

# **CONCEPTUAL REVIEW OF AWARENESS, ADOPTION, AND PERCEPTION OF ARTIFICIAL INTELLIGENCE TOOLS FOR ACADEMIC LIBRARY SERVICES IN DEVELOPING COUNTRIES**

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## **Abstract**

Artificial Intelligence (AI) is increasingly transforming academic libraries by improving information organisation, enhancing service delivery, and supporting research and learning. However, awareness, adoption, and perception of AI technologies remain uneven across academic libraries in developing countries because of infrastructural, institutional, and human capacity constraints. This paper presents a conceptual review of the interrelationship among awareness, perception, and adoption of AI tools in academic libraries within developing countries. Drawing on recent literature, the paper argues that awareness provides the cognitive foundation for understanding AI technologies, perception shapes librarians' attitudes toward their usefulness and associated risks, while adoption represents the practical implementation of AI applications in library operations and services. The review further identifies institutional readiness, digital infrastructure, leadership support, funding, policy frameworks, and professional competencies as critical determinants of successful AI integration. Although awareness of AI is gradually increasing among academic librarians, adoption remains fragmented and largely experimental because of persistent technological and organisational challenges. The paper concludes that sustainable AI integration requires continuous professional development, strategic investment in digital infrastructure, supportive institutional policies, and ethical governance. The review contributes to the growing literature on AI in Library and Information Science by providing a conceptual framework for understanding the interaction among awareness, perception, and adoption within resource-constrained academic environments.

Keywords: Artificial Intelligence; Academic Libraries; Developing Countries; Awareness; Adoption; Perception; Library Services.

## **Introduction**

Artificial Intelligence (AI) has emerged as one of the most transformative technologies shaping higher education and knowledge institutions worldwide. Its growing application in academic libraries is redefining how information resources are acquired, organised, retrieved, preserved, and disseminated. Through technologies such as machine learning, natural language processing, predictive analytics, intelligent chatbots, and recommender systems, AI has significantly enhanced the efficiency and quality of library services. Consequently, academic libraries are increasingly embracing AI as a strategic tool for improving user experience, supporting research, and strengthening knowledge management in the digital age.

Despite these advances, the pace and extent of AI integration vary considerably across countries and institutions. Academic libraries in many developing countries continue to face significant challenges, including inadequate funding, poor ICT infrastructure, limited technical expertise, unstable electricity supply, and weak institutional policies. These constraints influence not only the availability of AI technologies but also librarians' awareness, perceptions, and willingness to adopt innovative digital solutions. Although awareness of AI has improved through professional development programmes, conferences, online learning platforms, and scholarly publications, opportunities for structured institutional training remain limited in many developing countries (Eiriemiokhale & Sulyman, 2023; Emiri, 2023).

Awareness, perception, and adoption represent three closely related constructs that influence the successful integration of AI into academic libraries. Awareness reflects librarians' knowledge and understanding of AI technologies, perception encompasses their attitudes and beliefs regarding the benefits and challenges of AI, while adoption refers to the actual implementation and utilisation of AI applications in library operations. Although these constructs are conceptually distinct, they interact dynamically to shape institutional readiness for technological innovation. Understanding this interaction is essential for explaining why AI adoption remains uneven despite increasing awareness of its potential benefits.

This paper therefore provides a conceptual review of awareness, adoption, and perception of Artificial Intelligence tools in academic libraries in developing countries. It synthesises current literature to examine how these three constructs influence AI integration and identifies the institutional, technological, and human factors that facilitate or constrain successful implementation. By presenting an integrated conceptual perspective, the paper contributes to the growing body of knowledge on AI in Library and Information Science and provides a foundation for future empirical investigations.

### **Conceptualizing Artificial Intelligence in Academic Libraries**

Artificial Intelligence (AI) refers to computer-based systems capable of performing tasks that normally require human intelligence, including learning, reasoning, decision-making, natural language processing, pattern recognition, and problem-solving. Recent advances in AI have expanded its application across education, healthcare, business, and information services, making it one of the most significant drivers of digital transformation. Within Library and Information Science (LIS), AI is increasingly recognised not merely as an emerging technology but as a strategic innovation capable of reshaping how academic libraries acquire, organise, preserve, retrieve, and disseminate knowledge.

