Artificial Intelligence: An Essential Component for Libraries in the Digital Age (A Literature Review)

Artificial Intellegence sebagai Kebutuhan Perpustakaan pada Era Teknologi Informasi (A Literature Review)

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Abstract

Background/Problem Statement: *Information technology induces profound transformations in individuals' approaches to information retrieval, enabling libraries to enhance their services through the integration of these technological advancements. The integration of technology-driven services, including Artificial Intelligence, presents a potential avenue for enhancing library offerings. Nonetheless, libraries are unable to adopt AI without adequate preparation.* ***Purpose:*** *to enhance exploration concerning the applications of AI services within the library context and the necessary preparations required.* ***Method:*** *This study utilized a literature review methodology, examining scholarly articles concerning Artificial Intelligence in library services published from 2020 to 2025. The chosen literature was sourced from esteemed academic databases and examined using thematic content analysis to uncover applications of AI and factors related to library readiness.* ***Result:*** *The findings of this research highlight various domains within AI that can be utilized in libraries, including natural language recognition, computer vision, speech recognition, and robotics. The establishment of the library for the implementation of AI involves the allocation of resources, consideration of user needs, attention to hardware and software elements, and support from a sufficient network infrastructure.* ***Conclusion:*** *The study arrives at the conclusion that AI has emerged as an essential component for libraries in the age of information technology. Nonetheless, effective execution hinges on the preparedness of the organization, encompassing fiscal backing, personnel resources, technological frameworks, and service planning centered around user needs.*

Keywords: *Artificial Intelligence;* Information Technology*; Library*

Abstrak

Latar Belakang/Permasalahan: Teknologi informasi membawa perubahan yang signifikan terhadap kebiasan masyarakat dalam mencari informasi, maka perpustakaan dapat menggunakan teknologi informasi dalam meningkatkan layanannya. Kebutuhan akan layanan yang berbasis teknologi seperti *Artificial Intellegence* menjadi pilihan dalam meningkatkan layanan di perpustakaan. Kesiapan Organisasi dalam penerapan pengunaan AI di layanan sangat membantu dalam hal pengunaan teknologi informasj hanya saja sedikit yang menggunakan AI di perpustakaan. Akan tetapi perpustakaan tidak dapat menerapkan AI jika dalam persiapan akan hal tersebut tidak diusahakan. **Tujuan**: bertujuan untuk dilakukan pendalaman penelitian terkait layanan apa saja yang dapat diterapkan dengan AI di perpustakaan kemudian hal apa saja yang perlu dipersiapkan. **Metode**: Studi ini menggunakan pendekatan tinjauan pustaka dengan menganalisis artikel-artikel ilmiah terkait Kecerdasan Buatan dalam layanan perpustakaan yang diterbitkan antara tahun 2020–2025. Pustaka yang dipilih diperoleh dari basis data akademik yang bereputasi dan dianalisis melalui analisis konten tematik untuk mengidentifikasi aplikasi AI dan faktor kesiapan perpustakaan. **Hasil**: bidang-bidang AI yang dapat diterapkan di perpustakaan, seperti pengenalan bahasa alami, visi komputer, pengenalan percakapan, dan robotika. Adapun persiapan dari perpustakaan itu sendiri dalam menerapkan AI dapat dengan mengalokasikan biaya, memperhatikan pengguna perpustakaan, memperhatikan komponen-komponen perangkat keras dan lunak, kemudian dibantu dengan jaringan yang memadai. **Kesimpulan**: Ketersediaan teknologi informasi ini tidak menutup kemungkinan perpustakaan memiliki potensi untuk terus

berkembang secara dinamis dan akhirnya *Artificial Intellegence* dapat diterapkan di perpustakaan.

Kata kunci: Artificial Intellegence; Teknologi Informasi; Perpustakaan

I. INTRODUCTION

Background. The application of AI in libraries is not intended to replace librarians. Rather, AI serves as a strategic tool to create a more inclusive, adaptive, and efficient digital library ecosystem that serves the public in the information age.

