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Research Paper

From Manuscripts to Metadata: Evolving Roles of Libraries and Archives in Knowledge Preservation

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Abstract
Libraries and archives have undergone a profound transformation—from safeguarding fragile manuscripts and printed books in physical spaces to becoming active digital stewards of an ever-expanding universe of information. No longer limited to static preservation, they now curate, digitize, and provide access to vast collections across multiple formats and platforms. This article traces their historical progression, while analyzing the complex challenges brought on by the digital age, including issues of metadata creation, legal constraints, and technological obsolescence. It also highlights key opportunities such as open access initiatives, advances in metadata standards, and participatory archiving models that promote inclusivity and collaboration. As essential custodians of cultural memory, libraries and archives play a critical role in ensuring the preservation, organization, and equitable dissemination of knowledge in an increasingly interconnected and digital world.

Keywords: *Knowledge Preservation, Digital Curation, Digital Turn, Metadata Complexity, Digital Obsolescence*

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I. Introduction

Since the formation of knowledge is a tale of human ingenuity, curiosity, and the everlasting quest to comprehend the world, preserving that knowledge is another enduring goal of human beings. From ancient texts to digital metadata, the journey is not just one of how technology has evolved; it also demonstrates how human perceptions about knowledge have changed over the years.The progress of civilisations has depended on preserving knowledge throughout history. From ancient clay tablets and handwritten scrolls to today's enormous and intricate digital repositories, societies have come up with ways to store, protect, and transmit information from a generation to another. At the heart of this endeavor libraries and archives performed as custodians of societies intellectual heritage, by preserving fragile manuscripts to sophisticated digital information enriched with metadata. "From manuscripts to metadata" depicts a paradigm shift in the way knowledge is organised, shared, and conveyed, as well as in the means by which information is saved and accessed. The conventional perception of an archive as a vault of delicate parchment or a library as an oasis of tranquility that houses antiquated books, emphasises its fundamental function in preserving the tangible artefacts of our collective past.

However, the landscape of knowledge preservation has drastically changed with the onset of digital technologies, due to its increased fluidity and decentralisation, information is now more vulnerable to manipulation and loss. In addition, it is now more widely available than before. The rapid expansion of digital technology, the exponential rise of information, and the introduction of new communication channels, compelled libraries and archives not only adopt new tools but to reconsidering their responsibilities in a world with an abundance of data, increasing user demands, and the boundaries between creator, curator, and consumer are increasingly blurred.

This evolution includes a shift in focus from physical preservation of manuscripts and artefacts to the stewardship of vast digital repositories, curation of born digital content, and the management of intricate metadata systems which ensure information's continued discoverability, authenticity, and use.

This ongoing transformation not only involves digitization of old collections using new technologies, but significantly implies the change in the definition of knowledge preservation as well. At the moment, libraries and archives have to take the charge in addressing challenges like information overload, digital obsolescence, and the

moral obligations of privacy and access in a globalised society. In addition to their expertise in technology, their shifting roles demand for a fresh dedication to collaboration, innovation, and engagement with society. The professional practices of librarians and archivists have also been reshaped by this transformation, requiring the acquisition of new competencies in data science, digital curation, ethical stewardship, and engagement with the community. Furthermore it has also pointed out the issues related to intellectual property, inclusivity, representation and the ethical significance of preservation in the digital era.

In tracing the journey from manuscripts to metadata, this article explores how libraries and archives are adopting the transformation-from the manuscript traditions of the past to the metadata-driven infrastructures of today. In order to safeguard human knowledge how these institutions are embracing new technologies, reshaping their goals and handling new issues. Ultimately, it explores how, at a time of perpetual change, the enduring goal of libraries and archives—to connect people with knowledge—continues to guide their innovation in an era of constant change.

II. Methodology

This article employs a qualitative, historical-analytical methodology, synthesizing interdisciplinary literature from Library and Information Science (LIS), archival studies, digital humanities, and cultural history. It integrates case studies and institutional examples from both India and international contexts to illuminate key developments. The analysis is grounded in theoretical perspectives drawn from metadata theory and digital preservation frameworks, offering a conceptual lens through which the evolving roles of libraries and archives are examined.

