

HARNESSING ARTIFICIAL INTELLIGENCE FOR 21ST CENTURY KNOWLEDGE ORGANISATION SERVICES IN LIBRARIES

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Abstract

The rapid advancement of Artificial Intelligence (AI) has significantly transformed knowledge organisation and information services across various sectors, including libraries. This paper examines harnessing artificial intelligence for 21st Century knowledge organisation services in libraries, highlighting their effect on information retrieval, user experience, and operational efficiency. It explores key AI applications such as machine learning, natural language processing, and chatbots in library environments. The study also discusses challenges including ethical concerns, data privacy, and skill gaps among librarians. The study methodology involved conducting a comprehensive systematic review of the literature to identify published academic literature relevant to the research topic. The literature was organised according to the four objectives of the study and described in sufficient detail to provide a comprehensive account of what is known about the use of AI for knowledge organisation in libraries. The paper concludes that while AI enhances knowledge organization, service delivery and positions libraries as intelligent knowledge hubs. Its successful adoption and use require strategic planning, policy frameworks, and continuous professional development of the library staff. Recommendations for both practice and responsible adoption and use of artificial intelligence were suggested.

Keywords: Artificial Intelligence, Harnessing, Knowledge Organisation Services, Libraries.

Introduction

Libraries have historically functioned as custodians of knowledge and pivotal hubs for the dissemination of information. Nonetheless, the advent of the digital era and the unprecedented surge in information volume have compelled the adoption of innovative methodologies for service delivery. Artificial Intelligence (AI), conceptualized as the emulation of human cognitive processes in machines, has emerged as a disruptive influence in contemporary librarianship (Oname and Alex-Nmecha, 2020). In the 21st century, libraries are evolving from mere passive providers of information to proactive, user-oriented systems of knowledge. AI technologies present substantial opportunities to augment operational efficiency, enhance accessibility, and deliver customized services.

Artificial Intelligence represents a specialized domain within computer science, aiming to develop sophisticated machines capable of executing tasks typically requiring human cognitive abilities (Copeland 2024), including but not limited to learning, reasoning, problem-solving, perception, language comprehension, and decision-making. The field of AI encompasses a diverse array of methodologies, such as robotics, computer vision, machine learning, and natural language processing. AI is fundamentally transforming the organization of informational resources within libraries by reshaping the processes of categorization, maintenance, and accessibility of these resources.

Kalisdha (2024) asserts that AI exerts a substantial impact on the structuring of informational sources in libraries, enhancing both the efficiency and accuracy of information retrieval. AI systems possess the capability to autonomously generate metadata, identify patterns within extensive datasets, and classify informational resources through the application of machine learning algorithms. This automated approach facilitates the expeditious completion of cataloguing and indexing responsibilities, thereby liberating librarians to focus on more advanced tasks, such as curating specialized collections and providing personalized services to patrons. Furthermore, the utilisation of

AI-driven information organization systems can significantly augment the consistency and quality of metadata by rectifying errors and inconsistencies that arise from manual classification processes (Ali *et al.*, 2023).

As posited by Abimbola (2024), AI algorithms possess the capability to adapt and evolve over time, assimilating feedback and user interactions to enhance the relevance and precision of search results. This adaptive intelligence facilitates the organization of information sources in a manner that is more centered on the user by aligning library resources with the evolving needs and preferences of library communities. Organizations of information sources driven by artificial intelligence not only enhance productivity but also foster innovation in the realms of information access and discovery (Jarrahi *et al.*, 2022).

AI systems equipped with natural language processing capabilities can understand and interpret user inquiries with greater nuance, thus enabling semantic search and improving contextual relevance. This capability allows users to identify pertinent resources more efficiently, even when their queries are intricate or ambiguous. Artificial intelligence augments libraries' capacity to effectively manage and utilize their information resources by automating labor-intensive tasks and providing valuable insights. By alleviating challenges such as linguistic barriers and information saturation, AI-driven knowledge organizations contribute to the democratization of access to information (Lowa, 2024).

Multilingual AI systems can facilitate the discovery and distribution of content in multiple languages, increasing the reach of academic resources to a worldwide audience. Additionally, AI systems that can filter and prioritize content based on relevance and dependability help users navigate the abundance of knowledge found in digital archives (Okunlaya *et al.*, 2024). The organization of knowledge in libraries is significantly impacted by AI's contribution to data integration and metadata enrichment. By extracting crucial information from multimedia assets, including as images, videos, and audio files, AI-driven systems can improve metadata (ExLibris, 2024). Digital assets become more

discoverable and contextual because to this improved metadata, which facilitates cross-referencing different resource types and multidisciplinary research.

