



Identifying Challenges in Implementing Ai-Based Systems in a Library Context: A Case Study of The National Institute of Social Development (NISD) Library, Sri Lanka

Karunanayaka K.P.G.I.

National Institute of Social Development, Liyanagemulla, Seeduwa, Sri Lanka

ARTICLE INFO

Article History

Received: 4 April 2026

Revised: 20 May 2026

Published Online: 1 July 2026

Keywords:

Artificial Intelligence, Digital
Innovation, Implementation
Challenges, Library Management
Systems, Sri Lanka.

*Corresponding Author

Email: gayan@nisd.ac.lk

How to cite: Karunanayaka,
K.P.G.I. (2026) 'Identifying
Challenges in Implementing AI-
Based Systems in a Library Context:
A Case Study of the National
Institute of Social Development
(NISD) Library, Sri Lanka', *Journal
of Eurasian Social Sciences*, 1(1),
pp. 21–28.

ABSTRACT

The integration of artificial intelligence (AI) into library management systems presents both transformative opportunities and considerable implementation challenges, particularly in resource-constrained public sector contexts. This qualitative case study examines the challenges encountered during the implementation of an AI-based library management system at the National Institute of Social Development (NISD) Library in Sri Lanka. Data were collected through semi-structured interviews with five library staff members and two system administrators, supplemented by analysis of LMS usage statistics and institutional documents over a six-month period. Thematic analysis revealed five principal challenge categories: inadequate technological infrastructure, including unreliable internet connectivity and insufficient server capacity; financial constraints encompassing high initial costs and ongoing subscription expenses; significant skills gaps requiring extensive staff training; data quality deficiencies in legacy catalogue records that hindered optimal AI performance; and organizational resistance to change driven by job displacement anxieties. While the system yielded measurable efficiencies including a 40% reduction in cataloguing time and 15 hours of weekly staff time savings these benefits were achievable only after sustained investment in addressing the identified barriers. The findings contribute empirical evidence on AI adoption challenges in developing-country libraries and offer a contextualized framework for institutions navigating similar transitions. The study concludes that sustainable AI integration in library settings demands coordinated infrastructure development, targeted capacity building, phased implementation strategies, and institutional change management.



1. Introduction

Libraries worldwide are under mounting pressure to modernize their operations amidst expanding collections, shrinking budgetary allocations, and rapidly evolving user expectations. Artificial intelligence (AI) technologies have emerged as a compelling avenue for libraries seeking to enhance operational efficiency, improve resource utilization, and elevate service quality. The integration of AI into library management systems (LMS) encompasses machine learning-driven cataloguing, natural language processing for enhanced search, predictive analytics for collection development, and intelligent inventory management capabilities that collectively promise significant efficiency gains.

Yet, while the potential of AI in library contexts is widely acknowledged in the literature, the practical challenges of implementing such systems particularly within developing-country public sector institutions remain insufficiently documented. Libraries in these settings contend with a distinctive array of structural, financial, and human resource constraints that can impede even well-designed technological interventions. Understanding these challenges is essential not only for academic completeness but also for informing policy and practice in similar institutional contexts.

The National Institute of Social Development (NISD) Library in Sri Lanka presents a revealing case for this inquiry. As a specialized academic library supporting social development research and education, NISD recently implemented an AI-supported library management system, making it a timely and contextually relevant site for studying AI implementation challenges in a resource-limited public sector environment. This paper therefore focuses specifically on the third objective of the broader NISD Library study: to identify the challenges encountered in implementing AI-based systems in a public sector library context.

1.1. Research Objective

The primary aim of this paper is to identify and analyses the challenges encountered during the implementation of an AI-based library management system within a public sector academic library in a developing country context. The specific objectives are:

1. To document the range of implementation challenges encountered at the NISD Library;
2. To examine the interplay between institutional capacity and technological demands;
3. To contextualize these findings within the broader literature on AI adoption in developing country libraries;
4. To propose practical recommendations for overcoming identified barriers.