III. Related Literature

Libraries and archives perform a pivotal role in safeguarding manuscripts to digital objects. A comprehensive literature review depicts the transformation. **Yann (2024)** explored that libraries have evolved from preserving ancient scrolls of the Library of Alexandria to managing diverse digital and physical collections. As formats expand and technology advances, they face growing challenges in storage, protection, and access. With the printing revolution the knowledge dissemination expanded **(Eisenstein, 1980)**. **Ari (2018)** stated that in the digital era, libraries play a pivotal role in preserving cultural heritage by digitizing collections and managing born-digital content, while addressing access, ethical, and legal challenges. Through collaboration and open standards, they safeguard diverse knowledge for future generations. **Lischer-Katz (2022)** identified five major periods of knowledge preservation and also explored how new techniques of digital reformatting emerged to preserve cultural heritage. **Wilson (2010)** highlighted that advancement in digital archival practices helps in preserving data for evidence, research, and reuse. Aligning metadata for recordkeeping and preservation helps address repository challenges. Collaboration between researchers and archivists is essential for effective, long-term data preservation. With the advent of new technologies for preservation, active digital curation is important to prevent knowledge loss **(Castillo, 2009). Walters & Skinner (2011)** described a new arena of libraries and librarians in digital curation through a series of case studies which explain emerging strategies and collaborative approaches in knowledge preservation.

1. Preservation in the Age of Manuscripts/ Traditional Knowledge Preservation

Traditional Knowledge encompasses the collective knowledge, customs, innovations and practices that have been passed down through generations within indigenous and local communities. It is a crucial component of cultural identity and legacy, including a wide range of fields like agriculture, medicine, environmental management, and cultural rituals. Historically this knowledge was preserved in handwritten manuscripts. In manuscripts texts were inscribed on handmade paper, birch bark, or palm leaves, and maintained in royal libraries, temples, and monasteries. In India, these manuscripts, often handwritten in scripts like Devanagari, Grantha, or Sharada, contained religious texts, scientific treatises, philosophical works, and local knowledge.

Ritualistic and manual conservation techniques such as, applying herbal oils to palm leaves, wrapping them in cloth, and storing them in wooden chests were used to preserve these manuscripts. Women and underprivileged groups were frequently excluded since access of these manuscripts were limited to the elites.

In a nutshell, preservation during the manuscript era established the foundations for the physical conservation and documentation of traditional knowledge.

2. The Print Revolution and Expanded Access

The 15th-century print revolution was a significant shift in the way knowledge was preserved and disseminated. With the invention of movable type printing presses by Johannes Gutenberg, mass production of books could be possible, making information more accessible than ever before. This technological breakthrough

not only safeguarded knowledge but allowed production of numerous copies, thereby mitigating the risk of damage or decay. At the same time the technology ensured an exclusive degree of textual standardisation, significantly lowering errors and guaranteeing uniformity across editions. From Gutenberg to the industrial revolution, advancement in printing technology democratized access to printed materials, accelerated knowledge dissemination and new intellectual paradigms. The emergence of public libraries were realised with the widespread availability of printed materials to empower broader sections of society to engage with, to facilitate learning and to contribute to intellectual and cultural discourse.

The Print Revolution marked a watershed in the history of knowledge preservation, ushering in an era of unprecedented scale in the sharing and organization of information. It reimagined libraries and archives, transforming them from exclusive keepers of handwritten manuscripts into vibrant, open-access hubs for knowledge dissemination. The foundational principles established during this period continue to influence contemporary approaches to information access and preservation, even in our digital age. By dramatically increasing the production and circulation of texts, the print and industrial revolutions fundamentally reshaped how societies preserve, access, and engage with knowledge, laying the essential groundwork for the modern information landscape.

3. The Digital Turn: From Print to Pixel

The term 'Digital Turn' signifies the transformation of traditional physical formats like manuscripts, analog records and books into digital formats and the changing roles of libraries and archives in preserving, managing and providing access to knowledge in new form. This transformation includes both the digitization of existing physical collections and curation of born-digital collections like e-books, databases, websites, emails, audiovisual content, and social media artifacts.

Digital archives facilitate item level description, replication and global accessibility leveraging the interoperable metadata standards and online platforms. Metadata plays a pivotal role in organisation, preservation, long term usability and discoverability of digital resources across institutional and geographic boundaries.

As a result libraries and archives evolved from static repositories of physical objects to dynamic facilitators of digital knowledge dissemination-developing user-centered access systems, advancing digital preservation protocols, and promoting open-access frameworks. The transformation also compelled it to acquire required competencies in the area of digital curation, metadata architecture, data governance, digital forensics, and cybersecurity to cope with complex digital environments.

