFID-based analytics, and improved inventory management. Similarly, AI-powered discovery systems and semantic search engines enhance information retrieval by enabling contextual and natural language-based searching.

Despite these advancements, the adoption of AI in library operations is not without challenges. Issues related to cost, technical expertise, data privacy, algorithmic bias, ethical concerns, and system interoperability raise critical questions about the sustainable and responsible implementation of AI technologies in libraries. Moreover, the readiness of library professionals and institutions to adapt to AI-driven environments remains a key concern, particularly in developing countries (Dwivedi et al., 2021).

Given the growing significance of AI in transforming library services, a systematic examination of its benefits and challenges is essential. This study seeks to explore various AI tools in library operations, highlighting their potential to enhance efficiency and service quality while critically examining the constraints associated with their implementation.

2. STATEMENT OF THE PROBLEM

Libraries are experiencing rapid transformation due to the exponential growth of digital information, increasing user expectations, and advancements in information and communication technologies. Traditional library operations such as cataloguing, circulation, reference services, and collection development are often time-consuming, labour-intensive, and insufficient to manage large volumes of digital and electronic resources efficiently.

Although Artificial Intelligence (AI) tools and software have the potential to automate routine tasks, improve information retrieval, enhance user engagement, and support data-driven decision-making, their adoption in libraries remains uneven. Many libraries, particularly in developing countries, face challenges such as lack of awareness, limited technical expertise, budget constraints, and uncertainty regarding free versus subscription-based AI tools.
There is also a lack of consolidated academic literature that systematically examines AI tools according to specific library operations and evaluates their accessibility and cost models. Therefore, the problem addressed in this study is the need to identify, analyze, and categorize AI tools and software used in various library operations, with a focus on their applicability, benefits, and availability (free or subscription-based), to support informed decision-making in modern libraries.

3. REVIEW OF LITERATURE

Rajpurohit (2026) examines how AI tools reshape the research ecosystem by enhancing key research tasks such as literature search, analysis, writing support, and citation management. It categorizes AI systems into five functional domains including intelligent search, note-taking, plagiarism detection, content generation, and citation tools, and

highlights their potential to improve research quality and efficiency when used responsibly and ethically. Singh (2025) provides a comprehensive overview of AI applications within Library and Information Science (LIS), showing how AI enhances service delivery, research support, information organization, and accessibility. It emphasizes that responsible and inclusive AI practices are necessary to mitigate ethical, privacy, and equity concerns in libraries. Demir (2025) evaluates both AI and robotic technologies in libraries worldwide. The research synthesizes international findings on how AI and robotics influence library services, detailing advantages like automation and challenges including ethical concerns and staff readiness. The study identifies a growing consensus on the importance of AI but also notes differences in research focus between regions. Mallikarjuna (2024) analyzes the broad impact of AI in academic libraries, identifying key benefits like improved efficiency and resource utilization. The study also notes common challenges such as ethical issues, privacy concerns, staff training requirements, and the need for user-centered implementation strategies. Benahal (2024) evaluates the use of ChatGPT to generate subject headings for library catalogues. While the study found that AI can expedite keyword generation and information retrieval, it also highlights limitations in uniformity and accuracy compared to human cataloguers, suggesting that refinement in AI prompts and syntax is required for practical adoption. Jyoti & Kumar (2024) have discussed how AI technologies are transforming traditional library functions, particularly in academic libraries. It highlights AI's role in automating services, enhancing user experience, personalizing information access, and streamlining operations, while noting ongoing challenges in staff competence and infrastructure. Konwar (2024) examines the wide-ranging applications of AI in library services, including data analysis, user behaviour prediction, and accessibility improvements. The study identifies both advantages (e.g., data insights and service enhancement) and drawbacks (e.g., ethical and operational barriers) in adopting AI.

4. OBJECTIVES OF THE STUDY

The main objectives of this study are:

a) To identify AI tools and software used in various library operations.
b) To examine the role of AI in improving library services.
c) To classify AI tools based on free and subscription models.
d) To analyze the benefits and challenges of implementing AI in libraries.

5. METHODOLOGY

The study is based on a descriptive and analytical approach. Data is collected from secondary sources such as journal articles, library science literature, professional websites, and software documentation. AI tools are then analyzed according to their application in different library operations.

6. AI TOOLS AND SOFTWARE IN LIBRARY OPERATIONS

The table below presents a systematic overview of artificial intelligence (AI) tools and software used across various library operations, including library automation, cataloguing, discovery, reference services, digitization, circulation, collection development, and administration. It categorizes each tool according to its specific function, highlighting how AI contributes to enhancing efficiency, accuracy, and user experience in modern libraries.

