



Knowledge Preservation Frameworks: Models, Best Practices, and Policy in the Digital Era

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ABSTRACT

Knowledge preservation is essential for ensuring the sustainability of cultural heritage and valuable information in the dynamic digital era. This study aims to systematically review and synthesize current models, best practices, and supportive policies for knowledge preservation across digital and traditional contexts. A Systematic Literature Review (SLR) was conducted on the Scopus database, reviewing literature published from 2019 to 2024. The PRISMA approach was applied to select ten relevant articles using "Knowledge Management" AND "Preservation" as primary search terms. The analysis revealed three main preservation models: the Open Access Knowledge Organization Model, the Heritage Building Information Modeling (BIM) Methodology, and a Secure Knowledge Transfer Framework. Key best practices include the digitization of traditional knowledge and social innovation in craft conservation through local community involvement. Essential policies identified were Green Digital Policies and Stakeholder-Based Policy Frameworks. The findings conclude that sustainable knowledge preservation requires a holistic framework. Success depends on the strategic integration of advanced technology, cross-sector collaboration, and supportive policies to maintain long-term accessibility and integrity. This research offers valuable guidance for practitioners and policymakers.

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1. INTRODUCTION

Knowledge preservation has emerged as a critical concern amid the complexities of the modern digital landscape, characterized by rapid technological advancements, immense data generation, and the intrinsic value of cultural heritage (Ahmad & Rafiq, 2022; Chigwada & Ngulube, 2025; Wu et al., 2023). The preservation of knowledge is crucial for sustaining cultural legacies and ensuring the continuous evolution of practices essential for societal growth and innovation. It transcends mere archival activities, demanding a strategic framework to maintain both traditional and digital narratives in a manner that supports informed decision-making and robust learning environments across vital sectors, such as education, health, and cultural heritage (Ahmad & Rafiq, 2022; Anyaoku et al., 2018; Thieberger & Harris, 2022). In this context, it is imperative to understand how systems for preserving knowledge function, integrating enduring values while simultaneously adapting to future transformative challenges. This duality requires a model that not only safeguards existing knowledge but also propels its evolution in the face of emerging risks associated with both formats of knowledge, traditional and digital.

The increasing predominance of digital information further complicates the knowledge preservation landscape, highlighting an urgent need for robust strategies tailored to the unique vulnerabilities of digital assets. The transition from traditional knowledge formats to increasingly digital repositories introduces risks of obsolescence; many digital artifacts, such as old software and file formats, are at risk of irrevocable loss due to inadequate preservation frameworks (Awamleh & Hamad, 2022; Masenya & Ngulube, 2019).

According to the article “Alih Media Digital dalam Kegiatan Pelestarian Informasi” by Fatmawati (2022), the preservation of library materials through digitization is a significant effort to ensure continued access to such information. Digitization efforts represent a significant response, particularly within libraries, as a vital strategy to counteract the degradation of cultural materials. However, the transition to digital also presents novel vulnerabilities, necessitating proactive management practices to circumvent rapid value depreciation and potential data loss, especially in light of technological advancements that may render certain systems obsolete (Ndegwa et al., 2022). Digital data that is not properly managed risks losing its value due to rapid technological changes and storage failures. This is reinforced by a report from the Digital Preservation Coalition (2024), which states that various types of digital data, such as discontinued video games and consumer social media, are at high risk of loss if there are no appropriate preservation measures in place.

Addressing these challenges necessitates a comprehensive and multi-layered approach. Beyond the mere storage of data, knowledge preservation today demands the integration of advanced technology, systematic documentation, and efficient access management. Advanced technologies, such as Artificial Intelligence (AI) and Database Management Systems (DBMS), are increasingly employed, enabling faster, more accurate data processing and providing enhanced security against the threat of information loss (UNESCO, 2023; Wei & Sun, 2021). Moreover, knowledge preservation models must be effective and context-sensitive, taking into account the unique needs and challenges of different settings—whether organizations, communities, or educational institutions. This complexity underscores the need for continuous research into effective preservation strategies

According to [Duff et al. \(2020\)](#) in the article “Digital Preservation Education: Educating or Networking?”, best practices in knowledge preservation involve a combination of technology, documentation, and integrated access management. Effective knowledge preservation models need to consider various contexts, such as organizations, communities, and educational institutions, by understanding the unique needs and challenges in each sector.