With the unprecedented opportunities for scalability and innovation, the digital turn has introduced new challenges including technological obsolescence, data fragility, and ethical concerns regarding access and privacy. Addressing these is crucial to maintain resilient, inclusive, and credible digital knowledge.

In summary, digital turn redefined the mission, methods, and societal relevance of libraries and archives enabling more democratic and far-reaching model of knowledge preservation and access overcoming the issues in manuscripts and print eras, shaping the future of cultural and intellectual memory in the digital age.

4. The Role of Metadata in Knowledge Preservation

Generally metadata is described as 'data about structured data' which is an integral part of preservation and organization of knowledge contained in digital form. As preservation is very crucial for physical materials, so do digital materials as they are more fragile and need more care and maintenance. Technical information such as file formats, software dependencies, and preservation activities are captured via metadata, which is essential in digital environments for maintaining the usability and authenticity of content over time.

Metadata comes in multiple forms such as Descriptive metadata (e.g., title, author, keywords), Administrative metadata (e.g., file type, copyright) and Structural metadata (e.g., how chapters relate in a digital book). Standards like MARC, Dublin Core, and MODS facilitated interoperability between systems.

Descriptive metadata enhances the discoverability of resources by enabling precise search and retrieval, while administrative and preservation metadata capture essential details such as technical specifications, provenance, rights, and the historical record of each item. This comprehensive documentation empowers

institutions to track modifications, manage migrations, and oversee preservation activities, thereby ensuring the enduring authenticity and integrity of knowledge collections.

Furthermore, a standard metadata framework facilitates interoperability across systems enabling institutions to share and integrate data across geographic and institutional boundaries. Ultimately it can be said that Metadata serves as the foundation of effective knowledge preservation, connecting users, systems, and content in a reliable, accessible, and sustainable digital environment.

5. Evolving Roles of Libraries and Archives From Passive Custodians to Active Facilitators

The roles of libraries and archives in knowledge preservation have changed time to time, from safeguarding fragile manuscripts to dynamic management of complex digital information governed by metadata.

Traditionally libraries and archives played the role of custodians of manuscripts, rare books and historical documents, concentrated on physical preservation restricted within scholarly institutions with limited access.

With the advent of digital technologies the libraries and archives started digitization of physical materials and curation of born digital materials like e-books, databases, websites, emails, and social media content. With the application of metadata libraries and archives ensured preservation, organization and retrieval of digitized and born-digital contents along with discoverability, interoperability, long-term usability and authenticity of these contents.

With the shift in the process of knowledge storage and preservation the roles of libraries and archives transformed as:

Dynamic knowledge hubs, where they foster learning, research and community engagement by leveraging open access policies and digital outreach. With this libraries and archives have broadened their impact, making knowledge resources available to wider and more diverse audiences than ever before.These organisations also host workshops, curate exhibitions and provide physical and virtual collaborative spaces where users can interact with various collections, exchange ideas and create new knowledge.

The advent of digital technologies has enabled libraries and archives to serve as **curators of digital collections.** Through digital archiving technology detailed **item level description** of collections is possible. This granular approach of description helps libraries and archives to reach out more users and serve them better.

The adoption of metadata standards has fundamentally transformed collaboration among libraries and archives. By providing a consistent structure for describing resources, these standards enable seamless sharing, integration, and cross-referencing of collections across diverse institutions and systems. As a result, **international collaborations, digital consortia, and shared repositories** have become standard practice, allowing institutions to pool resources, minimize duplication, and offer users access to a more comprehensive and interconnected body of knowledge that transcends institutional and geographic boundaries.

With the advancement of digital communication libraries and archives have become pivotal partners in the **research process** assisting scholars with **data management planning**, effective use of **digital tools**, and application of **metadata standards**.

By offering makerspaces equipped with 3D printers, multimedia labs, coding workshops, and collaborative learning hubs, libraries have transformed as **active learning spaces** which encourage creativity, experimentation, and hands-on learning**.** Archives, too, are reshaping their role—not just preserving history, but enabling **critical engagement** with it.

Libraries and archives play an important role in **policy development** including copyright, data privacy and ethics and sustainability in the digital environment.

