Journal of Engineering, Science and Sustainability

ISSN: 3107-474X (Online)

Vol. 1(2), Jul-Dec 2025, pp, 6-18

Journal homepage: *https://sprinpub.com/jess*

Research ***article***

Next-Gen Collection Strategies: Exploring the Role of Artificial Intelligence in Library Science

Urvashi Tyagi[1*], *Sanjay Kumar Sharma*[2]

[1,2]*Shri Venkateshwara University, Gajraula (U.P.) India*

ARTICLE INFO

Keywords:

Artificial Intelligence, Library Science, Collection Development, Recommendation Systems, User Engagement

Article History:

Received: 01-08-2025

Revised: 20-11-2025

Accepted: 01-12-2025

Published: 07-12-2025

ABSTRACT

This research explores how Artificial Intelligence (AI) might improve collection techniques in library science, with a focus on effectiveness, user involvement, and creative collection building. A structured online questionnaire with verified Likert-scale questions It was utilized to gather information from 384 participants using a quantitative research technique. Key concepts such AI-powered technology, user engagement, AI-driven recommendation systems, efficiency in library collection creation, and library staff efficiency are the focus of the inquiry. The representativeness of the sample is guarantee using a stratified random sampling procedure, and the analysis is bolstered by secondary data gathered from institutional records, government publications, and earlier studies. SPSS is used for statistical analysis in order to evaluate structural connections, validity, and dependability. The structures' good validity and reliability were confirmed by the results, indicating that they are appropriate for further study. Based on descriptive findings, consumers highly regard AI-based recommendation engines and advanced collection creation methods, whereas employees' efficiency is mostly perceived positively but remains to be improved. Testing hypotheses confirmed that AI is a major impact on user engagement and the growth of library collections. Notably, AI improves engagement both directly and indirectly via better staff performance, as seen by the mediation impact of staff efficiency. The correctness and resilience of the suggested framework are further confirmed by structural model fit indexes. All things considered, the results show that the implementation of AI is a key factor in improving library user engagement, strategic collection development, and operational efficiency. By offering empirical proof of AI's ability to transform collection tactics and change the role of library professionals, this research adds to the expanding conversation on next-generation library practices. The conclusions drawn have applications for academics, library administrators, and legislators who want to leverage AI-powered technology to provide sustainable and user-focused library services.

1. Introduction

Libraries are employing artificial intelligence (AI) to perform tasks such as automated indexing of collections, library service tasks, prediction of reader needs, and optimization of storage placement of books. AI is increasing its presence in our everyday lives. Since it provides computational techniques for automatically learning new information, this technology is critical to the development of intelligent libraries. A machine learning method named Transformer is utilized to train OpenAI's ChatGPT, which is a deep language model, to understand and generate text in natural language. However, says The Curriculum for Media and Information Literacy by UNESCO Educators and Learners, AI also threatens information literacy [1]. To chart important themes for future library development and operations, this research investigates the effects of using AI in libraries a form of information technology advancement. It emphasizes pedagogical strategies for educating library staff in AI skills. The fundamental mission of libraries has always been around knowledge retention and fair access to information. In the opinion of Nancy Kranich, American Library Society's president, libraries are "uniquely positioned" to make the playing field even by offering "content and services for all people" [2] . Public libraries in specific have served communities as egalitarian institutions that encourage self-education and literacy as stepping stones to individual progress and active citizenship [3]. Artificial intelligence (AI) is robots' capacity to exhibit human-like characteristics such as learning, thinking, understanding language, recognizing objects, and decision-making [4]. It is a broad field that encompasses a variety of technologies, including as natural language processing and machine vision. Machine learning (ML) is a kind of artificial intelligence that allows computers to gain knowledge from data without the need for explicit programming. Machine learning algorithms discover patterns in data, recommendations, or decisions so that humans do not need to specify all the rules explicitly in order to make predictions [5]. Looking at the shifting landscape of AI research in library science from a bibliometric point of view is what gives this study its importance. Libraries face a number of challenges in meeting the changing needs and expectations of their patrons in the era characterized by exponential growth in digital material and rapid technical advancements. One possible solution to these issues is the implementation of AI, which enables libraries with characteristics to improve user experiences, maximize the use of resources, and accelerate processes [6]. Using a rigorous bibliometric analysis, the aim aims to provide light on the trends and patterns influencing AI's influence on books. This study tries to offer meaningful insights on present and future orientations of AI studies in library science by analyzing quantitative publication output, research topics, cooperation networks, and citation patterns.

* ***Corresponding Author***:

tyagi.urvashi944@gmail.com (U. Tyagi)

https://doi.org/10.55559/jess.v1i2.584

Libraries are experiencing a revolutionary transformation through artificial intelligence. This implies that intelligent technologies are being utilized to enhance things. Information organization and discovery are accelerated by AI. Imagine it as the library's friendly virtual assistant. may point you in the direction of what you need or suggest books. Consider how much faster it would be to organize and classify books, for example. AI is capable of doing that, saving time. seek more assistance from the library staff [7]. Several challenges, of course. We must ensure that everyone who visits a library is comfortable with artificial intelligence and that privacy is secured. investigation examines actual cases and narratives to demonstrate how AI is already changing libraries. To put it simply, AI is transforming the way libraries operate. Although it's fascinating, we must utilise technology carefully to ensure that it supports libraries' mission and values. AI makes intelligent technology possible, such as virtual assistants and sophisticated algorithms. AI for libraries may be likened to a librarian who never sleeps.

The use of artificial intelligence (AI) is spreading across many industries and occupations, making it a powerful force in research and scholarly discourse. Increased productivity, better customer service, educated decision-making, individualised experiences, less risks and mistakes, and higher efficiency are some of its advantages. Despite being slower to incorporate AI, academic libraries are catching up over time. Though interest in incorporating AI into libraries has grown over the last five years, the concept has been around since 1985. The main effects of AI on libraries include sophisticated cloud service identification for online material, next-generation browsers that use semantic analysis, and voice Machine translation and detection for instantaneous multilingual support [8]. AI in academic libraries has a lot of promise to increase information access in novel ways, optimise processes, and improve user experiences. Numerous studies examine artificial intelligence (AI) with special focus on AI-based solutions for educational libraries, advantages, difficulties, adoption methods, and Academic libraries' preparedness to incorporate AI into their resources and offerings. Research also looks at how librarians see AI technology and how they feel about them. Among the most fundamental roles of university libraries is to ensure that all users including faculty, students, and staff have ready access to relevant, up-to-date material. By collecting, conserving, and making library materials accessible University libraries have a responsibility to encourage intellectual pursuits and inquiry among its patrons, including faculty, pupils, and others. Consequently, the university sector and higher education depend heavily on university libraries [9]. By supporting the institutions' research, teaching, and learning initiatives, they help them achieve their goals and missions. University libraries use robotic technology to streamline operations, simplify and improve services, and foster efficiency in order to successfully carry out their mission. Robotics is described differently by various academics. According to, robots are mechanical devices that utilise artificial intelligence (AI) methods to automate jobs that are currently under direct human supervision or that follow a predetermined program and set of basic principles. Robots, according to, are robots that can do a variety of automated tasks things computers have programmed. According to these two meanings, One area of artificial intelligence called robotics is concerned with machine learning, perpetual tasks, and motor tasks.

"Library" is a reference to the Latin word "liber," meaning "book." "Bibliotheca" is a synonym for in Greek and Romance languages. A more suitable definition may be provided by a collection of books and/or other written or non-printed resources that are kept up to date and arranged for potential use (e.g., reading, consultation, study, research). Institutional libraries employ librarians and other staff members who have received training in meeting user requirements, and they are set up to make access easier for a particular user demographic [10]. The Persian word hane, which means libraries-house, which is a location where books are gathered, and the Arabic term kitab, which is the plural of kütüb, sources of the Turkish word "kütüphane," which means library. The Arabic term "kitab" comes from the words "writing" and "name." Libraries serve a variety of audiences and fulfil a variety of purposes depending on their kind. Public libraries support researchers and students in higher learning, whereas university and school libraries often provide books and resources to everyone for free. National libraries safeguard a nation's literary and historical legacy, whereas special libraries serve specialised disciplines like law or medicine [11]. Libraries are establishments that preserve the intellectual, cultural, and educational legacies of many civilisations and are crucial to the growth of society and the scientific community. We may infer the origins of modern science and culture from the scientific and cultural interactions that numerous ancient civilisations had with one another and/or with succeeding civilisations. The most significant repositories of the intellectual accumulation that results from this interaction are libraries and archives. Library automation systems have been in use from the late 1980s and early 1990s. has progressed from its invention to widespread deployment. The library's materials and services have undergone significant changes due to technological advancements during the last two decades, particularly in the last decade. Particularly in scientific and special collections, books are quickly being supplanted by digital materials as the main library resource. Other digital resources, including digital collections, institutional repositories, and e-books, have also gained popularity. Library patrons expect quick and simple access to library materials and services, similar to how they obtain information in the digital era [12]. The library automation system, commonly known as the integrated library system (ILS), has remained mostly unchanged over the previous two decades. The library's process and environment are constantly evolving, making it challenging to manage. Library personnel express frustration with the ILS's inability to handle their regular tasks. The complexity of library applications and systems might lead to confusion among users. Library automation systems are on the verge of a significant transformation. The library literature refers to them as second-generation or next-generation automation systems. The second-generation library automation system has two pillars: (1) comprehensive and unified resource management regardless of format or location, and (2) a shift away from traditional ILS models towards service-oriented architecture (SOA). We are at the start of a new age for library automation systems. Vendors of library systems are developing and implementing second-generation automation systems in response to changing needs. We anticipate that the idea and execution of the new library automation system will swiftly spread across all sorts of libraries. This will improve library operations for both staff and patrons.

