Techniques of Preserving the Rich Cultural Heritage Managed by Digitization

Divya Kapil
Department of School of Computing, Graphic Era Hill University, Dehradun, Uttarakhand, India 248002

Abstract

The protection of historical sites is increasingly crucial to our way of life. This inheritance helps us understand our forefathers and their production and living practises. The fast progress of 3D technology has made it possible to more accurately portray this aspect of existence. By using cutting-edge technology, our priceless intangible and material cultural legacy may be protected for future generations. These tools allow for the recording, retrieval, and display of cultural artefacts. It's not only man-made structures that are considered. Skills like acting, craftsmanship, and storytelling that have been handed down through the ages are examples of our intangible cultural heritage (ICH). This kind of culture is often lost as a result of the quick progress of civilisation and the widespread movement of people. For this reason, protecting ICH is crucial in the modern world. It is important to record and safeguard cultural heritage materials so that they may be used by future generations and enjoyed by a wide audience. In order to comprehend how criteria for digitization, availability, and preservation are implemented in the digital process, this study surveys and discusses relevant academic literature. Additionally, it investigates the potential for establishing national standards for the long-term digital preservation as well as retrieval of cultural assets.

Keywords: Digital preservation of heritage resources; Digitization standards; Metadata standards.

Introduction

Digitalization and Digital Presentation of Cultural Heritage : Whether passed down orally through generations or recorded for posterity in the form of songs, poetry, paintings, tales, philosophical concepts, etc., heritage information is the legacy we receive from the past. Historically, these historical records were written and recorded on a wide variety of mediums, including but not limited to stones, clay tablets, forests, palm leaves, papers, metals, etc. The onus for archiving and disseminating a society's cultural artefacts is squarely on the shoulders of that society's members. Heritage materials are being collected, curated, and managed by museums, libraries, archives, and other GLAMs. Manuscripts, rare publications, and other archival materials that are part of India's cultural history are the subject of this research. As one of the world's earliest cultures, India has preserved a wealth of historical knowledge in the form of texts written in a wide variety of scripts and languages. These cultural knowledge resources are dispersed throughout the nation, but there have been serious and successful efforts to gather, organise, and archive them. One of the oldest and most extensive collections of manuscripts is located in India. Heritage institutions and private collections around the nation house these materials. Over 60,000 are readily available in

European countries, so it is estimated that the total number of books in the country's collection is over 5 million. More than 1.5 million manuscripts are also accessible in South Asia along with other Asian nations.

These priceless cultural artefacts are dispersed around the nation, and without effective preservation measures, they may soon be lost forever. To achieve this goal, they must be recognised, recorded, maintained, and made available to academics. The main issue for institutions when collecting, preserving, and disseminating cultural items is making them accessible. Every time one of these precious, delicate resources is used or handled, it becomes more susceptible to damage. Therefore, the primary challenges for archives are preservation and accessibility. In order to achieve these goals, it will be necessary to digitise and archive not just the digitally generated documents but also the analogue information resources. The word "digitization" is used throughout this study to refer to the process of developing and maintaining digital assets.

Process of digitization

Digitising, in a technical sense, is the process of converting physical items (such books or photos) into digital data. Any information can be "digitised," or reduced to the binary digits 0 and 1, for use in digital systems. Therefore, all digital data is inherently encoded information that must be decoded before it can be used effectively. This method relies on electrical current, computer hardware, and programme code. To digitise a text, for instance, you need a keyboard, a mouse, and some software.

a) Using a keyboard to type mechanically

b) generating a current that is then converted into a binary representation of zeros and ones

c) Letter sign language interpretation

d) Currently being converted into a typeface and added to a document by software

e) Conversion into a visual representation for presentation

Therefore, digital data depends on the availability of said mandatory components in order to have any meaning.

Digital Presentation

As global conservation efforts have advanced, so too has the commonly accepted notion of cultural heritage (CH). United Nations Educational, Scientific, and Cultural Organisation (UNESCO) has a broad definition of legacy that encompasses both physical and intangible forms of cultural expression. The former includes things like historic structures, museums, and archaeological finds. The five subfields of ICH were established by the 2003 UNESCO Agreement on the Safeguarding of ICH.

i. expressions and customs passed down orally (such as language or storytelling);

ii. expressions of human creativity (music, dance, drama, and the like);

iii. celebrations, rituals, and other forms of social interaction;

iv. science and philosophy about the cosmos and the natural world;

v. Ancient artisan techniques and know-how.

This definition of ICH should be considered provisional. Traditional performances and sports, cuisine, animal husbandry, pilgrimage sites, and memorials are only few examples of areas where there are regional distinctions.

