

## UNLOCKING ARTIFICIAL INTELLIGENCE POTENTIAL IN KENYAN LIBRARIES: A NATIONAL READINESS AND NEEDS ASSESSMENT

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### ABSTRACT

*Artificial Intelligence (AI) is transforming global knowledge ecosystems, yet its adoption within African library systems remains uneven. Thus, while Kenya possesses a robust national digital agenda, empirical evidence regarding sector-wide library readiness is fragmented. This study systematically assesses AI awareness, current applications, multi-dimensional readiness, operational barriers, and strategic priorities within academic, public, school, special, national, and community libraries in Kenya. Grounded in the Technology-Organization-Environment (TOE) framework, the study used a scoping review methodology following the PRISMA-ScR pipeline. Synthesizing data from 58 peer-reviewed publications and institutional documents published between 2019 and 2026, the study employed thematic analysis to map the national baseline. The thematic synthesis reveals a distinct "awareness-implementation gap." While conceptual awareness of AI among information professionals is high, operational implementation is low, placing overall national readiness in the "Moderate-Low" tier. Key structural barriers include a profound practical skills deficit, funding constraints and lack of localized institutional strategies. Despite a supportive national macro-environment, a critical micro-policy gap exists regarding sector-specific guidelines for data privacy, ethics, and algorithmic governance. Technical services (cataloguing and metadata generation) and intelligent information retrieval were identified as the highest priority areas for AI integration. Sustainable AI integration in Kenyan libraries is constrained by structural and human capital deficits rather than professional resistance. To transition libraries into active participants of the algorithmic knowledge economy, the study proposes a five-part strategic framework: establishing a library-specific national governance policy, modernizing LIS curricula, upgrading core digital infrastructure baselines, fostering strategic public-private partnerships, and initiating longitudinal empirical research.*

**Keywords:** Artificial Intelligence; Library Readiness; Technology-Organization-Environment (TOE) Framework; Kenya; Scoping Review.

## Background

Artificial Intelligence (AI) has emerged as a foundational technology driving the transformation of contemporary knowledge ecosystems. Its rapid advancement is fundamentally reshaping how information is created, organized, preserved, accessed, and utilized across sectors. Within the library and information profession, AI is recognized not merely as a technological innovation but as a strategic enabler capable of redefining service delivery models, improving operational efficiency, and enhancing user experiences (Cox et al., 2019)<sup>1</sup>. The convergence of machine learning, natural language processing, computer vision, robotics, predictive analytics, and generative AI technologies has created unprecedented opportunities for libraries to evolve from traditional information repositories into intelligent knowledge environments (Wheatley and Hervieux, 2020)<sup>2</sup>.

Globally, libraries are leveraging AI-powered solutions to automate metadata creation, improve information retrieval through semantic search, support digital preservation, optimize collection management, provide personalized recommendations, and deliver virtual reference services through conversational agents. Major academic and national libraries in North America, Europe, Asia, and Australia have integrated AI into discovery systems, research support services, scholarly communication workflows, and digital archives (Hervieux and Wheatley, 2020)<sup>3</sup>. These developments have demonstrated the potential of AI to enhance service accessibility, increase operational effectiveness, and facilitate evidence-based decision-making.

The emergence of generative AI technologies has accelerated these transformations. Large language models, intelligent research assistants, and automated content-generation tools are redefining interactions between users and information systems (Onyancha, 2023)<sup>4</sup>. Consequently, libraries are increasingly expected to support AI literacy, facilitate ethical AI use, and participate actively in the governance of algorithmic knowledge systems. The role of libraries is therefore expanding beyond information provision to encompass stewardship of responsible AI adoption, digital inclusion, data ethics, and knowledge equity.

In Africa, however, adoption of AI within library systems remains uneven and relatively underdeveloped. Although governments and institutions are increasingly embracing digital transformation agendas, significant disparities persist in infrastructure, digital competencies, financial resources, and policy preparedness (Mtega, 2024)<sup>5</sup>. Libraries across the continent also continue to face challenges related to inadequate technological infrastructure, limited institutional investment, insufficient technical expertise, and weak regulatory frameworks governing emerging technologies (Chisita and Chimanzi, 2021)<sup>6</sup>. Consequently, the benefits associated with AI-enabled library services remain largely unrealized.

