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Digital Preservation of Art and Cultural Heritage in India: Integrating Multidisciplinary Art Practices, Emerging Technologies and Cultural Sustainability

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Abstract

The swift advancement of digital technologies has significantly transformed the documentation, conservation, and dissemination of art and cultural heritage worldwide. In India, a country renowned for its diverse tangible and intangible cultural heritage, digital preservation has emerged as a critical strategy for safeguarding artistic traditions, historical artifacts, indigenous knowledge systems and cultural memory against threats posed by urbanisation, environmental degradation, technological obsolescence and socio-cultural transformations. This research paper explores the role of digital preservation in integrating multidisciplinary art practices with emerging technologies to nurture sustainable cultural heritage management in the Indian context. Adopting an interdisciplinary approach, the study explores the convergence of visual arts, digital humanities, museum studies, heritage conservation, information technology, three-dimensional documentation and digital archiving. It critically evaluates how these technologies facilitate the preservation, interpretation, accessibility and public engagement of cultural resources while promoting collaborative practices among artists, designers, technologists, researchers, museums, archives and local communities. The research paper further discusses the opportunities and challenges associated with digital preservation, including issues of authenticity, long-term digital sustainability, ethical documentation, intellectual property rights, digital inclusion and policy implementation. Drawing upon selected Indian case studies and contemporary heritage



initiatives, the research highlights the transformative potential of digital ecosystems in enhancing cultural resilience, supporting educational outreach and encouraging participatory heritage practices. The study explores that an integrated multidisciplinary framework is essential for balancing technological innovation with cultural sensitivity, ensuring that digital preservation extends beyond mere digitisation to become a dynamic process of cultural continuity, knowledge exchange and sustainable development. By contributing to the discourse on digital heritage and multidisciplinary art practices, this research offers valuable insights for scholars, cultural institutions, policymakers, artists and heritage professionals engaged in preserving India's rich artistic and cultural legacy for future generations.

Keywords: Digital Preservation; Cultural Heritage; Multidisciplinary Art Practices; Emerging Technologies; Cultural Sustainability.

1. Introduction

Cultural heritage constituted one of the most significant archives of collective memory, social identity, historical knowledge and creative expression. In India, the concept of heritage extended across an exceptionally broad cultural spectrum encompassing monuments, archaeological sites, paintings, sculptures, manuscripts, textiles, crafts, music, dance, theatre, oral traditions, rituals, festivals and indigenous knowledge systems. This diversity makes India's heritage simultaneously material and immaterial, historical and contemporary, institutional and community-based.

The preservation of such heritage has traditionally depended upon museums, archives, libraries, archaeological institutions, conservation laboratories and community-based transmission. However, these mechanisms increasingly face challenges associated with environmental deterioration, urban expansion, natural disasters, inadequate documentation, changing lifestyles, technological transformation and the declining transmission of traditional knowledge. Digital technologies have consequently emerged as important instruments for documenting and extending access to cultural resources.

UNESCO's *Charter on the Preservation of Digital Heritage* defined digital heritage as including resources created digitally as well as materials converted from analogue formats. Importantly, the Charter identified technological obsolescence, inadequate resources, unclear institutional responsibility and insufficient legal frameworks as threats to digital continuity. It therefore positioned preservation as an ongoing process extending from creation to access rather than as a one-time digitisation activity.



The relevance of this perspective is particularly strong in the Indian context. India's cultural resources are distributed across national and state museums, archaeological sites, universities, archives, libraries, religious institutions, private collections and communities. The Government of India's digitisation initiatives have attempted to address this dispersed heritage landscape. The National Mission on Monuments and Antiquities, for example, has focused on systematic documentation and digitisation of built heritage, monuments and antiquities. Government data published in 2025 reported more than 1.23 million antiquities digitised and over 11,400 heritage sites and monuments documented under the initiative.

At the same time, digital heritage is not merely a technical domain. It intersected with visual culture, contemporary art, museum practice, design, anthropology, conservation science, information technology and community knowledge. Multidisciplinary art practices can therefore play an important role in transforming digital documentation into meaningful cultural interpretation.

This research paper examined this intersection and proposed that India's digital preservation agenda should move from a predominantly object-centred digitisation model towards an integrated cultural ecosystem model incorporating technology, artistic interpretation, institutional collaboration and community participation.

2. Research Gap

Existing scholarship on digital cultural heritage has demonstrated the growing importance of technologies such as 3D scanning, photogrammetry, virtual reality, artificial intelligence, digital archives and interactive platforms. Recent research has particularly emphasised the growing application of digital technologies to intangible cultural heritage, including documentation, classification, restoration, exhibition, education and cultural innovation. A 2026 scoping review of research published between 2020 and 2025 demonstrated the increasing interdisciplinary role of digital technologies in safeguarding intangible cultural heritage.