Libraries will remain dynamic in the years to come because the knowledge and services provided by the LIS community and profession will change along with the demands and expectations of academics. Libraries and LIS workers should take advantage of the tremendous technology possibilities and fast change that are occurring now. There is growing demand on librarians to be flexible and to identify what our library's clients may desire before they even realize it exists or that they need it. We must continue to monitor proactive and individual alerting methods such as Google Alerts, Change-Detect, Spy-on-it, and others [13]. In

contrast to Web 2.0, a term often used to characterize the alleged continuous The World Wide Web's development from a collection of websites to a fully functional computer system service, the next era of librarian has been named "Librarian 2.0." For a number of applications, Web 2.0 is eventually expected to replace desktop software. According to the Texas Library Association and Texas Library and Archives Commission, libraries are tools for creativity and are shaped by the ideas that society must maintain an open and public structure (systems) in a true democracy in order to inform and encourage a free-thinking populace for advancement of services.

Skills Library Staff Need in the Future

Since a librarian demonstrates the ability to provide library programs, services, and tools that are essential to the current academic environment and knowledge era, their work is highly diverse and vital. constantly evolving data requirements of students as well as in providing support to academic staff who are involved in study, information creation, and lecture-room teaching. In order to accomplish fundamental objectives that support the university's mission and vision, librarians need to possess both the intellectual capacity and the skills necessary to successfully accomplish these objectives. IT, instruction, interaction, organizing, and planning

- Proficiency in writing and spoken communication, together with the ability to negotiate or bargain, is essential for teaching and fostering relationships between libraries.
- Communication skills are intimately linked to training skills. To teach users how to use new technologies, distribute specific information, and provide knowledge, bibliographic guidance, and user education, a librarian must possess training skills.
- The ability to use technology to help libraries in the ICT era carry out their tasks efficiently.
- Planning and organizing abilities that support short- and long-term planning for the library; the capacity to prioritize tasks and organize one's workload due to the abundance of requests.
- Project management abilities as well as entrepreneurial and proactive talents that support creative results and outputs. The majority of libraries must start and complete initiatives with deadlines that must be closely followed.
- Relational and teamwork abilities that support fruitful working relationships and results.
- Learning and ability to manage themselves, together with a willingness to further their professional and career goals, are essential for librarians. These abilities support the continuous development and growth of the librarian's expertise, which improves the activities, results, and outputs of the library or institution.

Additionally, the modern librarian requires a wide range of additional abilities and character traits. For instance, dedication to serving the needs of library patrons, capacity to manage obligations at work and at home, flexibility and readiness to work under pressure, and adherence to moral principles, integrity, and quality control.

1.1 THE ROLE OF AI IN LIBRARIES

AI is having a big effect on modern libraries. It is changing many facets of the library's operations, offerings, and patron experiences. These are a few of its most significant facts:

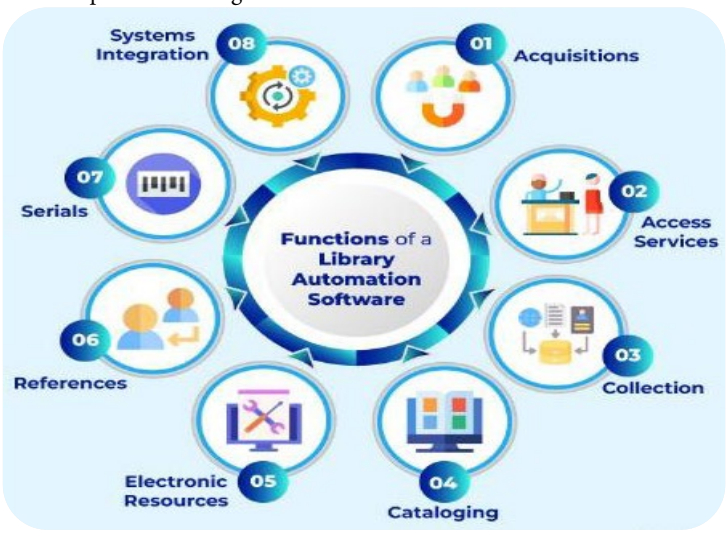


Figure 1 Function of an automation software

- **Curation and recommendation systems:** AI algorithms look at a user's preferences, borrowing history, and reading patterns to provide tailored recommendations. These resources assist users in finding the appropriate books, articles, and further materials faster.
- **Information retrieval:** Algorithms for artificial intelligence search engines enable easy information retrieval from databases and library catalogs. Techniques for Natural Language Processing (NLP) improve search accuracy by comprehending and answering queries of users.
- **Digital archives and preservation:** AI is helping libraries to preserve old and fragile items. It is able to scan them, converting them into digital formats that can be searched by anyone. And AI can categorize and organize these digital files., which is quite a relief.
- **Chatbots and virtual assistants:** Libraries use AI chatbots, helpers to give folks quick help. They answer questions and guide them to the stuff they're looking for. These helpers are always on, which makes getting in touch way simpler.
- **Text analysis and data mining:** Libraries can use AI technologies include sentiment analysis and text mining., to pull useful info from tons of text. Librarians can then use what they find to see how people are using the library, help with research, and put together better collections.
- **Content creation and generation:** AI helps make writing easier by creating things like metadata, abstracts, or

summaries. This lets librarians focus on important stuff rather than getting stuck on boring tasks.

- **Accessibility services:** AI can really help people with disabilities get what they need from libraries. Like, there's software that uses AI to help people who can't see use computers and hear text read aloud.
- **Predictive analytics for collection management:** Libraries use data to guess what resources they'll need in the future. This helps them improve their collections and inventory control. AI looks at usage and outside stuff to make these decisions.
- **Security and fraud detection:** Libraries are using artificial intelligence (AI) to beef up security, like spotting fraud, managing who goes where, and guarding their online stuff.
- **Language translation services:** Libraries that have books and stuff in different languages can use computer translation to help people read them in other languages. This way, more people can get to enjoy what the library has.

Libraries have been used as information distributors and repositories for thousands of years. This vast volume of information has to be well organised in order to be accessible. Thus, organising knowledge is one of the library's primary responsibilities. As technology develops, people must live up to ever-increasing standards. The capacity of Artificial intelligence (AI) is the ability of a digital computer, software-controlled device, or software to reproduce intellectual characteristics. that are comparable to those of sentient beings (humans) in their functioning. The utilisation of information resources, search functionalities, and the speed at which requests are handled will all be impacted by the library's incorporation of AI [14]. Through social networking and mobile platforms, AI technology can be used to create new immediate digital reference services by combining material from third parties with the resources currently found in libraries. Moreover, some additional fascinating uses Robotics, AI in libraries includes things like natural language processing and sorting algorithms. The application of AI in libraries is growing. These involve, for example, deep learning using virtual reality, library expert systems, and robots that read books and stores. Despite the notion that incorporating AI into libraries will make librarians more distant from their patrons, in reality, it will probably enable libraries to do more. Additionally, AI will modernize libraries, significantly enhance operations and facilities, and raise their importance in a quickly changing digital world.

Large data, artificial intelligence (AI), machine learning (ML), natural language processing (NLP), and other data science-related ideas are among the new technical advancements that are sweeping the academic community. Public service providers may seem less aggressive than commercial players, such as publishers and numerous start-ups, who are actively investigating AI to improve their services and manufacturing methods. the heart this change are research libraries that support academic institutions and other intellectual groups. In order to support their operations and services, they look through library technology reports to select the best products, participate in national or international projects to benefit from cooperative technology development, and follow the developments of academic publishers and other close partners with conflicting emotions. Discussions about these new developments' effects on the research environment have surfaced [15].

