

ARTIFICIAL INTELLIGENCE ADOPTION AND USE IN ACADEMIC LIBRARIES IN KENYA: OPPORTUNITIES, CHALLENGES, READINESS FACTORS AND POLICY IMPLICATIONS

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ABSTRACT

Artificial Intelligence (AI) is transforming academic libraries by driving breakthroughs in information discovery, automation of library operations, enhancing research analytics, and personalized user services. This paper examines AI adoption and use in academic libraries in Kenya, focusing on current applications, opportunities, barriers, readiness factors, and overarching policy implications. This study adopted a Systematic Literature Review (SLR) approach guided by the Technology–Organization–Environment (TOE) Framework. Literature published between 2020 and 2025 was retrieved and synthesized from leading scholarly databases, professional reports, and policy documents. Findings indicate that AI presents robust opportunities for intelligent information retrieval, automated cataloguing, virtual reference services, research analytics, digital preservation, and advanced knowledge discovery. Notably, however, systemic adoption remains at an emerging stage due to inadequate ICT infrastructure, financial limitations, insufficient AI competencies among information professionals, ethical anxieties, resistance to organizational change and lack of formalized governance frameworks. We recommend strategic investment in digital infrastructure, development of institutional AI policies, continuous professional development initiatives, ethical governance mechanisms, and integration of AI competencies into modern Library and Information Science (LIS) education curricula.

Keywords: Artificial Intelligence, Academic Libraries, Digital Transformation, Technology Adoption, Research Support Services, Kenya, TOE Framework, AI Governance.

INTRODUCTION

Artificial Intelligence (AI) has emerged as a disruptive technological force, radically reshaping the paradigms of information management, knowledge curation, and institutional service delivery. Globally, academic libraries—long regarded as the intellectual hubs of higher education institutions—are exploring AI-driven technologies to maximize resource discovery, automate highly repetitive operations, empower researchers with predictive analytics, and deliver highly personalized information services.

AI applications within contemporary information spaces are multifaceted, spanning, intelligent information retrieval systems and semantic search engines, natural Language Processing (NLP) chatbots and virtual reference assistants, machine learning-based automated metadata generation and automated cataloguing, context-aware recommendation engines and predictive library analytics and AI-enabled research support tools and automated digital preservation pipelines.

These sophisticated systems allow contemporary libraries to pivot away from passive, transactional service delivery models toward proactive, intelligent, and user-centric knowledge environments.

In the Kenyan context, higher education institutions have achieved commendable milestones in foundational digital transformation in the past two decades. Thus, a number of universities have successfully institutionalized electronic resource management systems (ERMS), open-access institutional repositories (IRs), and advanced Integrated Library Systems (ILS). However, despite these foundational achievements, adoption of advanced, cognitive AI technologies remains conspicuously low or relegated to isolated pilot projects. The systemic gap between experimental interest and institutionalized deployment stems from a complex matrix of technological, organizational, financial, and regulatory challenges remains wide.

Thus, while AI applications present unprecedented opportunities to revolutionize academic library ecosystems and catalyze research support services, its structural adoption within Kenyan universities is visibly constrained. The current academic discourse in developing nations remains heavily skewed toward conceptual AI awareness, hypothetical use cases, and technological possibilities, leaving a notable empirical gap regarding practical institutional preparedness, ethical governance, long-term financial sustainability, and local policy frameworks.

Without targeted strategic interventions, academic libraries in Kenya risk experiencing fragmented and unequal technological adoption, inefficient or redundant IT infrastructure investments, compromised data privacy, and systemic biases. Consequently, there is therefore, an urgent need to systematically dissect the specific barriers, opportunities, and readiness metrics that govern how Kenyan library environments can ethically, efficiently, and sustainably assimilate AI into their operational fabrics. This study examines the structural landscape of AI

adoption within Kenyan academic libraries, deploying the Technology–Organization–Environment (TOE) framework to map out institutional readiness, technical capacities, and external environmental imperatives required for sustainable transformation.

