

# STATUS OF DIGITIZATION AND DIGITAL PRESERVATION OF CULTURAL HERITAGE RESOURCES IN THE CULTURAL HERITAGE INSTITUTIONS OF INDIA

A Thesis submitted to the  
Babasaheb Bhimrao Ambedkar University, Lucknow  
in fulfilment of Requirement for the Award of Degree of

**Doctor of Philosophy**  
**in Library and Information Science**



by  
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UTTAR PRADESH, INDIA

**2022**

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I, **Rahul Pandey** declare that the thesis entitled “**STATUS OF DIGITIZATION AND DIGITAL PRESERVATION OF CULTURAL HERITAGE RESOURCES IN THE CULTURAL HERITAGE INSTITUTIONS OF INDIA**” has been prepared by me under the supervision of Dr. Vinit Kumar, Assistant Professor, Department of Library and Information Science. No part of this thesis has formed the basis for the award of any degree, diploma or fellowship previously.

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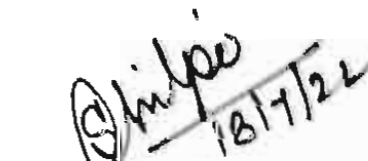
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Supervisor

  
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Date: 18.07.2022



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Submitted by	O. P. Saini
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Sources included in the report

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STATUS OF DIGITISATION AND DIGITAL PRESERVATION OF CULTURAL HERITAGE RESOURCES IN THE CULTURAL HERITAGE

Chapter 1 Introduction

It shall be the duty of every citizen of India to value and preserve the rich heritage of our composite culture. Article 51A, Part IVA, Fundamental Duties, Indian Constitution 1.1 Culture "Culture is the backbone of every nation around the world." Culture plays a vital role in expressing any country's customs, traditions, beliefs, and religions. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) defines culture as the set of distinctive spiritual, material, intellectual, and emotional features of society or a social group that encompasses Scientific, art, and literature but lifestyles, ways of living together, value systems, traditions, and beliefs. (UNESCO, 2001). The

British anthropologist, E. B. Tylor, in his book "Primitive Culture" (1871), offered a definition of culture as "a complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society." In other words, we can say that culture is the way we live, behave, believe, talk, dress, entertain, eat, etc. We can easily observe that, likewise, geographical conditions vary from place to place in the same way, the cultures, traditions, and languages of a group of people in that region also change. All the activities of day-to-day life that we do are the result of a culture that we learned from our ancestors. A Jamaican activist, Marcus Garvey, said regarding the importance of culture, "A people without the knowledge of their past history, origin, and culture is like a tree without roots."

1.2 Heritage As culture is about what we create, in the same way, heritage refers to the things that we inherit from our ancestors. "Heritage" is the record of the living styles of people of past and present generations. "Heritage" is the history of past events, knowledge, values, and traditions that developed thousands of years ago. It provides the basis for understanding the ideas, opinions, ways of living and various aspects of our past generations. "Heritage" consists of the traditions, monuments, objects, and culture of any country. The term "heritage" is used in a number of societal disciplines, including biology, industry, food, and virtual heritage. Cultural heritage is also a component of society. According to the UNESCO convention of 1972, cultural heritage includes the following:

Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings, and combinations of features, which are of outstanding universal value from the point of view of history, art or science. Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science. Sites: works of man or the combined works of nature and man, and areas, including archaeological sites, which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view. 1.3

Cultural Heritage

The International Council on Monuments and Sites (ICOMOS) in 2002 expressed cultural heritage as "an expression of the ways of living developed by the community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions, and values.

Cultural heritage is often expressed as either intangible or tangible cultural heritage.

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## ACKNOWLEDGEMENT

*First and foremost, I would like to thanks to God who has given me the courage, serenity and motivation to complete this study.*

*There are many people whom I would like to acknowledge for enabling me to stand at the significant milestone of completing doctorate degree. With great pleasure, I consider myself lucky to have Dr. Vinit Kumar, Assistant Professor, Department of Library and Information Science, Babasaheb Bhimrao Ambedkar Central University, Lucknow as my research work supervisor. I offer him heartfelt gratitude for his innumerable guidance, help, support, affection and encouragement throughout the research study. His precious guidance helped me in all the time of research, from the stage of planning research to analyzing results, discussions and compilation of the thesis.*

*I also wish to state truthful thanks to Prof. Shilpi Verma, Head, Department of Library and Information Science, B.B.A.U, Lucknow and all the faculty members of the Department of Library and Information Science, Prof. K. L. Mahawar, Prof. M.P.Singh, Dr. Sharad Kumar Sonkar and Mr. Somipam R. Shimray for their encouragement, cooperation and valuable suggestions for the study.*

*I wish to acknowledge Prof. Sanjay Singh, Vice Chancellor, Babasaheb Bhimrao Ambedkar University, Lucknow for providing all the support, facilities and excellent environment during the research work. Thank you sir for everything.*

*I am truly thankful to Mrs. Shikha Awasthi, who has been a constant source of support and encouragement during the challenges of research work. She supported me unconditionally and boosted my morale time to time.*

*I am highly indebted and thoroughly grateful to Ms. Khusbu Thakur and Ms. Mamta, without their cooperation, this study cannot be completed. I am again giving truthful thanks to all.*

*I am also grateful to all curators/ deputy curators/digitization project incharge of cultural heritage institutions for their cooperation and assistance in providing the valuable data and information which was required for the completion of the study.*

*I would like to thanks to all friends for their cooperation and help throughout research work. I am placing special thanks to all authors who have contributed their valuable research paper or research works on digitization and digital preservation, which were used for the study.*

*I extend genuine gratitude to family members, especially loved parents, father Mr. Ashok Kumar Pandey and mother Mrs. Anita Pandey, who taught the value of hard work and encourage to contribute something for Library and Information Science profession. Last but not least, I am thankful to one & all who directly or indirectly helped to bring this into final shape. Finally, I would like to thank everybody who was important to the successful realization of thesis, as well as expressing apology that I could not mention them personally.*

*Thank you all once again!*

Date: 18/07/22

Place: Lucknow

  
(Rahul Pandey)

## **PREFACE**

In the age of globalisation, cultural heritage is the means by which we can understand the practises, places, things, artistic expressions, and values connected to our previous generations. This cultural heritage is gathered, stored, and preserved in numerous Galleries, Libraries, Archives, and Museums (GLAMs) across the country in the form of text-based resources, visual resources, and multimedia resources. However, with the development of technology, the work of GLAMs has expanded beyond the collection, storage, and preservation of heritage material. It now includes improving access to cultural materials; making art objects more discoverable to a wider audience; allowing multiple users to access the information at once; and increasing collaboration for resource sharing. Cultural heritage institutions (CHIs) have started digitization initiatives to close the existing gap. By converting their analogue material into digital format, they are able to offer a number of advantages, including increased document accessibility, physical space savings, simultaneous document use, and decreased document fragility.

The first chapter of the study provides a general overview of all issues related to the digitization and digital preservation of cultural heritage resources in the Cultural Heritage Institute (CHI) of India. This chapter discusses the notion of culture, heritage, cultural heritage resources, cultural heritage institutions, digitization, preservation, and digital preservation, major initiatives toward digitization in the world and India, the statement of the problem, the necessity for the study, the study's objectives, the study's hypothesis, and a brief description of the study's methodology.

The second chapter highlights the existing literature in the field of digitization and digital preservation, which was divided on the basis of a thematic review into three

sections, namely, national digitization project studies; academic digitization project studies; and organisational or institutional digitization project studies.

The third chapter highlights the methodology adopted to achieve the objectives of the research and the data collection tools used to collect primary and secondary data from the respondents. For the present research work, the survey method followed by a structured questionnaire was used, and for the secondary data content analysis was preferred.

The fourth chapter tabulates, statistically analyses, interprets, and graphically represents the information gathered from study participants.