The function of libraries is firmly defined ever since the global sustainable development initiative known as Agenda 2030 was put into action. The process of including libraries in this action program has been heavily influenced by the International Federation of Library Associations (IFLA). National policy also reflects this acknowledgment; example, the agenda 2030 roadmap in France acknowledges libraries as an essential component in the process of building a sustainable future by enlightening and teaching people. Our cultures are seeing the emergence of a technology that also affects growth overall, while equitable growth sits at the nexus of social, economic, and environmental problems [16]. A remarkable amount of media attention has been paid to artificial intelligence (AI) technologies with the launch of in November 2022, the intelligent conversational platform ChatGPT was created. Artificial intelligence, creative intelligence, of which it is but one kind, is alreadyan essential component of our digital life on a daily basis. When we browse social networks, when we use GPS to navigate, or when we obtain product suggestions on streaming or e-commerce platforms, we are able to find it.

Transforming Library Services with AI:

Libraries have always served as information and knowledge centres, but as artificial intelligence (AI) advances, they are seeing major changes in the way they interact with their users and provide services. 19. AI is revolutionizing library services in the following ways:

1. **Enhanced Search and Discovery:** How people search for library material is being entirely revolutionized with AI-driven indexing and recommendation systems. Through observation of user interest and behavior, AI systems can provide personalized recommendations, facilitating users' search for relevant content across large libraries.
2. **Automated Metadata Generation:** Utilizing artificial intelligence (AI) tools like natural language processing (NLP) and machine learning allows for the automation of library materials' metadata creation. This enhances resource visibility by making cataloging easier, saving libraries time, and ensuring continuity and accuracy in metadata
3. **Virtual Assistants and Chatbots:** Chatbots and AI-powered robots are being utilized by libraries to offer users instant help. By making recommendations, helping patrons navigate the buildings, and answering common questions, these virtual assistants can potentially make patrons happier and more engaged.
4. **Data Analytics for Collection Management:** Libraries can take data-driven decisions regarding expenditures and collection building by using data analytics technologies based on artificial intelligence. Libraries may improve their holdings to satisfy the needs and goals of its patrons by analyzing usage trends, circulation statistics, and patron ratings.
5. **Digital Preservation and Access:** The scanning and library asset maintenance, especially of rare and fragile artifacts, are simplified through AI technology. More people can access physical documents by applying them to digital forms using picture recognition and optical character recognition (OCR) technology.
6. **Accessibility Enhancements:** Accessibility features powered by artificial intelligence, such as language translation and text-to-speech functions, allow users with disabilities or linguistic barriers to access more information with greater ease. Through these enhancements, libraries are able to provide for all members of the community in an equal and unbiased manner.
7. **Content Analysis and Insights:** Libraries can draw significant information from textual content, such as digital books and learned journals, through AI-driven analysis tools. Libraries can identify trends, themes, and trends that inform collection building and research projects through text mining and sentiment analysis.
8. **Predictive Analytics for Resource Allocation:** With past usage records and external factors, AI technologies can also predict future demand for library materials. This allows libraries to anticipate what their users will require, distribute resources as effectively as possible, and enhance users experience overall.

All things considered, Libraries are being transformed by AI by increasing accessibility, optimizing operations, boosting resource discoverability, and enabling libraries to provide better services to their users [17]. Libraries can adjust to the changing requirements of their communities and continue to be important information and knowledge centres in the digital age by skillfully using AI technology.

Slowness was the library's best-kept secret embrace of digital technologies and automation. From archives and audiobooks to make areas and video collections, The public believes that a library is at the forefront of technology. While claiming that anyone may access the information online, library critics refer to the actual stacks and socioeconomic divide. Instead of asserting that the library is not succeeding in digitizing, the argument emphasizes. Although librarianship is quick to refute this claim, the field finds it difficult to acknowledge its shortcomings in light of the advancement of digital technology. In the past, the library has been hesitant to adapt, often delaying responding to a new trend until a certain technology has reached market saturation. The library will embrace the usage of a technology after its users have been exposed to it in a variety of settings [18]. The potential of these two disciplines, which have been popularised by science fiction, is just now becoming apparent. Different conceptions of what artificial intelligence (AI) is and what qualifies as AI hamper this effort. Although it is often understood that artificial intelligence Artificial intellect (AI) is computer software that mimics human intellect. really much more than that. AI is now widely used in daily life because to technologies like The Internet of Things, satellites, autonomous automobiles, and—perhaps most obviously—Google.

1.2 *AI-POWERED RECOMMENDATION SYSTEMS IN LIBRARIES*

Recommendation engines driven by AI are changing how libraries work today. Libraries are now using these systems to watch what people do, what they like, and what books and resources they have. By knowing these things, the systems give custom suggestions, which makes the whole library visit better and helps people find what they're looking for quick. They do this by using advanced algorithms and machine learning.

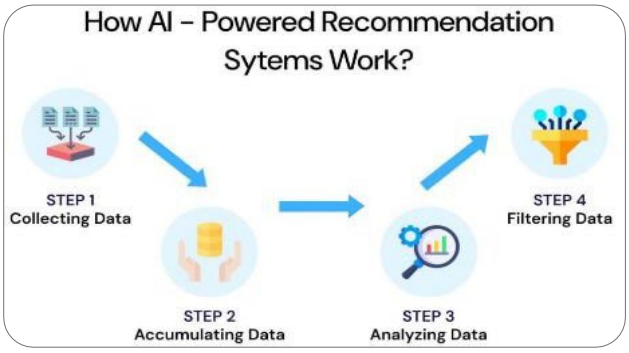


Figure 2 Ai powered recommendation system

- ***Personalization and user engagement:*** Recommendation systems look at what people do and like using innovative techniques like text-based and collective filtering. Librarians can then make the library experience better by getting to know what each user likes, which will probably get people to use the library more.
- ***Content-based filtering:*** Recommendation systems often use filtering by content to provide suggestions. These systems look at what you've liked before and then advise similar items. Nine AI helpers check out the item's content and match it to your past preferences to give you better ideas.
- **Collaborative filtering:** Okay, so collaborative filtering gives suggestions by checking out what users do and like. AI finds similar users and suggests things that those users liked.
- ***Hybrid recommendation systems:*** So, library recommendation systems often mix content-based and collaborative filtering. This combo takes the good bits from each approach to give you better, more varied recommendations that fit what you like.
- ***Improved resource discovery:*** So, library recommendation systems often mix content-based and collaborative filtering. This combo takes the strong points from both methods to give users better, more diverse, and personal suggestions.
- **User feedback integration:** AI usually uses what you put in to get better at giving advice as time goes on. So, librarians can figure out if people dig the stuff that's suggested, and the system can tweak itself to get even better later.
- ***Ethical considerations:*** Librarians using AI to suggest books should consider ethics. They should be upfront about how the suggestions are made and try to avoid biases creeping into the AI. Reducing bias helps include everyone, and being open builds trust with users.
- ***Real-time assistance for patrons:*** Helping customers out in real time means giving them quick, interactive support or info, usually when they're dealing with customer service or need help. This type of assistance employs various tech and means to communicate so people are able to receive help quickly when they need it.

Libraries have traditionally been knowledge bases, giving access to information resources and aiding research and pedagogy efforts. However, with the digital era changing the way individuals perceive and search for information, libraries need to radically change their operating models and service provision. In response to these changes, the concept of "smart libraries" emerged, leveraging advanced technology to deliver dynamic, stimulating, and productive learning spaces [19]. Computational methods, Internet of Things (IoT) technology, and artificial intelligence (AI) platforms They're all used in sophisticated libraries to maximize resource consumption, enhance customer satisfaction, and automate processes. Almost 45% of higher institutions globally have made use of smart technology, based on recent statistics, and projections show that the figure will have a compound annual growth rate (CAGR) of 12.8% from 2023 to 2030. [20].

Significant of the study

The present study, "Next-Generation Collection Strategies: Investigating the Role of Artificial Intelligence in Library Science," is significant in that it highlights Artificial intelligence's transformative potential in reframing how libraries create, curate, and disseminate their collections. Old-fashioned collection production methods are no longer sufficient in offering timely access to relevant information in view of the fast development of digital materials and evolving user needs. Libraries can enhance decision-making, personalize resource recommendations, and optimize acquisition strategies with the help of AI-based tools like natural language processing, machine learning, and predictive analytics. As it helps bring insights on how AI can enhance user experience, increase efficiency, and support evidence-based collection management, this research is important for researchers, library staff, and policymakers. It also addresses problems such as resource shortages, information overload, and the demand for innovative solutions in the information era, which ultimately contributes to libraries being relevant and sustainable in the society of knowledge.

Problem Statement

While libraries have always been critical to the management and sharing of information, traditional collecting strategies have

been severely challenged by the runaway growth of digital content, demands for instant access from users, and the emergence of big data. Traditional collection organisation, cataloging, and maintenance methods are frequently time-consuming, manual, and lack a high degree of flexibility in responding to evolving information needs. Libraries find it challenging to uphold accuracy, personalization, and effectiveness in handling resources due to increasing digital material complexity. Additionally, being able to offer relevant and user-centric services is impaired by the lack of automation and knowledge-based decision-making features in most library systems. These concerns illustrate the significance of exploring innovative, technology-based answers that can transform gathering strategies and enhance library science's overall effectiveness in a digital age.