2. Literature Review

2.1. AI in Library Management: Scope and Promise

The application of AI in library management has advanced substantially over the past decade, moving well beyond simple task automation towards sophisticated systems incorporating machine learning, natural language processing, and predictive analytics (Cox & Mazumdar, 2022). Academic libraries adopting AI report significant gains in cataloguing accuracy, resource discovery, personalized user services, and evidence-based collection development. Cox and Mazumdar (2022) estimate that AI can reduce manual processing time in academic libraries by up to 50%, while Johnson et al. (2023) demonstrate the capacity of predictive analytics to anticipate resource demand and prevent unnecessary acquisitions.

Despite this promise, Kumar and Singh (2023) caution that AI implementation entails substantial energy consumption and infrastructure investment, both of which complicate the calculation of net sustainability and operational gains. This tension between technological aspiration and institutional constraint is especially pronounced in developing-country settings.

2.2. Implementation Challenges in Developing-Country Libraries

The literature consistently identifies a cluster of barriers impeding AI adoption in libraries with limited resources. Bhardwaj and Shukla (2021) characterize these barriers as structural, encompassing inadequate technological infrastructure, shortages of qualified technical personnel, and financial constraints that limit both initial investment and ongoing maintenance. Their analysis of library digitalization efforts across South Asian countries reveals that even where motivation and policy support exist, implementation frequently stalls at the level of infrastructure and skills.

Rafiq et al. (2019), examining libraries in South Asian contexts, identified a specific set of interrelated obstacles: chronic underfunding, scarcity of training opportunities for existing staff, and entrenched institutional reluctance to adopt new technologies. This last challenge organizational resistance has received growing scholarly attention as a sociotechnical phenomenon rather than mere technical inertia. Staff anxieties about automation-driven job displacement, combined with uncertainty about changed workflows, represent a significant human dimension of implementation failure.

Ullah and Ameen (2018) highlight the gap between institutional capacity and technological potential as one of the most persistent obstacles in developing-country library contexts. Where institutional readiness including leadership support, adequate resourcing, and staff preparedness does not keep pace with the demands of new systems, implementations are prone to underperformance or abandonment. Their systematic review

of LIS research methodologies further underscores the importance of qualitative, contextualized approaches for capturing the complexity of such phenomena.

2.3. Data Quality and Legacy System Constraints

A dimension frequently underestimated in AI implementation planning is the quality and readiness of existing data. AI-based cataloguing and search functions depend critically on well-structured, consistent, and comprehensive metadata. In libraries where cataloguing has been carried out manually over decades, legacy records often contain inconsistencies, incomplete fields, and non-standardized entries that require extensive remediation before AI features can operate reliably (Hazen, Russo & Confente, 2021). This data preparation burden represents a hidden implementation cost that compounds financial and staffing challenges.

Taken together, the literature portrays AI implementation in developing-country libraries as a multidimensional challenge requiring simultaneous attention to infrastructure, finance, human resources, organizational culture, and data quality. The NISD Library case offers an opportunity to examine how these challenges manifest in a specific institutional context and to identify the interrelationships among them.

3. Methodology

3.1. Research Design

A qualitative case study design was adopted for this research. This approach is well suited to investigating complex contemporary phenomena within their real-world context, particularly when the boundaries between phenomenon and context are not clearly demarcated (Yin, 2018). The implementation of an AI-based LMS at a single institution presented an opportunity for in-depth, contextualized analysis of challenges that would not be accessible through survey-based or experimental approaches.

3.2. Case Selection

The NISD Library was selected as the study site for three reasons. First, it is a specialized academic library operating within the public sector, representative of a category of institution that faces distinctive resource constraints while managing significant knowledge responsibilities. Second, NISD had recently completed the initial implementation of an AI-supported library management system, making the implementation experience fresh and accessible to participants. Third, the Sri Lankan public sector library context offers a well-documented instance of developing-country institutional conditions, facilitating comparison with the existing literature.