Kenya presents a particularly important context for examining AI readiness within libraries. As one of Africa's leading digital innovation hubs, the country has made considerable progress in ICT development, digital governance, mobile technology adoption, and innovation ecosystem growth. Recent government initiatives, including the *National Digital Master Plan (2022–2032)*

and the *National Artificial Intelligence Strategy*, underscore Kenya's commitment to harnessing emerging technologies to accelerate socio-economic development and position itself competitively within the global digital economy (Republic of Kenya, 2022)<sup>7</sup>.

Libraries occupy a strategic position within this transformation agenda. They serve as critical institutions supporting education, research, innovation, lifelong learning, and knowledge dissemination. As universities, research institutions, government agencies, and communities increasingly rely on digital information resources, libraries are expected to adopt technologies capable of managing growing information complexity while responding to evolving user expectations (Makanya, 2020)<sup>8</sup>. AI technologies offer significant potential to support these objectives through intelligent automation, enhanced resource discoverability, data-driven service optimization, and personalized information delivery. However, despite the growing prominence of AI within the broader national discourse, there remains limited understanding of the extent to which Kenyan libraries are prepared to adopt and integrate these technologies. Existing evidence suggests that AI implementation remains largely experimental, fragmented, and institution-specific (Mwanzu, 2021)<sup>9</sup>. While isolated initiatives have emerged within selected academic and special libraries, there is little comprehensive evidence regarding awareness levels, technological preparedness, organizational capacity, policy alignment, and strategic priorities across the wider library sector. Furthermore, available studies remain dispersed across multiple disciplines and library types, limiting the development of a coherent national perspective.

Artificial Intelligence is increasingly becoming a strategic imperative for libraries worldwide. Its application in areas such as intelligent information retrieval, metadata automation, digital preservation, collection analytics, research support, and personalized user services has demonstrated significant potential to improve efficiency, accessibility, and service quality (Cox et al., 2019)<sup>1</sup>. As knowledge institutions navigate rapidly evolving digital environments, the ability to harness AI technologies is increasingly viewed as a determinant of institutional relevance, competitiveness, and sustainability.

Despite these global developments, evidence suggests that Kenyan libraries remain at the periphery of AI adoption. Although awareness of AI technologies appears to be growing among information professionals, practical implementation remains limited, fragmented, and largely confined to pilot initiatives (Kavulya, 2024<sup>10</sup>; Mwanzu, 2021)<sup>9</sup>. Many libraries continue to operate within traditional service models characterized by manual workflows, limited automation, and inadequate digital infrastructure. Consequently, opportunities to leverage AI for enhancing service delivery, improving operational efficiency, and supporting knowledge discovery remain substantially undexploited.

The challenge is compounded by the absence of comprehensive empirical evidence regarding the preparedness of Kenyan libraries to adopt AI technologies. Existing studies have largely focused on specific institutions, technologies, or user perceptions, resulting in a fragmented body of knowledge that provides little insight into national readiness patterns (Onyancha,

2023)<sup>11</sup>. There is limited understanding of the technological capacities, organizational conditions, human resource competencies, policy environments, and institutional strategies that influence AI adoption across different categories of libraries. Without such evidence, policymakers, library managers, professional associations, training institutions, and development partners lack the information necessary to design targeted interventions and allocate resources effectively.

Furthermore, the emergence of Kenya's National Artificial Intelligence Strategy creates both opportunities and responsibilities for the library sector. As institutions central to information access, digital literacy, and knowledge management, libraries must be positioned to contribute meaningfully to the country's AI transformation agenda. However, the extent to which libraries possess the infrastructure, competencies, governance mechanisms, and institutional readiness required to support this transition remains unclear.

The absence of a national evidence base on AI readiness therefore represents a significant policy and practice gap. Addressing this gap is critical for informing strategic planning, strengthening institutional capacity, guiding investment decisions, and ensuring that libraries are not left behind in Kenya's evolving digital ecosystem. This study responds to this need by systematically synthesizing existing evidence to establish a national baseline of AI readiness and identify priority interventions necessary for sustainable AI adoption within Kenyan libraries.