Table: AI Tools and Software in Library Operations

Library Operation	**AI Tool / Software**	**Purpose / Use**	**Type of Accessibility**
Library Automation (ILS/LMS)	Koha	Complete library management (cataloguing, circulation, OPAC)	Free (Open Source)
	SOUL (INFLIBNET)	Automation for academic libraries (India)	Free for eligible institutions
	LIBSYS / LIBSYS Neo	Cloud-based library automation with AI features	Subscription
	Ex Libris Alma	Advanced cloud library services platform	Subscription
	Evergreen	Library automation system	Free (Open Source)
Cataloguing & Classification	MarcEdit	MARC record creation and editing	Free
	OCLC WorldCat Metadata Services	Metadata creation, authority control	Subscription
	Ex Libris Metadata Assistant	AI-assisted metadata generation	Subscription
	ChatGPT	Subject analysis, summaries, classification help	Free / Paid (Premium)
Information Retrieval & Discovery	EBSCO Discovery Service	Unified search of library resources	Subscription
	Primo (Ex Libris)	AI-based discovery interface	Subscription
	Yewno Discover	AI concept-based research discovery	Subscription
	Google Scholar	Scholarly search engine	Free
Reference Services	Library Chatbots	24×7 virtual reference service	Free / Subscription
	IBM Watson Assistant	AI chatbot for user support	Subscription
	ChatGPT	Virtual reference, Q&A assistance	Free / Paid
Digitization & Digital Libraries	DSpace	Digital repository for documents	Free (Open Source)
	Greenstone	Digital library software	Free
	Omeka	Digital collections & exhibits	Free / Paid
	ABBYY FineReader	AI-based OCR and text recognition	Subscription
Acquisition & Collection Development	Alma Analytics	Usage analysis & collection planning	Subscription
	OCLC Collection Evaluation	Data-driven collection decisions	Subscription
	Excel with AI plugins	Budgeting and data analysis	Free / Paid

Circulation Services	Koha Circulation Module	Issue, return, renewal of books	Free
	RFID Library Systems (3M, Bibliotheca)	Self-checkout and security	Subscription
Serials Management	EBSCO Holdings Management	E-journal management	Subscription
	Alma Serials Module	Print & electronic serials control	Subscription
Plagiarism Detection	Turnitin	Academic plagiarism checking	Subscription
	iThenticate	Research plagiarism detection	Subscription
	Grammarly	AI writing & plagiarism support	Free / Paid
Reference Management	Zotero	Citation & reference management	Free / Paid (Storage)
	Mendeley	PDF & reference management	Free / Paid
	EndNote	Advanced citation tool	Subscription
User Education & Information Literacy	Canva (AI tools)	Posters, tutorials, guides	Free / Paid
	Powtoon	Animated instructional videos	Free / Paid
	H5P	Interactive learning content	Free
Administration & Reporting	Koha Reports	Library statistics & reports	Free
	Power BI	Data visualization & dashboards	Free / Paid
	Tableau	Advanced analytics & reporting	Subscription

The table clearly shows that artificial intelligence tools and software are being applied across almost all major library operations, ranging from automation and cataloguing to reference services, digitization, and administration. It indicates a balanced mix of free/open-source tools (such as Koha, DSpace, Greenstone, and Zotero) and subscription-based systems (such as Ex Libris Alma, LIBSYS, EBSCO, and Turnitin), highlighting that libraries with limited budgets can still adopt AI through open solutions, while well-funded institutions can invest in advanced commercial platforms. The table also reveals that core operational areas like library management, discovery services, and plagiarism detection rely more heavily on paid tools due to their advanced analytics and support features, whereas areas such as digitization, reference management, and reporting offer more free alternatives. Overall, the table demonstrates that AI adoption in libraries is flexible and scalable, enabling institutions of different sizes and financial capacities to enhance efficiency, improve user services, and support data-driven decision-making.

7. ROLE OF ARTIFICIAL INTELLIGENCE IN IMPROVING LIBRARY SERVICES

Artificial Intelligence (AI) enhances library services by improving efficiency, accessibility, and user engagement. AI-powered tools such as chatbots and virtual assistants strengthen reference services by providing instant and round-the-clock user support. In information retrieval, AI-driven discovery systems enable semantic and contextual searching, resulting in more accurate and relevant results.

AI improves technical services through automated cataloguing, metadata generation, and classification, reducing processing time and improving consistency. Circulation services benefit from AI-enabled analytics and RFID systems that support efficient inventory management and usage monitoring. In digital libraries, AI-powered OCR and content tagging enhance access to digitized and archival resources.

