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DIGITAL LIBRARY MANAGEMENT IN HIGHER EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Background: The rapid advancement of information and communication technology has transformed traditional libraries into digital libraries that provide electronic access to information resources. As essential components of higher education, digital libraries support academic activities, research productivity, and knowledge dissemination. **Purpose:** This study analyzes the development, challenges, and future directions of digital library management through a Systematic Literature Review (SLR).
Methods: A total of 45 peer-reviewed articles published between 2015 and 2024 were retrieved from Scopus, Web of Science, and Google Scholar. The review followed a systematic process of identification, screening, eligibility assessment, and inclusion of relevant studies.
Findings: Effective digital library management is shaped by four key factors: digital infrastructure, metadata standards, user-centered services, and digital preservation strategies. Emerging technologies, including artificial intelligence, cloud computing, and big data analytics, have enhanced information retrieval and digital resource management. Nevertheless, digital libraries continue to face challenges related to copyright, technological constraints, and users' digital literacy.
Originality/Value: This review synthesizes recent research trends and highlights future directions for strengthening digital library management in higher education institutions.

Keywords: Digital library; Digital library management; Academic digital library

1. INTRODUCTION

The rapid growth of information technology has fundamentally transformed the way information is produced, stored, and disseminated in modern society (Hilbert, 2020; Kudlai, 2024; Ibrayeva, Sarsenova, & Kondykerova, 2025). Libraries, which traditionally served as

physical repositories of knowledge, have evolved into digital platforms that enable users to access information remotely (Sumithra & Sakshi, 2024; Subangi, Kumaran, & Mohan, 2024; Deichakivska et al., 2024; Gutiérrez, 2025). Digital libraries provide electronic access to a wide range of resources, including academic journals, e-books, institutional repositories, and multimedia materials. This transition reflects a broader global shift in information provision and delivery (Warf, 1995; Kellerman, 2020; Chalaby & Plunkett, 2020), moving from traditional print-based models toward electronic and web-based formats that prioritize accessibility, speed, and interoperability (Mondal, & Mondal, 2024; Khan, Deacy & Healy, 2024).

In higher education institutions, digital libraries play a crucial role in supporting teaching, learning, and research activities (Ullah & Usman, 2023; Eniekebi, 2025; Chauhan, 2026; Kishor, 2024). The availability of digital information resources allows students and researchers to obtain knowledge quickly and efficiently without geographical limitations (Bhat, 2024; Tenya, Maina, & Awuor, 2023). Evidence from higher education institutions indicates that digital library implementation, when supported by structured operational planning, adequate human resources, and clearly defined organizational functions, can substantially strengthen the quality of academic services (Akinolo, 2022; Khoeini et al., 2024; Tano, 2024). Similarly, research conducted by 'Azah, Juraidah, & Fateh (2025) suggested that strategic library management combined with digital literacy initiatives contributes meaningfully to quality assurance frameworks, research visibility, and accreditation performance, particularly when institutions integrate digital repositories and open-access scholarly databases into their service models. As a result, universities worldwide have increasingly invested in digital library systems to enhance academic services and research productivity, with studies in Indonesian tertiary institutions further confirming that digitalization has become the preferred means of ensuring convenient academic access, even as limited technological competence among staff and constrained budget allocations continue to temper these gains.

However, the transition from traditional libraries to digital libraries presents significant managerial and technological challenges. Digital library management requires effective strategies for digital collection development, metadata management, digital preservation, and user access services. Comparative analyses of metadata, communication, content, and preservation standards demonstrate that frameworks such as Dublin Core, MARC, OAIS, and PREMIS remain indispensable for ensuring interoperability and long-term resource discoverability across increasingly interconnected library systems.

In parallel, research on information resource management in university digital libraries highlights persistent difficulties in collection organization, storage and backup, and secure resource sharing, and proposes standardized cataloguing procedures and reinforced digital protection measures as practical remedies (Fang, Fei, & Qingchun, 2023). Studies examining academic libraries in similarly report that, despite a generally moderate awareness among library staff of the benefits and requirements of digital preservation, institutions face urgent needs to develop new preservation-related competencies and strengthen collaboration between library staff and research communities to sustain long-term access to information (Awamleh & Hamad, 2022; Ahmad et al., 2025; Nurhidayah, Endah, & Gracegefa, 2025). At a broader level, a systematic review of digital curation services in academic libraries worldwide identifies the absence of clear policy frameworks (Ndhlovu, (2018; Zareef & Jabeen, 2025), shortages of skilled personnel (Yaroshenko & Iaroshenko, 2024), and inadequate technological infrastructure (Savitskaya, 2021; Pasqui, 2024; Sousa, 2025) as recurring barriers to effective digital curation adoption across diverse national contexts.