The fifth chapter presents the major findings and conclusion of the study. It deals with the suggestions and recommendations made in the study and suggestions for further future research.

## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Full Form</b>
AM	Allahabad Museum
ASI	Archeological Survey of India
ASI	Archeological Survey of India
CDAC	Centre for Development of advanced Computing
CH	Cultural Heritage
CHI	Cultural Heritage Institutions
CHR	Cultural Heritage Resources
ERDF	European Regional Development Fund
EU	European Union
GHSM	Gandhi Heritage Sites Mission
GLAMs	Galleries, Libraries, Archives, Museums
GOI	Government of India
HCDC	Human Centred Design and Computing
ICH	Intangible Cultural Heritage
ICOMOS	The International Council on Monuments and Sites
IFLA	International Federation of Library associations and Institutions
IGNCA	Indira Gandhi National Centre for the Arts
IM	Indian Museum
IMLS	The US Institute of Museum and Library Services
INTACH	Indian National Trust For Art and Cultural Heritage
NCF	National Culture Fund
NCSM	National Council of Science Museums

NGMA	National Gallery of Modern Art
NM	National Museum
NMI	National Museum Institute of Art, History, Conservation and Museology
NMM	National Mission on Manuscripts
NMMA	National Mission on Monuments and Antiquities
NRLCCP	National Research Laboratory for the Conservation of Cultural Property
SJM	SalarJung Museum
TCH	Tangible Cultural Heritage
UNESCO	The United Nations Educational, Scientific and Cultural Organization
VMH	Victoria Memorial Hall
WWW	World Wide Web
MARC	Machine Readable Catalogue
METS	Metadata Encoding and Transmission Standard
MODS	Metadata Objects Description Schema
CCO	Cataloguing Cultural Objects
CDWA	Categories for the description of Works of Art
PREMIS	Preservation Metadata Implementation Strategies
NEMO	The Network of European Museum Organisation
TIFF	Tag Image File Format
PDF	Portable Document Format
JPEG	Joint Photographic Expert Group

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*Chapter 1*  
*Introduction*



# CHAPTER 1

## INTRODUCTION

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**It shall be the duty of every citizen of India to value and preserve the rich heritage of our composite culture. (Article 51A, Part IVA, Fundamental Duties, Indian Constitution)**

### 1.1 Culture

"Culture is the backbone of every nation around the world." Culture plays a vital role in expressing any country's customs, traditions, beliefs, and religions. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) defines culture as the set of distinctive spiritual, material, intellectual, and emotional features of society or a social group that encompasses Scientific, art, and literature but lifestyles, ways of living together, value systems, traditions, and beliefs. (UNESCO, 2001). The British anthropologist, E. B. Tylor, in his book "Primitive Culture" (1871), offered a definition of culture as "a complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society." In other words, we can say that culture is the way we live, behave, believe, talk, dress, entertain, eat, etc. We can easily observe that, likewise, geographical conditions vary from place to place in the same way, the cultures, traditions, and languages of a group of people in that region also change. All the activities of day-to-day life that we do are the result of a culture that we learned from our ancestors. A Jamaican activist, Marcus Garvey, said regarding the importance of culture, **"A people without the knowledge of their past history, origin, and culture is like a tree without roots."**

## 1.2 Heritage

As culture is about what we create, in the same way, heritage refers to the things that we inherit from our ancestors. "Heritage" is the record of the living styles of people of past and present generations. "Heritage" is the history of past events, knowledge, values, and traditions that developed thousands of years ago. It provides the basis for understanding the ideas, opinions, ways of living and various aspects of our past generations. "Heritage" consists of the traditions, monuments, objects, and culture of any country. The term "heritage" is used in a number of societal disciplines, including biology, industry, food, and virtual heritage. Cultural heritage is also a component of society. According to the UNESCO convention of 1972, cultural heritage includes the following:

**Monuments:** architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings, and combinations of features, which are of outstanding universal value from the point of view of history, art or science;

**Groups of buildings:** groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;

**Sites:** works of man or the combined works of nature and man, and areas, including archaeological sites, which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

## 1.3 Cultural Heritage

The International Council on Monuments and Sites [ICOMOS] in 2002 expressed cultural heritage as “an expression of the ways of living developed by the

community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions, and values. Cultural heritage is often expressed as either intangible or tangible cultural heritage.

Cultural heritage is an expression of the living patterns of people from previous generations. It is human nature to want to know about our past and culture, and cultural heritage is one way to learn about our thousands-year old religion, culture, customs, beliefs, and art. There are a lot of reasons why we want to know our past and our culture, such as we give value to our past and to our ancestors, we want to know the creations of past generations, and we want to be a part of the past. According to UNESCO, cultural heritage can be divided into two broad categories: tangible cultural heritage and intangible cultural heritage.

### **1.3.1 Tangible cultural heritage**

"Tangible Cultural Heritage" refers to physical artefacts produced, maintained, and transmitted intergenerationally in a society. It includes works of art, buildings and monuments, and other physical or tangible products of human creativity that have cultural value in a society (UNESCO, 2003).

### **1.3.2. Intangible cultural heritage**

According to UNESCO (2003), "Intangible Cultural Heritage" indicates the practises, sentiments, expressions, knowledge, skills, as well as the instruments, objects, artefacts, and cultural spaces associated therewith—that communities, groups, and, in some cases, individuals recognise as a part of their cultural heritage. Basically, intangible cultural heritage (ICH) refers to the practises, expressions, rituals, habits, and knowledge that we have inherited from our past generations, and always try to learn something new from all of those.

Tangible cultural heritage may be further divided into moveable and immovable heritage. Moveable hand weage refers to any collection of Galleries, Libraries, Archives and Museums (GLAMs) which include books, manuscripts, periodicals, photographs, microfilms, CD-ROM databases, digital images, audio, videotapes, paintings, sculptures, etc. On the other hand, the immovable heritage is made up of works of architecture, monuments, archaeological sites, and historical buildings. With the following graph, we can easily understand the division of cultural heritage and its subdivisions.