The incorporation of Artificial Intelligence (AI) in libraries is redefining their function from a physical collection of books to an interactive digital information hub. This technology is utilized to automate the technical responsibilities of librarians while enhancing search precision for users.

The advancement of information technology has enabled the shift of technical activities to electronically based management systems, usually known as automation. Recent technology breakthroughs increasingly prioritize automation because of the rapidity, precision, and convenience of the outcomes achieved. It is widely acknowledged that nearly all facets of contemporary life are inextricably linked to advancements in information technology. The application of information technology has become predominant in addressing societal requirements (Widianto, 2021). In this setting, libraries must innovate in the advancement of their collections and information services.

The implementation of AI in library services aims to enhance the user experience by transitioning from manual search methods to intelligent, autonomous digital interactions. This technology minimizes information retrieval duration and offers tailored service.

The accessibility of information in the Industry 4.0 era has facilitated more efficient information retrieval for society. The paradigm of library users has transitioned from perceiving libraries as conventional information reference centers to recognizing digital-based information sources as key references. Users often favor information technology for information-seeking endeavors due to its enhanced efficiency and effectiveness in obtaining data. A prevalent sort of Artificial Intelligence (AI) utilized by the public is Google (Tjiptasari, 2022).

Library information providers must adapt to consumers' demands and comprehend their entire information-seeking activities (Hidaya, 2020). The material offered is anticipated to correspond with users' needs, ensuring that libraries continue to be pertinent information providers in the contemporary era. The myriad processes associated with library administration may result in inefficiency and employee fatigue. Accelerated technological progress has broadened operational domains, thereby requiring the integration of artificial intelligence (Wirawan, 2017). The implementation of Artificial Intelligence can provide a solution for libraries in offering information services to users (Khulzannah et al., 2023).

Artificial Intelligence denotes intelligence synthesized using computer science (Chhaya et al., 2020). Libraries embody an environment with considerable potential for AI integration, since AI has been utilized across diverse sectors, including education, healthcare, information and communication technology, licensing, transportation, and other specialized disciplines (Yusriadi et al., 2023). Consequently, it is fitting for libraries to innovate and integrate Artificial Intelligence into their services.

Problems. Libraries continuously adapt in reaction to contemporary developments, as they are intrinsically linked to the rapid progress of information technology (Nurqolbi, 2023). Society's growing need for convenience and practicality influences consumer

expectations regarding library services. Thus, libraries may employ AI to adapt to technology advancements and improve information service delivery.

Nonetheless, the necessity for libraries to integrate Artificial Intelligence poses a conundrum, as some libraries remain inadequately equipped for AI implementation. Moreover, identifying the functional domains most appropriate for AI application poses a considerable problem before deployment. This study seeks to equip library managers with insights on the integration of AI in library settings as an essential component of the information technology era (Prasetio & Winanda, 2023).

Prior research mostly focused on AI applications and technological dimensions within libraries. Nevertheless, insufficient focus has been directed upon library preparedness, organizational prerequisites, and the requisite resources for AI implementation.

Previous Literature Review. The initial pertinent study was executed by Athanasia Octaviani Puspita Dewi, titled Artificial Intelligence as a New Concept in Libraries. The research indicated that numerous libraries have yet to adopt AI as a service that provides concrete advantages. The research elucidates the advantages of AI in libraries and delineates possible uses of AI inside library services. The results delineate several library functions that can be enhanced by the use of AI (Dewi, 2020).

The second study, authored by Edward Luca, Bhuva Narayan, and Andrew Cox, titled Artificial Intelligence and Robots for Librarianship and Information Professions, underscores the profound influence of the industrial revolution on human behavioral patterns resulting from technological progress. Libraries and various industries are more reliant on technology as society becomes more digitally oriented. Consequently, libraries must evolve to maintain relevance and strengthen their connection with users. The findings delineate technological practices in libraries, specifically several facets of AI and robotics, along with their ramifications for library patrons (Luca et al., 2022).