Without an integrated strategic approach, the risk of loss is not limited to digital information but also extends to the valuable traditional cultural heritage of local communities ([Arias-Pérez et al., 2021](#)). Therefore, systematic efforts are needed to ensure the sustainability and accessibility of knowledge, both digital and traditional, so that it remains relevant and useful amid ever-changing technological developments. Cutting-edge methodologies, such as Building Information Modeling (BIM), have gained traction in the preservation of built heritage, demonstrating the increasing intersection of technological innovation and legacy conservation ([Harada et al., 2018](#)). Furthermore, innovative knowledge transfer frameworks fortified by Artificial Intelligence (AI) and secure data exchange mechanisms are being leveraged to enhance data accessibility and security across various domains ([Wei & Sun, 2021](#)). These technologies enable faster, more accurate data processing and provide better security against the threat of information loss. Additionally, Open Access Knowledge Organization Models have emerged, advocating for transparent accessibility to cultural heritage and linguistic diversity resources, thereby democratizing preservation efforts ([Yang et al., 2022](#)).

These advancements, however, necessitate a broader discourse on effective collaboration and engagement strategies—especially the ramifications of social innovation in integrating traditional knowledge into contemporary frameworks, which accentuates the human aspect of preservation efforts ([Arias-Pérez et al., 2021](#); [Lu et al., 2023](#)).

While numerous studies explore discrete dimensions, whether they focus on technical models, sociocultural practices, or policy implications, there is a striking lack of integrated examinations that elucidate the interplay between these factors. Existing scholarship tends to prioritize either technological effectiveness or policy impacts, neglecting the comprehensive, systematized overviews essential for practitioners to navigate the intricate landscape of preservation. Moreover, literature indicates a rising need for frameworks that are context-sensitive, recognizing sector-specific challenges and tailoring approaches accordingly ([Lichty, 2020](#); [Matlala et al., 2022](#)). Such integrative understanding is paramount for addressing the multifaceted and complex risks associated with both digital and traditional knowledge, revealing an evident demand for cross-domain comparative analyses that map effective strategies across different contexts.

This study aims to systematically review and synthesize current models, best practices, and supportive policies for knowledge preservation across digital and traditional contexts grounded in high-quality literature published between 2019 and 2024. By viewing these components through a unified lens, the study aspires to present a contemporary framework that outlines the essential relationships between technological, collaborative, and policy-driven efforts in advancing knowledge preservation. The contributions of this research encompass a structural categorization of preservation mechanisms, fostering clarity in distinguishing between various models (e.g., Open Access, BIM), practices (e.g., digitization, social innovation), and policies (e.g., Green Digital, stakeholder involvement). This categorization seeks to provide a practical taxonomy for both scholars and practitioners, thereby advancing collective comprehension of the current preservation ecosystem.

Moreover, by mapping how these elements interconnect to support sustainable knowledge management, this research underscores the importance of advocating holistic approaches

while detailing which strategies can effectively serve to maintain the integrity and accessibility of both digital and traditional knowledge forms (Lichty, 2020; Mosweu, 2023). Importantly, this research establishes a basis for policy and practice guidance that can directly influence decision-makers in the creation and implementation of socially-informed, strategically-designed frameworks aimed at knowledge preservation.

In conclusion, the primary objective of this study is to systematically review and synthesize the existing academic literature to delineate, analyze, and structurally compare the key knowledge preservation models, best practices, and supportive policies. Through this effort, the research aims to construct an integrated framework for sustainable knowledge management that can inform future research and practice in diverse contexts, advancing both academic discourse and the practical strategies vital for successfully preserving knowledge in an era characterized by relentless change.