Contribution of the Study

This research adds to the body of knowledge on AI in libraries by investigating how AI-powered resources can change cataloguing practice. Of specific interest is how AI can improve cataloguing, automate metadata creation, optimize the buying of resources, predict user preferences, and offer personalized recommendations for library users. The study provides insight into how AI can reconcile the disparity between conventional library procedures and the requirements of today's digital age by focusing on the next generation methods. The study also offers a model for AI integration in libraries management systems, which will facilitate academic institutions, librarians, and policymakers to adopt data-informed, user-centric, and sustainable acquisition practices.

2. REVIEW OF LITERATURE

[21] Modern technical innovations include AI. AI may transform the greatest digital services and is already used in libraries. The goal of this project is to demonstrate AI in libraries. Some research has tackled this topic, but only for a few applications. The link between AI and libraries is evident, but this session will address some of the remaining questions about AI knowledge and library services. Before adopting AI in library services, our research will assist academics, librarians, and policymakers address these concerns. Content analysis is used in this qualitative research. We searched the research on "smart libraries" and "artificial intelligence" latest breakthroughs. We read extensively about "ambient intelligence," "data mining," "electronic resource management," "Internet of Things," "smart technologies," and "artificial intelligence." This article covers AI in library services' merits and drawbacks and possible remedies. This study found that AI might benefit library services. Insufficient money, librarians' reluctance to adopt AI, and a lack of technical expertise make AI adoption in libraries difficult. Results show that libraries may advance faster using AI when used for their jobs. Additionally, this analysis suggests some free applications. This study may interest academics, librarians, lawmakers, researchers, and the government since it gives a nationwide overview of library technology use. This investigation may illuminate the present state of this technology and its potential to improve information center and library services. Library employees will be able to apply AI into their daily tasks thanks to this research. speeding improving library operations. This research attempts to equip librarians with the tools they need to deploy AI in libraries. AI-powered library services will pave the road for its future use.

[22] Studies in machine learning and artificial intelligence is being conducted by academics, researchers, and information professionals due to the increasing significance of these new technologies. Gathering the results of empirical studies that investigate potential AI and ML applications in libraries is the primary motivation for this comprehensive literature analysis. To achieve the goals of the research, a review of the literature conducted systematically using the initial criteria. Scopus, LISA, Web of Science, and LISTA were the databases from which we retrieved our data. One hundred and twenty-two articles were reviewed and assessed to give a synopsis of the most popular library-related AI and ML topics and approaches, using a rigorous and well-known selection process. Currently, most AI and ML research pertinent to the LIS discipline appears to be theoretical, according to the results. However, there are academics who have opted to concentrate on specific projects or case studies. Researchers, librarians, and school administrators will all benefit from this study's comprehensive overview of library AI and ML applications. They may utilize this information to prepare for future advancements and implement strategies that are more tech-focused.

[23]This study emphasises the important relationship between library and artificial intelligence (AI) by looking at how affects library services. Few studies have examined the impact on academic researchers and use awareness, notwithstanding earlier study. To enhance the provision of services in the information age, the study intends to assist policy makers, librarians, and academics in addressing these concerns prior to implementing AI in library services.

[24] The study investigates how Malaysian libraries might enhance their content marketing strategies by implementing artificial intelligence (AI). With more than 75% of libraries investigating AI technologies, user engagement has increased by 45%. Data privacy and digital inequality are issues that must be addressed, though. The study examines how AI affects user adoption and happiness using the Technology Acceptance Model and Personalisation Theory. It suggests making calculated investments in personnel development, ethical standards, and AI infrastructure.

[25] The study examines how Library services are being transformed by artificial intelligence (AI), which improves user experiences, operational effectiveness, and information availability. Applications such as AI-powered virtual assistants, personalised recommendation systems, automated cataloguing, and predictive analytics for collection management are highlighted. The digital divide and However, integration raises ethical questions. In order to realize AI's full potential, the research suggests inclusive service models, ethical AI development, and further collaboration between libraries and AI researchers.

[26] The research explores how social science research is being transformed due to the meeting point of library and information science (LIS) with artificial intelligence (AI). AI-driven innovations are increasing information retrieval, database organising and curating, and pattern detection in them. Librarians might focus on offering personalised services by leveraging AI to automate procedures such as cataloguing, classification, and preservation. Additionally, AI may develop customized recommendation systems that exploit a user's learning history and interests to suggest appropriate materials. which results in more comprehensive and insightful social science analysis.

[27] summarized the literature regarding artificial intelligence (AI) use in libraries for role that these applications play in library functions. Employing the Scopus database, the research methodology discovered 66 related papers in artificial intelligence. This page gave the overall conclusions and summaries of the 65 articles that were analyzed after duplicates were removed and filters had been used. Researchers interested in researching AI usage in libraries can use the information provided here as a source.

[29] explored how AI impacts library functions, specifically on information management. AI enhances resource allocation, enhanced search, and accelerates cataloging. It impacts user experiences as well by enabling decision-making based on data

and mitigating information overload problems. The proposed approach simplifies interactions, detects routes within the library, automates tasks for both the librarians and the users, and simplifies searches of books. The research underscored the importance of understanding AI technologies for the development of intelligent systems and how AI can revolutionize libraries by developing an information ecosystem that has evolved to become responsive, efficient, and accessible.

[30] discussed potential future developments, provides a summary of the AI applications being used in libraries today. and discusses the challenges and ethical problems involved with integrating AI into library systems. Using a mixed-methods approach, the study integrates qualitative information from expert interviews and literature reviews with quantitative data from a survey of 200 library employee's interviews. The results showed that while people are becoming more aware of AI applications, such as conversational search engines, AI assistants, automated classification, and recommendation engines, real Implementation was still restricted because of issues including insufficient training, financial limitations, and moral dilemmas. Compared to public or special libraries, academic libraries had a somewhat greater rate of AI integration. It ends with practical suggestions, such as user-driven development tactics, cross-sector partnerships, the creation of ethical AI frameworks, and focused training initiatives.

[31] This research explored the impacts of personalized recommendations driven by artificial intelligence (AI-PPRs) on TikTok (Douyin in China) users' engagement, browser habits, and purchase intents in order to fully comprehend the effects of these suggestions on users' happiness and purchase intent along with any potential privacy concerns. In order to investigate Douyin users' experiences and perceptions of AI-PPRs based on the stimulus-organism-response model and the theory of expectation value, the study used qualitative methods via interviews. Through live streaming and captivating short movies, Douyin's AI-PPRs which include finding new products for the pleasure experience improve user engagement by cutting down on search time and raising satisfaction. However, when customisation has seen as invasive, it may cause unpleasant feelings and avoidance behaviours, raising privacy problems. While technical difficulties like network problems might have had a detrimental effect on user experience, cultural context and the time of recommendations can affect receptiveness. Since inadequate or inappropriate material might result in unfavourable opinions and disengagement, content quality was essential. Genuine influencer endorsements and those from reliable sources are more palatable. "Douyin Monthly Payment" has become one of the innovative payment options that encourages client loyalty. Maintaining customer engagement and loyalty in AI-PPRs and maintaining trust depend on striking a balance between customisation and privacy.

This chapter [32] investigated the use of AI, focusing on recommendation and knowledge discovery systems. Suggestion AI-powered engines provide personalized recommendations, boosting user engagement and streamlining the process of finding information. AI-driven resource identification tools help with trend analysis and resource summaries by drawing insightful conclusions from large datasets. The user-centered, efficient, and enriching nature of the library experience was enhanced by the integration of various AI-powered technologies. This chapter demonstrated how AI-driven search and recommendations may turn libraries into flexible, dynamic organizations at the center of the dissemination of information. In the rapidly developing digital world, libraries must manage massive amounts of material while also providing users with excellent resource discovery. The management of libraries has been transformed dramatically because artificial intelligence (AI) has been used.

[33] Examining how AI-powered recommendations affect customer behavior in online marketplaces was the aim of this study.. It concerned hybrid recommender systems involving natural language processing methods and collaborative filtering approaches. The work develops and examines these systems based on the Kaggle dataset for Amazon sales, measuring their performance in terms of visual attractiveness, diversity, relevance, and satisfaction. Through an examination of their principles, operation, in terms of effect on client loyalty, the research also considered the wider implications of AI-driven recommendations for customer engagement. The research also considered ethical issues and identifies key factors that lead to their effectiveness. Overall, this research provides a comprehensive examination of AI-driven recommender systems in e-commerce platforms.