AI-driven data integration techniques have also made it possible for libraries to integrate and harmonize various data sources, including external databases, digital repositories, institutional repositories, and library catalogues (Akinyemi, 2023). This integrated approach to information organization promotes multidisciplinary collaboration and knowledge sharing among researchers, educators, and students by making a wide range of resources easily accessible. Because of this, AI improves efficiency, accuracy, innovation, democratization, and integration, which changes the way libraries organize their knowledge. By using AI technology to optimize information discovery, administration, and dissemination processes, libraries can improve academic experience and increase knowledge generation and dissemination in higher education.

The integration of intelligent systems into libraries began in the 1990s, utilizing AI technologies to provide knowledge-based services to both library patrons and staff. Despite its complexity, AI aims to develop computer systems with human-like intelligence, significantly impacting the field of librarianship (Bashorun *et al.*, 2024).

Statement of the Problem

The rapid growth of information resources in the 21st Century has created significant challenges for libraries in the area of knowledge organization. Traditional methods of cataloguing, classification, indexing, and information retrieval are becoming increasingly inadequate in handling the large volume, variety, and complexity of both print and digital information resources. Many libraries still rely heavily on manual processes, which are often time-consuming, labour-intensive, costly, and prone to human error. As a result, users frequently experience difficulties in accessing accurate, timely, and relevant information resources.

Artificial Intelligence (AI) has emerged as a transformative technology capable of improving knowledge organization through automated cataloguing, metadata generation, intelligent indexing,

semantic searching, and enhanced information retrieval systems. Despite these potentials, many libraries, particularly in developing countries, have not fully harnessed AI technologies due to inadequate infrastructure, lack of skilled personnel, insufficient funding, poor technological awareness, and resistance to change. Furthermore, the inability of libraries to effectively integrate AI into knowledge organization processes may reduce service efficiency, limit users' satisfaction, and hinder libraries from meeting the evolving information needs of 21st Century users. It is therefore necessary to examine how AI can be harnessed to improve knowledge organization in libraries, identify the challenges affecting its adoption and explore strategies for effective implementation.

Objectives of the Study

The specific objectives are to:

1. identify the importance of AI in knowledge organization in libraries;
2. examine the applications of artificial intelligence for knowledge organisation in libraries;
3. determine the benefits of AI in Library Services; and
4. identify the challenges and Ethical Considerations.

Methods

The methodology involved conducting a comprehensive systematic review of the literature to identify published academic literature relevant to the research topic. The keywords and search terms used included “importance of AI knowledge organisation, applications of AI for knowledge organisation, benefits of AI in library services and challenges and ethical considerations”. The literature reviewed for this study was sourced from open-access databases and search engines such as: Google Scholar, JSTOR, Emerald Insight, ScienceDirect, PubMed Central, Taylor & Francis Online, Journal of Librarianship and Information Science, Library Philosophy and Practice (e-journals), Applied Science, Information Fusion, International Journal of Applied and Science Research, Frontiers of Artificial Intelligence, Physical Medica, Computers in Human Behavior Report, Business Horizons, Sustainable Development, The Journal of Academic Librarianship, South Africa Journal of Library and

Information Science, Library Hi Tech, Discovery of Artificial Intelligence, Journal of Information Technology and Complex and Intelligent System were equally included as relevant grey literature sources. The literature was organised according to the four objectives of the study and described in sufficient detail to provide a comprehensive account of what is known about the use of AI for knowledge organisation in libraries.

Importance of Artificial Intelligence in Knowledge Organisation in Libraries

AI-driven knowledge organizations greatly enhance library services by improving information administration and distribution efficiency, accuracy, originality, and accessibility. By using AI technology to optimize resource utilization, improve decision-making, and streamline operations, knowledge organizations can develop additional services (Kulkov *et al.*, 2023). One of AI's main implications for sustainability is its capacity to automate labor-intensive procedures including data classification, indexing, and metadata creation (Kulkov *et al.*, 2023).

By reducing errors and inconsistencies and the time and effort required for information management, this automation produces more reliable and trustworthy data repositories. This improved data quality leads to better resource allocation and decision-making, which ultimately enhances service delivery. As a result, AI-powered knowledge organizations facilitate sophisticated data analytics and knowledge creation by identifying patterns, trends, and anomalies in large datasets (Aldoseri and Hamouda, 2022). This data-driven strategy helps libraries make educated decisions that support service delivery by improving performance optimization, risk assessment, and predictive modeling. For example, AI systems can analyze energy use data to identify problem areas and implement targeted energy-saving and energy-efficient strategies.

In conclusion, AI-driven knowledge organizations are essential to the provision of services because they enable improved data management, improved decision-making, creativity and collaboration, individualized learning, moral behavior, and flexible strategies. By utilizing AI technology, libraries

can contribute to a more resilient service delivery system and produce positive environmental, social, and economic consequences through data-driven insights and automation skills (Monyela and Tell, 2024).