Nevertheless, three significant gaps remain.

First, digital preservation is frequently approached as a technological problem rather than an interdisciplinary cultural practice. Digitisation is often discussed in relation to scanning, storage and database management without sufficiently addressing artistic interpretation, community participation and cultural meaning.

Second, tangible and intangible heritage are often treated as separate categories. In reality, the two are closely connected. A traditional painting, for example, may represent a tangible object



while simultaneously embodying intangible knowledge concerning technique, symbolism, ritual and community identity.

Third, relatively limited attention has been given to the role of multidisciplinary art practice as an active preservation methodology. Contemporary artists working with photography, video, installation, performance, animation, digital modelling, projection, sound and immersive environments can contribute to heritage interpretation and cultural transmission.

The present study therefore addressed the following research gap:

How can multidisciplinary art practices and emerging digital technologies be integrated into a culturally sensitive and sustainable framework for preserving India's tangible and intangible heritage?

3. Objectives of the Study

The study has five objectives:

1. To propose an integrated framework for sustainable and participatory digital heritage preservation in India.
2. To identify ethical, technological, institutional and cultural challenges associated with digital preservation.
3. To analyse the potential of emerging technologies for preserving tangible and intangible cultural heritage.
4. To examine the relationship between digital preservation and multidisciplinary art practices in India.
5. To investigate the role of artists, museums, technologists, researchers and communities in digital heritage ecosystems.

4. Research Methodology

The study adopted a qualitative, exploratory and interdisciplinary research methodology. It combines critical literature review, conceptual analysis and examination of selected Indian digital heritage initiatives.

The primary documentary sources include UNESCO conventions and recommendations, Indian government reports and publicly documented digital heritage projects. UNESCO's 2003 Convention established community participation as a central component of intangible cultural heritage safeguarding, while its digital heritage framework emphasised continuity, authenticity, accessibility and institutional responsibility.



Selected Indian initiatives have been examined as illustrative cases, including:

- National Mission on Monuments and Antiquities;
- Museums of India—National Portal and Digital Repository;
- Indian Heritage in Digital Space (IHDS);
- 3D heritage documentation initiatives;
- AipanVR as an example of immersive interpretation of a traditional art practice.

The research does not claim statistical generalisation from these examples. Rather, the cases are examined to identify recurring strategies, opportunities and limitations that can inform a broader conceptual framework.

The study used thematic analysis around six dimensions:

documentation, technology, interpretation, participation, accessibility and sustainability.

This methodology is appropriate because digital heritage is a rapidly evolving field in which technological, artistic and cultural variables interact.

5. Digital Preservation: From Digitisation to Digital Continuity

A fundamental conceptual distinction needs to be established between digitisation and digital preservation.

Digitisation involved converting analogue cultural resources into digital formats. Digital preservation is considerably broader. It included the creation, description, authentication, storage, migration, management, accessibility and continued usability of digital resources.

UNESCO explicitly identified digital continuity as a fundamental principle and argues that preservation measures should operate throughout the digital information life cycle. It further notes that authenticity required attention not only to content but also to functionality and documentation.

Consequently, photographing a sculpture does not constitute complete digital preservation. A robust digital preservation strategy would ideally include:

- high-resolution documentation;
- technical metadata;
- descriptive metadata;
- provenance information;



- conservation condition;
- contextual information;
- rights information;
- preservation copies;
- redundant storage;
- format migration;
- authentication;
- controlled access; and
- mechanisms for future interoperability.

This distinction is especially important for digital artworks. A video installation, interactive artwork or software-dependent work may lose its original characteristics if the underlying software becomes obsolete. UNESCO's 2015 Recommendation specifically recognised the challenges of preserving multimedia works, interactive hypermedia, online dialogues, dynamic data and emerging digital formats.

Digital preservation should therefore be understood as a continuing process of cultural stewardship rather than a technological endpoint.

6. Multidisciplinary Art Practices and Digital Heritage

The relationship between art and heritage preservation has expanded considerably through contemporary multidisciplinary practices. Traditional art forms such as painting, sculpture and printmaking can now interact with digital photography, animation, projection mapping, sound, video, VR, AR, interactive installations and digital modelling.

This creates two important possibilities.

6.1 Art as Documentation

Artists possess visual and observational skills that can contribute to detailed documentation of cultural practices. Photography, drawing, video, sound recording and visual mapping can preserve aspects of cultural practice that may not be adequately captured by conventional textual records.