Preservation, the intentional maintenance of cultural artefacts for future generations, is a common practise in fields as diverse as history museums, cultural centres, research in science, educational institutions, and more. Using a variety of 3D technologies is one way to further this procedure. They make it possible to experience inaccessible parts of cultural heritage. Documentation, protection, rebuilding, restoration, conservation, dissemination, and spreading are all areas of research related to preservation. The act of documenting is intrinsically linked to the act of archiving data in different forms.

To safeguard anything is to take measures to prevent its being harmed, destroyed, or lost in some other way. To better comprehend CH items, the method of reconstruction is used. Restoring anything entails a variety of processes, such as splicing in new materials, removing and replacing damaged ones, and making minor adjustments and filling in missing areas. Protecting cultural artefacts ensures they will be there for future generations to learn from and appreciate. Using cutting-edge tools, information is disseminated on TCH and ICH items' representation and visualisation. The goal of disseminating is to introduce as many people as possible to a certain cultural tradition.

The preservation of physical cultural artefacts is more common than that of immaterial ones. Thanks to excavations, we have access to artefacts from the past that were once lost to time. The situation is even more precarious when it comes to the intangible parts of culture that are handed down from one generation to the next. The data shows that movement of people is a factor in the forgetting and alteration of such cultures. It's common for people's histories and insights to be lost or miscommunicated. Indigenous communities also suffer as civilizations shift. This is why it is crucial to preserve intangible cultural artefacts for future generations. Analogue data, text, and 2D technologies are all viable options for storing ICH. On sometimes, though, this alone is not sufficient. Furthermore, as time passes, there is a natural decline in the quality of recorded ICH for analogue technologies. The acquisition and collecting of ICH data is made safer and more permanent thanks to digital technology, which also aid in the ICH documentation procedures. Further, utilising multiple 3D technologies yields a richer comprehension of the topic and adds novel perspectives to the research.

The value of 3D technology in several scientific disciplines has been rising steadily in recent years. The project's goal was to conduct a literature assessment on the use of 3D digital technology in the processing, presentation, and security of data relating to intangible cultural assets. Scopus, Web of Knowledge, and IEEE Xplore were used as the foundation for the research. The purpose of this study was to answer questions such as whether or not these technologies are employed in the ICH sector, what themes are the most popular, which nations are leading the way in such studies, and what kinds of research are being conducted. No comparable parallel exists in terms of quantitative research, geographical breadth, technical depth, or breadth of product offerings, as far as the authors are aware.

Digital 3D methods are used in: Virtual presentations of monuments and ancient relics often make use of research into contextually relevant (CH) features including 3D scanning, modelling in 3D, Virtual Reality (VR), and Augmented Reality (AR). Motion capture, whether 3D or 4D, provides a means of documenting and passing on how tasks are completed from one generation to the next. When presenting cultural elements, it is common practise to use a combination of digital technologies (such as audiovisual ones) and 3D techniques. It's feasible to document national dances (including their sequences), practise traditional crafts, and share narratives, historical events, and construction techniques from bygone eras. These technologies, despite their immaterial nature, make the preservation of this kind of culture conceivable.

Archiving Digital Content: The term "digital preservation" refers to the process of preserving digital files, which includes the digitization of analogue information resources as well as the incorporation of born-digital resources already present in those files. For as long as it's needed, digital assets must be preserved via a "series of regulated actions," as defined by the Digital Preservation Coalition in 2008. Since electronic information are more complex than analogue ones, preserving them may prove difficult in the future because they won't be readable or usable. Hardware and software solutions are required for the recovery of these digital documents stored on various devices. In the event that these technologies become outmoded or incompatible, the associated risk increases since they will no longer be accessible or readable with the currently available gear and software. Digital files and the associated metadata may be readily edited or altered, making it difficult to retain the original and integrity of the data they contain.

Methods of Preserving: Uwe M. Borghoff has proposed three strategies for archiving digital information. The most frequent approach to digital preservation is known as "migration," and it entails moving data from one storage media to another or converting files from a particular format to another. Second, emulation keeps the digital information unaltered. The goal of this method is to emulate the behaviour of existing computer systems in order to generate new digital information resources. Thirdly, appropriate metadata of digital document is described using markup languages. To specify what should be included or excluded from digital texts, markup languages make use of tags.

Sustainable Digital Preservation and Retrieval of Heritage Knowledge

Sustainability in digitization refers to the ongoing process of preserving digital pictures and electronic resources so that they remain available and their information is maintained. Interoperability helps with both searching for and collecting metadata from the depository system when data is being searched across computers. These are crucial components of digital library systems that will increase access to information worldwide. The use of standards and norms in the digital process is crucial to ensuring long-term viability, preservation, and retrieval. These standards aid in preventing unnecessary variances in information and making metadata interoperable, both of which are crucial in the preservation and exchange of knowledge resources. Having these entries in a standardised format also facilitates linking to them, harvesting them for use in one's own database, and providing a number of indexing and separating library services. For this reason, only by making use of preexisting standards and protocols can sustainable digitalization and interoperability with regard to information preservation and sharing be realised.