Against this backdrop, there is an urgent need to systematically examine the readiness of Kenyan libraries to participate in the emerging AI ecosystem. Understanding current capacities, barriers, opportunities, and strategic requirements is essential for informing evidence-based policy development, institutional planning, professional capacity building, and sustainable technology adoption. This study addresses this gap by providing a comprehensive national assessment of AI readiness and needs across academic, public, school, special, national, and community libraries in Kenya.

### **Objectives of this study were to;**

1. assess the level of awareness of Artificial Intelligence technologies among Kenyan libraries.
2. identify current and emerging applications of AI in Kenyan libraries.
3. evaluate the readiness of Kenyan libraries for AI adoption.
4. examine technological, organizational, and environmental barriers affecting AI implementation.
5. identify opportunities and priority areas for AI integration in library services.
6. propose recommendations for enhancing AI readiness and sustainable adoption in Kenyan libraries.

### **Theoretical Framework**

The study was anchored on the **Technology–Organization–Environment (TOE) Framework** developed by Tornatzky and Fleischer (1990). The framework explains technology adoption as a function of three interacting dimensions:

- Technological context refers to the availability, accessibility, compatibility, and complexity of technologies required for AI implementation.
- Organizational context focuses on institutional resources, leadership commitment, staff competencies, financial capacity, and organizational culture.
- Environmental context encompasses external factors such as government policies, regulatory frameworks, partnerships, competition, and industry trends.

The TOE framework provides a comprehensive lens through which factors influencing AI readiness and adoption in libraries can be systematically examined, moving beyond purely technical considerations to incorporate structural and environmental realities (Chisita and Chimanzi, 2021)<sup>6</sup>.

### Conceptual Framework

The conceptual framework assumes that AI readiness and adoption in Kenyan libraries (dependent variable) is directly influenced by five key independent variables across the TOE dimensions.

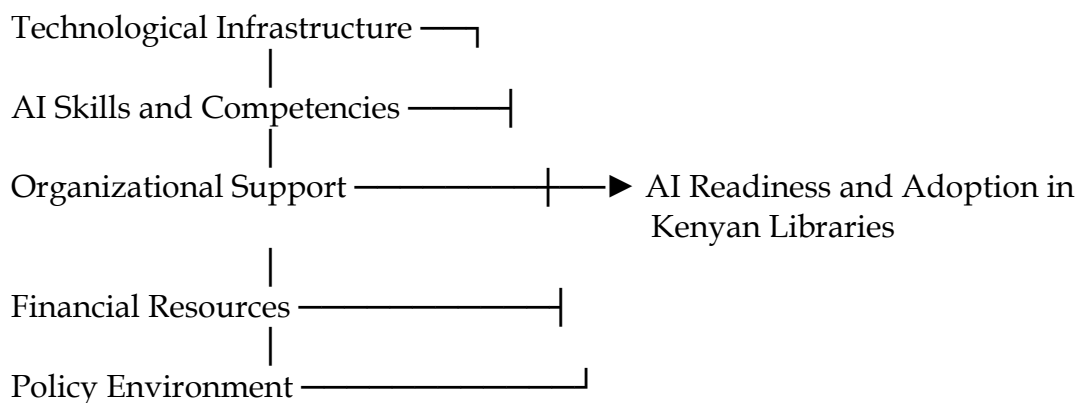


Figure 1: Conceptual Framework Mapping AI Adoption Determinants

### Methodology

This study employed a scoping review methodology guided by Arksey and O'Malley's (2005) framework to map the emerging research area, identify knowledge gaps, and synthesize evidence from diverse sources.

The review process involved five distinct stages:

1. Identifying the research question.
2. Identifying relevant studies.
3. Selecting eligible studies using strict inclusion criteria.
4. Charting the data using a structured review matrix.
5. Collating, summarizing, and reporting the findings via thematic analysis.

Literature searches were conducted across Scopus, Google Scholar, African Journals Online (AJOL), institutional repositories, government reports, conference proceedings, and relevant grey literature for publications produced between 2019 and 2026. Data extraction captured publication characteristics, library types, AI application areas, readiness indicators, barriers, opportunities, and recommendations.