### Classification of cultural heritage by UNESCO

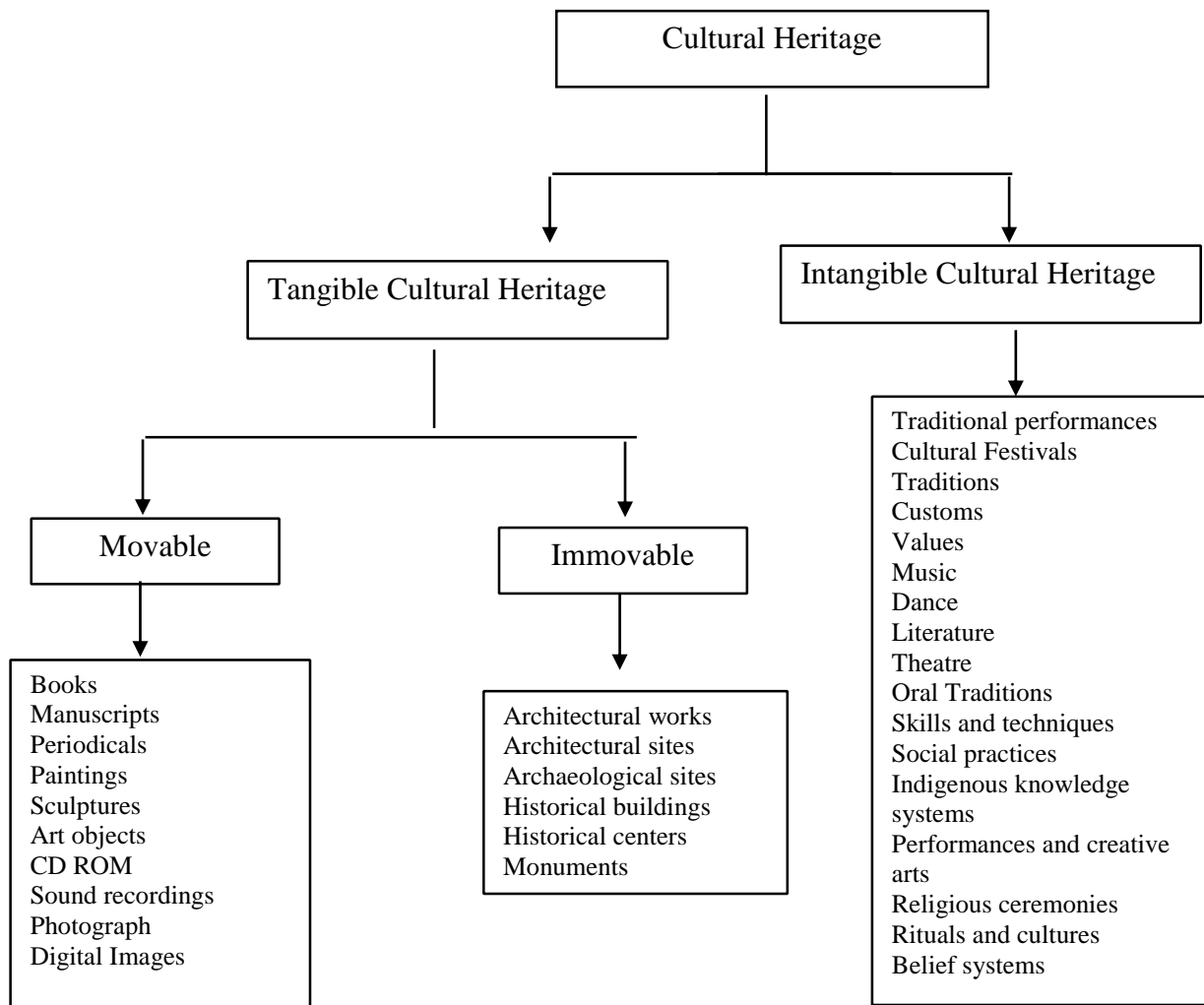


Fig: 1.1 Classification of cultural heritage by UNESCO

In the previous paragraphs, we discussed culture, heritage, and cultural heritage and the classification of cultural heritage, but there is a high need to discuss the significance and role of cultural heritage in our society. Every country in the world has a rich heritage and holds a collection of indigenous knowledge, beliefs, morals, customs, and various ways to gain knowledge and progress in society. It is a blend of philosophy, art, religion, and creativity done by our ancestors.

#### **1.4. Cultural heritage resources**

The resources that provide information associated with traditions, practises, and customs are cultural heritage resources such as manuscripts, paintings, sculptures, coins, rare books, rare photographs, and decorative art pieces.

#### **1.5 Cultural heritage institutions**

After analysing the importance of cultural heritage materials and cultural heritage resources to our society, galleries, libraries, archives, and museums (GLAMs) started to collect the resources having cultural values, and this is why GLAMs are known as cultural heritage institutions with collections in book form and stored easily in the GLAMs. But with the information explosion, it is complicated for GLAMs to make available all the resources in their organisations. In the mid-1990s, with the advent of the World Wide Web (WWW), experts used a technique in which they convert the traditional printed material into a digitised format with the binary code in the form of ones and zeros (1 and 0).

In the Indian scenario, the Ministry of Culture has divided the cultural heritage resources into two broad categories: tangible and intangible cultural heritage. Furthermore, the Ministry covers the 14 tangible cultural heritage institutions (CHIs) across the country. A brief description of these institutions has been given in the section that follows.

## **1.6 Overview of Cultural Heritage Institutions (CHI's)**

### **1.6.1 Indian Museum (IM)**

The Indian Museum was established on February 2, 1814 in Kolkata as a repository of rare and unique objects relating to social and natural sciences as well as the humanities. This gallery has categorised its collection into 6 sections consisting of 35 galleries, namely art, anthropology, archaeology, and archaeology. The directorate has nine service units that coordinate preservation, publication, security, educational presentation, photography, modelling, and the library. The major aim of the museum is to make their museum a visitor-friendly destination and to enhance the satisfaction level of the visitors' engagement. (Indian Museum, 2022)

### **1.6.2 Archeological Survey of India**

The ASI was established in 1861 as an attached office of the Ministry of Culture, Government of India. The major aim of the ASI is to protect, preserve, and conserve the centrally protected monuments or sites (3693) of national importance, which consist of 24 world heritage properties. The ASI is also engaged in the digitization and preservation of various art objects available in their 52 site museums located across the country. (Archeological Survey of India, 2015)

### **1.6.3 Victoria Memorial Hall**

The foundation stone of the VMH was laid by the Prince of Wales, later King George V, in January 1906. It was opened to the public in 1921 and was declared as an institution of national importance by the Government of India Act of 1935. Presently, the museum is considered one of the best museums of unique visual art. In 2015, VMH

was named the cleanest monument in India, and it ranked ninth in Asia in terms of popularity in 2017. (Victoria Memorial Hall, 2017)

#### **1.6.4 Allahabad Museum**

The first prime minister of India, Pt. Jawahar Lal Nehru, took an initiative to reopen the museum in 1923-24 under the operation directorship of Pt. Brij Mohan Das, who was then executive officer of the revenue board for the establishment of public libraries and museums in the north-western provinces. In 1954, the museum was opened to the public and shifted to the Chandra Shekhar Azad Park, which is across from the Municipal Board building. In 1985, the museum was designated as an institution of national importance by the ministry of culture, government of India. There are 16 galleries in the museum, which include sculpture, paintings, coins, manuscripts, arms and armour from different parts of the country. (Allahabad Museum, 2017)

#### **1.6.5 National Museum**

The blueprint for establishing the NM in New Delhi was prepared by the Maurice Gwyer committee in May 1946, but in 1949 this museum was declared as the national museum of the country. The rich and rare collection of NM consists of artefacts from the sites of Harappan civilization such as pottery, seals, terracotta, toys, jewellery, and tools. The museum has a huge collection of Central Asian art, including miniature paintings, pre-Columbian and western art, and musical instruments. (National Museum, 2019)

#### **1.6.6 Salar Jung Museum**

The SJM was established in the year 1951 by the Nawab Mir Yousuf Ali Khan, popularly known as Salar Jung III. This museum was declared as an institution of

national importance by an act of parliament in 1961. At present, the museum has 39 galleries in three blocks ranging from Telangana, Andhra Pradesh, Karnataka, and many more states of India. (Salar Jung Museum, 2018)

### **1.6.7 National Gallery of Modern Art**

The National Gallery of Modern Art was inaugurated in 1954 by the first vice president of India, Dr. S. Radhakrishnan, in New Delhi, and presently NGMA is working with two branches in Mumbai and Bengaluru. The prime goal of NGMA is to acquire and preserve modern art from 1850 onwards and represent these arts to a global audience. (National Gallery of Modern Art, 2009)

### **1.6.8 National Research Laboratory for the conservation of cultural property**

The NRLC is a subordinate office of the ministry of culture, the government of India, with its headquarters in Lucknow, and has two campuses; one is a regular operational laboratory in Mysore and the other is a training institute in Lucknow. Since its inception, the laboratory has been engaged in the advanced conservation of cultural property through scientific research, training, collaboration, and public participation. (National Research Laboratory for the conservation of cultural property, n.d.)

