ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(c) Nov – Dec, 2025

OPEN ACCESS Original Research Article

THE TRANSFORMATIVE ROLE OF ARTIFICIAL INTELLIGENCE IN LIBRARY AND INFORMATION SCIENCE: A LITERATURE REVIEW AND PILOT SURVEY ANALYSIS

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Abstract:

The integration of artificial intelligence (AI) is catalyzing a paradigm shift within Library and Information Science (LIS), fundamentally altering professional practices and service models. This article provides a systematic examination of AI's transformative impact through a dual-method approach: a compreh ensive literature review and a pilot survey of LIS professionals (n=7). The findings reveal that AI-driven tools are primarily valued for enhancing operational efficiency—particularly in cataloguing, information retrieval, and collection management—and for enabling personalized user services. The survey indicates strong confidence among professionals in their ability to adapt to AI, despite a current implementation gap. However, this technological adoption is not without significant challenges. The analysis critically addresses the crucial ethical and pragmatic considerations inherent in implementation, including algorithmic bias, data privacy, and the need for robust governance frameworks to ensure equitable outcomes. The study concludes that the future of LIS hinges on a balanced approach that leverages AI's potential for innovation while steadfastly upholding the profession's core ethical values.

Keywords: *Artificial Intelligence, Library and Information Science, Automation, User Services, Ethics, Professional Development, Survey*

Introduction:

The adoption of AI in library services constitutes the most recent stage in an ongoing process of technological enhancement designed to optimize information management and accessibility. This progression began with the transition from physical cataloguing methods to digital infrastructure, marked by the implementation of integrated library systems and online public access catalogs that automated essential functions [5].

Later developments in digital storage and data exchange created the necessary foundation for contemporary innovations. The current transformation extends beyond simple automation—which handles repetitive duties—to incorporate genuinely cognitive systems. Leveraging machine learning algorithms, natural language processing, and semantic technologies, these advanced systems can identify complex patterns, generate predictive insights, and facilitate nuanced information interactions [6, 7]. This evolution signals a fundamental transformation of libraries from passive collection sites into proactive, intelligent participants in the global information network [8, 9].

While the theoretical potential of AI is extensively discussed in literature, empirical data on practitioner perceptions and readiness remains less explored. This article seeks to bridge that gap by synthesizing a systematic literature review with original findings from a pilot survey, offering a grounded perspective on the real-world opportunities and challenges of AI integration in LIS.

Methods:

This study employed a mixed-methods approach to comprehensively evaluate the role of AI in LIS.

ISSN–2278-5655

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1. **Systematic Literature Review**

   A systematic literature review was conducted to map the current landscape of AI applications in LIS. Peer-reviewed articles, conference proceedings, and seminal industry reports published between 2018 and 2024 were identified from major databases, including PubMed, Scopus, and Library &Information Science Abstracts. The search strategy utilized keywords such as "artificial intelligence," "machine learning," "natural language processing," "libraries," "Information retrieval," and "digital curation." The selected literature was synthesized to identify emergent themes, documented applications, and prevalent challenges.

2. **Pilot Survey**

   To complement the literature with empirical data, a qualitative survey was distributed to LIS professionals. A cohort of ten professionals was targeted, from which seven complete responses were received (70% response rate). The survey was designed to capture:

   - **Demographics:** Current role and institutional affiliation.
   - **Baseline Awareness:** Familiarity with AI concepts.
   - **Current Implementation:** The extent of AI tool adoption in their institutions.
   - **Perceptions and Vision:** Perceived benefits, high-impact areas, desired services, confidence in adaptation, and a long-term vision for AI in libraries.

   The quantitative data from multiple-choice questions were analyzed descriptively, while qualitative responses from open-ended questions were thematically coded to identify key trends and insights.

Results:

The results are presented in two parts: first, the findings from the systematic literature review, and second, the original data from the pilot survey.

1. Findings from the Literature Review

1. **Automation and Operational Efficiency**

   The implementation of AI has significantly streamlined back-end library operations. Machine learning algorithms are now deployed for automated cataloguing and classification, extracting metadata from digital assets and suggesting subject headings with high accuracy [5]. Robotic process automation (RPA) handles repetitive tasks such as fine calculation, inventory management via RFID, and processing inter-library loan requests. These advancements have demonstrated a measurable impact on workflow, reducing administrative overhead and enabling library staff to redirect their efforts toward more complex, user-facing services.

2. **Information Retrieval and User Engagement**

   AI has profoundly enhanced information discovery and access. Natural Language Processing (NLP) powers semantic search engines that understand user intent and context, moving beyond simple keyword matching [6,7]. AI-powered chatbots and virtual reference assistants provide 24/7 support, answering frequently asked questions and guiding users to relevant resources. Furthermore, recommendation engines, akin to those used by commercial platforms, analyze user behavior and loan history to provide personalized reading and research suggestions, thereby increasing collection engagement [6].