[34] investigated the ways through which library systems can be integrated with artificial intelligence (AI), highlighting the ways through which it can improve services through automation, personalization, and improved access to information. NLP enriched search interfaces and user interaction, while machine learning and deep learning automate categorization and retrieval processes. Computer vision captures and stores library materials digitally, while knowledge representation and reasoning structure digital information. In addition to solving ethical problems such as maximizing algorithmic fairness and ensuring privacy, the chapter emphasizes the necessity of accountability and transparency. All things being equal, AI technologies could potentially revolutionize traditional library systems, boosting user interaction and operational efficiency.

AI has transformed library services by [35] promoting inclusive user experiences and allowing personalised distribution. Libraries may enhance user engagement and information delivery by using technology such as recommender systems, machine learning, and natural language processing. By analysing user behaviour, machine learning models proposed resources in a personalised way. Information overload and linguistic obstacles are reduced via natural language processing. Recommender systems used content-based and collaborative filtering strategies to recommend relevant resources. Chatbots and digital assistants driven by AI provide real-time assistance, simplifying questions guaranteeing accessibility for those with impairments. These resources improved inclusion for people with visual and auditory impairments when linked with assistive technology. AI-powered solutions break down language, cultural, and geographic obstacles to provide library services to underprivileged populations.

2.1 *Research Gap*

Despite the fact that a growing amount of research has examined how artificial intelligence (AI) was changing library services, the majority of these studies are still fragmented, either concentrating on particular contexts like academic libraries in Malaysia or Nigeria or on particular tools like recommender systems, cataloguing automation, or virtual assistants. Instead of providing empirical insights into real-world implementation, user uptake, and long-term sustainability, the majority of the research being done now is descriptive or conceptual in personality. Furthermore, while comprehensive ways to tackle these obstacles are not well established, issues including budgetary limitations, librarians' reluctance to accept new technology, a lack of technical skills, and ethical considerations like data privacy and digital inequality are recognised. Few studies incorporate cross-disciplinary perspectives or offer comparative analyses of how various library systems academic, public, and special can adapt AI for collection strategies in varying socioeconomic and cultural contexts, even though earlier works emphasise AI's potential to improve personalisation, efficiency, and inclusivity. Therefore,

there is a deficiency of methodical, application-focused, and cross-context research that not only recognises the promise of AI but also tackles its obstacles by developing workable frameworks, regulations, and implementation plans specifically designed for next-generation library collection techniques.

3. METHODOLOGY

3.1 *Research design*

A quantitative research approach was used in the study to look at the artificial intelligence in library science. Data was collected from 384 respondents using a structured online questionnaire. The validated questionnaire used to gather the data consisted of Likert-scale questions. "Statistical software for the social sciences," or SPSS, was used to investigate the information.

3.2 *Conceptual framework*

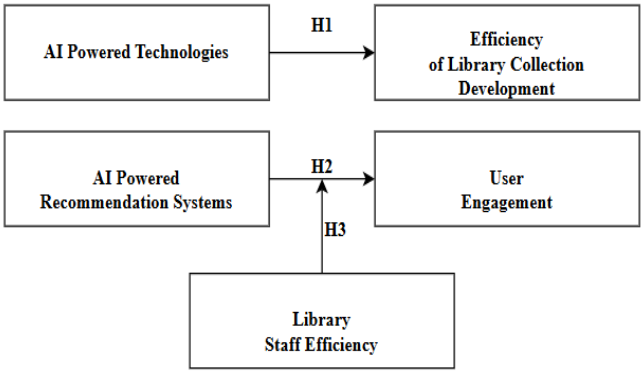


Figure 3 Conceptual framework

3.3 *Objectives*

- To investigate how AI-powered technologies affect library development efficiency.
- To explore how AI-powered recommendation systems affect user engagement while taking library staff productivity into account as a mediating factor.
- To evaluate how user pleasure, engagement, and general library patronage are affected by AI-powered technology development initiatives.

3.4 *Sample selection*

In order to create a representative dataset for analysis, the research used a sample size of 384 individuals. To investigate artificial intelligence in the field of libraries, the stratified random sampling technique was used.

3.5 *Data collection*

This study used a quantitative methodology, ensuring accuracy and reliability via the use of systematic data collection methodologies. A standardized several Likert-scale observations survey was employed as the primary instrument for gathering data in order to evaluate the artificial intelligence in library science. Important questionnaire elements are AI Powered Technologies, Efficiency of Library Collection Development, AI Powered Recommendation Systems, User Engagement, Library Staff Efficiency. Google Forms was used to collect 384 legitimate replies. Secondary data from published studies, government websites, and institutional records will be used to augment the original data.

3.6 *Measures*

A systematic questionnaire has been used to collect data. A five-point Likert scale (strongly disagree with strongly agree) has been used to develop the questionnaire, which asks users to rate their thoughts on the many research subjects being investigated. Both closed-ended and open-ended questions are included in the questionnaire. Thoroughly considered questions were developed to collect relevant data on the factors under investigation. The survey comprises five different kinds of respondents, and a unique questionnaire has been created for each. The factors and number of items taken into consideration for the research are shown in the table below.

S. No	Variable Name	No. Items
1	AI Powered Technologies	5
2	Efficiency of Library Collection Development	5
3	AI Powered Recommendation Systems	5
4	User Engagement	5
5	Library Staff Efficiency	5

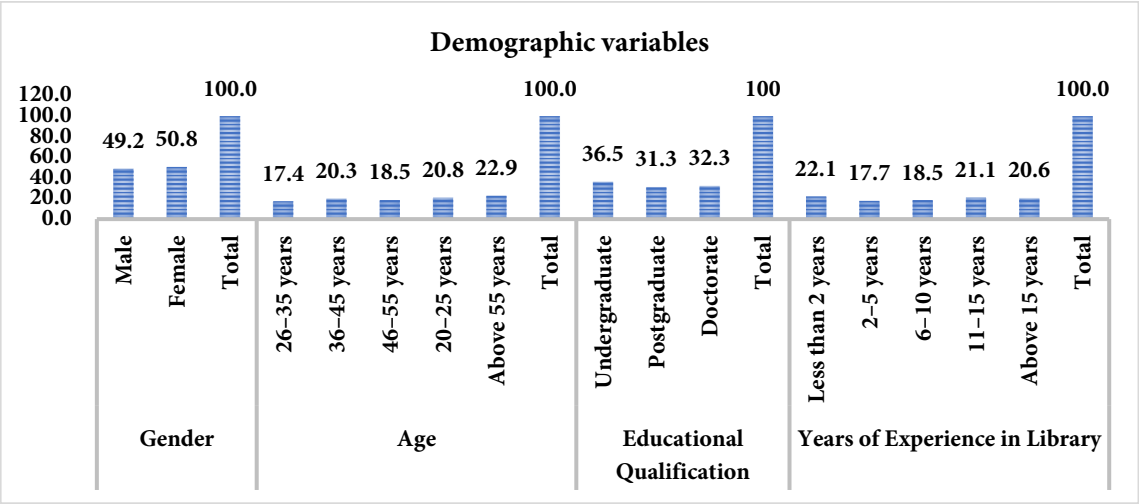
4. RESULTS

The study defines its objectives by investigating how AI-driven technologies might improve the production of library collections and how AI-based systems for recommendation affect user interaction, with library staff efficiency acting as a mediating variable. The results were analysed utilising a quantitative research design to achieve these objectives. Demographic profiling was initially performed to comprehend the respondents' backgrounds. The variables' validity and reliability have been assessed using Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Characteristic statistics were utilised to assess views regarding the constructs, subsequently followed by hypothesis testing by structural equation modeling (SEM) application. Confirmatory Factor Analysis is referred to as CFA. Various indicators of model fit were used to validate the measurement and structural models, hence confirming the accuracy and resilience of the findings.