OBJECTIVES

The primary objective of this study was to critically analyze the dynamics of AI adoption and use within academic libraries in Kenya. The specific objectives were to;

1. examine the current status and depth of AI adoption within Kenyan academic libraries.
2. identify the core opportunities presented by AI configurations in augmenting library services and institutional research output.
3. investigate the technical, operational, and structural challenges hampering systemic AI implementation.
4. analyze the technological, organizational, and environmental readiness factors of these institutions using the TOE Framework.
5. propose actionable policy recommendations and strategic interventions for sustainable, scalable, and ethical AI integration.

LITERATURE REVIEW

Defining AI in the Library Landscape

In the context of information science, AI refers to computational architectures capable of executing complex tasks traditionally requiring human cognitive faculties, such as machine learning, contextual reasoning, natural language comprehension, pattern recognition, and autonomous decision-making. In academic libraries, AI goes beyond standard automation (e.g., barcode scanning or basic SQL querying) by allowing systems to continuously learn from user data patterns, self-correct, and autonomously optimize workflow processes (Asemi and Asemi, 2023)¹.

Typology of Key AI Applications in Academic Libraries

AI DOMAIN	CORE APPLICATION	INSTITUTIONAL VALUE / IMPACT
Information Discovery	Intelligent Information Retrieval and Semantic Search	Moves past keyword matching to interpret user semantic intent, drastically reducing search fatigue (Breeding, 2024) ² .
User Services	Chatbots and virtual reference assistants	Provides 24/7 interactive support, answers FAQs, and assists users in navigating complex research databases (Lo, 2024) ³ .

Technical Services	Automated cataloguing and metadata generation	Uses Computer Vision and NLP to auto-extract metadata, classify texts, and assign subject headings rapidly.
Collection Management	Recommendation systems and predictive analytics	Analyzes historic usage behavior to predict future resource demands, optimizing collection acquisition budgets.
Research Support	AI-Enabled analytics and citation mapping	Map research trends, automate systematic reviews, and evaluate institutional citation impacts (Cox et al., 2024) ⁴ .
Archival Science	Digital preservation and handwritten Text recognition	Automatically transcribes, indexes, and repairs metadata patterns within digitized historical manuscripts and institutional repositories.

Theoretical Underpinnings: The TOE Framework

To evaluate how complex innovations are integrated, this study relies on the **Technology-Organization-Environment (TOE) Framework** (Tornatzky and Fleischer, 1990)⁵. The framework splits adoption influences into three interconnected spheres:

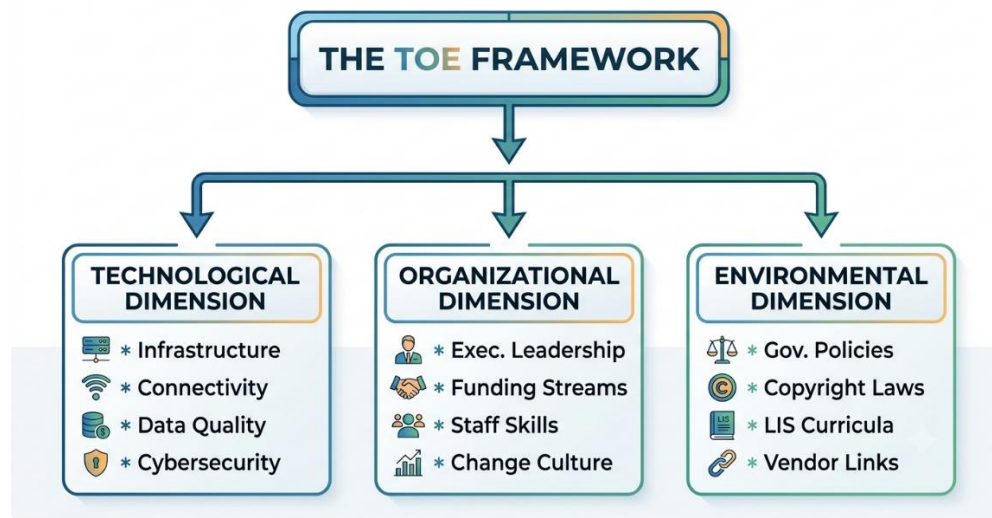


Fig 1: Technology-Organization-Environment (TOE) Framework

- a) Technological dimension focuses on the internal and external technologies available to the institution. This includes network infrastructure, high-speed connectivity,

compatibility with legacy integrated library systems, data quality, data availability, and cloud computing security pipelines.