3. **Ethical Considerations and Changing Roles**

   The adoption of AI is not without significant ethical implications. Key concerns identified include data privacy, given the extensive user data required for personalization; algorithmic

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(c) Nov – Dec, 2025

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bias, where training data can lead to skewed or discriminatory outputs [8]; and complex copyright issues in automated content analysis. Consequently, the librarian's role is undergoing a fundamental shift from information gatekeeper to information interpreter and technology facilitator, necessitating new competencies in AI literacy and data ethics.

2. Findings from the Pilot Survey

1. Respondent Profile and AI Familiarity

The survey captured insights from seven LIS professionals, including librarians, LIS faculty, and library directors from academic, public, and special libraries. A significant 85.7% of respondents reported being either "Very Familiar" (28.6%) or "Somewhat Familiar" (57.1%) with AI concepts, indicating a strong foundational awareness.

2. The Implementation-Confidence Paradox

Despite high familiarity, a majority (57.1%) reported that their institution had *not* implemented any AI-based tools, highlighting a significant adoption gap. However, this has not dented professional confidence. When asked about their confidence in the profession's ability to adapt, 85.8% of respondents were either "Very Confident" (42.9%) or "Somewhat Confident" (42.9%). This suggests a workforce that is prepared and eager to embrace AI, but potentially hindered by institutional barriers.

3. Perceived Benefits and High-Impact Areas

The survey results align closely with the literature regarding the perceived benefits of AI. The most frequently cited benefits were "Improved Efficiency and Automation of Routine Tasks" and "Enhanced User Experience and Personalization."

When asked to select areas where AI could help most, the top choices were:

- Cataloguing and Metadata Management
- Information Retrieval and Discovery
- Collection Development and Management

This confirms that professionals see AI's primary value in optimizing core operational and user-facing functions.

4. Vision for Future Services and Professional Evolution

The qualitative responses provided a clear vision for the future. When asked which AI service they would implement first, specific suggestions included "AI-based Circulation," "keeping book automaticaly on the shelf," and "AI-driven recommendation systems."

The open-ended question on the 10-year vision for AI yielded two dominant themes:

1. **Intelligent Personalization and Accessibility:** Respondents envisioned AI "personalizing discovery" and improving "24/7 accessibility," with one noting its potential to provide a "chance to available digital type resources to user."
2. **Strategic Reorientation of the Librarian's Role:** A central finding was the view that "AI can allow librarians to focus more on complex research support and management," positioning AI as a tool that augments professional expertise rather than replaces it.

Discussion:

The synthesis of the literature review and survey data presents a coherent narrative. AI is indeed a transformative force, with its potential recognized by both scholars and practitioners. The survey findings powerfully corroborate the literature's emphasis on automation, personalization, and collection management as key application areas.

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(c) Nov – Dec, 2025

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A critical insight from the survey is the implementation-confidence paradox. While libraries have been slow to adopt AI tools formally, the professionals within them are confident and ready for the transition. This suggests that the primary barriers are not a lack of willingness or skill among staff, but are likely institutional, such as funding constraints, technological infrastructure, and the complexity of integrating AI with legacy systems.

Furthermore, the vision articulated by respondents—of AI handling routine tasks to free up librarians for complex, value-added services—directly addresses the evolving roles discussed in the literature. The profession is not facing obsolescence but a renaissance, where human expertise is elevated by partnership with intelligent systems.

However, this optimistic future is contingent upon addressing the ethical imperatives highlighted in the literature. The survey respondents' focus on improved services must be balanced with a proactive development of ethical frameworks to manage data privacy and mitigate algorithmic bias, ensuring that the drive for efficiency does not compromise the library's mission of equitable service.

Conclusion:

In conclusion, the integration of artificial intelligence is fundamentally transforming the modern library, a transformation affirmed by both scholarly research and practitioner sentiment. This study demonstrates that AI is poised to drive unprecedented gains in efficiency and enable sophisticated, personalized user engagement. The clear vision from professionals is one where AI handles logistical burdens, allowing librarians to ascend to roles as expert guides, research partners, and curators of knowledge.

The path forward requires a concerted effort. Libraries must move beyond the awareness and confidence phase into active, strategic implementation. This will involve investing in not only technology but also in continuous staff development and the creation of robust ethical guidelines. The ultimate success of AI in LIS will be measured not by its technological sophistication, but by how effectively it is harnessed to uphold and enhance the core values of equity, privacy, and intellectual freedom that define the library profession. Ongoing dialogue between researchers and practitioners, as initiated in this study, will be essential to navigate this evolution successfully.

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ISSN–2278-5655

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Cite This Article:

Mrs. Patil S.S. (2025). *The Transformative Role of Artificial Intelligence in Library and Information Science: A Literature Review and Pilot Survey Analysis.* **In Aarhat Multidisciplinary International Education Research Journal**: Vol. XIV (Number VI, pp.135–140). **Doi: https://doi.org/10.5281/zenodo.18153295**