6.2 Art as Interpretation

Artists can also transform archival information into new experiential forms. A digital installation may communicate historical memory through image, sound and movement. A virtual environment can reconstruct an endangered cultural space. Animation can communicate



oral histories to younger audiences. Such practices can increase public engagement, particularly among audiences accustomed to interactive and visual digital environments. The role of the artist consequently expanded from creator to documentarian, interpreter, mediator and cultural collaborator.

However, artistic interpretation must remain distinguishable from historical evidence. Digital reconstruction should clearly identify which components are based on documented evidence and which involve creative interpretation.

7. Emerging Technologies for Digital Preservation

7.1 Three-Dimensional Documentation

- 3D scanning and photogrammetry are increasingly important for documenting monuments, sculptures, architectural details and archaeological sites.
- 3D documentation created spatial records that can be used for conservation monitoring, research, education and virtual exhibition. It can also provide a valuable reference in cases where physical heritage is damaged by environmental or human factors.
- Indian research initiatives demonstrated the potential of relatively accessible approaches. The Tirtha platform, for example, explored crowdsourced image collection and automated 3D reconstruction of heritage sites using computer vision and photogrammetry, including temple case studies in Odisha.
- This suggested that 3D heritage preservation does not necessarily have to remain restricted to institutions with expensive specialised infrastructure.

7.2 Virtual Reality

VR offers opportunities for immersive documentation and interpretation.

An important Indian example is AipanVR, which explored virtual reality as a means of preserving Uttarakhand's traditional Aipan art. The research involved ethnographic investigation in Almora, Nainital and Haldwani and interviews with Aipan designers before developing a VR experience.

This example is significant because Aipan is not simply a visual pattern. It is embedded within cultural, social and ritual practices. VR therefore executed an opportunity to document not only visual characteristics but also aspects of the experiential environment.

7.3 Virtual Museums and Digital Repositories



The Museums of India National Portal and Digital Repository represented an important institutional example. Developed by C-DAC for the Ministry of Culture, the platform provided integrated digital access to collections including sculptures, paintings, manuscripts, coins, textiles and other artefacts. It incorporated high-resolution images, metadata, search facilities and virtual exhibitions.

As of July 2026, the Ministry of Culture reported that 375,707 artefacts out of 488,983 had been digitised and made available online through the JATAN-based museum digitisation initiative.

This demonstrated a significant transition from physical collection management towards digitally mediated cultural accessibility.

7.4 Artificial Intelligence and Computer Vision

AI and computer vision can support:

- image classification;
- object recognition;
- pattern identification;
- metadata generation;
- restoration research;
- language processing;
- archival search;
- visual reconstruction; and
- predictive conservation.

The Indian Heritage in Digital Space initiative specifically identified 3D scanning, virtual reality, computer vision and AI among technologies relevant to heritage preservation and aims to support interdisciplinary research and multimedia heritage resources.

However, AI-generated reconstruction presents serious authenticity challenges. An algorithm may produce a visually convincing reconstruction that is historically inaccurate. AI should therefore assist scholarly interpretation rather than replace historical evidence.

8. Indian Digital Heritage Initiatives

India's institutional response to digital heritage has expanded considerably.

8.1 National Mission on Monuments and Antiquities



The National Mission on Monuments and Antiquities was established to document India's built heritage, archaeological sites and antiquities. The initiative addresses a fundamental challenge: heritage information is distributed across multiple institutions and geographical locations.

Digital documentation created possibilities for standardisation, research, conservation planning and public access. Government reporting indicated substantial progress in the digitisation of antiquities and documentation of heritage sites.

8.2 Museums of India

The Museums of India portal demonstrated how digital technologies can reduce geographical barriers to museum collections. Instead of requiring researchers and students to travel to multiple museums, digital platforms can provide centralised access to catalogued objects. The platform also demonstrated the potential of digital heritage to become an educational resource rather than merely an archival database.

8.3 Indian Heritage in Digital Space

IHDS represented a particularly significant conceptual development because its stated objective goes beyond documentation towards immersive experiences, analytical tools and public participation. The initiative proposed crowdsourcing, multimedia heritage repositories and interdisciplinary research. Its significance lies in the recognition that heritage digitisation should connect technology, scholarship and public engagement.

9. Digital Preservation of Intangible Cultural Heritage

Intangible heritage presented a more complex preservation challenge than physical artefacts.

UNESCO defined intangible cultural heritage through practices, knowledge, skills, expressions and cultural spaces recognised by communities. Such heritage is continuously recreated and transmitted across generations.