2. METHODS

The method used in this research is Systematic Literature Review (SLR), a method that involves analyzing and assessing previous research related to a specific phenomenon in a structured, systematic manner, allowing for replication by other researchers (Brereton et al., 2007). The goal of the SLR method is to identify, evaluate, and synthesize relevant findings to provide a comprehensive understanding of the researched topic.

This research began by creating a plan for research questions using the PICOC approach. PICOC is a scope within Systematic Literature Review (SLR) designed to help analyze articles in answering research questions by considering several aspects, namely Population, Intervention, Comparison, Outcomes, and Context (Cruz-Benito, 2016).

Table 1. PICOC structure

Aspect	Description
P (Population)	Organizations and institutions implementing knowledge preservation models in the education, health, and culture sectors.
I (Intervention)	Knowledge preservation models, including digital, traditional, or hybrid.
C (Comparison)	Comparison of technology-based models with conventional models..
O (Outcome)	Effectiveness of the model in maintaining the integrity, accessibility, and sustainability of knowledge.
C (Context)	Organizational settings, social environment, and policies supporting knowledge preservation.

3. RESULTS AND DISCUSSION

This research began with a literature selection process using the Scopus database, which has high credibility in providing quality scientific articles. The search was conducted using the keywords "*Knowledge Management*" and "*Preservation*" using Boolean Logic techniques to ensure relevant search results.

Boolean Logic utilizes logical connectors AND, OR, and NOT to filter search results. The AND connector was used to find articles containing both keywords simultaneously, so only articles discussing "*Knowledge Management*" and "*Preservation*" were included. The OR connector allowed the search to include articles containing one or both keywords, thus providing a

broader scope. Meanwhile, the NOT connector was used to exclude articles containing specific keywords, thereby helping to narrow the search focus.

The literature sources used included articles curated in the Scopus database over the last 5 years, from 2019 to 2024. Inclusion criteria were set to include articles relevant to the research topic, while exclusion criteria were used to filter out articles not aligned with the study's focus.

Table 2. Inclusion and exclusion data

Inclusion	Exclusion
All scientific works in the form of scientific articles	All scientific works not in the form of scientific articles
All scientific works in English	All scientific works not in English
All scientific works published from 2019-2024	All scientific works published before 2019
All scientific works that are open access	All scientific works that are not open access
All scientific works relevant to the research topic	All scientific works not aligned with the research topic

The selection method for this research adopted the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) approach to ensure that the selected literature had high relevance and quality. The selection process began with searching for scientific articles through the Scopus database, recognized as a credible source for providing valid and trustworthy scientific articles. The following is the selection flow used in this research with the PRISMA approach, the list of literature selection results, and the table of findings based on the selected articles.