4.1 *Demographic variables*

Table 1 Demographic variables

		Frequency	Percentage
Gender	Male	189	49.2
	Female	195	50.8
	Total	384	100.0
Age	26–35 years	67	17.4
	36–45 years	78	20.3
	46–55 years	71	18.5
	20–25 years	80	20.8
	Above 55 years	88	22.9
	Total	384	100.0
Educational Qualification	Undergraduate	140	36.5
	Postgraduate	120	31.3
	Doctorate	124	32.3
	Total	384	100
Years of Experience in Library	Less than 2 years	85	22.1
	2–5 years	68	17.7
	6–10 years	71	18.5
	11–15 years	81	21.1
	Above 15 years	79	20.6
	Total	384	100.0



With 49.2% of the participants being men and 50.8% being women, the social profile of the respondents (N = 384) shows a virtually equal gender distribution. The age bracket that is most prevalent is above 55 years (22.9%), followed closely by 20–25 years (20.8%) and 36–45 years (20.3%), demonstrating presence among both younger and older demographics. The educational qualifications reveal a varied composition, with 36.5% of respondents being undergraduates, 31.3% postgraduates, and 32.3% possessing doctorates, indicating a highly qualified respondent pool. Concerning library work experience, 22.1% has less than 2 years, while 21.1% and 20.6% have 11–15 years and over 15 years, respectively, indicating a balanced distribution of early-career and seasoned workers. The sample exhibits diversity in terms of gender, age, education, and professional experience.**Table 2** Validity and Reliability

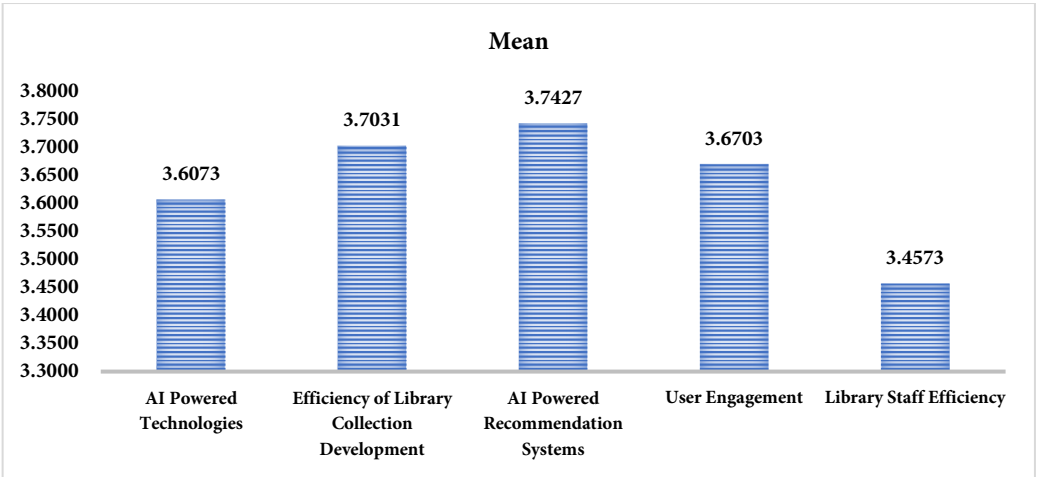
Constructs	Cronbach's Alpha	Composite Reliability	AVE
AI Powered Technologies	0.879	0.74	0.707
Efficiency of Library Collection Development	0.897	0.744	0.714
AI Powered Recommendation Systems	0.892	0.74	0.707
User Engagement	0.891	0.739	0.705
Library Staff Efficiency	0.86	0.705	0.648

The research constructs have great internal consistency and construct dependability, according to the reliability and convergent validity examination. The assessment items show excellent consistency, as shown by Cronbach's alpha values for all constructs ranging from 0.86 to 0.897, which are higher than the usually recognized threshold of 0.70. The constructs are reliable, as shown by the composite reliability (CR) ratings, which range from 0.705 to 0.744. Enough convergent validity and that the constructs explain a substantial portion of the variation in their respective indicators are shown by the average variance extracted (AVE) values, which range from 0.648 to 0.714 and are over the suggested criterion of 0.50. These findings demonstrate that the measurement model is accurate and valid for subsequent structural analysis.

Table 3 Mean and standard deviation

Variables	Mean	Std. Deviation
AI Powered Technologies	3.6073	0.78334
Efficiency of Library Collection Development	3.7031	0.79001
AI Powered Recommendation Systems	3.7427	0.79163
User Engagement	3.6703	0.83498
Library Staff Efficiency	3.4573	0.71511

The descriptive statistics of the study variables reveal that respondents typically possess a relatively favourable impression of the constructs examined. AI-powered recommendation systems received the highest mean score of 3.7427 (SD = 0.7916), showing a significant recognition of their function in library operations. The effectiveness of library collection creation (Mean = 3.7031, SD = 0.7900) and user engagement (Mean = 3.6703, SD = 0.8350) are closely ranked, indicating that respondents see both successful collection management and active involvement as vital components of library operation. AI-powered technologies achieved a mean score of 3.6073 (SD = 0.7833), signifying moderate adoption or consensus. The efficiency of library staff recorded a mean of 3.4573 (SD = 0.7151), which, despite being above the midpoint, indicates potential for enhancement. The statistics indicate a favourable yet diverse assessment of AI integration and operational effectiveness in the library context



5. Hypothesis

H1: AI-Powered Technologies have a positive effect on the Efficiency of Library Collection Development.

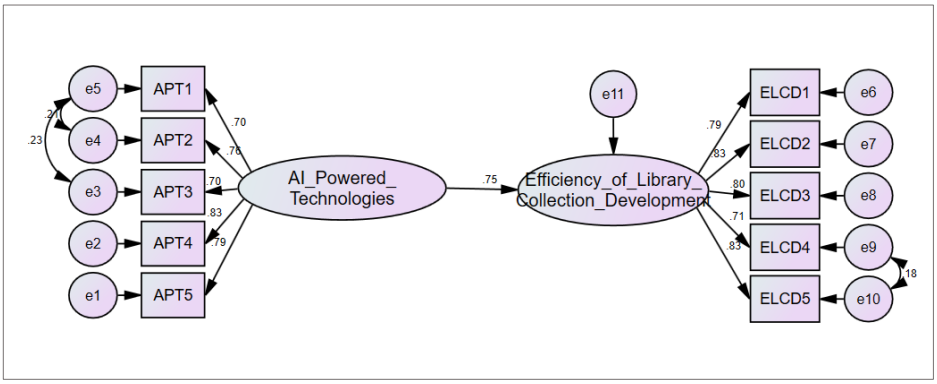


Table 4 Regression Weights: (Group number 1 - Default model)

Path			Standardized Estimate	S.E.	C.R.	P
AI-Powered Technologies	<---	Efficiency of Library Collection Development	0.746	0.059	12.358	***

The analysis of the proposed relationship (H1) reveals that AI-driven technologies significantly enhance the efficiency of library collection development. The standardised estimate of 0.746 indicates a significant effect, suggesting that an increase in the use or adoption of AI-powered technologies enhances the efficiency of library collection development. The standard error of 0.059 signifies a precise estimation of this effect, whereas the critical ratio (C.R.) of 12.358 denotes a very significant finding. The statistical significance of this link is shown by the provided p-value of *** at conventional levels, hence supporting H1 and showing that AI-powered technologies are integral to improving library collection building procedures.

Table 5 Model fit Summery

CMIN	DF	CMIN/DF	GFI	NFI	RFI	IFI	CFI	RMR	RMSEA
59.025	31	1.904	.969	.974	.963	.988	.988	.024	.049

The information provided shows the outcomes of a Confirmatory Factor Analysis (CFA) or Structural Equation Modelling (SEM) goodness-of-fit evaluation. Chi-square value (CMIN) is 59.025 with 31 degrees of freedom, resulting in a CMIN/DF ratio of 1.904, which signifies a satisfactory fit as values below 3 are typically deemed acceptable. The model's sufficiency is supported by the fit indices, which show that it fits the data well. The GFI, NFI, RFI, IFI, and CFI all above the necessary cutoff of 0.90. There is a close match between the Root Mean Square Residual (RMR) of 0.024 and the Root Mean Square Error of Approximation (RMSEA) of 0.049, as values below 0.05 are considered good. Collectively, these indices indicate if the data is well and strongly fitted by the equation.

H2: AI-Powered Recommendation Systems positively influence User Engagement.

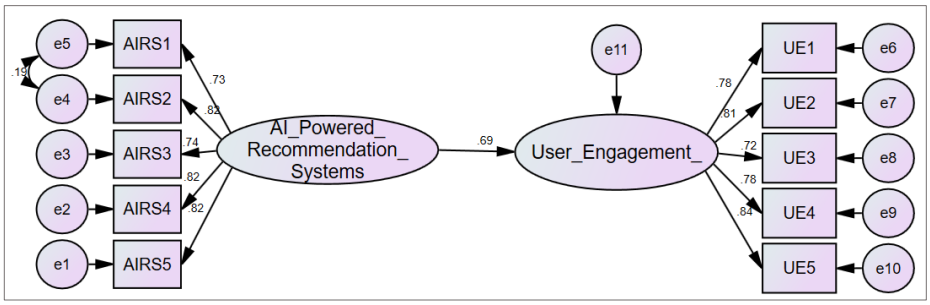


Table 6 Regression Weights: (Group number 1 - Default model)

Path			Standardized Estimate	S.E.	C.R.	P
User Engagement	<---	AI Powered Recommendation Systems	0.693	0.058	11.827	***

The findings show a robust and noteworthy positive correlation between AI-driven recommendation systems and user engagement. The standardised estimate of 0.693 indicates that when the efficacy of AI-powered recommendation systems improves, user engagement significantly increases. The standard error (S.E.) of 0.058 signifies a minimal degree of fluctuation in the estimate, demonstrating measurement precision. The critical ratio (C.R.) of 11.827 significantly exceeds the traditional threshold of 1.96 for significance at the 0.05 threshold, with the associated p-value being highly significant (***), affirming the statistical stability of this relationship. These data substantiate the idea that AI-driven recommendation systems enhance user engagement.