The third study, authored by Chhaya A. Khanzode and Dr. Ravindra D. Sarode, titled Advantages and Disadvantages of Artificial Machine Intelligence Learning: A Literature Review, examines the swift advancement of AI in libraries and information centers. Artificial intelligence is employed to tackle intricate issues and is typically defined as machines or systems designed to execute intelligent functions. Nevertheless, the application of AI necessitates an evaluation of its benefits and constraints. Consequently, the study delineates the advantages and disadvantages of Artificial Intelligence and Machine Learning to facilitate more efficient implementation in libraries and information centers (Chhaya A. Khanzode, 2020).

Artificial Intelligence is characterized as the capacity of technological devices to do acts that exhibit intelligent behavior, communication, and conduct akin to human intelligence (Rooney, 2019). Artificial Intelligence encompasses the design and development of computer systems to execute activities necessitating human intelligence, such as speech recognition, decision-making, visual perception, language translation, communication, and emotional recognition (Hasfera, 2023).

According to the researched literature, AI is an information technology product that emulates human intellect and can execute technical tasks with efficiency and effectiveness. The information technology era provides numerous options for technological utilization that improve performance across diverse domains of life. This age signifies socio-cultural transformations wherein society increasingly relies on technology, facilitating its use across several fields. Such environments foster ongoing innovation in reaction to swiftly evolving circumstances (Kurnia & Edwar, 2021). This corresponds with the present state of libraries, which have much potential to evolve in tandem with breakthroughs in information technology.

The advent of information technology has profoundly influenced library management and development. Efficiently operated libraries necessitate strategic planning to harmonize information technology and digitalization, encompassing effective management systems,

learning-support applications, functional system integration, and electronic management (Suti et al., 2020).

State of the art. Given the significance of AI adoption in libraries, it is essential to ascertain the characteristics that facilitate its implementation. In actuality, the preparation for AI integration is a challenging endeavor (Genesius et al., 2021). While most libraries currently employ information technology, the integration of AI as a supportive function in library operations remains limited. This article expands upon prior research by concentrating on the necessities of libraries and delineating the prerequisites for AI implementation. Although prior studies have shown that AI may be utilized in multiple library functions, insufficient focus has been placed on the preparatory elements necessary for its implementation.

Novelty. While current research has demonstrated the potential and uses of AI, the majority predominantly emphasize technological dimensions. Conversations regarding library preparedness, especially concerning institutional requirements, infrastructure, and ancillary resources, are still insufficient. Successful AI implementation relies not just on technological advancement but also on thorough organizational preparedness. This gap is the scientific originality of the current work.

Purpose. This study seeks to ascertain the necessity of Artificial Intelligence in libraries and evaluate the preparedness criteria essential for its successful implementation. The AI technology gap in libraries explores its impact on service delivery, operational efficiency, and user engagement, offering solutions for sustainable AI inclusion in modern library settings.

This research aims to investigate the imperative role of AI in libraries, including an analysis of the preparedness procedures for integrating Artificial Intelligence in the contemporary information technology landscape.

II. METHOD

This study utilizes a descriptive research methodology through a library research strategy. The research is performed by an examination of various scholarly journals pertinent to the study's subject matter. The principal data utilized comprises study findings from prior investigations that correspond with the data requisites of this investigation.

The research methodology comprises multiple phases. The researcher initially chooses and gathers articles that substantiate the research topic. The chosen journals are meticulously examined to find and extract pertinent key points for the study. Third, an analytical method is undertaken to confirm that the topic discussed signifies a progression or enhancement of prior research. The results from these procedures are documented, processed, and summarized to formulate conclusions (Mubarok, 2021).

Library research encompasses four primary stages from a technological standpoint. Initially, assemble research instruments and resources. The equipment comprise writing instruments and note-taking supplies, whilst the research resources encompass books, journals, and scholarly works pertinent to the research topic. Notes are recorded during the reading process to avert knowledge loss. Secondly, creating a functional bibliography to document the primary sources intended for research purposes. Third, properly managing time by designating certain periods within daily routines for research work, thereby sustaining focus and assuring consistent research advancement. Fourth, engaging in reading and compiling research notes. At this stage, the researcher identifies pertinent texts, examines them meticulously, gathers information, and systematically organizes it in accordance with the study framework to attain best results (Zed, 2017).