Contemporary libraries and archives pay more attention to **User-centred access** which provide digital platforms and interfaces to meet the various needs of their patrons. Accessibility features, interactive site design, linguistic support, and intuitive search tools make collections simple to use and explore. In order to continuously enhance services, many organisations ask for consumer feedback and use data analytics. Libraries and archives enable

people to explore, engage with, and add to collections by putting the user experience first. This turns passive consumption into active involvement in the creation and preservation of knowledge.

In a nutshell, libraries and archives are transforming them from passive custodians of information to active and responsible agents of knowledge creation, organization, preservation and access. Their expanding roles reflect a broader shift toward qualities like openness, inclusivity, and adaptability, which are essential for serving the complex information needs of contemporary society.

6. Required Skills and Responsibilities of Library and Information Science (LIS) Professionals and Archivists in Knowledge Preservation

The role of LIS professionals and archivists have become more dynamic, interdisciplinary and technology driven with the changing nature of knowledge creation and preservation. They are now expected to perform a variety of tasks that call for both advanced digital skills and traditional archival knowledge.

9.1 Key Skills

Technical Expertise: Proficiency in diverse softwares for organizing, retrieving and managing digital and physical collections. Competency in digital asset management system, cataloging tools, digital library management and open source software like DSpace, Omeka, or ArchivesSpace etc.

Proficiency in Cataloguing and Metadata: Familiarity with metadata schemes like Dublin Core, METS, MODS etc is very much essential with the knowledge of cataloging standards like MARC, RDA, BIBFRAME etc. Knowledge in controlled vocabularies, ontologies and linked data practice are needed to preserve knowledge in a digital environment.

Digital Curation and Archival Literacy: Skills in managing, organising, and preserving born-digital and digitised materials throughout its life cycle, while archival literacy enables them to assess long term value and risk associated with archival resources in both physical and digital forms. Both skill sets are important for knowledge preservation in the digital context.

Preservation and Security: Librarians and archivists need strong preservation and security skills to safeguard physical and digital collections. This includes implementing digital preservation strategies, managing archives, applying metadata standards, and using security measures like encryption, firewalls, and cryptography They also ensure proper conservation of both physical and digital items including obsolete and fragile formats. Together, these skills protect the integrity, accessibility, and longevity of cultural and intellectual heritage.

Project Management: In order to efficiently and properly plan, organise, and carry out complex projects like digitisation, cataloguing, and preservation projects, librarians and archivists need to have a fundamental knowledge of project management.

Communication and Instructional Skills: Strong communication and instructional skills helps librarians and archivists in effective dissemination of knowledge. It also enables others to equip themselves with the skills to preserve, access and contribute to the cultural and scholarly record. This human centered expertise is as crucial as technical know-how since knowledge preservation spans physical, digital and social domains. These skills ensure that preservation efforts are clearly understood, broadly accessible, socially inclusive, and sustainable over time.

Adaptability and Lifelong Learning: For meaningful and enduring knowledge preservation adaptability and lifelong learning are essential skills for librarians and archivists. To uphold the integrity and accessibility of the cultural and scholarly record these skills embrace professionals to embrace change, adopt emerging technologies and support diverse communities.

9.2 Core Responsibilities

Collection Development and Curation: To support institutional missions and users needs librarians and archivists strategically select, collect and curate materials including books, documents, digital objects, and artifacts.

Content Management: For the maintenance of institutional repositories, archival databases, special collections, and multimedia content librarians and archivists oversee the organization, description, storage and preservation of physical and digital content using different Content Management Software (CMS) or Digital Asset Management tools.

Digital Preservation: Ensuring long term usability, safeguarding content from technological obsolescence and implementing preservation of digitized and born-digital content are essential responsibilities of librarians and archivists.

Metadata Management: To enable broader access to digital materials librarians and archivists design and apply metadata, as metadata ensures authenticity, discoverability and interoperability of digital resources.

Research Support: The most important role of the librarians and archivists are supporting research scholars and other users in their research through guiding them in information discovery, research data management, citation standards, and digital tools for scholarly communication.

Access and Discovery: Librarians and archivists facilitate discovery through search optimization and multilingual interfaces by developing user-centered access systems, catalogs, digital libraries, and online exhibits which allows various users to explore the preserved collections.

Community Engagement and Social Responsibility: To promote cultural inclusion and participatory spaces librarians and archivists collaborate with local communities by documenting oral histories, traditions and marginalised voices. They also support outreach services, conduct educational programs and foster social awareness through preserved content.