In academic libraries, AI extends beyond routine automation to support intelligent service delivery. AI-powered applications facilitate automated cataloguing, metadata generation, information retrieval, recommender systems, virtual reference services, plagiarism detection, research support, and collection management. These technologies improve operational efficiency, enhance service quality, and provide users with more personalised and responsive information services. Rather than replacing librarians, AI complements professional expertise by automating repetitive tasks and enabling librarians to concentrate on higher-level functions such as information literacy instruction, research consultation, knowledge curation, and digital scholarship.

A defining characteristic of AI in academic libraries is its capacity to enhance information discovery and knowledge organisation. Unlike conventional information retrieval systems that rely primarily on keyword matching, AI-enabled systems employ machine learning and natural language processing to interpret user intent, recommend relevant resources, and improve search precision. AI also supports metadata enrichment, semantic indexing, automated classification, and entity recognition, thereby improving the accessibility and discoverability of scholarly resources. Nevertheless, effective implementation requires continuous human oversight to ensure contextual accuracy, minimize algorithmic bias, and uphold professional standards of information organisation.

The adoption of AI also reflects the evolving role of academic libraries within the digital knowledge ecosystem. Modern academic libraries are increasingly expected to support research data management, scholarly communication, digital repositories, open science, and research impact assessment. Consequently, librarians are assuming expanded responsibilities as digital information specialists, data stewards, technology facilitators, and AI intermediaries. This transformation underscores the need for new competencies in digital literacy, data governance, ethical AI, and information analytics.

From the perspective of developing countries, however, the conceptualisation of AI cannot be separated from prevailing institutional realities. Although AI offers considerable opportunities to improve library services, its implementation is influenced by infrastructural limitations, inadequate funding, limited technical expertise, weak policy frameworks, and persistent digital inequalities. Therefore, AI should be understood not only as a technological innovation but also as a socio-technical and developmental phenomenon whose successful implementation depends on organisational readiness, human capacity, and supportive institutional environments. This perspective provides the conceptual foundation for understanding awareness, perception, and adoption of AI in academic libraries within developing countries.

## **2. Conceptualising Artificial Intelligence in Academic Libraries**

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the Fourth Industrial Revolution, fundamentally changing how information is created, organised, accessed, and utilised across sectors. AI refers to computer systems capable of performing tasks that traditionally require human intelligence, including learning, reasoning, problem-solving, decision-making, natural language processing, pattern recognition, and predictive analysis. Recent advances in AI have accelerated digital transformation within higher education institutions, positioning academic libraries as important beneficiaries of intelligent technologies that enhance knowledge management and information service delivery. Within academic libraries, AI should be understood as more than a technological innovation; it represents a strategic approach to improving library operations and user-centred services. AI applications support core library functions by automating routine processes, facilitating intelligent information retrieval, improving metadata creation, strengthening digital repositories, and enhancing research support services. Through technologies such as machine learning, natural language processing, recommender systems, and intelligent virtual assistants, libraries are increasingly able to deliver faster, more accurate, and personalised services to their users.

One of the major contributions of AI to academic libraries is the enhancement of information organisation and retrieval. Unlike conventional search systems that rely primarily on keyword matching, AI-powered systems analyse user intent, contextual meaning, and behavioural patterns to provide more relevant and accurate search results. AI also improves knowledge organisation through automated cataloguing, metadata enrichment, semantic indexing, and entity recognition, thereby increasing the discoverability and accessibility of scholarly resources. These capabilities contribute to more efficient knowledge management while supporting the teaching, learning, and research missions of higher education institutions.

AI has also expanded the scope of research support services provided by academic libraries. Modern libraries increasingly assist researchers in literature discovery, citation management, plagiarism detection, data management, research analytics, and scholarly communication. AI-powered tools enable librarians to deliver more efficient and responsive research support while improving the quality of information services. However, these technologies should complement rather than replace professional judgement. Human expertise remains essential in evaluating information quality, interpreting research contexts, addressing ethical concerns, and ensuring responsible use of AI-generated outputs.