References were selected because they specifically discussed Artificial Intelligence implementation, digital transformation, and information technology utilization in library environments. The majority of the selected articles were published in peer-reviewed

journals indexed in reputable databases such as Scopus, DOAJ, SINTA, and other recognized academic publishers.

Conversely, publications that did not specifically address AI applications in libraries, lacked sufficient methodological information, were duplicate records, or consisted solely of opinion pieces without academic evidence were excluded from the review. Through this selection process, the study aimed to ensure that the literature analyzed was relevant, credible, and capable of providing comprehensive insights into the necessity of Artificial Intelligence and the readiness factors required for its implementation in library environments.

Figure 1.
Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Topic	AI, library services, digital libraries, informat	Non-library AI studies
Publication Year	2020–2025	Before 2020
Document Type	Peer-reviewed journals, conference papers, a	Editorials, news articles, opinion pieces
Language	English, Indonesian	Other languages
Accessibility	Full text available	Abstract only
Quality	Indexed/reputable academic sources	Non-academic websites

In Figure 1. The chosen literature was then examined through thematic content analysis. The analyzed papers were classified into various areas, encompassing AI applications in libraries, technological infrastructure needs, organizational preparedness, human resource readiness, opportunities, and implementation obstacles. Comparable findings were amalgamated to discern repeating trends, construct research arguments, and derive conclusions concerning the imperative role of Artificial Intelligence in libraries during the information technology era.

III. RESULT AND DISCUSSION

This section is designed to fulfill the research objectives, namely to investigate the necessity of integrating Artificial Intelligence (AI) in libraries and to delineate the elements that must be established for its effective implementation in the information technology era. The discourse connects the findings from the literature review to pertinent theories and prior research outcomes.

The Role of Information Technology in Libraries. The advancement of information technology has profoundly influenced libraries as purveyors of information. Concurrently, the requirements of library users have grown more intricate owing to advancements in information technology. Library administrators, especially librarians, must provide exceptional and high-quality services to patrons.

Societal demands are perpetual and interrelated, and contemporary existence is inextricably linked to information and communication technology, which facilitates the dissemination of knowledge and underpins constant professional endeavors. Technology in libraries enhances the delivery of public services, including information search, circulation, and reference services. It additionally facilitates library functions, encompassing acquisition, processing, classification, topic heading identification, and cataloging. Moreover, technology streamlines administrative functions, including correspondence management and the documentation of library equipment and infrastructure.

Technological advancements enhance the effectiveness and efficiency of reporting procedures by facilitating swift data editing and updating. Furthermore, technology mitigates constraints associated with storage and physical space. Comprehensive

implementation of technology allows for the repurposing of library rooms for leisure or discussion activities (Putri et al., 2023).

The utilization of information technology yields beneficial value for libraries. Historically, libraries were regarded as musty spaces stuffed with books, and librarians were seen primarily as custodians of literature. The integration of information technology has converted libraries from conventional establishments into contemporary ones. This shift has resulted in the emergence of many types of libraries, including electronic, digital, cyber, and virtual libraries (Naila, 2018).

The swift evolution of information technology is characterized by accelerated and simplified methods of information processing, distribution, and retrieval. The integration of information technology in libraries signifies its advancement and evolution. It also fosters innovation in library services, processing systems, and information distribution (Nurulauni et al., 2022).

In this regard, information technology serves as a crucial prerequisite for the deployment of AI in libraries. Optimal AI implementation is unattainable without sufficient digital systems. Consequently, information technology readiness functions as a preliminary gauge of a library's capability to implement AI.

Library Readiness in Implementing Artificial Intelligence. The integration of AI in libraries necessitates meticulous planning to prevent failure or unforeseen setbacks. In this context, organizational culture is essential for establishing and maintaining a library's competitive advantage in the face of swiftly advancing technological developments.