3.3. Data Collection

Data were gathered through three complementary methods. Semi-structured interviews were conducted with five library staff members (including cataloguers, reference librarians, and a senior librarian) and two system administrators between July and December 2025. Interview protocols were designed to elicit detailed accounts of implementation difficulties, staff responses to the new system, technical and infrastructural problems encountered, and perceived gaps in training and support. Each interview lasted approximately 45 to 60 minutes and was audio-recorded with participant consent. Supplementary data were obtained through analysis of LMS usage statistics and system-generated reports covering the six-month implementation period, as well as review of institutional documents including technology policy statements, budget reports, and library operational records.

3.4. Data Analysis

Thematic analysis was employed to identify, organize, and interpret patterns across the dataset (Braun & Clarke, 2006). Interview transcripts were coded using both deductive codes derived from the research objectives and inductive codes emerging from the data. Initial codes were progressively consolidated into higher-order themes representing distinct challenge categories. The analytical process was iterative, with themes reviewed and refined across multiple coding passes. Triangulation of interview data with documentary and statistical sources enhanced the credibility of the findings. Member checking with two participants was conducted to verify interpretive accuracy.

4. Findings

Thematic analysis of the data yielded five overarching challenge categories: infrastructure limitations, financial constraints, skills gaps, data quality issues, and organizational resistance to change. These are reported in turn below.

4.1. Infrastructure Limitations

The most immediately disruptive challenge encountered during implementation was the inadequacy of the NISD Library's existing technological infrastructure. Interview participants consistently identified unstable internet connectivity as a critical obstacle, with the AI system's cloud-dependent functions frequently inaccessible or slow during peak usage periods. One system administrator described connectivity interruptions as occurring on a near-daily basis during the first three months of operation, disrupting cataloguing workflows and eroding staff confidence in the system.

Server capacity also proved insufficient to handle the processing demands of machine learning-based cataloguing and the simultaneous operation of natural language search

functions. This necessitated an unplanned mid-implementation investment in server upgrades, which had not been budgeted for at the outset. Participants noted that the vendor's infrastructure assessment prior to implementation had not adequately accounted for the institution's network environment, suggesting a gap in pre-implementation planning processes.

4.2. Financial Constraints

Financial limitations constituted the second major challenge category. The initial implementation cost significantly exceeded the library's annual technology budget, requiring special institutional approval and a reallocation of funds from other planned activities. Participants expressed concern about the sustainability of ongoing costs, particularly annual software licensing fees and technical support subscriptions. A senior librarian observed that the budget for maintaining the system over its projected five-year lifespan had not been systematically planned, creating uncertainty about the library's capacity to sustain the investment.

The financial challenge was further compounded by the costs associated with data preparation and infrastructure upgrades, both of which were underestimated at the planning stage. The cumulative financial burden placed considerable strain on an institution operating within the tight fiscal parameters typical of Sri Lankan public sector bodies.

4.3. Skills Gaps

A pronounced gap between the digital skills of existing staff and the competencies required to effectively operate and maintain the AI-based system was identified as a central implementation challenge. Library staff reported feeling underprepared to interact with the system's AI-driven interfaces, troubleshoot errors, or interpret system-generated analytics. Initial training, provided by the software vendor over two days, was described by multiple participants as insufficiently tailored to the specific operational context of the library and too brief to build lasting competency.

The absence of in-house technical expertise meant that any system anomaly requiring more than basic troubleshooting was dependent on external vendor support, creating delays and operational disruptions. Participants called for a more sustained programme of professional development, including ongoing training sessions, access to user communities, and the designation of an internal system champion with advanced technical knowledge.

4.4. Data Quality Issues

The quality of pre-existing catalogue records posed a significant barrier to optimal utilization of the AI system's automated cataloguing and search features. Legacy records, accumulated over several decades of manual cataloguing, contained numerous inconsistencies in metadata fields, non-standardized

subject headings, incomplete author information, and records formatted to know-obsolete conventions. The AI cataloguing module's performance was demonstrably lower on records with incomplete or inconsistent metadata, producing misclassifications that required manual correction.