Therefore, the digital preservation of intangible heritage should capture:

- practitioners;
- processes;
- performance;
- language;
- sound;
- movement;



- tools;
- materials;
- social context;
- historical narratives;
- community meanings; and
- transmission mechanisms.

A recorded dance performance, for example, is only one representation of the tradition. Documentation should ideally include interviews with practitioners, information concerning the performance context and community interpretation.

UNESCO explicitly required community participation in identifying, defining and safeguarding intangible cultural heritage.

The implication is fundamental: communities should not merely be subjects of digital documentation; they should be participants and decision-makers in the preservation process.

10. Community Participation and Cultural Sustainability

Cultural sustainability required heritage to remain meaningful and viable within living communities.

UNESCO's ethical principles state that communities should have the primary role in safeguarding their intangible cultural heritage and that collaboration should involve transparent consultation and free, prior, sustained and informed consent.

This principle has direct implications for digital archives.

A community should ideally participate in decisions concerning:

1. what should be documented;
2. how it should be described;
3. who may access the material;
4. whether sacred or restricted knowledge should be digitally reproduced;
5. how practitioners should be credited;
6. whether commercial use is permitted; and
7. how the digital archive should be governed.



This approach helped prevent what may be described as digital extraction, where cultural information is collected by external institutions and subsequently detached from the communities that created it.

Digital preservation becomes culturally sustainable when communities perceive the archive as a resource that serves their interests rather than merely as an institutional collection.

11. Ethical Challenges

11.1 Authenticity and Representation

Digital reproductions may appear authoritative because of their technical precision. However, digital representation always involves selection and interpretation. A 3D model may accurately reproduce geometry but cannot reproduce all dimensions of materiality, historical context or embodied experience. Authenticity must therefore include provenance, documentation and transparency concerning the methods used to create the digital representation.

11.2 Intellectual Property

Digitisation may create new risks of unauthorised copying and commercial exploitation. Traditional designs, indigenous knowledge and community cultural expressions may not fit neatly within conventional individual copyright frameworks.

Digital repositories should therefore develop culturally appropriate rights-management systems.

11.3 Privacy and Sensitive Knowledge

Oral histories and community archives may contain personal information or culturally restricted knowledge. Open access should not automatically mean unrestricted access. UNESCO's digital heritage framework itself recognised the need to balance public accessibility with protection of sensitive and personal information.

11.4 Digital Obsolescence

Digital preservation paradoxically created its own preservation problem. File formats, storage systems, software and hardware become obsolete. Long-term sustainability therefore requires:

- multiple backups;
- format migration;



- preservation metadata;
- integrity checking;
- institutional responsibility;
- open or well-documented standards; and
- periodic technological review.

12. Digital Inclusion and the Indian Context

India's digital heritage future cannot be separated from the digital divide.

Large cultural institutions may possess sophisticated equipment and technical staff, whereas local artisans, rural communities and small museums may lack comparable resources.

A national digital heritage strategy should therefore support:

- low-cost documentation tools;
- mobile-based recording;
- community training;
- regional digital laboratories;
- university–museum partnerships;
- open-source technologies;
- multilingual interfaces;
- local data stewardship; and
- capacity building.

The UNESCO approach to intangible heritage similarly places emphasis on community capacity-building and inclusive participation.

This suggested that India's universities can play a particularly important role. Art and design institutions can collaborate with computer science departments, museums, archaeology departments, libraries and local cultural organisations to develop interdisciplinary digital heritage laboratories.

13. Proposed Multidisciplinary Digital Preservation Framework

Based on the analysis, this study proposed an Integrated Multidisciplinary Digital Heritage Sustainability Framework (IMDHSF).

The framework consisted of seven interconnected stages:



Stage 1: Identification - Identify culturally significant objects, sites, practices, narratives and knowledge systems through archival research and community consultation.

Stage 2: Documentation - Use appropriate methods including photography, audiovisual recording, 3D scanning, photogrammetry, GIS and oral-history documentation.

Stage 3: Contextualisation - Attach historical, geographical, artistic, social, linguistic and cultural metadata.

Stage 4: Preservation - Implement secure storage, redundancy, authentication, format migration and digital continuity measures.

Stage 5: Multidisciplinary Interpretation - Bring together artists, designers, conservators, historians, anthropologists, technologists, archivists and community representatives.

Stage 6: Public Engagement - Develop virtual exhibitions, digital storytelling, educational resources, VR/AR experiences, interactive installations and participatory platforms.

Stage 7: Cultural Sustainability - Ensure that communities remain active participants and beneficiaries and that preservation contributes to intergenerational transmission.