Artificial Intelligence Applications for Knowledge Organisation in Libraries

Numerous innovative solutions that improve accessibility, streamline processes, and improve user experiences are examples of artificial intelligence applications for information organization in libraries (Akinola, 2023). These apps leverage AI-powered techniques like data analytics, machine learning, and natural language processing to optimize resources, generate new ideas and knowledge, and streamline procedures. An overview of the existing AI applications for knowledge organization in libraries is given in this section. Digital resources including books, articles, and multimedia content can have their metadata automatically generated by AI algorithms (Akinyemi, 2024). Library collections are made more discoverable and searchable by automating tedious activities and ensuring accurate and uniform metadata.

Semantic search and recommendation systems: AI-powered semantic search engines use natural language processing (NLP) techniques to evaluate user queries and retrieve relevant content based on meaning and context (Olujimi and Ade-Ibijola, 2023). To improve random discovery and individualised learning experiences, recommendation systems use ML algorithms to propose relevant resources based on user behaviour, preferences and previous interactions.

Text mining and data extraction: Text mining and data extraction from scholarly literature can be made possible by libraries using AI technology to identify trends, gain insights, and assess research topics (Wagner *et al.*, 2021). This data-driven approach supports knowledge building, evidence synthesis, and research effect assessment.

Content organisation and personalisation: Digital material is arranged and chosen by AI-powered content curation platforms based on user preferences, study domains, and subject areas (Eg *et al.*,

2023). By personalizing content recommendations, alerts, and notifications, these systems allow users to investigate relevant resources and keep up with the most recent developments in their sectors.

Digital preservation and archiving: By automating file format conversion, integrity checks, and metadata enrichment, AI technologies support digital preservation efforts (Diaz *et al.*, 2021; Kim, 2023). AI-powered archive solutions provide the long-term accessibility and utility of digital assets, safeguarding the academic legacy and supporting future research initiatives.

Enhanced accessible formats: By transforming text into accessible formats like braille, audio, and large print, AI systems increase the inclusivity and accessibility of academic information for people with disabilities (Chemnad and Othman, 2024). These AI-driven accessibility solutions support a variety of learning methods and promote equitable access to knowledge.

Data analytics for collection management: AI-powered data analytics tools look at usage patterns, citation networks, and collection metrics to aid in collection development decisions (Litsey and Mauldin, 2017). Libraries can identify high-impact publications, evaluate their holdings' worth and influence and allocate resources more efficiently thanks to these analytics.

Virtual assistants and chatbots: By answering questions, providing guidance, and expediting the process of locating materials, AI-powered chatbots and virtual assistants provide library users with individualized, interactive support (Aboelmaged, 2024). These AI-powered assistants boost patron engagement, expedite response times, and enhance the general user experience in libraries.

Predictive analytics for user behaviour: AI systems use user behavior data to predict user preferences, interests, and information needs (Zhang *et al.*, 2020). Predictive analytics helps libraries anticipate client requirements, tailor services, and concentrate outreach initiatives, all of which improve patron satisfaction and retention.

Quality assurance and data governance: AI systems support data governance and quality assurance processes by spotting errors, inconsistencies, and compliance issues in metadata and content (Aldoseri and Hamouda, 2022). AI-powered quality control solutions increase the reliability and validity of library resources by ensuring data accuracy, consistency, and adherence to rules. These AI applications demonstrate how AI technology could transform libraries by improving scholarly collaboration, streamlining information access, and optimizing knowledge organization. By using AI-driven solutions, libraries can meet evolving user expectations, enhance their capabilities, and improve knowledge and research outcomes (Baber *et al.*, 2024). These AI techniques and technologies are now being used for information retrieval, cataloguing, and metadata enrichment.

Benefits of Artificial Intelligence in Library Services

The adoption and use of Artificial Intelligence in libraries offer several advantages:

1. Improved Efficiency: Automation of routine tasks saves time and resources.
2. Enhanced User Experience: Personalized services meet individual user needs.
3. 24/7 Accessibility: AI systems provide round-the-clock services.
4. Data-Driven Decision Making: Analytics support strategic planning.

AI-driven systems significantly improve how information is stored, retrieved, and delivered in modern libraries.

Challenges and Ethical Considerations

Data Privacy and Security: Artificial Intelligence systems rely on user data, raising concerns about privacy and data protection.

Skill Gap Among Librarians: The adoption and use of Artificial Intelligence require new technical skills, necessitating continuous professional development.

Ethical and Bias Issues: Artificial Intelligence systems may reflect biases in data, leading to ethical concerns in information access and representation.