- b) Organizational dimension looks at internal institutional characteristics, including executive leadership commitment, dedicated funding streams, staff digital competencies, organizational culture, and internal resistance to technological change.
- c) Environmental dimension explores the external ecosystem in which the university operates. This encompasses national ICT policies, data protection regulations, intellectual property/copyright laws, professional association standards, and partnerships with global technology vendors.

METHODOLOGY

This study employed a rigorous Systematic Literature Review (SLR) design, conducted in strict adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) principles.

Search Strategy and Selection Criteria

Extensive literature mapping was conducted across the period 2020–2025 using the following leading scholarly databases: *Scopus*, *Google Scholar*, *Emerald Insight*, *SpringerLink*, *Taylor & Francis Online*, *IEEE Xplore*, and *Library and Information Science Abstracts (LISA)*. The Boolean search strings were carefully calibrated to isolate relevant literature using terms such as: ("Artificial Intelligence" OR "AI" OR "Machine Learning" OR "Chatbots") AND ("Academic Libraries" OR "University Libraries") AND ("Adoption" OR "Challenges" OR "Readiness") AND ("Kenya" OR "Developing Nations").

Inclusion and Exclusion Criteria

- a) **Inclusion:** Peer-reviewed journal articles, conference proceedings, and authoritative policy papers published between 2020 and 2025; papers written in English; studies directly addressing AI applications, opportunities, challenges, or implementation frameworks within university library settings.
- b) **Exclusion:** Non-English papers, editorials, brief blog posts, publications pre-dating 2020, and studies strictly focused on public or school library ecosystems without application to higher education.

Through a structured multi-stage screening process (title review, abstract screening, and full-text eligibility assessment), a total of **72 high-quality publications** were selected for deep synthesis. The extracted data was analyzed using thematic content analysis, directly mapped against the technological, organizational, and environmental pillars of the TOE framework.

RESULTS, POLICY IMPLICATIONS AND RECOMMENDATIONS

The thematic synthesis indicates that AI adoption within academic libraries in Kenya sits at an emerging and highly fragmented stage (Masinde et al., 2024)⁶; Sang, 2024)⁷. While there is broad awareness of generative AI technologies (such as large language models) among library personnel, institutionalized infrastructure remains scarce.

Technological Readiness Realities

- a) ***Inadequate Infrastructure and Power Grid Inconsistencies***- Advanced machine learning tools require robust computing backends. Many Kenyan libraries struggle with legacy servers and fluctuating internet bandwidth, which severely limits the real-time processing required by smart retrieval tools.
- b) ***Interoperability Barriers***- Current Integrated Library Systems (ILS) run on older architectures that lack the API flexibility required to connect seamlessly with modern AI plugins or open-source chatbot systems.
- c) ***Data Silos and Quality Constraints***- AI algorithms require vast pools of clean, structured metadata to learn effectively. Fragmented institutional repositories and inconsistent cataloguing practices across departments introduce noise, which can degrade the accuracy of recommendation engines.

Organizational Hurdles and Capacity Building

- a) The most prominent challenge identified is a pronounced lack of AI-specific technical competencies among information professionals (Ngulube and Mosha, 2024)⁸. Librarians are highly skilled in traditional information management but often lack foundational knowledge in data science, prompt engineering, and algorithmic auditing.
- b) Library budgets in public and private Kenyan universities have faced persistent financial cuts. Available funds are usually prioritized for physical collection maintenance and standard electronic journal subscriptions, leaving little room for R&D investments in cognitive computing.
- c) There is notable organizational resistance driven by fears of professional displacement. Staff often view autonomous search utilities, conversational bots, and auto-cataloguing agents as direct threats to job security rather than tools designed to augment their roles.