### Search Selection and Literature Distribution

A total of 146 records were initially identified through database searches. The selection flow followed a structured PRISMA-ScR pipeline:

**Table 2: PRISMA-ScR Selection Process and Sample Size Evolution**

Records identified through database searches (n = 146)

| PRISMA Stage   | Description                           | Records Remaining (n) |
|----------------|---------------------------------------|-----------------------|
| Identification | Initial database search results       | 146                   |
| Deduplication  | Removal of identical titles/abstracts | 123                   |
| Screening      | Title and abstract evaluation         | 76                    |
| Eligibility    | Full-text article assessment          | 58                    |
| Included       | Final synthesis and thematic analysis | 58                    |

The 58 peer-reviewed publications and institutional documents that met the final inclusion criteria were distributed across the following source types:

**Table 1: Distribution of Reviewed Literature**

| SOURCE TYPE              | NUMBER OF STUDIES | PERCENTAGE (%) |
|--------------------------|-------------------|----------------|
| Journal Articles         | 32                | 55.2           |
| Conference Papers        | 10                | 17.2           |
| Government Reports       | 5                 | 8.6            |
| Theses and Dissertations | 6                 | 10.3           |
| Professional Reports     | 5                 | 8.6            |
| Total                    | 58                | 100.0          |

## Data Presentation, Interpretation and Discussion

Thematic synthesis of the reviewed literature revealed a complex, evolving AI landscape within Kenyan libraries characterized by high conceptual awareness but low operational implementation.

### 1. AI Awareness and Perceptions (The Awareness–Implementation Gap)

Awareness of AI concepts among library professionals is high (Mwanzu, 2021)<sup>9</sup>. Librarians demonstrate familiarity with emerging technologies such as machine learning, conversational agents (e.g., ChatGPT), and automated discovery systems. However, this understanding remains predominantly conceptual rather than practical.

**Table 2: AI Awareness and Competency Levels among Library Professionals**

| INDICATOR                        | ASSESSMENT |
|----------------------------------|------------|
| Awareness of AI Concepts         | High       |
| Understanding of AI Applications | Moderate   |
| Practical AI Skills              | Low        |
| Institutional AI Implementation  | Low        |
| AI Policy Readiness              | Low        |

This divergence signifies an *awareness–implementation gap*, where recognition of AI's potential value has not translated into active deployment due to institutional and technical deficits (Mtega, 2024)<sup>5</sup>.

### 2. Comprehensive Readiness Assessment (TOE Dimensions)

Evaluating institutions against the broad TOE pillars indicates that overall national readiness falls into the **Moderate-Low** tier.

**Table 3: Multi-Dimensional AI Readiness Matrix**

| DIMENSION                | COMPONENT EVALUATION                                                                                                                                                                                                                                                                       | OVERALL ASSESSMENT  |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Technological Context    | <ul style="list-style-type: none"> <li>• ICT Infrastructure: Moderate</li> <li>• High-Speed Internet: Moderate</li> <li>• Data Management Systems: Low</li> <li>• AI-Compatible Platforms: Low</li> <li>• Cloud Infrastructure: Low</li> <li>• Cybersecurity Capacity: Moderate</li> </ul> | Low                 |
| Organizational Context   | <ul style="list-style-type: none"> <li>• Institutional Support:</li> <li>• Staff Competencies: Low</li> <li>• Financial Capacity / Funding: Low</li> </ul>                                                                                                                                 | Moderate            |
| Environmental Context    | <ul style="list-style-type: none"> <li>• Policy and Regulatory Preparedness</li> </ul>                                                                                                                                                                                                     | Low                 |
| <b>OVERALL READINESS</b> | <b>Comprehensive National Baseline</b>                                                                                                                                                                                                                                                     | <b>Moderate-Low</b> |

While basic digitization and internet connectivity have achieved moderate baselines, libraries fundamentally lack the advanced data management tools, cloud infrastructure, and native AI-

compatible software systems required to execute complex operations (Kavulya, 2024)<sup>10</sup>. This exposes a critical digital maturity gap.

### 3. Barriers to AI Adoption

Human capital and financial deficits represent the most pressing inhibitors to technology adoption within the sector.

| Barriers                    | Percentage(%) |
|-----------------------------|---------------|
| Skills Deficit              | 85%           |
| Funding Constraints         | 79%           |
| Lack of Library AI Strategy | 74%           |
| Limited Leadership Support  | 63%           |
| Resistance to Change        | 52%           |

*Figure 3: Major Barriers to AI Adoption (% of Reviewed Studies Identifying Factor)*

The prominent 85% skills deficit underscores that AI adoption is fundamentally a human-capacity challenge. Librarians lack structured, practical training in data analytics, machine learning mechanics, and algorithmic systems (Onyancha, 2023)<sup>4</sup>. Furthermore, legacy library management software, unreliable institutional networks, and a lack of clear leadership strategies leave libraries operating within manual, traditional workflows.