Table 7 Model fit Summery

CMIN	DF	CMIN/DF	GFI	NFI	RFI	IFI	CFI	RMR	RMSEA
76.392	33	2.315	.963	.967	.955	.981	.981	.029	.059

A generally favorable fit of the proposed structural equation model is shown by the model fit indices. With 33 degrees of motion and a Chi-square value (CMIN) of 76.392, the CMIN/DF ratio is 2.315, below the generally accepted cutoff of 3, suggesting an acceptable fit. The comparative fit indices NFI (0.967), RFI (0.955), IFI (0.981), and CFI (0.981) all above the necessary cutoff of 0.90, indicating a strong match between the suggested model and the observed data, and the goodness-of-fit index (GFI) is 0.963. The model shows an adequate to excellent fit, as shown by the root mean square residual (RMR) of 0.029 and the root mean square error of approximation (RMSEA) of 0.059, both of which fall within acceptable standards. All together, these indices show that the equation is well-defined and successfully depicts the relationships between the variables.

H3: Library Staff Efficiency mediates the relationship between AI-Powered Recommendation Systems and User Engagement.

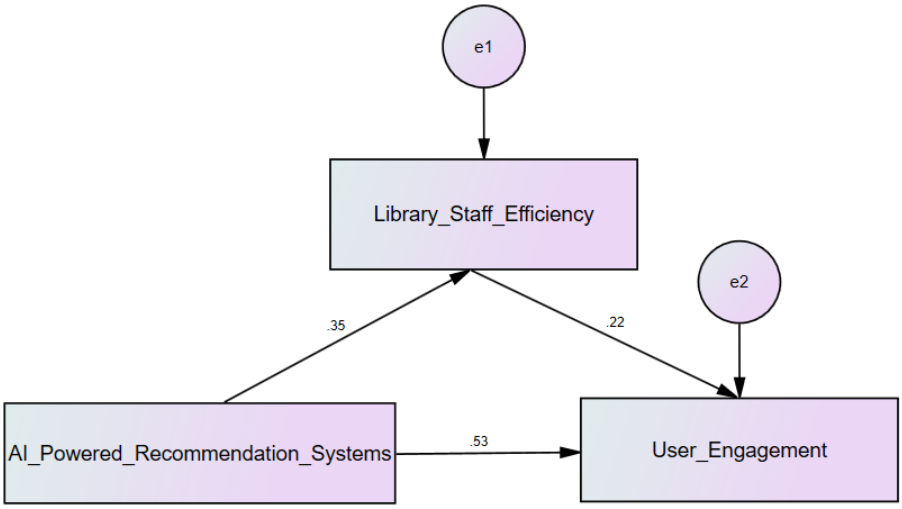


Table 8 Regression Weights: (Group number 1 - Default model)

Path			Standardized Estimate	S.E.	C.R.	P
Library Staff Efficiency	<---	AI Powered Recommendation Systems	0.351	0.043	7.336	***
User Engagement	<---	AI Powered Recommendation Systems	0.529	0.044	12.624	***
User Engagement	<---	Library Staff Efficiency	0.219	0.049	5.223	***

The structural equation modelling (SEM) findings demonstrate a significant positive correlation between AI-driven recommendation systems and both library staff productivity and user engagement. AI-driven recommendation systems yield a standardised estimate of 0.351 regarding library staff efficiency (S.E. = 0.043, C.R. = 7.336, $p < 0.001$), indicating that implementation of AI tools significantly improves staff performance in library management. Furthermore, AI-driven recommendation systems significantly impact user engagement, with a standardised estimate of 0.529 (S.E. = 0.044, C.R. = 12.624, $p < 0.001$), indicating an effective direct effect on user interaction with library resources. Moreover, the efficiency of library personnel significantly influences user engagement (standardised estimate = 0.219, S.E. = 0.049, C.R. = 5.223, $p < 0.001$), hence substantiating mediating function of staff efficiency in the correlation between AI-driven recommendation systems and user engagement. These data indicate that AI deployment directly increases user engagement and indirectly enhances it by enhancing library staff efficiency.

6. Discussion

This study highlights artificial intelligence (AI) applications in libraries include growing because it improves efficiency, accessibility, and user engagement. Instruments like chatbots, recommendation systems, and automated cataloguing have improved resource management and user contentment [36]. Nonetheless, the study highlights obstacles such as substantial implementation costs, talent deficiencies, moral challenges, and

data privacy concerns that require careful consideration. To guarantee ethical and sustainable adoption, libraries must allocate resources for staff training, enhance openness and inclusivity, and foster collaboration among professionals and policymakers.

This study focused at the growth, major contributors, the topical development of AI studies in in university libraries using bibliometric analysis. The results show noteworthy trends in authorship patterns, regional contributions, publication output, and new AI applications. In addition to descriptive data, it is crucial to assess these findings in view of the study's goals, draw conclusions about their applicability, and suggest particular ideas for further study. Research demonstrates how AI is increasingly being used to improve user interactions, improve resource discovery, and automate routine library tasks. The rise in research on AI indicates that university libraries are progressively using AI to increase productivity, customise services, and facilitate digital transformation. But even with this expansion, certain fields of study are still lacking in depth [37]. AI-powered educational honesty solutions for detecting plagiarism and accessible solutions for people with disabilities, for instance, are not as well researched as chatbots and data mining. Future research possibilities are presented by these gaps. Research on AI has significantly increased since 2015, according to publication patterns, and has peaked in recent years. Multi-author articles often get more academic attention, as seen by the high impact of joint research. The necessity for greater multidisciplinary research cooperation is highlighted by this trend. To create more complex AI applications, university libraries should integrate knowledge from data analytics, computer science, and data ethics into their AI studies.

The demographic research provides a comprehensive perspective on the subject matter by demonstrating an even and diversified representation across an array of demographic factors, including gender, age, education, and professional experience. It has been established via the assessments of reliability and validity that the constructs that were used are reliable and consistent, which in turn contributes to the increased trustworthiness of the outcomes. According to the qualitative analysis's findings, respondents' opinions on artificial intelligence technologies and its applications were mostly positive, particularly recommendation systems, which are recognised as having a significant influence on user interaction and library activities. The testing hypothesis demonstrates that technologies powered by artificial intelligence provide a significant acceleration in the growth of collections, and that recommendation systems are strongly connected with improved user involvement. The mediation study reveals that the efficiency of library personnel is of utmost importance, as they act as a conduit between user interaction and systems for suggestions. This highlights dual effect artificial intelligence, which directly enhances engagement while indirectly reinforcing it via higher staff productivity. Strong theoretical and empirical validation is shown by the fact that the suggested structural models match effectively as shown by the model fit scores that were obtained from the research. Based on these results, Artificial intelligence's integration with library science results in a boost in efficiency in operations and a greater enrichment in user involvement, making it feasible to apply new collection methods that utilize both technological innovation as well as human knowledge.

7. Conclusion

Based on the research findings, the development of libraries is greatly impacted by artificial intelligence. science by making it more efficient, raising the level of user interaction, and enhancing the creation of quality collections. The age and gender profile of the individuals who took part in responding reveals a satisfactory blend of genders, age brackets, education levels, and work experience, ensuring that a complete outlook is gained. The results of tests for validity and reliability indicate that concepts applied within the research are consistent, reliable, and apt for structural analysis based on findings. Descriptive data indicate that AI-based recommending systems and collection development practices are greatly valued. Conversely, staff efficiency, despite being viewed positively, has potential for improvement. Testing the hypothesis proves that technology driven by artificial intelligence vastly improves the process of building library collections, while recommendation systems immensely increase user engagement. Furthermore, the mediation impact of staff efficiency highlights the fact that artificial intelligence not only directly improves user engagement but also increases it by boosting staff effectiveness. The model fit indices provide further evidence that the structural model provides a reliable and accurate depiction of the interactions that occur between the components. The results of the research show that the use of AI in libraries improves collecting methods, increases user engagement, and has a major influence on operational effectiveness., therefore establishing AI as a revolutionary force in the practices of future libraries.

Reference

[1] L. Husni and A. Armizawati, "Utilization of Artificial Intelligence in Libraries as a Form of Library Development," … *Int. Conf.* …, pp. 79–85, 2024, [Online]. Available: https://proceeding-perpus.uinib.ac.id/index.php/AICIBLib/article/view/2%0Ahttps://proceeding-perpus.uinib.ac.id/index.php/AICIBLib/article/download/2/10

[2] N. Kranich, "Libraries, the Internet, and democracy," *Libr. Democr. cornerstones Lib.*, pp. 83–95, 2001.