### **1.6.9 National Council of Science Museums**

The NCSM is an autonomous body founded in 1978 with the goal of raising public awareness of science and technology and cultivating a spirit of scientific inquiry. It is the largest network of science centres and museums in the world that work together under a single 1.6.9 National Science Museum Council. It helps people learn about science through interactive exhibits and outreach programmes. NCSM has 23 mobile science exhibition units throughout the country to communicate the message of science to the doorsteps of rural people. (National Council of Science Museums, 2022)

**1.6.10 National Museum Institute of Art History, Conservation, and Museology**

The NMI was established on January 27, 1989 under the Societies Registration Act 1860 and became deemed a university in April 1989. Since its inception, the institute has been one of the leading centres in the country for training and research in the fields of art and cultural heritage. The objective of this institute is to provide training and research in the fields of art history, art conservation, and museology. This institute also offers masters and Ph.D. courses in the history of art conservation and museology and conducts certificate courses. (National Museum Institute of Art History, Conservation, and Museology, 2017)

**1.6.11 National Mission for Manuscript**

The NMM was launched on February 5th, 2003, with the aim of documenting and cataloguing Indian manuscripts. The other objectives of the NMM are to promote ready access to documented manuscripts through publications in the form of books as well as in machine-readable form; preservation of manuscripts by training awareness and financial support; and to create a national manuscript library at IGNCA. (National Mission for Manuscript, 2016)

**1.6.12 National Mission on Monuments and Antiquities**

The NMMA was launched in 2007 with the aim of documentation and the creation of databases on built heritage sites and developed a uniform format for the documentation of antiques available in different formats in central government, state government, private and university museums. The ASI is the nodal agency for NMMA to implement the various activities across the country. (National Mission on Monuments and Antiquities, 2018)

### **1.6.13 Gandhi Heritage Sites Mission**

The government of India constituted a Gandhi heritage sites panel in April 2006, headed by Shri Gopal Krishna Gandhi. Based on the recommendation of the panel, the GHSM was created in 2013 with the view to preserving for posterity the identified sites of literary and visual heritage associated with Gandhi Ji. The Gandhi heritage portal has been set up by the ministry of culture with the help of the Sabarmati Ashram preservation and memorial trust (SAPMT), Ahmedabad. (Gandhi Heritage Sites Mission, 2022)

### **1.7 Digitization**

Digitization enables galleries, libraries, archives and museums to convert their analogue materials into digital formats. The US Institute of Museum and Library Services (IMLS) defines digitization as “the process of converting, creating, and maintaining books, artworks, historical documents, photos, journals, etc. in electronic representation so they can be viewed via computers and other devices.” In short, we can say that digitization is the process of changing analogue material into a digital format. In various ways, digitization has made the life of a human being very easy in various ways, as if we are unable to go somewhere to submit any official paper, we just scan it from our cell phone and send the digitised format of that paper. In the same way, digitization plays a vital role in GLAMs as well. If any institute has a limited number of copies of any book, then they digitise it and enable various users to access it at the same time. There are a lot of examples which we can see in our day-to-day life and which make our lives easier by using digitization technology. There are various benefits to digitising heritage material in GLAMs as users can provide access at any location at any time, save space, improve the instant demand facility, and there is no occurrence

of issues related to the deterioration of the material. The fragile nature of heritage materials is one of the major reasons for keeping them for a long time.

### **1.8 Need of digitization and preservation**

Digital and analogue kinds of materials are fragile in nature and can be lost with the passing of time. Consequently, to provide long-term access to digital and analogue materials for future generations, the preservation of cultural materials is required. In the present era of infopassingon technology, the majority of the heritage material is either digitised or born-digital, but there is an ocean of literature in GLAMs that is still in printed form and it deteriorates over time. So there is a high need to digitise as well as to preserve cultural heritage resources.

In the context of GLAMs, preservation is a broader concept that comprises two techniques, namely, conservation and restoration. The International Federation of Library Associations and Institutions (IFLA) has defined these terms as under:

**Preservation** includes all the managerial and financial considerations, including storage and accommodation provisions, staffing levels, policies, techniques, and methods involved in preserving library and archive materials and the information contained in them.

**Conservation** denotes those specific policies and practises involved in protecting library and archival materials from deterioration, damage, and practises involving the methods and techniques devised by technical staff.

**Restoration** refers to those techniques and judgments used by technical staff engaged in the making of good and archive material damaged by time, use, and other factors.

Along with the discussion of the above-defined terms, there are two more concepts that create confusion-one is digitization for preservation, and the second is digital preservation. The concept of digitization for preservation comes from the traditional technique in which the digitization of fragile materials has been done to keep them safe for a long time in GLAMs. But digital preservation is a newer technology that involves not only digitization and preservation but also includes documentation for policies, strategies, and actions that ensure wider access to digital content over time.

In the above paragraph, we discussed various terms and techniques related to digitization and preservation, but in the present paragraph, we discussed the concept of preservation and digital preservation in detail. According to the UNESCO charter for the preservation of digital heritage (2003), digital heritage has been defined as “unique resources of human knowledge and expression.” It embraces cultural, educational, scientific, and administrative resources as well as technological, legal, medical, and other kinds of information created digitally or converted into digital format from existing analogue resources.

This traditional preservation method just transforms the printed material into digital formats and is preserved in GLAMs. It has the potential to save our heritage materials from deterioration and keep them safe for a long time, but is unable to provide wider access to our cultural materials across the globe. With the advent of technology, heritage institutions enhance their cultural materials from printed to digital and later-born digital. These changes in the collection of GLAMs encourage the technique of digital preservation in heritage institutions.

Digital preservation is the conservation of all digital materials, whether they were born digital, such as emails, websites, videogames, and other electronic files, or

whether they have been digitised from analogue materials (Conway, 2010). Digital preservation is the technique by which GLAMs are capable of managing and preserving digital and born-digital heritage material for long-term access. The most important reason for putting cultural heritage online is to enhance so as to provide provisions for students, teachers, and researchers to explore and connect with our past. This in turn will help cultural archivists to measure their success by analysing how people use, reuse, explore, and understand these objects.

### **1.9. Major initiatives related to digitization**

After discussing the various concepts and terms related to digitization and digital preservation, it is also necessary to list the major digitization and digital preservation initiatives undertaken by different organisations and GLAMs to digitise, preserve, and enhance access to cultural heritage material across the globe and in India. There are various organizations dedicated to digitization projects globally, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Federation of Library Associations and Institutions (IFLA), the European Union (EU). In the same way, various Indian organizations and institutions working in the field of digitization and digital preservation, such as the Anthropological Survey of India, Archaeological Survey of India (ASI), National Archives of India, Indira Gandhi National Centre for the Arts (IGNCA), National Mission for Manuscripts, and Indian National Trust for Art and Cultural Heritage (INTACH), The major initiatives by various organizations are as follows:

## 1.9.1 Major initiatives at a glance: Globe

Table 1.1 Major initiatives at a glance: Globe

Name of Project	Year	Project accomplished by	Purpose
Memory of the World	1992	UNESCO	To safeguard the documentary heritage of humanity.
International Dunhuang Project	1994	British Library	IDP is an international collaborative effort to conserve, catalogue and digitise manuscripts, paintings, and artefacts from the Mogao caves (a system of 500 buddha temples in China)
Lithuanian digitization Project	2005	The National Library of Lithuania is funded by the European Regional Development Fund (ERDF)	To preserve Lithuanian heritage objects collected by Memory Institutions.
Europeana	2008	European Union	to make Europe's cultural heritage accessible to everyone.
ENUMERATE	2011	Collections Trust (UK) is in charge of the project, which is	To create a reliable baseline of statistical data about digitization,

		funded by the European Union.	preservation, and online access to cultural heritage in Europe.
Digital Library and Digital Archives (also known as DIKDA)	2012	The Slovak National Library (SNL) and the Slovak National Archive (Slovakia) funded by ERDF	It aimed to digitise 2.52 million objects from the SNL and the Slovak National Archives.
CEPROQHA Project	2017	Qatar University and Brunel University (UK) are funded by the Qatar National Research Fund (QNRF)	aiming to achieve cost-effective acquisition and digital preservation of cultural heritage artefacts in Qatar.