The increasing adoption of AI is also redefining the professional role of academic librarians. Rather than serving primarily as custodians of information resources, librarians are increasingly functioning as digital information specialists, technology facilitators, research partners, and data stewards. This transformation requires new competencies in digital literacy, data governance, information ethics, and AI applications. Continuous professional development therefore becomes essential if librarians are to effectively manage and support AI-enabled library services.

### **3. Awareness, Adoption, and Perception of Artificial Intelligence in Academic Libraries**

Awareness, perception, and adoption are three interrelated constructs that collectively influence the successful integration of Artificial Intelligence (AI) into academic library services. Although each construct represents a distinct aspect of technology acceptance, they are interconnected and mutually reinforcing. Awareness provides the knowledge base for understanding AI technologies, perception shapes librarians' attitudes and beliefs regarding their value and potential risks, while adoption represents the practical implementation of AI applications in library operations. Understanding the

interaction among these constructs is essential for explaining the varying levels of AI integration observed in academic libraries, particularly within developing countries.

#### *Awareness of Artificial Intelligence*

Awareness refers to librarians' knowledge, familiarity, and understanding of AI technologies and their potential applications in academic libraries. It encompasses exposure to emerging AI tools, awareness of their capabilities, and recognition of their relevance to library services. In many developing countries, awareness has improved through conferences, workshops, professional associations, scholarly publications, and online learning platforms. However, opportunities for structured institutional training remain limited, resulting in uneven levels of awareness across institutions. Consequently, many librarians possess only a general understanding of AI rather than the practical competencies required for effective implementation

#### *Perception of Artificial Intelligence*

Perception refers to librarians' attitudes, beliefs, and professional judgments concerning the use of AI in academic libraries. These perceptions are shaped by previous experiences with technology, organisational culture, institutional support, and individual expectations regarding the benefits and challenges associated with AI adoption. Positive perceptions are often associated with expectations of improved efficiency, enhanced user services, increased productivity, and expanded research support. Conversely, concerns relating to job displacement, ethical issues, algorithmic bias, data privacy, and loss of professional autonomy may generate resistance to AI implementation. The coexistence of these positive and negative views illustrates the complex nature of librarians' perceptions of AI technologies.

#### *Adoption of Artificial Intelligence*

Adoption represents the practical utilisation and institutional integration of AI technologies into academic library operations and services. It extends beyond awareness and favourable perceptions to include the actual implementation of AI-enabled applications such as intelligent cataloguing systems, virtual reference services, recommender systems, plagiarism detection tools, and digital repository management. In many developing countries, adoption remains selective and incremental because of infrastructural limitations, inadequate funding, shortages of skilled personnel, and insufficient policy support. As a result, AI implementation is often confined to specific library functions rather than being fully integrated into all aspects of library service delivery.

#### *Interrelationships among Awareness, Perception, and Adoption*

The relationship among awareness, perception, and adoption is dynamic rather than linear. Awareness provides the foundation upon which librarians acquire knowledge of AI technologies. Increased awareness influences perception by enabling librarians to evaluate both the opportunities and challenges associated with AI implementation. Positive perceptions are more likely to encourage adoption, while negative perceptions may delay or discourage implementation. Nevertheless, awareness and favourable perceptions alone do not guarantee adoption. Organisational readiness, including leadership commitment, digital infrastructure, financial resources, supportive policies, and technical competence—plays a critical role in determining whether AI technologies are successfully implemented. Consequently, effective AI integration depends on the interaction of individual knowledge, professional attitudes, and institutional capacity.

#### **4. Determinants of Artificial Intelligence Integration in Academic Libraries**

The successful integration of Artificial Intelligence (AI) into academic libraries in developing countries is influenced by multiple interrelated factors that operate at institutional, technological, human, financial, and environmental levels. While awareness, perception, and adoption explain librarians' engagement with AI technologies, the actual implementation and sustainability of AI initiatives depend largely on the institutional conditions within which academic libraries operate. These determinants collectively shape the extent to which AI technologies can be effectively adopted and integrated into library services.