Information Ethics and Regulatory Compliance: The ethical and legal responsibilities of librarians and archivists are preserving, managing and providing access to knowledge. Their key responsibilities are protecting user privacy, respecting copyright, creating inclusive metadata, ensuring record integrity, complying with access laws, promoting digital equity, and fostering ethical information use.

7. Examples of Knowledge Preservation Initiatives

- The Traditional Knowledge Digital Library (TKDL) is a pioneering initiative to protect India's rich heritage and traditional knowledge especially on medicinal plants and formulations used in Indian medicinal systems. It was established in 2001 as a collaboration between the Council of Scientific and Industrial Research (CSIR) and the Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (Dept. of AYUSH), Ministry of Health & Family Welfare, Government of India, aiming to prevent biopiracy and unethical patents by digitally documenting and classifying India's traditional knowledge according to international patent systems.

- The National Mission for Manuscripts (NMM) is an initiative launched by the Ministry of Culture, Government of India in 2003 to identify, document, preserve, and promote India's rich manuscript heritage.

- The National Archives of India serves as the memory of the nation's administrative past. It plays a critical role in ensuring transparency, accountability, scholarly research, and the preservation of India's documentary heritage. It was established as the Imperial Record Department in Calcutta on March 11, 1891 and in 1911, it relocated to New Delhi.

- The National Digital Library of India (NDLI) is a digital knowledge repository initiated by the Ministry of Education, Government of India, under the National Mission on Education through Information and Communication Technology (NMEICT). It was established in 2018 with the goal to make quality educational resources freely accessible to all citizens of India.

- An initiative named Chronicling America by the Library of Congress was launched in 2007 to provide open access to digitized historic American newspapers.

8. Contemporary Challenges and Opportunities

All libraries and archives encountered a dynamic landscape of challenges and opportunities through preservation of manuscripts to digital knowledge curation. This transition is governed by technology, legal complexities, user expectations, and the global push toward open, equitable access to knowledge through preservation.

11.1 Contemporary Challenges

Digital Obsolescence: With the fast pace of technological advancement digital formats may become obsolete if regular data migration, emulation, and use of open source software is not done.

Metadata Complexity: Without proper metadata, digital collections become hard to find and use. Investment in high quality, interoperable and automated metadata tools is essential and requires time, expertise and standardisation.

Resource Constraints: Cost cutting, budget crunch, limited staff and outdated infrastructure is the scenario of most of the libraries and archives., which can hinder digitization and long term preservation of digitized materials.

Professional Incompetencies: Effective curation is affected globally due to scarcity in professional expertise in conservation, metadata, software, and digital archiving

Legal, Cultural and Ethical Issues: Preservation process may encounter copyright constraint, privacy concern and data protection issues in digitizing and sharing culturally sensitive and personal contents. Librarians and archivists must navigate clear policies and ethical digitization practices.

11.2 Contemporary Opportunities

Advanced Technologies: Emergence of advanced technologies like Artificial Intelligence (AI) and Machine Learning (ML) can scale up and enhance preservation processes including automated metadata creation, transcribing historical documents, and ensuring authenticity and traceability of digital records.

Open Access and Open Science: Open Access and Open Science promotes equity in knowledge access, innovation and global research collaboration across the globe e.g. National Digital Library of India (NDLI) and Europeana.

Collaborative Network: Collaboration between national and international institutions helps in standardized practice and collective progress in knowledge preservation.

Outreach and Inclusion: To support heritage preservation such as indigenous and traditional knowledge, libraries and archives encourage engagement of diverse communities, which not only enriches collections but also fosters outreach and inclusivity.

Lifelong Learning and Digital Literacy: Digital skill and information literacy helps users critically navigate and responsible use of information. Libraries and archives facilitate users in learning digital skills so that they can contribute to a more informed and digitally inclusive society.

IV. Conclusion

The role of libraries and archives transformed drastically in safeguarding manuscripts to digital content. To preserve collective resources in various formats, libraries and archives performed their responsibilities with resilience, innovation, and an enduring commitment. Beside conservation and storage, their responsibilities have expanded to community engagement, ethical stewardship and technological innovation in the digital environment. By embracing digital technologies, advancing metadata practices, and fostering collaboration, these institutions continue to uphold their mission as guardians of human knowledge—preserving the past, enriching the present, and ensuring the accessibility of our shared heritage for future generations.

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