Figure 1. PRISMA Selection Process Flowchart
Source: Author’s Research, 2025

Table 3. Literature selection list

Authors	Title	Year
Jia J.; Ma S.; Wang L.; Liu Y.; Deng R.H.	<i>A Secure and Robust Knowledge Transfer Framework via Stratified-Causality Distribution Adjustment in Intelligent Collaborative Services</i>	2024
Moya Espinosa P.I.; Cortés Rodríguez N.C.; Socha López J.C.	<i>Social Innovation for Conserving Textile-Craft Practices in Boyacá, Colombia; [Innovación social para la conservación de prácticas textiles artesanales en Boyacá Colombia]</i>	2024
Fraisse A.; Zhang Z.; Zhai A.; Jenn R.; Fishkin S.F.; Zweigenbaum P.; Favier L.; El Hadi W.M.	<i>A sustainable and open access knowledge organization model to preserve cultural heritage and language diversity</i>	2019
Glazova M.V.; Rizaev N.K.; Kholmatova D.A.; Abdurakhmanov O.K.	<i>Sustainable Management of Knowledge and Information Systems in The Green Digital Economy</i>	2024
Baik A.	<i>A Comprehensive Heritage BIM Methodology for Digital Modelling and Conservation of Built Heritage: Application to Ghiqa Historical Market, Saudi Arabia</i>	2024
Duine M.	<i>Summary report APE 2022 the future of the permanent record</i>	2022
Di Nardo M.; Murino T.; Adegbola K.	<i>A methodology for selecting optimal knowledge acquisition through analytic hierarchy process and environment parameters impact</i>	2023
Balogun T.	<i>Data management of digitized indigenous knowledge system in repositories</i>	2023
Beattie T.; Belmans N.; Carbol P.; Cowley M.; Faltejsek J.; Grambow B.; Holt E.; Salat E.; Tatomir A.; Théodon L.; Winsley R.; Zuidema P.	<i>Overview of knowledge management in EURAD</i>	2022
Vanino S.; Pirelli T.; Di Bene C.; Bøe F.; Castanheira N.; Chenu C.; Cornu S.; Feiza V.; Fornara D.; Heller O.; Kasparinskis R.; Keesstra S.; Lasorella M.V.; Madenoğlu S.; Meurer K.H.E.; O'Sullivan L.; Peter N.; Piccini C.; Siebielec G.; Smreczak B.; Thorsøe M.H.; Farina R.	<i>Barriers and opportunities of soil knowledge to address soil challenges: Stakeholders' perspectives across Europe</i>	2023

Table 4. List of research article findings

No	Category	Author & Year	Model / Practice / Policy	Main Findings
1	Model	Jia J. et al. (2024)	Secure and Robust Knowledge Transfer Framework	Uses stratified-causality distribution adjustment to enhance security and efficiency in intelligent collaborative services.
2	Model	Fraisse A. et al. (2019)	Open Access Knowledge Organization	Sustainable framework for organizing knowledge with open access principles to preserve cultural heritage and language diversity.
3	Model	Baik A. (2024)	Heritage BIM Methodology	Digital modeling approach for conserving built heritage, ensuring accessibility of cultural assets.
4	Model	Glazova M.V. et al. (2024)	Sustainable Knowledge Management in Green Digital Economy	Integrated systems approach for managing knowledge aligned with green economy principles.
5	Model	Di Nardo M. et al. (2023)	Optimal Knowledge Acquisition Methodology	Uses Analytic Hierarchy Process (AHP) to optimize knowledge acquisition considering environmental parameters.
6	Best Practice	Balogun T. (2023)	Digitization of Traditional Knowledge	Digitizing indigenous knowledge systems in repositories proven effective for preserving native culture.
7	Best Practice	Moya Espinosa P.I. et al. (2024)	Social Innovation in Craft Conservation	Preserving textile crafts by involving local communities, ensuring sustainability and intergenerational transfer.
8	Best Practice	Beattie T. et al. (2022)	Collaborative Knowledge Management in EURAD	Effective strategy in collaborative projects to address technical knowledge preservation challenges.
9	Best Practice	Vanino S. et al. (2023)	Soil Knowledge Management	Identifies barriers and opportunities, emphasizing cross-disciplinary collaboration and stakeholder input.
10	Policy	Duine M. (2022)	Standards for Permanent Record Preservation	International standards to ensure long-term access to permanent records in archival institutions.
11	Policy	Glazova M.V. et al. (2024)	Green Digital Policy Integration	Policy to integrate sustainability principles into the digital economy.
12	Policy	Vanino S. et al. (2023)	Stakeholder-Based Policy Framework	Policies emphasizing stakeholder engagement to address environmental challenges and ensure knowledge accessibility.