Libraries must allocate financial resources to sustain its information technology infrastructure, facilities, and equipment. Moreover, certain elements must be taken into account to facilitate expedited library development. Initially, the accessibility of information technology must correspond with the attributes and requirements of library users to guarantee significant advantages. Secondly, hardware serves to receive and transform input into precise and correct information. The selection of hardware must take into account the library's internal human resources to provide optimal functionality and reduce dependency-related hazards.

Third, software pertains to systems engineered to fulfill the requirements of library users. Multiple criteria must be assessed when considering software as an information system. Fourth, networks: the provision of hardware and software must be underpinned by dependable networks that link systems and transmit information to consumers. Fifth, data: data are the fundamental material for information processing and embody facts as characters, numbers, or symbols. Data are crucial for converting basic inputs into significant information (Hartono, 2017).

The literature review demonstrates that a library's preparedness for AI implementation relies on both technological availability and organizational preparation, together with supporting resources. Essential elements encompass budget distribution, personnel preparedness, hardware and software accessibility, and sufficient network support.

Budget allocation is essential as AI installation necessitates a substantial initial investment for infrastructure acquisition and system upkeep. Moreover, comprehending user attributes and requirements is crucial to guarantee that AI technologies deliver tangible advantages to library patrons. This aligns with (Hartono, 2017) who emphasizes that information systems are effective only when designed according to user needs.

Utilization of Artificial Intelligence in Libraries. Artificial Intelligence is a discipline within computer science dedicated to the automation of intelligent behavior. It can also be characterized as a domain that encompasses the processing, modeling, and storage of human intelligence into information technology systems, hence facilitating decision-making processes equivalent to those executed by humans. Artificial Intelligence incorporates advancements in computer science by infusing intelligence into computers via information

transmission, modeling, and storage, while connecting these processes with technical systems (Dewi, 2020).

Artificial intelligence functions as an instrument for executing tasks conventionally performed by people. It possesses the ability for quick learning and astute adaptability to environmental requirements. Artificial intelligence possesses considerable potential to revolutionize public administration, especially in intricate processes. Advancements in artificial intelligence for administrative data collecting and information transfer offer novel methodologies for managing extensive datasets. Artificial intelligence applications have been implemented across multiple sectors, including education, healthcare, information and communication technology, licensing, transportation, and economic services (Yusriadi et al., 2023).

Libraries and information services, akin to other sectors, are poised for transformation through AI and robotics. Artificial intelligence has significantly impacted information retrieval and recommendation systems, hence influencing data literacy and AI literacy. As user contexts progress with AI, the functions of library and information services must also evolve. New AI applications in scientific research impact scholarly communication and associated support services. Several libraries have already used AI-driven operations, including machine learning technology for activities including automatic clustering and classification of resources, linking collections, weeding collections, and employing robots for book retrieval (Luca et al., 2022)

Information technology is essential for facilitating the implementation of AI in libraries. Various AI domains relevant to libraries encompass natural language processing for translating foreign-language collections into Indonesian; computer vision for the automatic identification of book descriptions via cameras; speech recognition, akin to Google Voice, for recognizing spoken queries and retrieving pertinent information; and robotics for book retrieval and the identification of classification numbers on shelves (Dewi, 2020).

These AI tools allow libraries to remain abreast of technology changes. While numerous AI domains are feasibly implementable, libraries must prioritize their fundamental functions. Thorough execution necessitates sufficient preparation of all ancillary components. As technology advancements progress, libraries are anticipated to evolve correspondingly. Consequently, proficient management of library resources is crucial to maintain the relevance and sustainability of libraries in modern society.

Discussion of Research Findings. The AI-driven literature review approach in libraries emphasizes the incorporation of artificial intelligence techniques to accelerate the systematic identification, selection, mapping, and synthesis of scholarly articles. In the digital era, contemporary libraries offer access to academic databases and AI-driven information literacy guidelines to assist scholars in identifying research gaps while maintaining academic integrity.