Digitisation of Cultural Heritage Knowledge in India : The Indira Gandhi National Centre for the Arts (IGNCA), the National Archives of India (NAI), and the National Mission for Manuscripts are just a few of the Indian heritage institutions that have made strides towards digitising and integrating their cultural heritage resources into digital collections in order to launch digital information services for a wider range of users. The IGNCA is a leading cultural organisation that preserves and makes accessible a broad variety of cultural artefacts, such as manuscripts, microfilms, small--fiches, negatives, pictures, audio-visuals, etc. IGNCA has digitised its cultural legacy using a wide range of methodologies, technologies, and preservation strategies. IGNCA has around 5,500,000 items in its historical collection, including books, journals, manuscripts, microfilms, pictures, audio recordings, and video recordings. around 46% of these items have been digitised. Digitising cultural assets has occurred in accordance with UNESCO, IFLA, and UNC digitization project rules, standards, protocols, and multilingual open standards for typefaces like Unicode. The Ministry of cultural in India has launched the 'National Mission for Manuscripts (NAMAMI)' to locate the many arts and cultural manuscripts that are now hidden around the nation, digitise them, and make them available online. Across four areas of India, it maintains a "Manuscript Resource Centre" (MRC) with a plethora of manuscripts. Manuscripts have been digitised in an effort to preserve a large number of texts and pages as well as a geographically organised list of MRCs.

What the writer suggests As part of the digitization process, GLAMs should investigate the feasibility of crowdsourcing, particularly for tasks like the transcription of handwritten documents, the transcription of audio recordings, and the description of artefacts. About 21,000 oriental writings and 2.5 lakh printed books can be found in the Khuda Bakhsh Oriental Public Library. It's possible this library may digitise the first handwritten collection in the country and make it available online.

There is now a pilot project underway to digitise 100,000 pages of manuscripts, and 1,214 manuscripts totaling 3,57,915 folios have already been digitised and made available for study. The manuscripts that make up India's cultural history are owned by a number of different organisations, including the National Library of India in Kolkata, the National Archives of India in New Delhi, the Nehru Memorial Museum and Library (NMML), and the Rampur Raza Library. In addition, these establishments have begun digitising manuscripts along with other rare collections for the sake of preservation and user access. Panjab University in Chandigarh, for example, has begun a digitalization effort to digitise manuscripts or rare books at the Punjab level to protect documents from destruction, theft, and deterioration.

Different parts of the nation may use different materials, adopt different technology, and implement different standards and methods in their efforts to protect and maintain historical information via digitization. It's possible that in India, heritage agencies are using a variety of digital preservation strategies to protect cultural artefacts from decay. Without the development of comprehensive digital policies at the national and institutional levels, the task of digital preservation will become increasingly difficult even while the underlying technology evolves at a breakneck pace. Digital preservation & physical conservation of texts and other rare items need the integration of digital technology platforms. Sustainable digital safeguarding of our cultural information requires a well-equipped infrastructure, consistent financing, innovative digital technologies, well-trained staff, and the application of standardised digitisation standards. Consistent norms and procedures are,

therefore, a necessary condition for achieving the aforementioned goals. Digitization, file formats, metadata persistence, and information retrieval all have associated standards and protocols. The criteria of master access and the files' picture quality are the subject of these guidelines. Metadata that meets industry standards improves digital information system functionality, such as resource discovery, connectivity, and quality assurance.

Standards for Digital Heritage Resources : Numerous initiatives were taken over the past few decades to establish standards as well as unify them in order to optimise the result and achieve high quality digital resources in India and abroad through the digitization of cultural heritage. While the Centre over Development for Advanced Computing (C-DAC) created the EGov-PID preservation data standard for government electronic records in 2013, the National Mission for Manuscripts (NAMAMI) in India designed guidelines for digitization of archival material as well as metadata scheme in 2003. However, the European Union (EU) has created the Europeana Data Model (EDM) to handle a massive metadata repository as well as aggregation assistance for all kinds of European cultural heritage data. The National Manuscript Mission NAMAMI's overarching goal is to ensure that future generations may benefit from India's extensive manuscript collection. Namami has produced a guideline and standard of digitization for the creation of digital archives of historic materials such as manuscripts addressing digitisation, file formats, information, and retrieval of digital resources in order to cope with the born-digital or digitisation of heritage resources. Based on Dublin Core, which includes 24 descriptive & 16 technical fields, Manus e-Granthavali is a metadata standard for digital libraries. Guidelines for digitising manuscripts, printed books, maps, pictures, slides, negatives, microfilms, etc., with the goals of long-term use and reduced need to rescan material, are discussed. The guidelines also address the proper naming, arrangement, and preservation of visual materials. Egov-PID is the Government PID Standard for Electronic Records Preservation, Information, and Documentation. When it comes to language technology or heritage computing, the Centre for Advancement of Advanced Computing (C-DAC) has been at the forefront of innovation. Grantha, Vedic, Samavedic, modi, etc. are all examples of legacy scripts that it helps to standardise and portray. Using the Dublin Core Metadata Initiative (DCMI) and its 22 descriptive fields, the Egov-PID preservation metadata standard was established and developed in 2013.