Environmental and Regulatory Realities

- a. Although Kenya enforces the *Data Protection Act (2019)*, there are few localized regulatory directives addressing the unique intellectual property challenges raised by generative AI training within university setups.

- b. Local Library and Information Science (LIS) training institutions continue to rely on traditional information management curricula, which limits the flow of data-literate graduates into the job market.

Strategic Synthesis of Core Opportunities

Despite these systemic headwinds, strategic AI adoption holds immense promise for the sector:

Hyper-personalized content discovery: Moving from strict keyword indexes to semantic intent models matches student research queries accurately, boosting the utility of subscribed e-resources.

Operational optimization via automation: Handing over repetitive indexing, metadata tagging, and circulation FAQs to automated systems frees up information specialists to lead deep-dive research support and data literacy workshops.

Predictive, data-driven collection auditing: Shifting procurement from reactive models to predictive models ensures that collection spending aligns with actual university research trends.

POLICY IMPLICATIONS

Transition toward AI-integrated information spaces requires systemic policy updates across three institutional levels namely;

a. National Government and Regulatory Bodies

The Ministry of Education, alongside the Commission for University Education (CUE), needs to formulate standardized guidelines for AI integration in higher education. This includes creating cloud computing sandboxes for academic research and offering targeted grants to modernize institutional IT backbones.

b. Institutional and University Management

Universities must move past ad-hoc software adoption by establishing formal Institutional AI Governance Committees. These bodies will be responsible for creating data-sharing protocols, validating the algorithmic fairness of library tools, and ensuring compliance with national data privacy statutes.

c. Professional Bodies and Consortia

The Kenya Library Association (KLA) and the Kenya Information Literacy Alliance must lead the design of continuous professional development modules. Building strategic partnerships with regional consortia (like KLISC) can also help libraries negotiate collective licenses for AI-powered indexing engines and discovery tools.

RECOMMENDATIONS

To accelerate sustainable and ethical AI integration within Kenyan academic libraries, there is need to;

Prioritize campus network modernization, shift library systems to resilient cloud hosting environments, and opening up API layers on legacy software to allow for easy AI integration.

1. Draft institutional guidelines outlining how data is handled, ensuring user privacy is protected and algorithmic biases are checked when deploying conversational search utilities.
2. Deploy continuous capacity-building programs covering prompt engineering, Python basics for data analysis, and digital resource curation.
3. Revamp university LIS programs to incorporate core data science, computational linguistics, and algorithmic ethics modules into their foundational degrees.
4. Use collective bargaining frameworks via groups like the Kenya Library and Information Services Consortium (KLISC) to reduce the cost of licensing cutting-edge AI technologies.
5. Launch small-scale, low-risk pilot projects – such as open-source NLP chatbots tailored to local dialects – to build internal institutional confidence before embarking on wide-scale rollouts.

CONCLUSION

Integrating Artificial Intelligence into Kenyan academic libraries presents a vital opportunity to modernizing information discovery, streamlining operations, and boosting institutional research output. Using cognitive search tools, automated metadata generation, and predictive user analytics allows libraries to evolve into dynamic, user-centered knowledge hubs that can better support the demands of contemporary higher education. However, realizing this potential requires a balanced approach that addresses technological readiness, organizational capacity, and supportive external policy environments. By strategically upgrading infrastructure, investing in professional upskilling, and establishing robust ethical frameworks, Kenyan academic libraries can navigate the complexities of this digital shift and ensure a responsible, sustainable transition into an AI-augmented future.

10. FUTURE RESEARCH AGENDA

To expand on the insights generated by this systematic review, future empirical research should focus on;

- a) Conducting exhaustive, field-wide surveys across public and private Kenyan universities to benchmark hardware, software, and data maturity levels.

- b) Employing models like UTAUT to evaluate how students and faculty interact with AI-driven reference platforms.
- c) Developing cost-benefit analysis frameworks to guide library directors in evaluating long-term investments in proprietary versus open-source AI tools.
- d) Investigating potential biases within global discovery tools when indexing indigenous knowledge systems and African scholarly publications.

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