Knowledge preservation, whether in digital or traditional forms, requires various models and approaches tailored to the context of organizations, communities, and educational institutions. Based on the selected research, several main models used in knowledge preservation are:

- (i) **Open Access Knowledge Organization Model**
This model emphasizes open access principles to ensure that preserved knowledge is accessible to all parties. [Fraisse et al. \(2019\)](#) developed a sustainable knowledge organization model to preserve cultural heritage and language diversity with open access principles. This model allows knowledge related to traditional culture and language to remain accessible and usable by future generations.
- (ii) **BIM Methodology for Built Heritage Preservation**
Baik proposed the use of Building Information Modeling (BIM) as a digital approach to preserving historical built heritage. BIM enables digital modeling to document and maintain the integrity of buildings, while ensuring future accessibility to cultural assets ([Baik A, 2024](#)).
- (iii) **Secure Knowledge Transfer Framework**
Jia proposed a secure knowledge transfer framework through stratified-causality distribution adjustment. This approach enhances security and efficiency in intelligent collaborative services, relevant for organizations requiring knowledge management with high-security levels ([Jia et al., 2024](#)).

The main differences between these models lie in their specific purposes and application contexts. The open access model focuses more on preserving cultural and linguistic knowledge, the BIM model is oriented towards the physical and digital preservation of built heritage, while the secure knowledge transfer framework is relevant for knowledge management in intelligent and collaborative services. Overall, these models demonstrate the importance of tailoring the approach to specific knowledge preservation needs and goals.

Knowledge preservation requires the application of advanced technology, systematic documentation, and efficient access management. Proven effective best practices involve cross-sector collaboration and technological innovation. Some best practices identified in the literature are:

- (i) **Digitization of Traditional Knowledge**
Balogun highlights the importance of digitizing traditional knowledge in open repositories. Digitization allows indigenous cultural information to remain accessible to future generations even if its physical condition degrades ([Balogun, 2023](#)).
- (ii) **Social Innovation in Craft Conservation**
Moya developed a social innovation approach for preserving textile crafts by involving local communities. This approach ensures the sustainability of traditional knowledge while encouraging effective intergenerational transfer ([Espinosa et al., 2024](#)).
- (iii) **Collaboration in Knowledge Management within Collaborative Projects**
Beattie suggest collaboration strategies among stakeholders in collaborative projects to address technical knowledge preservation challenges. This strategy ensures that knowledge is not only maintained but also developed and passed on ([Beattie et al., 2022](#)).

These practices emphasize the importance of digital technology and collaboration for maintaining knowledge sustainability. Open repositories, digitization, and social innovation are key elements that ensure knowledge remains relevant and accessible. It is important to continually adopt these approaches in knowledge preservation to address challenges in the digital era.

Policies play a crucial role in supporting knowledge preservation, especially in ensuring sustainable access to knowledge across various sectors. Effective policies involve integrating sustainability principles into the management of the digital economy and cross-sector collaboration. Some key policies identified in this research include:

(i) Green Digital Policies

Glazova emphasize the importance of policies that integrate sustainability principles into the digital economy. These policies enable environmentally friendly knowledge preservation while reducing the negative impact of technology (Glazova et al., 2024).

(ii) Stakeholder-Based Policies

Vanino propose policies that prioritize stakeholder engagement in knowledge preservation. This cross-sector collaboration aims to address environmental challenges while maintaining sustainable knowledge access (Vanino et al., 2023).

(iii) Standards for Permanent Record Preservation

Duine (2022) recommends international standards to ensure long-term access to permanent records in archival institutions. These standards guarantee that information that has been digitized or stored in permanent formats remains accessible.

These policies emphasize that knowledge preservation requires a holistic framework, involving sustainability principles, cross-sector collaboration, and the implementation of international standards. With the right policies, knowledge preservation can support sustainable development and guarantee future generations' access to valuable information resources.

6. CONCLUSION

Knowledge preservation is essential for maintaining the sustainability of cultural heritage and information, both digitally and traditionally. Research through Systematic Literature Review (SLR) identified technology-based preservation models, such as Building Information Modeling (BIM), and secure knowledge transfer frameworks. Best practices in knowledge preservation involve cross-sector collaboration, digitization of traditional knowledge, and supportive policies, such as green digital policies. The success of preservation depends on the integration of technology, policy, and management involving various parties, as well as the ability to adapt to ongoing changes.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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