To restore readability to government digital documents that have become unusable owing to the ageing of their storage medium, software, or other factors. Using the open information archiving system (OAIS) Reference Model, which is intended to preserve digital records in accordance with ISO 1472122, a set of standards and recommendations for digital preservation have been established to aid with the digitalisation of countries. Data Model for Europeana The European Union (EU) has supported a number of research and development initiatives exploring new frontiers in digital culture. In 2005, work began on The Europeana, which moved online to its current home at Europeana.eu in 2008, with the goal of simplifying access to European information resources. The primary goal of the Europeana standard is to improve access to the collections of European cultural organisations. Different metadata schemas are used by each of these museums and libraries to index their collections. These disparate information methods were translated into a uniform format so that they could be searched using a unified interface.

Dublin Core, IFLA Bibliographical Record Standard FRBROO, and CIDOC-CRM were all utilised to create Europeana's unified metadata structure. The Europeana Data Model (EDM) is a metadata

standard that was established to give its users with more and better information retrieval. It is built on Dublin Core (DC) and Metadata Encoding & Transport Standard (METS) parts. The fundamental benefit of the EDM is that it can be used to map the collections of many different types of institutions, including libraries, museums, and archives. Through its work in heritage resource collection and management, it enables collaboration between institutions to better serve users' information needs.

Interoperability of Metadata Standards Mapping In order to fulfil their information management needs, digital archive systems use several metadata standards. Consistency, immigration, preservation of information, and retrieval of digital resources might be threatened in the future as a result of these differences in how cultural organisations describe and manage digital legacy resources. There is currently no system in place to aid with the repair of extensive digital preservation initiatives undertaken by historic organisations. There might be a variety of information formats and standards in use among the country's cultural heritage entities. Mappings among metadata standards may be performed on both the scheme and record levels to improve compatibility across metadata applications. To map and convert data straight to an intermediate format or one of the standard metadata schemas, any institution may utilise the existing crosswalk. A crosswalk table is a tool for establishing a connection between entities from various metadata schemas. It is utilised when a number of digital systems with varying metadata schemes need to be interfaced in order to arrive at a standardised national or worldwide schema.

After researching the digitization mechanism used by major Indian heritage institutions, cultural institutions in India could create a suitable digital archival system for common information systems by using the crosswalk table. The issue of incompatibility between systems is addressed, and digital sustainability in some form is achieved, using this kind of information system.

Conclusions

Each historic organisation is digitising with the intention of preserving unique content, but they all approach the task in various ways. Improve the digital evolution of its history and cultural resources by developing a national digitization policy and drafting digitization or metadata preservation guidelines. Organisations may maintain resources for future generations by migrating data from one generation to another, in accordance with new technology and software, all thanks to standards for digitization, access, and preservation. The above analysis supports the claim that the majority of case studies on the digitization of historical materials are done by individual institutions. So far, there has been no research that compares how different heritage organisations handle digitization and what methods they use. Therefore, it is believed that collective and institutional efforts to apply standards for heritage resource digitization, metadata conservation, and discovery are required. Additionally, Indian businesses must comprehend the difficulties and rewards of implementing well-known standards and tools. To further illustrate the connection between the constituent parts of various metadata formats, an example crosswalk table was provided. In order to guarantee the long-term digital preservation or accessibility of cultural materials, it is recommended that a thorough assessment of heritage organisations' digitization efforts be done and executed through an extensive crosswalk table.

Divya Kapil

References

1. Graham, B. Heritage as knowledge: capital or culture?. Urban Studies, 2002, 39(5-6), 1003-1017.
2. Bountori, L. Archives in the digital age: Standards, policies and tools. Elsevier, Cambridge, 2017.
3. Tripathi, D.S. Guidelines for digitisation of archival material. National Mission for Manuscripts, New Delhi,
4. Kumar, S. & Shah, L. Digital preservation of manuscripts: A case study. In 2nd Convention Planner-2004, Imphal, 2004, 27- 28.
5. Arora, J. Digital preservation: An overview. Bridging the Digital Divide, 2009, 29-30.