##### *Institutional Leadership and Strategic Commitment*

Institutional leadership plays a critical role in promoting digital transformation within academic libraries. Library administrators and university management influence AI integration through strategic planning, policy formulation, resource allocation, and the promotion of an innovation-oriented organisational culture. Institutions with visionary leadership are more likely to invest in emerging technologies and encourage experimentation with AI-enabled library services. Conversely, weak institutional commitment often delays technological innovation and limits opportunities for sustainable AI implementation.

##### *Digital Infrastructure and Technological Readiness*

Adequate digital infrastructure is a fundamental requirement for AI implementation. Effective AI applications depend on reliable internet connectivity, stable electricity, modern computing facilities, integrated library management systems, cloud technologies, and secure digital platforms. In many developing countries, deficiencies in these areas remain

major barriers to AI adoption. Without the necessary technological infrastructure, academic libraries cannot fully exploit the capabilities of AI, regardless of librarians' awareness or willingness to adopt new technologies.

#### *Human Capacity and Professional Development*

The successful implementation of AI requires librarians with appropriate digital competencies and technical expertise. Beyond general ICT literacy, librarians need knowledge of AI applications, data management, digital scholarship, information ethics, and emerging technologies. Continuous professional development through formal training, workshops, conferences, and collaborative learning is therefore essential. Strengthening librarians' competencies enhances their confidence in using AI technologies and contributes to sustainable innovation within academic libraries.

#### *Financial and Policy Support*

Financial investment and supportive policy frameworks are indispensable for AI integration. Implementing AI technologies requires sustained funding for hardware acquisition, software licensing, infrastructure development, staff training, and system maintenance. In addition, institutional and national policies provide the regulatory framework necessary for responsible AI implementation, addressing issues such as data governance, intellectual property, privacy, cybersecurity, and ethical use of AI. In the absence of adequate funding and clear policy direction, AI initiatives are often fragmented and difficult to sustain.

#### *Ethical and Socio-cultural Factors*

The adoption of AI in academic libraries is also influenced by ethical considerations and socio-cultural contexts. Librarians are expected to uphold professional values relating to intellectual freedom, confidentiality, equitable access to information, and responsible information management. Concerns regarding algorithmic bias, transparency, data privacy, and potential job displacement may influence perceptions of AI and affect its acceptance. Similarly, organisational culture and attitudes toward technological change shape librarians' willingness to embrace innovation. Addressing these ethical and cultural concerns through appropriate governance frameworks and stakeholder engagement is therefore essential for successful AI integration.

#### **Summary**

The integration of AI into academic libraries is influenced by a combination of institutional leadership, technological readiness, human capacity, financial investment, policy support, and ethical considerations. These determinants are interdependent and collectively create the environment within which AI adoption can either flourish or stagnate. Strengthening these enabling conditions is therefore critical to achieving sustainable AI integration and enhancing the quality of academic library services in developing countries.

## **5. Implications of Artificial Intelligence Integration for Academic Libraries in Developing Countries**

The increasing integration of Artificial Intelligence (AI) into academic libraries has significant implications for library management, information service delivery, professional practice, and higher education. As AI technologies continue to evolve, academic libraries are transitioning from traditional information centres to digitally driven knowledge hubs that provide intelligent, responsive, and user-centred services. This transformation presents both opportunities and challenges that require strategic planning, ethical governance, and continuous capacity development.

One of the most significant implications of AI is the improvement of library service delivery. AI-powered technologies enable academic libraries to provide faster information retrieval, personalised recommendations, intelligent virtual reference services, automated cataloguing, and efficient collection management. These innovations improve users' access to scholarly information while enhancing the quality, accuracy, and responsiveness of library services. Consequently, librarians are able to devote more time to research support, information literacy instruction, and other specialised professional services that require human expertise.

AI integration also has important implications for the professional development of librarians. The changing technological landscape requires librarians to acquire new competencies in artificial intelligence, data management, digital scholarship, research analytics, and information ethics. Continuous learning and professional development have therefore become essential components of modern librarianship. Academic libraries and Library and Information Science schools should work collaboratively to ensure that librarians possess the knowledge and skills required to manage AI-enabled information environments effectively.