The data remediation process systematically reviewing and standardizing legacy records demanded substantial staff time and proved far more resource-intensive than initially anticipated. Participants estimated that data cleaning occupied the equivalent of one full-time staff member for approximately four months, a hidden cost that had not been factored into the implementation timeline or budget.

4.5. Organizational Resistance to Change

The fifth challenge category encompassed the human and cultural dimensions of implementation. A subset of library staff expressed reservations about the new system, rooted primarily in concerns about job security in the face of automation. The introduction of AI-driven cataloguing and inventory functions, which automated tasks previously performed manually, generated anxiety among staff who perceived their roles as potentially redundant.

Beyond job displacement concerns, resistance was also manifest as scepticism about the reliability and appropriateness of AI-generated outputs, particularly among senior staff accustomed to exercising professional judgment in cataloguing decisions. Some participants reported deliberately avoiding certain AI-generated recommendations, preferring to rely on established manual practices even where the system's outputs were demonstrably accurate. This behavioural resistance reduced system utilization rates during the early implementation period and attenuated the efficiency gains that the system was designed to deliver.

Change management support was largely absent from the implementation process. No structured communication strategy had been developed to explain the rationale for the new system, address staff concerns, or articulate the implications for roles and workflows. Participants suggested that participatory engagement of staff in the design and rollout of the system could have mitigated resistance and improved adoption outcomes.

5. Discussion

The findings from the NISD Library case align closely with and extend the existing literature on AI implementation challenges in developing-country libraries. The infrastructure and financial challenges observed corroborate Bhardwaj and Shukla's (2021) characterization of structural barriers in South Asian institutional contexts, and resonate with Rafiq et al.'s (2019) documentation of chronic underfunding and inadequate technical support. The severity of connectivity-related

disruptions at NISD, however, points to a dimension that the existing literature has not fully addressed: the interaction between AI systems' real-time data processing requirements and the network instability prevalent in many developing-country settings. This represents a compatibility challenge that goes beyond simple infrastructure insufficiency.

The skills gap findings reinforce Ullah and Ameen's (2018) argument that the distance between institutional capacity and technological demand is a defining constraint in developing-country library digitalization. What this study adds is a more granular account of how that gap manifests operationally specifically, in the inability to interpret system outputs, the dependence on external support, and the erosion of staff confidence that follows early technical difficulties. These observations suggest that training needs in AI implementation extend well beyond the procedural to encompass conceptual literacy in AI functions and outputs.

The data quality challenge, while implicit in much of the AI in libraries literature, emerges here as a substantial and underappreciated barrier in its own right. The resource intensity of legacy data remediation—four full-time months of staff effort in this case—has significant implications for implementation planning, particularly in institutions where catalogue records span long periods of manual practice. This finding underscores the importance of pre-implementation data audits as a standard component of AI adoption planning.

The organizational resistance documented in this study adds empirical depth to the sociotechnical dimensions of AI adoption. The NISD case illustrates that resistance is not monolithic: it encompasses rational economic concern (job security), professional identity defense (cataloguing expertise), and practical skepticism (reliability of AI outputs). Effective change management therefore requires differentiated responses—transparent communication about role evolution, demonstration of AI system accuracy, and meaningful staff participation in implementation decisions.

It is noteworthy that despite these challenges, the NISD Library ultimately realized measurable efficiency gains: a 40% reduction in cataloguing time, a 35% decrease in unsuccessful searches, and savings of approximately 15 staff hours per week. This outcome suggests that the identified challenges, while significant, are not insurmountable. Rather, they are preconditions that must be addressed systematically for the potential of AI in library contexts to be realized.