### 1.9.2 Major initiatives at a glance: India

India has a vast heritage because of the diversity of culture, customs, traditions, religions, and languages. All these aspects of society had their own values and played a significant role in day-to-day life in different ways. We can't live the ancient ways of life, but we can learn about them by looking at coins, manuscripts, paintings, sculptures, photographs, and decorative art in India's Galleries, Libraries, Archives, and Museums (GLAMs). A number of digitization and digital preservation initiatives have been completed and are ongoing in India. Some of them are as follows:-

- The Department of Culture, Government of India, launched the National Mission for Manuscripts in 2003 with the main objective of facilitating conservation and preservation. The Secretariat Library under the Department of

Culture has undertaken work on digitising government resources such as the Annual Reports, Commission and Committee Reports of the Central Government of India and Gazettes of India.

- The National Library of India has undertaken digitization of often used rare books and documents such as East India Company records, diaries, etc. as well as MSS on paper and palm leaves.
- The Parliament Library has digitised all debates, questions, Committee Reports, and biodata of present and past Members of Parliament, including photographs, addresses etc.
- The Khuda Bakhsh Oriental Public Library has initiated the digitization of the Arabic and Persian manuscripts of India.
- The National Science Foundation of the USA has initiated the “million book project” at Carnegie Mellon University in the USA, with India as a partner. The Indian Institute of Science, Bangalore, is the focal point of this activity in India. The project aims to digitise one million books in 2005 in India alone.
- Khuda Baksh Oriental Public Library has digitised the Arabian and Persian manuscripts of the medieval period.
- Bhandarkar Oriental Research Institute (BORI), Pune, has taken an initiative to digitise manuscripts in Arabic, Urdu, Persian, and Turkish languages under a pilot project with the aim of 10 lacs of manuscripts at the initial stage.

### **1.10 Statement of the Problem**

Culture plays a vital role in the life of a person and society. It includes traditions, practices, customs, and living patterns of the past generations and is represented in the form of various cultural heritage resources. There are a number of studies conducted to explore the status of digitization and preservation of heritage resources in cultural

heritage institutions (CHIs) individually and the practices followed by them in their digitization projects, but there is a need to highlight the digitization and preservation efforts taken by various CHIs on a single platform, which will be helpful for professionals and researchers in understanding the trends and major practices followed by CHIs in the field of digitization and preservation of cultural materials. This study will help policymakers of digitization initiatives to understand the selection of material to be digitised, challenges in digitization, preferred file formats for different kinds of resources, and the common metadata entry elements for describing art objects. So to fill the existing gap present study is entitled “STATUS OF DIGITIZATION AND DIGITAL PRESERVATION OF CULTURAL HERITAGE RESOURCES IN THE CULTURAL HERITAGE INSTITUTIONS OF INDIA” and the study aims to explore the various aspects related to digitization and digital preservation of heritage material in the cultural heritage institutions of the country.

### **1.11 Need of the Study**

Indian culture is one of the most ancient cultures in the world. The Galleries, Libraries, Archives, and Museums (GLAMs) of the country collected and preserved the cultural heritage resources from a long time ago, and with the availability of digital technology, our GLAMs provide access to heritage resources not only in analogue format but also in digital format. There were a lot of studies conducted across the world and in India in the field of digitization and preservation of heritage resources, but the majority of the studies highlighted the national digitization projects, institutional or organizational digitization initiatives, digitization of manuscripts, preservation of newspapers, and digitization and preservation in archives, but there is a high need to explore the status of digitization of cultural heritage resources in cultural heritage institutions in India, the various kinds of heritage material provided by them, challenges

in providing access and digitization of heritage resources, and various practises followed by institutions in digitization and preservation of heritage material. The findings of this study will benefit library professionals, archivists, and curators who want to digitise their collections in terms of practises followed by these CHIs, as well as people who want to learn about Indian cultural heritage and the diverse collections available in the country's GLAMs.

### **1.12 Objectives of the Study**

The objectives of the present study are as follows:

1. To identify the types of cultural heritage resources available in the cultural heritage institutions of India.
2. To assess the status of digitization of cultural heritage resources available in the cultural heritage institutions of India.
3. To find out the underlying reasons for the digitization and digital preservation of cultural heritage resources in the cultural heritage institutions of India.
4. To identify the factors considered by cultural heritage institutions in digitization policy.
5. To analyse the different criteria used by the cultural heritage institutions while selecting any material for digitization.
6. To assess the significant challenges faced by cultural heritage institutions in digitising and preserving their heritage collections.
7. To understand the preferred collaborative digital activities among the cultural heritage institutions in India.
8. To identify the practises followed for the digital storage and digital preservation of cultural heritage resources by cultural heritage institutions.

9. To study the different metadata elements used to describe the particular art objects available in the cultural heritage institutions.

### **1.13 Aims of the study**

The present study attempts to represent the rich cultural heritage of a country available in the heritage institutions and the major practices followed by these heritage institutions in the digitization and preservation of this heritage.

### **1.14 Population and Scope of the Study**

- The Ministry of Culture, Government of India, divided its cultural heritage into two sections, namely, tangible cultural heritage and intangible cultural heritage.
- Tangible cultural heritage includes artistic creations, built heritage such as buildings and monuments, and other physical or tangible products of human creativity that are invested with cultural significance in society.
- On the other hand, intangible cultural heritage refers to the practises, expressions, rituals, habits, and knowledge that we have inherited from our past generations, and we always try to learn something new from all of those.
- The present study is limited to the Tangible Cultural Heritage Institutions under the Ministry of Culture, Govt. of India because the major goal of the study is to assess the status of digitization and digital preservation of cultural heritage resources and to know the several types of art objects available in various cultural heritage institutions (CHIs) of India. These kinds of art objects are available in the tangible CHIs so we include it in our study.
- The Ministry of Culture includes 13 tangible CHIs and one national culture fund under the tangible CHIs.
- For the present study, we include all 13 CHIs in our study, and we exclude the national culture fund (NCF) from the study because the NCF is a funding agency

that approves the proposals of CHIs and provides financial aid to achieve their goals.

- For the collection of secondary data, researcher visited the official website of the National Portal and Digital Repository for Museums of India (<https://museumsfindia.gov.in/repository>).
- To assess the technical information related to digitization and digital preservation a questionnaire has been prepared for the Human-Centered Design and Computing (HCDC) Group at the Centre for Development of Advanced Computing (C-DAC) Pune
- The details of the tangible cultural heritage included in the study are as below:

**Table 1.2 Tangible CHIs and their acronyms**

S.No.	Name of cultural heritage institutions	Acronym
1	Archeological Survey of India	ASI
2	National Museum	NM
3	National Gallery of Modern Art	NGMA
4	Indian Museum	IM
5	Victoria Memorial Hall	VMH
6	Salarjung Museum	SJM
7	Allahabad Museum	AM
8	National Council of Science Museums	NCSM
9	National Museum Institute of History of Art, Conservation and Museology	NMI
10	National Research Laboratory for Conservation of Cultural Property	NRLC
11	National Mission for Monuments and Antiquities	NMMA

12	National Mission for Manuscripts	NMM
13	Gandhi Heritage Site Mission	GHSM

### 1.15 Hypotheses

**H1-**Among all the cultural heritage institutions in the country, the National Museum has digitised the maximum art objects.

**H2-**To provide long-term access to the heritage collection for future generations is one of the major reasons for digitising the cultural resources.

**H3-**There is no uniformity in the application of metadata entry elements by different cultural heritage institutions in various art object categories.

### 1.16 Methodology

The major aim of the present study is to know the status of digitization and digital preservation of cultural resources in the cultural heritage institutions of India.