The framework can therefore be conceptualised as:

Community Knowledge → Documentation → Digital Archive → Multidisciplinary Interpretation → Public Engagement → Cultural Transmission → Sustainable Preservation

This framework represented the principal conceptual contribution of the study.

14. Discussion

The analysis demonstrated that digital technologies can significantly strengthen India's heritage preservation ecosystem, but technological innovation alone cannot ensure cultural sustainability.

The most important transformation is therefore conceptual: digital preservation needs to move from an object-centred approach towards a relationship-centred approach.

An object-centred model asks:

How can this artefact be digitised?

A relationship-centred model asks:



What cultural knowledge, community relationship, artistic practice, historical meaning and social memory does this artefact represent, and how can these dimensions be responsibly preserved?

The second question is more appropriate for India's complex heritage environment.

Recent research reinforces the value of multidisciplinary digital technologies in safeguarding intangible heritage. The 2026 scoping review by Wei and colleagues identified expanding applications across documentation, classification, exhibition, education and cultural innovation.

Similarly, India's contemporary digital heritage initiatives demonstrate increasing institutional recognition of immersive technologies, digital repositories, AI, AR/VR and multimedia documentation.

Nevertheless, several tensions require continued scholarly attention.

Technology versus authenticity: Digital reconstruction can increase accessibility but may simplify complex historical realities.

Access versus cultural rights: Open digital access can promote education but can also facilitate appropriation.

Innovation versus continuity: Contemporary artistic reinterpretation can revitalise heritage but should not displace community meanings.

Centralisation versus diversity: National repositories can improve access but must accommodate India's linguistic, regional and community diversity.

Preservation versus living practice: Recording a tradition does not guarantee its continuation.

The final point is particularly significant. A digital archive of a traditional craft cannot substitute for apprentices learning from practitioners. A recording of a dance cannot replace the social environment in which it is performed. Digital preservation should therefore function as an enabling infrastructure for cultural transmission, not as a replacement for living heritage.

15. Originality and Research Contribution

The study contributed to existing scholarship in three principal ways.



First, it conceptually connects digital preservation with multidisciplinary art practice, rather than treating heritage technology as an exclusively technical field.

Second, it proposed an Integrated Multidisciplinary Digital Heritage Sustainability Framework (IMDHSF) connecting documentation, preservation, artistic interpretation, public engagement and community participation.

Third, it explored for a shift from digitisation to cultural continuity. This perspective recognised that sustainable heritage preservation depended not merely upon creating digital records but upon ensuring that knowledge remained accessible, meaningful, ethically represented and capable of intergenerational transmission.

The proposed framework may be particularly relevant for universities, museums, archives, cultural organisations and government agencies developing digital heritage programmes in India.

16. Conclusion

Digital preservation has become an increasingly important strategy for safeguarding India's artistic and cultural heritage. The scale and diversity of India's tangible and intangible heritage make digital technologies particularly valuable for documentation, conservation, research, education and public engagement.

However, this study demonstrated that digitisation should not be regarded as synonymous with preservation. Long-term preservation required technological continuity, metadata, institutional responsibility, ethical governance, community participation and sustainable access.

Multidisciplinary art practices provide an important bridge between heritage preservation and contemporary cultural experience. Through digital photography, video, animation, installation, VR, AR, 3D modelling, sound and interactive media, artists can contribute to both documentation and interpretation.

At the same time, technological systems must remain culturally sensitive. Communities must participate in decisions concerning representation, access, ownership and interpretation. This is particularly important for intangible cultural heritage, where cultural identity is inseparable from living practitioners and transmission practices. UNESCO's framework explicitly places communities at the centre of safeguarding activities.

The proposed IMDHSF consequently positioned digital preservation as a continuous cultural ecosystem involving:



technology + art + heritage scholarship + institutions + communities + sustainable access.

India's future digital heritage strategy can benefit substantially from such integration. National archives can provide infrastructure; museums and archives can provide professional stewardship; universities can provide research and interdisciplinary expertise; artists can provide creative interpretation; technologists can develop digital tools; and communities can provide cultural knowledge and legitimacy.

The ultimate objective should not be to create digital substitutes for India's heritage. Rather, digital technologies should enable heritage to remain visible, accessible, interpretable, participatory and culturally alive.

Digital preservation can thus become more than an archival mechanism. It can become a dynamic form of cultural continuity through which India's artistic traditions, historical memories, indigenous knowledge and creative practices are documented responsibly, interpreted creatively, transmitted across generations and sustained within an increasingly digital society.

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