Additionally, emerging technologies such as artificial intelligence, cloud computing, and big data analytics have introduced new opportunities for improving digital library services. Reviews focused on developing countries report that artificial intelligence offers considerable potential to improve information access, operational efficiency, and user experience in libraries, although this potential is frequently constrained by inadequate infrastructure, a shortage of skilled personnel, and the absence of clear data privacy regulations (Cox & Mazumdar, 2022; Mahmud, 2024). Artificial intelligence library services innovation framework for university education, despite its capacity to support intelligent decision-making in information retrieval and resource sharing, adoption remains limited because it is rarely incorporated into institutional strategic planning. Investigations conducted in academic libraries further demonstrate that artificial intelligence applications, including natural language processing tools and predictive analytics, hold considerable promise, though funding constraints, librarians' attitudes, and limited technical skills continue to hinder widespread deployment. Beyond artificial intelligence, research examining cloud-based big data management among leading Iranian universities found that manpower, economic constraints, and organizational readiness were the most influential factors shaping the current, generally unfavorable, state of cloud-based data management practices in academic libraries.

Despite the increasing importance of digital libraries, previous studies on digital library management are scattered across multiple disciplines, including information science, computer science, and knowledge management. Consequently, a comprehensive synthesis of existing research is necessary to better understand the current state of digital library management and identify future research directions that can meaningfully inform practice across varied institutional and national settings. Therefore, this study aims to conduct a Systematic Literature Review (SLR) to analyze the development, challenges, and future trends in digital library management, particularly in the context of higher education institutions.

2. METHODS

This study employed a Systematic Literature Review (SLR) approach to analyse and synthesise research related to digital library management. The researchers adopted this method because it enabled them to identify, evaluate, and interpret existing studies in a transparent and reproducible manner (Kitchenham, 2004). The review process comprised four sequential stages: the researchers first identified relevant literature, then screened the retrieved articles, subsequently assessed their eligibility, and finally selected the studies for inclusion. By following this staged sequence, the researchers ensured that only high-quality and topically relevant articles entered the final analysis.

The researchers conducted the literature search across four major academic databases: Scopus, Web of Science, ScienceDirect, and Google Scholar. They combined the following keywords when querying these databases: "digital library management," "digital repositories," "academic digital libraries," "digital information systems," and "digital knowledge management." The researchers limited the search to peer-reviewed journal articles published between 2015 and 2024, a decade that captured the accelerating digitalisation of higher-education libraries across diverse national contexts. This strategy, for illustration, surfaced studies ranging from artificial-intelligence-driven library service frameworks examined in Nigeria and Malaysia to cloud-based big-data management practices investigated in Iran, reflecting the international breadth of the databases consulted.

To safeguard the quality of the review, the researchers applied a predefined set of inclusion and exclusion criteria. They included studies that were published in peer-reviewed journals, appeared between 2015 and 2024, focused on digital library systems or management, and were written in English. Conversely, they excluded conference abstracts without full papers, non-academic publications, duplicate records, and studies unrelated to digital libraries. By applying these criteria consistently, the researchers filtered out low-quality or tangential sources while retaining studies with clear methodological and thematic relevance to digital library management in higher education.

The researchers followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to structure the article selection process. As illustrated in the flow diagram above, the selection proceeded through four stages. During the identification stage, the researchers retrieved 120 articles from the databases searched. They then screened these records by title and abstract, removing 35 duplicates and narrowing the pool to 85 articles. Next, they assessed the eligibility of these 85 articles, excluding 25 that did not meet the topical criteria and retaining 60 articles for full-text review. Finally, after examining the full texts against the inclusion and exclusion criteria, the researchers excluded a further 15 articles and included the remaining 45 articles in the final analysis. This staged reduction from 120 to 45 articles illustrates the rigor with which the researchers filtered the literature to ensure that the review synthesised only the most credible and relevant evidence on digital library management in higher education institutions.