This study will be completed by following these steps:

1. **Data Collection:** In the present study, a survey method was employed using a structured questionnaire for primary data and website analysis was used for secondary data.
2. **Population and Sample:** Under the Ministry of Culture, Govt. of India, there are 13 Tangible Cultural Heritage Institutions working, and they are all the population of study, and researcher take the whole population as a sample of the study.
3. **Analysis:** After the collection of data, it has been presented through tables for a better and easier understanding of each aspect discussed in a questionnaire.

For the visual representation of data graphs and charts were also used where it was essential.

4. **Result and Discussion:** The results and discussion will be interpreted and reported in the final report.

### **1.17 Chapterisation**

The entire research work will be completed in five sections. The logical structure of chapters, sections, and sub-sections, including completed studies, helps the readers and the researchers of the specific field understand the background of the concepts, ideas, and opinions of various experts.

**1. Introduction:** This chapter provides a brief overview of the concepts, research problems, objectives, needs, significance and hypotheses of the study.

**2- Review of Literature:** This chapter contains a critical appraisal of the previous studies that are closely related to the current study to understand the methodology, analysis tools, correct approaches of investigation, and probable results.

**3-Methodology:** This chapter will list out the steps followed during the conduct of this study. including the sample, sample size, data collection tool, technique, and analysis methods.

**4-Data analysis and interpretation:** This chapter brings out the analysis of the collected data, which will help assess the major findings of the study.

**5- Findings, Suggestions, and Conclusion:** This chapter summarises the study and includes the final results. This chapter further lists some suggestions, recommendations, and areas of further research.

**1.18 Conclusion**

To conclude, we can say that this chapter gives an overview of all the aspects related to digitization and digital preservation of cultural heritage resources in the Cultural Heritage Institute (CHI) of India. This chapter involves the concept of culture, heritage, cultural heritage resources, cultural heritage institutions, digitization, preservation, digital preservation, major initiatives towards digitization in the globe and India, statement of the problem, need for the study, objectives of the study, the hypothesis of the study, and a brief methodology used to conduct the study. In the next chapter, we will discuss the previous studies in the fields of digitization and digital preservation across the world and India, which will help us understand the existing gaps and progress in the field.

## References

Allahabad Museum (2017). About. Retrieved from: <https://theallahabadmuseum.com/>

Archeological Survey of India (n.d.). About. Retrieved from: <https://asi.nic.in/>

Conway, D. R. D. P. (2010). Implementing PREMIS: a case study of the Florida Digital Archive. *Library Hi Tech*, 28(2), 273 – 289 DOI: <http://dx.doi.org/10.1108/07378831011047677>

Fundamental duties (2019). Retrieved from [http://unipune.ac.in/university\\_files/Constitution/04FundamentalDutiesContentMCQ.pdf](http://unipune.ac.in/university_files/Constitution/04FundamentalDutiesContentMCQ.pdf)

Gandhi Heritage Sites Mission (2022). About. Retrieved from <https://www.indiaculture.nic.in/gandhian-heritage>

ICOMOS (2002). Cultural Heritage. Retrieved from [http://www.cultureindevelopment.nl/cultural\\_heritage/what\\_is\\_cultural\\_heritage](http://www.cultureindevelopment.nl/cultural_heritage/what_is_cultural_heritage)

Indian Museum (2022). About the museum. Retrieved from: <https://indianmuseumkolkata.org/>

Ministry of culture (2019). Tangible cultural heritage. Retrieved from <https://www.indiaculture.nic.in/tangible-cultural-heritage>

National Council of Science Museums (2022). About. Retrieved from <https://ncsm.gov.in/>

National Gallery of Modern Art (2009). About. Retrieved from <http://ngmaindia.gov.in/>

National Mission for Manuscript (2016). About. Retrieved from <https://www.namami.gov.in/>

National Mission on Monuments and Antiquities (2018). About. Retrieved from <http://nmma.nic.in/nmma/indexAction.do>

National Museum (2019). About museum. Retrieved from <http://www.nationalmuseumindia.gov.in/en>

National Museum Institute of Art History, Conservation, and Museology (2017). About. Retrieved from <http://nmi.gov.in/>

National Research Laboratory for the conservation of cultural property (n.d.). About Retrieved from <http://www.nrlc.gov.in/>

Salar Jung Museum (2018). About. Retrieved from <https://salarjungmuseum.in/>

UNESCO (1972). Convention Concerning the Protection of the World Cultural and Natural Heritage. Retrieved from: <https://whc.unesco.org/en/conventiontext/>

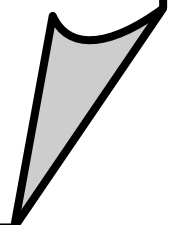
UNESCO (2003). Intangible cultural heritage. Retrieved from <https://ich.unesco.org/en/convention>

UNESCO (2009). The 2009 Unesco Framework For Cultural Statistics (FCS) Retrieved from: <https://unstats.un.org/unsd/statcom/doc10/BG-FCS-E.pdf>

Victoria Memorial Hall (2017). About the Museum. Retrieved from: <https://www.victoriamemorial-cal.org/home/content/en>



*Chapter 2*  
*Review of Literature*



## CHAPTER 2

### REVIEW OF LITERATURE

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#### 2.1 Introduction

The literature review for any research work is a very important aspect because a review of related literature is conducted to enable the researcher to understand the specific field of study. The present study aimed to explore the status of digitization and digital preservation of cultural heritage resources in cultural heritage institutions. The existing literature in the field was searched using queries such as “Digitization OR Digitization”, “Preservation OR Digital Preservation”, “Digitization AND Digital Preservation”, “Digitization Challenges”, “Digitization Issues”, “Digitization Barriers”, “Cultural Heritage Resources”, and “Cultural Heritage Institutions” in scholarly databases such as Scopus and Google Scholar. The existing literature in the field of digitization and digital preservation was divided on behalf of a thematic review into three sections, which are as follows:

- National digitization project studies
- Academic digitization project studies
- Organisational/ Institutional digitization project studies

Apart from the categorisation of studies into different themes, studies were further reviewed for the major impediments faced by the staff of GLAM institutions in digitising and preserving the resources available in their organisations. This review is presented as a separate theme.

- Impediments to digitization and digital preservation

## **2.2 National digitization project studies**

The studies that deal with national digitization and digital preservation projects across the globe and India were discussed in this section as follows:

Janowaska (2021) examined how museums in Poland deal with the obstacles of digital transformation and showed that 37.5% of museums digitised between 11% and 25% of their collections, while more than 20% of museums indicated that they digitised between 1–10% and 26–50%. Regarding the problem of digitization, it was found from the survey that 47% of respondents accepted the lack of finance, followed by organisational difficulties of digitization (31%), and technical difficulties (22%).

A study conducted by Ahmed and Sharma (2020) described the current practices of the digitization of heritage resources in Indian cultural heritage. The study focuses on heritage resources such as manuscripts, rare books, and other material housed by selected Indian libraries and archives. The study disclosed the digitization projects carried out by the Indian heritage organisation to highlight the success and also challenges faced by information professionals while adopting new information and communication technologies (ICT) as they change rapidly. Various efforts have been made by heritage institutions in India, such as the Indira Gandhi National Centre for the Arts (IGNCA), the National Archives of India, and the National Mission for Manuscripts, to digitise their cultural heritage resources and integrate them into the digital collection in order to launch digital information services for a larger group of users. The results of the study revealed that every heritage organisation has its own goals to achieve through digitization and has adopted different methods and practises for digital preservation. Therefore, it is an urgent requirement to develop a digitization policy at the national level and also draw up standards for digitization and metadata preservation to improve the digital transformation of its heritage and cultural resources.