Additionally, AI-based analytics support evidence-based library management by analyzing user behavior and resource utilization. Overall, AI plays a significant role in transforming library services into intelligent, user-centered, and data-driven systems.

8. BENEFITS AND CHALLENGES OF AI TOOLS IN LIBRARY OPERATIONS

8.1 Benefits of AI Adoption in Library Operations

The integration of artificial intelligence (AI) into library operations has significantly transformed traditional library functions by improving efficiency, accuracy, and service delivery. AI-driven automation enables libraries to streamline routine tasks such as acquisition, cataloguing, circulation, and metadata management, thereby reducing manual workload and operational delays. Machine learning and natural language processing techniques enhance cataloguing accuracy and ensure consistency in subject indexing and classification.

AI-based discovery systems facilitate faster and more relevant information retrieval through semantic and contextual search capabilities, improving the overall user experience. Virtual reference services and chatbots provide uninterrupted, 24×7 assistance, thereby extending library services beyond physical and temporal boundaries. Furthermore, AI-powered analytics support evidence-based decision-making in collection development, budgeting, and resource optimization. Digitization and preservation activities also benefit from AI-enabled OCR and automated content tagging, increasing accessibility to rare and archival resources. Overall, AI contributes to improved service quality, personalized user engagement, and efficient utilization of library resources.

8.2 Challenges in Implementing AI Tools in Library Operations

Despite its advantages, the adoption of AI in library operations presents several challenges. High initial investment costs and recurring expenses related to licensing, infrastructure, and system maintenance remain major barriers, particularly for public and small academic libraries. The effective implementation of AI tools requires skilled manpower, and the lack of technical expertise among library professionals necessitates continuous training and capacity-building initiatives.

Data privacy, security, and ethical concerns are critical issues, as AI systems often rely on user data for analytics and personalization. Algorithmic bias in AI-driven discovery and recommendation systems may affect equitable access to information. Interoperability issues between AI applications and existing library management systems further complicate implementation. Additionally, dependence on stable IT infrastructure and resistance to technological change among staff can hinder smooth adoption. Legal ambiguities related to copyright, plagiarism detection, and AI-generated content also pose challenges that require policy-level interventions.

RECOMMENDATIONS

The following recommendations are proposed:

(i) Adoption of Open-Source AI Tools: Libraries with limited budgets should prioritize open-source and free AI tools such as Koha, DSpace, and Zotero to modernize services without significant financial burden.

(ii) Capacity Building and Training: Library professionals should be provided with regular training and skill-development programs to effectively use AI tools and understand emerging technologies.

(iii) Hybrid Human–AI Approach: AI tools should be used to support, not replace, professional judgment. Human oversight is essential to ensure accuracy, ethical use, and quality of library services.

(iv) Strategic Investment in Subscription Tools: Well-funded libraries should invest in advanced AI-based subscription tools for discovery, analytics, and plagiarism detection to enhance service quality and research support.

(v) Policy and Ethical Frameworks: Libraries should develop clear policies addressing data privacy, ethical use of AI, and transparency in AI-driven services.

(vi) User Awareness and Engagement: Libraries should educate users about AI-enabled services to improve acceptance, trust, and effective utilization.

(vii) Future Research: Further empirical studies are recommended to evaluate the long-term impact of AI tools on user satisfaction, library performance, and information access.

CONCLUSION

Artificial Intelligence has emerged as a powerful enabler in transforming traditional library operations into efficient, user-centric, and data-driven services. This study examined the application of AI tools and software across various library functions, including automation, cataloguing, information retrieval, reference services, digitization, collection development, circulation, and administration. The benefits of AI tools demonstrate that AI enhances accuracy, reduces manual workload, improves access to information, and supports informed decision-making in libraries.

The study also reveals that both free/open-source and subscription-based AI tools play significant roles in library environments. While open-source tools provide cost-effective solutions for basic operations, advanced subscription-based systems offer sophisticated analytics, discovery services, and research support. However, challenges such as financial constraints, lack of technical expertise, infrastructure limitations, and ethical concerns continue to affect the widespread adoption of AI in libraries.

Despite these challenges, the integration of AI is no longer optional but essential for libraries seeking to remain relevant in the digital age. With proper planning, staff training, ethical frameworks, and balanced use of AI alongside professional expertise, libraries can fully harness the potential of artificial intelligence. The study concludes that strategic and responsible implementation of AI will play a crucial role in shaping the future of smart libraries and strengthening their role in knowledge creation and dissemination.

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