6. Conclusion

This case study has documented five principal categories of challenge encountered in implementing an AI-based library management system in a public sector academic library in Sri Lanka: infrastructure limitations, financial constraints, skills

gaps, data quality issues, and organizational resistance to change. These challenges are interrelated and mutually reinforcing; infrastructure deficiencies amplify skills gaps, financial constraints limit both training and data remediation, and unaddressed staff anxieties reduce system utilization.

The NISD Library experience demonstrates that the benefits of AI in library management are achievable even in resource-constrained developing-country contexts, but only when implementation is underpinned by realistic planning, phased investment, and sustained attention to the human dimensions of technological change. The findings call for a recalibration of AI implementation planning in similar institutions one that treats infrastructure readiness, data quality, staff capacity, and organizational culture as foundational considerations rather than afterthoughts.

Future research should examine longitudinal outcomes of AI library implementations across different developing-country contexts, explore the effectiveness of specific change management interventions in library settings, and develop evaluation frameworks tailored to AI-driven resource management in public sector libraries.

7. Recommendations

Based on the findings of this study, the following recommendations are proposed for libraries in comparable contexts undertaking or planning AI system implementations:

Pre-Implementation Infrastructure and Data Audit: Before system deployment, libraries should conduct comprehensive assessments of network reliability, server capacity, and catalogue data quality. Remediation of legacy data should be factored into implementation timelines and budgets as a discrete, resourced activity.

Phased and Incremental Deployment: Implementation should proceed in stages aligned with budgetary cycles and institutional capacity, beginning with features offering the most immediate efficiency returns before advancing to more complex AI functions. This approach limits exposure to implementation risks and builds staff confidence progressively.

Sustained Capacity Building: A structured, multi-stage training Programs covering both procedural operation and conceptual understanding of AI systems should be embedded in implementation plans. Training should be supplemented by the designation of internal system champions with advanced technical competencies and ongoing professional development opportunities.

Proactive Change Management: Institutional leadership should develop and implement a transparent communication strategy addressing the implications of AI adoption for staff roles, workflow changes, and the complementarity of human

and AI functions. Participatory engagement of staff in system design and rollout decisions can reduce resistance and improve adoption outcomes.

Collaborative and Open-Source Solutions: Participation in library consortia and adoption of open-source AI tools can reduce financial barriers and provide access to peer expertise. Cost and knowledge sharing through professional networks offers a pragmatic pathway to sustainability for resource-constrained institutions.

Ongoing Monitoring and Evaluation: Post-implementation review processes should be established to assess system performance, resource efficiency outcomes, and staff utilization patterns. Evidence-based adjustments informed by monitoring data support continuous improvement and demonstrate value to institutional stakeholders.

Ethical and Privacy Governance: Clear institutional policies on data management, user privacy, and algorithmic transparency should be developed and communicated to staff and users, ensuring that AI deployment complies with professional standards and applicable legal obligations.

References

- Bhardwaj, R.K. & Shukla, P. (2021). Artificial intelligence and its applications in libraries: An overview. *International Journal of Information Dissemination and Technology*, 11(2), 78–84.
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- Cox, A. & Mazumdar, S. (2022). Defining artificial intelligence for librarians. *Journal of Library Administration*, 62(8), 1025-1046.
- Hazen, B.T., Russo, I. & Confente, I. (2021). Supply chain management for circular economy: Conceptual framework and research agenda. *International Journal of Logistics Management*, 32(2), 510-531.
- Johnson, P., Smith, R. & Williams, T. (2023). Predictive analytics in library collection development: An AI approach. *Collection Management*, 48(1), 45-62.
- Kumar, S. & Singh, V. (2023). AI implementation in libraries: Energy costs and sustainability considerations. *Information Technology and Libraries*, 42(1), 18-35.
- Rafiq, M., Ameen, K. & Jabeen, M. (2019). Information and communication technologies in LIS education in Pakistan. *Education for Information*, 35(1), 21-41.
- Ullah, M. & Ameen, K. (2018). Account of methodologies and methods applied in LIS research: A systematic review. *Library & Information Science Research*, 40(1), 53-60.

Yin, R.K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). Sage Publications.