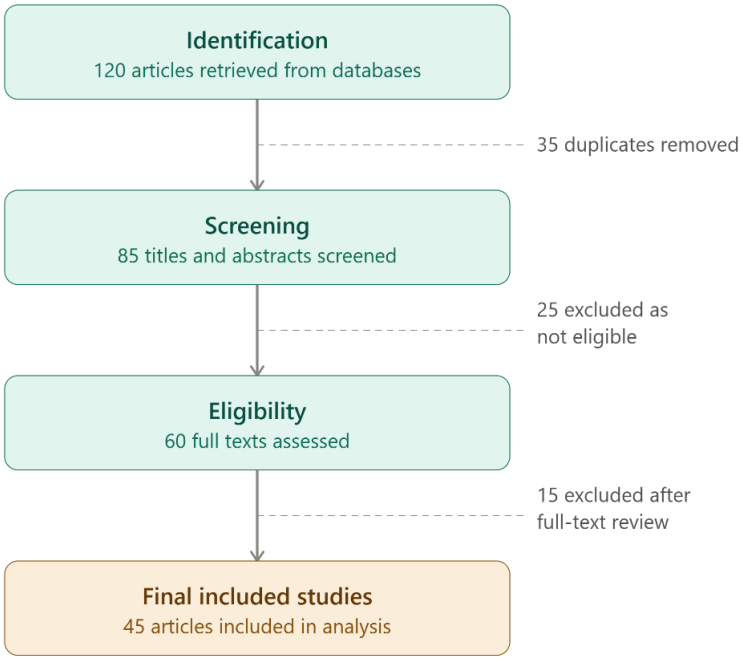


Figure 1. Selected documents stages

3. RESULTS AND DISCUSSION

Trends in Digital Library Research

The reviewed studies indicated that digital library research grew significantly over the past decade, expanding from a narrow focus on storage and access toward a broader concern with intelligence, sustainability, and user-centred design. The researchers identified five

recurring themes across the 45 included articles: digital repository systems, information retrieval technologies, digital preservation strategies, user experience and usability, and the integration of artificial intelligence. This pattern indicated that digital libraries were increasingly evolving from simple digital storage systems into intelligent knowledge management platforms.

Within the repository systems theme, studies conducted in Ukrainian higher education institutions demonstrated that repository quality depended not only on technical infrastructure but also on total-quality-management principles and professional collaboration with external partners (Kurhanskyi, 2026). Within the information retrieval and metadata theme, a comparative review of metadata, communication, and preservation standards confirmed that frameworks such as Dublin Core, MARC, and PREMIS remained essential for cross-platform interoperability (Meghanandha et al., 2025). Within the preservation theme, both a global systematic review of digital curation services (Zareef et al., 2025) and a Jordan-based survey of library employees (Awamleh et al., 2022) converged on similar conclusions: preservation outcomes depended heavily on staff competencies, institutional policy, and sustained funding rather than technology alone. Within the artificial intelligence theme, reviews conducted in developing-country contexts (Barsha et al., 2023) and within Indian academic libraries (Jha, 2023) confirmed that AI adoption remained promising but constrained by infrastructure gaps and limited technical skill among library personnel. Taken together, these themes suggested that the field was moving in a consistent direction internationally, even though the pace of transformation varied considerably by region.

Table 2. Summarises several representative studies examined during the review, illustrating the range of foci that characterized the literature on digital library management

Author(s)	Publication Year	Focus of Study	Key Findings
Christine L. Borgman	2018	Privacy, governance, and stewardship of research ("open") and institutional ("grey") data at universities, using the University of California as a case example	Universities face a "privacy frontier" as open-access mandates for research data collide with growing volumes of "grey data" (administrative, learning-analytics, operational) that fall outside existing privacy regulations like HIPAA/FERPA/PII. Responsibility for data is diffuse and governance is uneven; the paper distinguishes autonomy privacy, information privacy, and information security, and calls for embedding a privacy "ethic," promoting joint governance, and building awareness rather than reactive panic.
Gobinda Chowdhury	2014	Sustainability of digital libraries (conceptual/theoretical)	Proposes a conceptual model and research framework built around three interconnected sustainability dimensions economic, social, and environmental for digital libraries. Identifies the major factors influencing each dimension and argues these should be studied together (not in isolation) to build digital libraries that are simultaneously economically viable, socially useful, and environmentally sound.
Md. Atikuzzaman	2025	Opportunities and challenges of AI adoption in academic libraries, from the perspective of LIS practitioners in Bangladesh	Based on interviews with practitioners at three public universities, the study finds AI offers key opportunities such as facilitated user services/interaction, enhanced processing activities, and smoother library operations, but adoption is constrained by practical and institutional challenges (e.g., limited infrastructure, skills, and funding).
Abdul Kadir Salifu, Iddrisu Sulemana, Richard Bruce Lamptey, Ismail	2026	AI adoption opportunities/challenges in two Ghanaian academic libraries (KNUST and UDS) qualitative	AI adoption is at an early stage; librarians recognize AI's benefits but implementation is uneven (KNUST is building AI chatbots, UDS lacks a concrete plan). Existing use is limited to tools like Turnitin/AI-