[3] D. L. Gilton, *Lifelong learning in public libraries: Principles, programs, and people*. Scarecrow Press, 2012.

[4] A. Kaplan and M. Haenlein, "Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence," *Bus. Horiz.*, vol. 62, no. 1, pp. 15–25, 2019.

[5] M. I. Jordan and T. M. Mitchell, "Machine learning: Trends, perspectives, and prospects," *Science (80-.).*, vol. 349, no. 6245, pp. 255–260, 2015.

[6] M. N. Islam and H. Guangwei, "Trends and Patterns of Artificial Intelligence Research in Libraries: A Bibliometric Analysis," *SAGE Open*, vol. 15, no. 2, pp. 1–21, 2025, doi: 10.1177/21582440251327528.

[7] P. Kumar and Jyoti, "Reshaping the library landscape: Exploring the integration of artificial intelligence in libraries," *IP Indian J. Libr. Sci. Inf. Technol.*, vol. 9, no. 1, pp. 29–36, 2024, doi: 10.18231/j.ijlsit.2024.005.

[8] E. D. Orubebe, E. A. Oloniruha, and B. D. Oladokun, "Adoption and utilization of artificial intelligence in academic libraries: Challenges and opportunities in developed and developing nations," *Int. J. Knowl. Content Dev. Technol.*, pp. 1–13, 2024.

[9] K. A. Owolabi, N. C. Okorie, O. E. Yemi-Peters, S. O. Oyetola, T. O. Bello, and B. D. Oladokun, "Readiness of academic librarians towards the use of robotic technologies in Nigerian university libraries," *Libr. Manag.*, vol. 43, no. 3–4, pp. 296–305, 2022, doi: 10.1108/LM-11-2021-0104.

[10] J. M. Reitz, "ODLIS Online dictionary for library and information science," 2017.

[11] R. Article and A. Info, "Uluslararası Sosyal ve Beşeri Bilimler Dergisi International Journal of Social Sciences & Humanities," vol. 9, no. 2, pp. 59–74, 2025.

[12] Y. Wang and T. A. Dawes, "The next generation integrated library system: A promise fulfilled," *Inf. Technol. Libr.*, vol. 31, no. 3, pp. 76–84, 2012, doi: 10.6017/ital.v31i3.1914.

[13] A. A. Kinengyere, "Meeting: 100. Continuing Professional Development and Workplace Learning with New Professionals SIG," *Contin. Prof. Dev.*, pp. 1–16, 2009.

[14] R. Basak, P. Paul, S. Kar, I. H. Molla, and P. Chatterjee, "The future of libraries with AI: Envisioning the evolving role of libraries in the AI era," in *AI-Assisted Library Reconstruction*, IGI Global Scientific Publishing, 2024, pp. 34–57.

[15] A. Gasparini and H. Kautonen, "Understanding Artificial Intelligence in Research Libraries: An Extensive Literature Review," *Lib. Q.*, vol. 32, no. 1, pp. 1–36, 2022, doi: 10.53377/lq.10934.

[16] M. Garnier, M. Cussac, C. Delaune, C. Espy, and L. Papon-Vidal, "The Pivotal Role of Libraries in Sustainable AI Development," *Can. J. Inf. Libr. Sci.*, vol. 47, no. 2, pp. 137–149, 2024, doi: 10.5206/cjils-rcsib.v47i2.17699.

[17] Chandramani Kailash Gajbhiye, "Impact of Artificial Intelligence (AI) in Library Services," *Int. J. Multidiscip. Res.*, vol. 6, no. 3, pp. 1–13, 2024, doi: 10.36948/ijfmr.2024.v06i03.22452.

[18] A. Wheatley and S. Hervieux, "Artificial intelligence in academic libraries: An environmental scan," *Inf. Serv. Use*, vol. 39, no. 4, pp. 347–356, 2020, doi: 10.3233/ISU-190065.

[19] B. Ram, A. Kumar, and S. K. Pal, "Applications of the internet of things in library and data privacy," *IP Indian J. Libr. Sci. Inf. Technol.*, vol. 8, no. 1, pp. 14–19, 2023.

[20] D. M. S. G. Rathod, "The Rise of Smart Libraries: Integrating IoT, Cloud Services, and AI for Next-Gen Learning Spaces," *Int. J. Res. Libr. Sci.*, vol. 11, no. 2, pp. 211–226, 2025, doi: 10.26761/ijrls.11.2.2025.1883.

[21] S. K. Jha, "Application of artificial intelligence in libraries and information centers services: prospects and challenges," *Libr. hi tech news*, vol. 40, no. 7, pp. 1–5, 2023.

[22] R. K. Das and M. S. U. Islam, "Application of artificial intelligence and machine learning in libraries: a systematic review," *arXiv Prepr. arXiv2112.04573*, 2021.

[23] M. K., "A Study on Impact of Artificial Intelligence (AI) on Library Services," *Int. J. Res. Libr. Sci.*, vol. 9, no. 4, pp. 189–199, 2023, doi: 10.26761/ijrls.9.4.2023.1696.

[24] N. A. Aqilah Mohd Sapri, A. N. Zanol Rashid, and W. A. M. Ahmad Tarmizi, "Leveraging AI for Effective Content Marketing in Libraries: Maximizing User Engagement," *Int. J. Res. Innov. Soc. Sci.*, vol. VIII, no. IX, pp. 3510–3521, 2024, doi: 10.47772/ijriss.2024.8090293.

[25] S. N. Satheesh, V. A. Rinsey Antony, S. Anantharaman, and R. C. Ashraf, "Artificial Intelligence in Library Services: Enhancing Access, Operational Efficiency, and User Experience," *Libr. Prog. Int.*, vol. 44, no. 3, pp. 5838–5843, 2024.

[26] D. Kamal Gulati and B. Unhelkar, "The Future of Social Sciences Research: AI-Driven Innovations in Library and Information Science," *Libr. Prog. Int.*, vol. 44, no. 2, pp. 422–428, 2024.

[27] A. Subaveerapandiyan, "DigitalCommons @ University of Nebraska - Lincoln Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library Operations Review," no. August 2023, pp. 6–24, 2023, doi: 10.6084/m9.figshare.22573345.v1.

[28] A. A. Adewojo, O. B. Amzat, and H. S. Abiola, "AI-powered libraries: enhancing user experience and efficiency in Nigerian knowledge repositories," *Libr. Hi Tech News*, vol. 42, no. 2, pp. 12–16, Dec. 2024, doi: 10.1108/LHTN-08-2024-0142.

[29] D. P. SK Kannaujia, PK Verma, SK Verma, *AI-Powered Revolution: Automating InformationManagement in Libraries*. 2024.

[30] D. Mondal, "AI Powered Libraries: Charting the Future of Information Services," 2025.

[31] L. Ding, G. Antonucci, and M. Venditti, "Unveiling user responses to AI-powered personalised recommendations: a qualitative study of consumer engagement dynamics on Douyin," *Qual. Mark. Res. An Int. J.*, vol. 28, no. 2, pp. 234–255, Dec. 2024, doi: 10.1108/QMR-11-2023-0151.

[32] R. Sivasankari, S. Suriya, S. Sindhu, J. S. Devi, and J. Dhilipan, "AI-powered recommendation systems and resource discovery for library management," in *Applications of artificial intelligence in libraries*, IGI Global Scientific Publishing, 2024, pp. 223–244.

[33] Erdal Ozcelik, "Analysing the Role of AI-powered Recommender Systems in Enhancing Customer Engagement in Online Marketplaces: Developing A Product Recommendation System," pp. 1–23, 2024.

[34] P. Meesad and A. Mingkhwan, "AI-Powered Smart Digital Libraries BT - Libraries in Transformation: Navigating to AI-Powered Libraries," P. Meesad and A. Mingkhwan, Eds., Cham: Springer Nature Switzerland, 2024, pp. 391–428. doi: 10.1007/978-3-031-69216-1_10.

[35] Ugochukwu Francis Ikwuanusi, Peter Adeyemo Adepoju, and Chinekwu Somtochukwu Odionu, "AI-driven solutions for personalized knowledge dissemination and inclusive library user experiences," *Int. J. Eng. Res. Updat.*, vol. 4, no. 2, pp. 052–062, 2023, doi: 10.53430/ijeru.2023.4.2.0023.

[36] R. Sundar M, P. L, R. M. – Ece, and D. K. Meena, "Role of Artificial Intelligence in Modern Education," vol. 4, pp. 396–410, 2025, doi: 10.51767/ic250444.

[37] M. N. Islam *et al.*, "Application of artificial intelligence in academic libraries: a bibliometric analysis and knowledge mapping," *Discov. Artif. Intell.*, vol. 5, no. 1, 2025, doi: 10.1007/s44163-025-00295-9.