Ogbu, Abubakar and Batagarawa (2020) noted that the high level of illiteracy on the use of ICT in the management of CHI's and the lack of digital archiving software were the major constraints found with the digitization of resources in Nigerian museums, with a mean score of 3.78. These constraints were followed by the increasing pressure of modernisation (3.69) and the cost of digitization of art objects (3.67). Further study suggested that strategies to enhance the digitization of resources in museums of Nigeria, such as change should be introduced with maximum effectiveness and the least stress on staff and organisations, with a mean score of 3.83, followed by CHI's should monitor interactions with other digital cultural heritage collections to improve their experience; the availability of qualified staff to support new services in CHI's; and precautionary principles during the management of cultural heritage should be applied to avoid irreversible damage or loss.

A study conducted by Kovacik (2018) discussed the national project by the Slovak National Library (SNK) and its partner, the Slovak National Archives (SNA). The aim of this project was to digitise 2.52 million objects of the SNK and SNA, 1,10,000 objects of the Slovak National Gallery and other Slovak galleries, 1,83,000 objects of the Slovak Digital Museum, 2000 large digitised Slovak Monuments, and 58,700 audiovisual objects of the Slovak Film Institute. The project also aimed to digitise the oral and other ephemeral histories of the Roma people in Slovakia. From the technical point of view, it is observed that within a project, the experts used the loose-less JPEG 2000 format to contain master copies of individual pages with a resolution of 300 dpi and, in the case of objects with high historical or artistic value, 400 dpi. They used the lossy JPEG 2000 format for post-processed user copies of individual pages. Along with these standards, experts used two high-speed document scanners for loose sheets, one large format scanner for posters and maps, and 19

professional book scanners to digitise the various Slovakian objects. For the storage of primary scans, they used a tape library called a storage device with a capacity of 25 PB. From the point of view of access to digitised content, users can just register themselves on the Slovakiana portal and gain unlimited online access to copyrighted works.

Balogun (2018) discussed the importance of the document selection process in the digitization of archival material and also recommended the various methods to digitise the content at the national archives of Nigeria, and it was observed from the findings that there is a high need to formulate a policy in the archives of Nigeria for successful digitization projects. It was also seen that there were some barriers to digitising the content in the Nigerian archives, such as a lack of skilled professionals, equipment, and training. It was recommended in the study that to achieve a successful digitization project, the institutions should frame the standard policy.

A study conducted by Belhi et. al. (2017) elaborates that one of the major goals of Qatar National Vision 2030 is to preserve Qatar's national heritage and to achieve it, a cooperative project named CEPROQHA was started between international heritage and Brunel University (UK) funded by the Qatar National Research Fund (QNRF). The major aims of this project were to develop a 3D holoscopic cost-effective acquisition approach, a bespoke content management system for 3D cultural heritage assets, and to establish standards for long-term digital preservation.

Lawrenz (2017) describes the digitization of the archive of German architect Friedrich W. Hinkel, which was a pilot project of the German Archaeological Institute (DAI) to create a National Heritage Registry for Sudan. Hinkel's collection contains over 33.000 photographs, 12000 slides, 540 topographical maps, 4.000 drawings, and more than 20.000 index cards, as well as over 400 folders containing geographically

structured information on archaeological sites in differing stages of preparation for publication in his series “The Archaeological Map of Sudan”. After the digitization of archival material, the digitised items were integrated into two applications named iDAI.objects and iDAI.bookbrowser. The iDAI.objects application includes digitised items such as photographs, slides, maps, and drawings. On the other hand, the digitised items comprising several pages were integrated into the iDAI.bookbrowser application. These digitization projects were highly valuable and played a significant role in the development of the National Heritage Registry for Sudan.

A study conducted by Kaddu (2015) identified the collaboration of the World Digital Library (WDL) and the National Library of Uganda (NLU) in the digitization, preservation, and conservation of Uganda’s cultural heritage. To review the progress in the digitization programmes, a physical visit to various organisations and interviews with authorities are conducted. The conservator of NLU commented regarding the preservation and conservation of dirty documents, infected material, and manually or dehumidified documents that they do not have the equipment to perform these tasks. In the case of preservation in their organisation, the conservator replied that they do not work much for preservation at NLU because many items are infected with dust, food, or liquid due to low awareness among people about preserving the documents. Regarding the challenges faced in preserving material, they agreed there is a poor environment for documents due to humidity, insects, water and dust. Secondly, the lack of awareness, lack of internet access, national priorities, scattered collections, and the absence of a regional centre were also challenging factors for them. The major suggestion to resolve most of the problems was the availability of adequate funds.

Bishi (2015) sought out the current status of digital heritage preservation at the National Archives of Zimbabwe (NAZ) and identified the obstacles to the development

of a competent digital archiving system. The results of the study indicated NAZ started a small-scale digitization programme and converted audiovisual archives from analogue to digital. During digitization, NAZ faced several technological obsolescences, such as a lack of technical expertise and insufficient funds.

Dowding (2014) assessed the role of a national university in developing sustainable cultural heritage preservation policies in Kazakhstan. Nazarbayev University has mainly two major digital collections, namely the Kazakh cultural collection on the recommendation of the Kazakh language department and the Central Asian collection developed in collaboration with the Eurasia Regional Studies Institute. The major aim of the university is to develop these collections to fulfil the needs of the Kazakh local population. The major technical constraints in the university were the lack of technical infrastructure, restrictive copyright and access to quality scholarly publications. The agency of statistics of the Republic of Kazakhstan (2013) points out that only 7.6% of the population had a home internet connection.

Gbaje and Mohammad (2013) conducted a study to examine the coverage area of digital preservation policy, challenges to policy implementation, and the skill requirements for digital preservation in Nigerian National Information Centres. For the present study, researchers selected three national information centres: the National Library of Nigeria; the National Archives; and the National Bureau of Statistics; and interviewed their directors. The results of the study showed that the National Bureau of Statistics covered a maximum number (5 out of 12 ) of areas in their digital preservation policy, while the National Library of Nigeria covered only three areas and the National Archives had no digital preservation policy. On the question of challenges in the implementation of digital preservation policy, The National Bureau of Statistics accepted that they have only one barrier, and that is insufficient skilled staff in the

digital preservation unit. On the contrary, the National Library faced various challenges such as lack of funds, lack of skilled manpower, lack of staff, lack of equipment, and insufficient skilled staff in the digital preservation unit. All the three NICs agreed that computer programming and basic computer application skills were the important skills for digitization activity.

Voutssas (2012) analysed the challenges faced in digital preservation in Latin American countries. In the study, the author divided the barriers into six groups, such as cultural, technological, legal, methodological, economic, and social. Under the cultural factor, it is noted that the majority of cultural organisations in Latin America do not preserve their heritage materials while the major technical issues faced by institutions are the obsolescence of computers, storage devices, and media. Copyright or legal responsibility of documents to be chosen for preservation was a problem in Latin American countries, just as it was in other places. There is a lack of standards and tools used in digital preservation, and the lack of financial aid is also observed in digital preservation. Along with all these issues, Latin American countries also face the problem of social inequality, and it is essential to overcome this problem if we work effectively towards an information society.

Abdulkareem, Isah and Issa (2012) analysed the challenges in preserving the Arabic manuscripts in Nigerian educational and information systems. The findings indicate that Nigerian institutes prefer changing media or relying on hard copy media, which means printing out digital materials in hard copy. Secondly, they prefer technology preserved, which includes good maintenance, air conditioning, and the purification of the storage environment of the heritage collection. Thirdly, they prefer technology emulation, which involves the replication of older technologies or devices with newer ones. Fourthly, they prefer migration, which includes the usage of newer

hardware and software instead of an older version. Fifthly, they prefer an encapsulation strategy that includes the grouping of metadata, software viewers, and discrete files that form the digital documents. Furthermore, the results of the research showed that Nigerian organisations generally faced the problems of lack of evaluation policies, lack of descriptive policies, physical vulnerability, high technological obsolescence, and difficulty in recruiting properly qualified staff. Apart from all these challenges, the low level of ICT awareness is one of the major problems in preserving Arabic manuscripts. Further, the study offered some recommendations to achieve meaningful digital preservation, such as: the institutions working for the preservation of Arabic manuscripts should incorporate ICT applications into their activities; there should be a provision of training in ICT coordination among all organisations; and clear standards and guidelines should play a significant role in preserving Arabic manuscripts.