The results demonstrate that AI technologies have dramatically altered the literature review process by enhancing the speed and efficiency of information retrieval, allowing academics to examine extensive quantities of scholarly articles in a reduced timeframe. AI-driven solutions provide automated keyword extraction, citation analysis, topic modeling, semantic search, and trend identification, thus enhancing the comprehension of current research landscapes.

The results corroborate Dewi (2020), who recognized many AI applications in libraries, such as natural language processing and robotics. This study builds upon prior research by highlighting organizational preparation as essential for effective AI implementation.

Moreover, the results align with the assertions of Luca et al. (2022), who contended that AI revolutionizes information services and librarianship methods. This study emphasizes the significance of financial, infrastructural, and human resource preparedness, in contrast to earlier research that concentrated mostly on technology innovation.

Artificial intelligence can aid libraries in information administration, user service provision, and enhancing collection management efficacy. AI can be employed to

authenticate indexing, search, and browse information content, while also enhancing the user experience. Libraries presently possess the capacity to integrate AI.AI implementations in libraries encompass automated book purchase, serial control, cataloging, information retrieval and dissemination, circulation, cooperative acquisitions, and interlibrary lending (Tupan, 2025).

The findings indicate that library administrators ought to formulate strategic strategies for AI adoption that align technology investment with staff development.

In the digital era, modern libraries progressively offer access to academic databases and AI-driven information literacy resources to assist users in identifying research gaps while upholding academic rigor and authenticity. The findings indicate that libraries are transforming from conventional information repositories into sophisticated research support centers that utilize AI to improve knowledge discovery and evidence synthesis. AI solutions diminish manual screening efforts, enhance the precision of article relevance evaluations, and facilitate the visualization of research networks and developing academic trends.

The study identifies several challenges related to AI adoption in library services, including issues of algorithm transparency, potential biases in AI-generated recommendations, disparities in digital literacy among users, and the necessity for librarian competencies in AI-assisted research support. Notwithstanding these obstacles, the findings indicate that AI possesses significant potential to enhance library services by augmenting research productivity, facilitating informed decision-making, and enabling more efficient detection of research gaps across many academic fields.

Research Limitations. This research possesses numerous limitations. Initially, it utilizes a library research methodology, indicating that the results are significantly contingent upon the quality and breadth of the material examined. Secondly, the study lacks empirical field data, including case studies or direct observations of libraries that have used Artificial Intelligence. Consequently, the findings may not entirely reflect the actual circumstances of AI implementation in libraries.

IV. CONCLUSION

The discussion concludes that the integration of Artificial Intelligence in libraries is an essential requirement aligned with advancements in information technology. Artificial intelligence possesses considerable potential to augment the efficacy and efficiency of library services, especially in collection administration, information retrieval, and user services.

The successful adoption of AI is contingent upon libraries' preparedness in several supporting areas, including budget allocation, human resource readiness, hardware and software availability, and sufficient network infrastructure. Inadequate and hasty preparation may hinder optimal AI implementation.

Consequently, libraries must formulate cohesive strategic plans to guarantee that the application of Artificial Intelligence significantly enhances library services and fortifies their positions as pertinent information suppliers in the technological age.

Given these constraints, it is advisable for future study to utilize empirical methodologies, like case studies, surveys, or comprehensive interviews with libraries that have adopted or are in the process of adopting Artificial Intelligence. Future research may utilize the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovations Theory (DOI), or the Technology–Organization–Environment (TOE) framework to elucidate the determinants affecting AI adoption and implementation in library contexts. These theoretical frameworks can offer profound insights into users' acceptance of AI technologies, organizational preparedness, technological competencies, and environmental factors influencing AI implementation. Thus, next research is anticipated to offer more extensive contributions to the progression

of library and information science, enhance theoretical discourse on technology adoption, and bolster evidence-based library administration practices in the digital age. Subsequent research may concentrate on evaluating librarians' human resource preparedness for AI adoption and investigating the effects of AI implementation on user satisfaction and information-seeking behavior. Thus, next research is anticipated to provide more extensive contributions to the advancement of library and information science as well as library management practices in the digital age.

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