Abu, Kadir Fuseini, Ahmed Mustapha		multiple case study	detection software. Four main barriers identified: insufficient funding, inadequate infrastructure, lack of technical skills, and absence of institutional AI policy frameworks. Recommends sustained funding, policy development, staff training, and ethical guidelines.
Theophilus Kwamena Ocran, Paulina Afful-Arthur	2022	Role of digital scholarship in an academic library (University of Cape Coast, Ghana), from faculty perspective	Faculty appreciate digital scholarship services (information literacy training, reference lists, new-materials lists) and see them as relevant, reliable, and integrated into teaching/research. However, faculty face inadequate facilities, limited open access to reading materials, and insufficient digital tools/platforms, limiting fuller use of digital scholarship.
Ying Chun Wang, Rui Xing	2011	Application of cloud computing to digital libraries (conceptual/technical)	Analyzes cloud computing's concept and features, proposes a cloud-computing-based model for digital libraries, and discusses associated security issues, concluding with several key questions that should be addressed when building cloud-based digital libraries.
Nuno Miguel Teixeira Sousa	2025/2026	Systematic literature review on AI's role in digital preservation of academic repositories and scientific data in higher education libraries	Identifies five consistent themes: (1) automation of curation via NLP for scalable metadata, (2) semantic enrichment improving discovery/reuse, (3) predictive analytics for format obsolescence and proactive migration, (4) interoperability gains from standards-driven metadata (Dublin Core, PREMIS, METS), and (5) governance needs (transparency, bias mitigation, capacity-building). Benefits coexist with infrastructure, skills, and ethical constraints; recommends modular tools, collaborative governance, and staff AI literacy.
Andrew M. Cox, Suvodeep Mazumdar	2022	Conceptual definition of AI for the library profession and its implications	Develops a taxonomy of five AI use cases in libraries: back-end automation (RPA/robotics), user-facing services (knowledge discovery, chatbots, living systematic reviews), building data-scientist communities, data/AI literacy training, and analyzing/predicting user behavior. Concludes librarians' roles will shift rather than disappear given AI's dependence on well-managed data, but warns of potential negative impacts on equality, diversity, and inclusion if AI skills aren't spread widely across the profession.

Collectively, these studies reveal a persistent gap between practitioner enthusiasm and institutional readiness in library technology adoption. Across contexts ranging from cloud computing (Wang & Xing, 2011) to contemporary AI integration (Sousa, 2026; Cox & Mazumdar, 2022), librarians consistently recognize the transformative potential of emerging technologies, yet implementation remains constrained by recurring structural barriers such as inadequate infrastructure, insufficient funding, limited technical skills, and underdeveloped policy frameworks (Atikuzzaman, 2025; Salifu et al., 2026). Notably, governance and ethical considerations emerge as an underexplored but critical dimension (Borgman, 2018; Sousa, 2026), suggesting that technological capability continues to outpace institutional and regulatory preparedness. This pattern indicates that sustainable technology adoption in academic libraries requires deliberate investment in staff training, governance structures, and policy development, rather than passive reliance on organic diffusion.

Digital Library Development

Digital library initiatives grew rapidly in recent years, particularly within higher education institutions. Many universities implemented institutional repositories and digital

library platforms to improve access to academic resources. Representative examples identified in the review included university institutional repositories, digital thesis and dissertation archives, and open-access journal platforms. Consistent with this pattern, a case study of an Indonesian Islamic higher education institution found that digital library implementation succeeded when it was supported by structured operational planning, adequately trained human resources, and clearly defined organisational functions. Similarly, an evaluation of digital libraries in institutions concluded that digitalisation had become the preferred means of ensuring convenient academic access, although it continued to be constrained by limited staff competence in information technology and restricted budget allocations (Tenya, , Maina, & Awuor, 2023).