High Implementation Costs: The deployment of Artificial Intelligence technologies requires significant financial investment and infrastructure.

Despite its potential, the integration of Artificial Intelligence in libraries presents challenges that must be addressed for effective implementation.

Future Prospects of Artificial Intelligence in Libraries

The future of libraries lies in the continued integration of AI technologies. Emerging trends include:

1. AI-driven knowledge graphs
2. Voice-assisted search systems
3. Predictive analytics for user needs
4. Integration with smart learning environments

Artificial Intelligence is expected to redefine the role of librarians as information facilitators and technology managers rather than traditional custodians of books.

Conclusion

By improving efficiency, efficacy, accessibility, and user engagement, artificial intelligence is transforming 21st Century information organisation services in libraries. The advantages exceed the drawbacks, notwithstanding ongoing difficulties like ethical dilemmas and skill deficits. To stay relevant in the digital age, libraries need to strategically embrace artificial intelligence. For implementation and service delivery to be sustainable, investments in infrastructure, training, and policy development are crucial.

Recommendations

Monyela and Tella (2024) cited numerous suggestions as recommendations for practice, such as:

1. AI-driven tools and technologies should be integrated into the existing scholarly communication platforms and research procedures in order to allow their seamless adoption and offer publishers, institutions, and researchers user-friendly interfaces. This involves developing AI-powered literature

search engines, citation management systems, and collaborative platforms to enhance research discovery, access, and collaboration.

2. There should be a call for multidisciplinary collaboration and knowledge exchange among AI researchers, domain experts, and stakeholders in the scholarly community in order to co-design and co-develop AI solutions that meet specific needs and obstacles in scholarly communication and research collaboration. This cooperative approach fosters creativity, diversity of perspectives, and ethical considerations while utilizing AI for academic purposes.

3. For AI-driven academic communication and research collaboration, ethical standards, best practices, and guidelines for data security, bias reduction, transparency, and accountability in AI algorithms and systems should be established. This ensures that AI is used appropriately and promotes fairness, inclusivity, and trust in academic research and communication practices.

4. Researchers, publishers, and academic institutions should receive continuous education and training programs that equip them with AI literacy, skills, and competencies in order to employ AI tools and technologies in scholarly communication, research collaboration, and knowledge management. This includes training in AI-enabled data analysis, ethical AI practices, machine learning, and natural language processing.

Recommendations for AI Adoption and Use in Libraries

The following recommendations were made to include:

1. Artificial intelligence should be adopted and used ethically by libraries in order to enhance services, promote diversity, and increase access to knowledge. Regarding the responsible use and application of artificial intelligence.
2. Ethics guidelines should be established and adhere to ethical rules and guidelines for the use of AI that cover topics such as responsibility, fairness, openness, data protection, and bias prevention. Verify that AI processes and systems adhere to ethical and legal standards, including data protection laws and regulations such as the GDPR. The protection of user

- privacy ought to come first. Strong data protection measures, sensitive data anonymization, obtaining informed consent prior to data collection and use, and ensuring data security throughout the whole AI lifecycle—from data gathering to processing and storage—are all necessary to achieve this.
3. User-friendly interfaces should be provided with thorough documentation, and understandable explanations of how AI algorithms work, what data they use, and the conclusions they draw in order to ensure that AI systems are transparent and explainable. Urge library users to trust and understand AI technologies.
 4. Employ strategies to lessen bias in AI algorithms and data sets, such as a variety of training data, regular audits, bias detection tools, and continuous performance monitoring of AI systems to identify and address potential biases that could influence decision-making.
 5. Ensure that a variety of users, including those with special needs or impairments, can utilise AI-powered services and products, keep accessibility and inclusivity in mind. Provide alternative access options to suit varying degrees of technological literacy.
 6. Inform library users on AI technology, including its benefits, limitations, and potential risks. Educate people on digital literacy, AI literacy, and the appropriate usage of AI-powered goods and services.
 7. Develop cooperative relationships with researchers, business partners, AI specialists, and other libraries in order to share best practices, collaborate on AI projects, and stay current on the latest developments and discoveries in AI technologies relevant to libraries. Ongoing
 8. Regular evaluation of the efficacy, impact, and ethical implications of AI applications in library services. To identify areas for development and improvement, gather user feedback, run usability tests, and monitor AI usage data.

9. Include users, employees, and members of the community in decision-making processes about the uptake and application of AI. Ask for thoughts, recommendations, and feedback to make sure AI initiatives align with the goals and values of the library community.
10. Create a framework for the library's ethical AI governance, including roles and responsibilities for AI supervision, adherence to moral principles, risk management protocols, and avenues for resolving ethical complaints or issues with AI use.

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