### 4. Priority Areas for AI Integration

Despite infrastructural limitations, libraries express a strong strategic interest in implementing automation within data-intensive, repetitive domains to drive administrative efficiency and discoverability.

**Table 4: Priority Action Areas for Library AI Integration**

| LIBRARY FUNCTION                                      | PRIORITY LEVEL | STRATEGIC FOCUS                               |
|-------------------------------------------------------|----------------|-----------------------------------------------|
| Cataloguing                                           | Very High      | Automation of technical services              |
| Metadata Generation                                   | Very High      | Standardizing consistency and discoverability |
| Intelligent Discovery Systems / Information Retrieval | Very High      | Semantic, context-aware user search           |
| Virtual Reference Services                            | High           | Chatbots and conversational query handlers    |
| Digital Preservation                                  | High           | Scalable archiving and classification         |
| Research Support Services                             | High           | Automated literature mapping                  |
| Collection Analytics                                  | Moderate       | Data-driven acquisition planning              |

|                          |     |                               |
|--------------------------|-----|-------------------------------|
| Administrative Functions | Low | Routine back-office workflows |
|--------------------------|-----|-------------------------------|

## 5. Environmental Factors and Theoretical Implications

The findings offer strong empirical support for the TOE framework, demonstrating that technology adoption cannot be accomplished in an institutional vacuum. Although Kenya's overarching macro-environment is highly favorable—buoyed by the *National Digital Master Plan* (Republic of Kenya, 2022)<sup>7</sup>—there is an immediate micro-level policy gap. The absence of library-specific implementation guidelines creates critical governance uncertainties surrounding data privacy, intellectual property, algorithmic transparency, and ethics (Chisita and Chimanzi, 2021)<sup>6</sup>. Investment in physical hardware or software will fail to deliver sustainable results without synchronized progress in professional reskilling, governance frameworks, and change management.

## Conclusion

This study provides a comprehensive national synthesis of AI readiness and needs within Kenyan libraries. The findings indicate that while information professionals possess a high conceptual awareness of AI's transformative potential, practical implementation remains restricted to fragmented, institution-specific pilot projects.

The baseline analysis demonstrates that sustainable AI adoption is constrained less by professional resistance or lack of interest, and more by core structural deficits: inadequate digital infrastructure, severe practical skill shortages, funding limitations, and an absence of sector-specific policy frameworks. These combined factors place Kenyan libraries at the periphery of global developments.

Nevertheless, unique opportunities exist for targeted intervention. The alignment of Kenya's expanding digital innovation ecosystem with the library sector's high-priority operational needs (such as cataloguing automation and semantic search) offers a clear pathway forward. By addressing the identified readiness gaps, libraries can successfully position themselves as core components of Kenya's emerging algorithmic knowledge economy.

## Recommendations

Based on the national synthesis, the study presents the following five-part strategic framework for sustainable AI integration:

1. Stakeholders should develop a national, library-specific implementation framework aligned directly with Kenya's National AI Strategy. This document must provide definitive guidelines on algorithmic governance, user data privacy, intellectual property protection, and ethics.
2. Higher education training institutions must urgently modernize their curricula to integrate foundational AI literacy, machine learning concepts, data analytics, and digital

preservation strategies. Parallel continuous professional development (CPD) programs must be established to upskill practicing librarians (Mtega, 2024).

3. Libraries must prioritize investments in core digital maturity baselines. Budgets should focus on upgrading to modern, interoperable library management systems, high-speed connectivity networks, secure cloud computing spaces, and robust cybersecurity architectures.
4. Strategic public-private partnerships should be fostered among universities, technology firms, government bodies, and international development organizations to facilitate knowledge exchange, secure technical support, and pool resources for pilot deployments (Makanya, 2020).
5. Future research should transition beyond conceptual readiness assessments toward empirical, longitudinal studies that actively evaluate the performance, user acceptance metrics, long-term operational impacts, and socio-ethical implications of active library AI systems within the African context.

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