However, several challenges remained, including limited technological infrastructure, budget constraints, and uneven levels of digital literacy among users. A systematic review focused specifically on artificial intelligence adoption in libraries similarly found that, although the technology offered considerable promise for improving search accuracy and service delivery, actual implementation lagged behind international benchmarks because it was rarely embedded within institutional strategic planning. Furthermore, many universities remained in the early stages of digital library transformation, focusing primarily on digitising existing collections rather than developing advanced digital services such as predictive analytics or AI-assisted preservation, a pattern that a review of preservation strategies in academic libraries suggested was common among resource-limited institutions more broadly (Nurhidayah et al., 2025). Therefore, improving digital library management practices was identified as essential for enhancing research productivity and knowledge dissemination in Indonesian higher education institutions, and for narrowing the gap between Indonesia's current digitisation-focused stage and the more advanced, AI-integrated stage already emerging in some university systems elsewhere.

Future Trends in Digital Library Management

Based on the literature review, four emerging trends were identified as likely to shape the future of digital libraries.

1. Artificial intelligence integration

The reviewed studies indicated that AI technologies would enable smarter information retrieval systems and automated metadata generation. Research on AI-driven digital preservation of academic repositories found that natural-language-processing tools could enhance automatic metadata extraction and enrichment while supporting compliance with international standards such as PREMIS (Sousa, 2025). At the same time, a framework proposed for AI-enabled library services in university education cautioned that adoption would remain limited unless institutions incorporated AI explicitly into strategic planning rather than treating it as an ad hoc technical addition (Okunlaya et al., 2022).

2. Cloud-based library systems

The review found that cloud computing was expected to allow libraries to manage large digital collections at lower infrastructure cost. However, evidence from Iranian universities showed that the current state of cloud-based data management remained unfavourable in practice, constrained primarily by workforce capacity and economic factors rather than by the technology itself (Bonjar, Ziaie, & Salami, 2021), suggesting that future adoption would depend as much on capacity-building as on technical investment.

3. Open access movement

The increasing demand for open-access publications was expected to encourage universities to develop institutional repositories and digital publishing platforms further. Studies on repository quality management indicated that sustaining open-access infrastructure required continuous professional development among library staff and active cooperation with external professional associations (Kupriene & Petrauskiene, 2018); Sylvester & Sylvester, 2025).

4. Data analytics for user behaviour

The review anticipated those libraries would increasingly use data analytics to understand user needs and improve service quality. Evidence from academic libraries, however, showed that while many institutions had begun using digital tools for outreach and marketing, few had adopted dedicated analytics platforms, largely due to insufficient staff training in tools (Rudenko, Kyryliuk, & Khutorna, 2022; Ye, Kim, & Cho, 2023). This finding suggested that the realisation of data-driven library services would depend heavily on parallel investment in staff capability, echoing the workforce-related constraints identified across the AI and cloud computing themes.

4. CONCLUSION

This systematic literature review of 45 peer-reviewed studies (2015–2024) demonstrates that digital libraries have become indispensable infrastructures for higher education, with effective management depending on the integration of robust technologies, standardized metadata, user-centered services, sustainable preservation, and sound governance. Emerging technologies such as artificial intelligence, cloud computing, and big data are transforming digital library services, but their success requires adequate funding, institutional policies, and staff capacity. Persistent challenges such as including copyright, infrastructure, financial constraints, and digital literacy gaps, particularly in developing countries continue to limit progress. These findings provide strategic guidance for policymakers and library managers while emphasizing the need for future research on cost-effective technological adoption and sustainable governance models.

AUTHORS' CONTRIBUTIONS

Ola Ahmad Salah Al Qaderi: Writing oiginal draft preparation. Ideas; formulation or evolution of overarching research goals and aims. **Andi Aswan:** Supervision. **Wahda Rasyid:** Supervision. **Mursalim Nohong:** Supervision. **Omer Mohamed Taha Alkanan:** Ideas; formulation or evolution of overarching research goals and aims.

CONFLICT OF INTERESTS

We state that there are no known conflicts of interest linked with this publication, and that there has been no significant financial assistance for this work that could have influenced its outcome.

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