Despite these opportunities, AI adoption introduces important ethical and governance considerations. Academic libraries must ensure that AI systems operate in ways that promote transparency, fairness, accountability, data privacy, intellectual freedom, and equitable access to information. Human oversight remains essential to minimize algorithmic bias, protect users' rights, and maintain professional standards in information organisation and service delivery. AI should therefore be viewed as a tool that enhances professional practice rather than a substitute for librarians' expertise and ethical responsibilities.

For developing countries, the successful integration of AI requires sustained institutional commitment and strategic investment. Improvements in digital infrastructure, policy development, funding, and capacity building are necessary to ensure that academic libraries benefit fully from AI technologies. Collaboration among universities, governments, professional associations, and technology providers will also play a critical role in creating an enabling environment for sustainable AI implementation. Ultimately, the future of AI in academic libraries will depend not only on technological advancement but also on the ability of institutions to develop supportive organisational structures and empower librarians to lead digital transformation initiatives.

### **Recommendations**

Based on the issues discussed in this review, the following recommendations are proposed to facilitate the successful integration of Artificial Intelligence in academic libraries within developing countries:

- i). Strengthen AI awareness and capacity building through regular workshops, seminars, professional development programmes, and continuous training for librarians.
- ii). Invest in digital infrastructure by improving internet connectivity, stable electricity supply, modern computing facilities, cloud technologies, and integrated library systems that support AI applications.
- iii). Develop institutional AI policies that provide guidance on ethical practice, data governance, cybersecurity, privacy protection, intellectual property, and responsible AI use within academic libraries.
- iv). Increase financial investment in AI technologies, including funding for infrastructure, software acquisition, maintenance, and staff development.

- v). Promote collaborative partnerships among universities, professional associations, government agencies, and technology providers to facilitate knowledge sharing, research, and innovation in AI-enabled library services.
- vi). Integrate AI competencies into Library and Information Science education to prepare future librarians with the technical, analytical, and ethical skills required for emerging digital environments.
- vii). Encourage empirical research that examines AI awareness, perception, adoption, and implementation across different categories of academic libraries in developing countries to validate and extend the conceptual relationships proposed in this review.

## Conclusion

Artificial Intelligence (AI) is transforming academic libraries by redefining how information resources are organised, managed, and delivered. This conceptual review examined the interrelationship among awareness, perception, and adoption of AI tools in academic libraries within developing countries and demonstrated that these constructs are fundamental to successful AI integration. The review established that awareness provides the foundation for understanding AI technologies, perception shapes librarians' attitudes towards their usefulness and challenges, while adoption represents the practical implementation of AI-enabled services. However, successful AI integration extends beyond individual knowledge and attitudes and depends on institutional readiness, including effective leadership, adequate digital infrastructure, sustainable funding, supportive policy frameworks, and continuous professional development.

The review further highlights that AI should not be regarded as a replacement for librarians but as a strategic tool that complements professional expertise, enhances service delivery, and strengthens research support. As academic libraries continue to evolve within the digital knowledge economy, librarians must develop new competencies that enable them to manage intelligent technologies responsibly while maintaining the ethical principles of librarianship.

Although academic libraries in developing countries continue to face infrastructural, financial, and human capacity challenges, the opportunities presented by AI far outweigh the associated constraints. Strategic investment in digital infrastructure, institutional capacity building, policy development, and collaborative partnerships will be essential for ensuring sustainable AI integration. Future empirical studies should examine the

conceptual relationships proposed in this review across different institutional and national contexts to provide further evidence for policy and practice.

Ultimately, the effective integration of Artificial Intelligence into academic libraries is not merely a technological undertaking but a strategic transformation that requires visionary leadership, organisational commitment, and continuous innovation. Institutions that successfully align these elements will be better positioned to deliver responsive, inclusive, and sustainable library services capable of meeting the evolving information needs of twenty-first-century learners and researchers.

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