Akinwele (2012) analysed the digitization of indigenous knowledge as a critical resource for the promotion of effective management of natural resources in Africa. For the study, the author collected the primary data by conducting interviews with 12 stakeholders in the Nigerian cultural institutes. The findings of the study indicated that the lack of adequate funds, lack of technical knowledge, and inadequate infrastructure are the major barriers in the management of natural resources in Africa. It is recommended in the study that governments and NGOs should take initiatives to preserve and digitise African indigenous knowledge.

Gbaje (2011) identified the major strategies for digital preservation in national information centres in Nigeria. The scope of the study was limited to the National Library of Nigeria, the National Archives of Nigeria and the National Bureau of Statistics.

According to the study's findings, migration strategy was used in all three institutions, while encapsulation was used in only one. On the other hand, the refreshing and emulation strategies were not used in any institution for preserving the documents. Further studies also examined the factors considered in adopting any strategy and found that the content of the document was the most significant factor for selecting any strategy. This research also highlights the various reasons for the failure of digital preservation in NIC, such as lack of training programmes, lack of funds, lack of awareness and lack of national-level standards.

Poll (2010) reported the results of NUMERIC, a project of the European Commission for evaluating the current state of digitization in cultural institutions in Europe. The results of the survey revealed that about 19% of the printed collections available in cultural institutions have been digitised until this study, while 30% of the institutions do not plan digitization. The survey also indicates that regarding the access policy of the institution and the accessibility of the digitised content, about 50% of the respondents accepted that they provide free and unrestricted access to their users. Further, it was also found from the survey that 70% of libraries and 48.5% of archives in European countries made available their digitised collections on the internet.

Manaf (2008) identified the perception of information professionals regarding the establishment of the National Digital Cultural Heritage Repository Centre (NDCHRC) in Malaysia. The study noted the major factors that contributed towards the establishment of NDCHRC in Malaysia and involved a three-round modified Delphi method to assess the opinions of experts regarding the establishment of a repository. In general, the author divided the contributing factors into four parts, such as human factors, governance factors, content management factors, and technological factors.

Experts agreed that some of the most important factors in establishing the NDCHR were coordination by the governing body; willingness to share among heritage institutions; and support from the government, relevant ministry and other coordinated agencies; security systems; and identifying the right institution to lead the project. Aside from these contributing factors, experts discussed some issues affecting NDCHR success, such as a lack of policy by the governing body, IPR issues, a lack of skilled staff, and a lack of standards and guidelines. The results indicated that 80% of the experts agreed that there is a high need to establish a central repository of cultural heritage in Malaysia.

The study of Manaf (2007) aimed to examine the current state of digitization initiatives by heritage institutions in Malaysia. It was discovered from the respondents that 64% of the heritage institutions in Malaysia had digitised their heritage documents. The survey results also revealed that 61% of the digitization projects in heritage institutions had been outsourced, while 39% were done in-house. Out of the total sample, 52.2% of the institutions consult external experts for the completion of their digitization projects. On the other hand, 47.8% consulted their internal experts for the completion of their digital projects. It is also visible from the research that 52.2% of the institutions agreed that they faced a problem of a lack of knowledge and skills in the area of digitization. Apart from these, Malaysian heritage institutions also faced problems with standards, insufficient funds, IPR issues, and insufficient commitment from top management. With regards to the selection of content to be digitised, the majority (91.3%) of the institutions prefer the cultural value of the digitised item and academic/research value (87.4%). Regarding the question of the purpose of the digitization in their institute, 21 institutes out of 23 admitted that they digitised to preserve the materials, followed by to support education and research activities.

A study conducted by Jiazhen and Doaling (2006) examined the major obstacles to preserving digital resources in heritage institutions in China. The study involved 57 representative research respondents from all over the country. The gathered data through an email questionnaire was divided into three sections, such as type of digital resources, preservation status of digital resources, and disaster recovery measures. The results of the study showed that 38.1 % of the heritage institution libraries used more than three picture storage formats within an organisation, while 50% of the information centres used more than two picture storage formats for digital storage, followed by floppy discs (47.6%) and magnetic tapes (61.9%). The physical deterioration of data is one of the major obstacles faced by cultural organisations in China, and it was found that 32.1% of archives, 71.4% of libraries, and 25% of the information centres accepted the physical deterioration as a barrier in digitising the content. Further, the study revealed that Chinese heritage institutions have obsolete storage media, which was 33% in libraries, followed by information centres (12.5%) and archives (10%). Aside from these findings, the results revealed that Chinese heritage organisations have some shortcomings when it comes to preserving their heritage content, such as a lack of uniform standards for the collection to be preserved, a lack of maintenance towards long-term access of resources, a lack of relevant knowledge for preservation, and the selection of poor storage devices.

### **2.3 Academic digitization project studies**

Rafeeq, Ameen and Jabeen (2018) investigated the hindrances to digitization projects in universities in Pakistan and found that lack of established digitization plans, policies and procedures was the most acceptable obstacle by the respondents, with a mean score of 3.86, followed by other projects that have higher priority (3.59) and lack of financial resources (3.58). The study recommended that professionals and

academicians work collectively in a planned way to overcome the issues. It is suggested to observe several existing guidelines regarding digitization, such as the Library of Congress guidelines, OCLC webjunction, and the National Library of Australia's digitization guidelines.

Erima, Masai and Wosyanju (2016) presented the state of preservation of academic research content in Kenyan universities and observed that the university does not have a well designed preservation practice model. They put their digitised content on computer hard drives, CDs, flash drives, and floppy discs, but there is no way to keep it safe for a long time at university. From the interview, it was found that the majority of respondents agreed with the lack of awareness and support from management, absence of written policy, financial constraints, legal issues, and lack of skilled personnel.

Dadzie and Walt (2015) confirmed the availability of policies for digitization in selected universities in Ghana and revealed that among the three oldest public universities, all have a strategic plan to digitise their library materials and they allocate 16–55% of their library budget on digitization activities. But there was a slight difference among the policies of the three universities towards access to the digitised content; two of the universities had open access policies and one had a restricted access policy.

Pandey and Misra (2014) discussed the several reasons for digital transformation of documents and the issues during digitization of library materials. They pointed out that the old age of the documents, the desire to enhance access, to create a single point of access, to facilitate a new form of access and use for better search and retrieval facilities were the most preferred reasons behind digitising the

documents. It was also discussed in the study that IPR issues, rapid changes in software and technologies, finance, inadequate skills, lack of technical expertise, inadequate infrastructure, and deterioration of digital media were the major issues found during study.

Ifijeh (2014) reported that for the digitization of theses in Nigerian academic libraries, there is a need to adopt the cloud computing preservation model through the operations of institutional repositories due to the use of outdated traditional preservation methods. The results also showed that the digital divide, poor infrastructure, data security breaches, and insufficient finance were the most common obstacles faced by digitization professionals in university libraries in Nigeria.

Baro, Oyeniran and Ateboh (2013) revealed in their study that out of 12 university libraries in Nigeria, 11 universities digitise their material to increase access to documents (91.7%), followed by historical value (83.47%), demand of users and to save libraries' physical space (66.7%). Regarding the challenges encountered in the digitization projects, lack of funds and the challenge of collecting material to be digitised were highly agreed upon by the authorities, followed by the absence of a digitization policy (83.3%). The study recommended training the staff and making a provision for the education of staff through seminars and workshops.

Olatokun (2008) analysed the several techniques used in the preservation of library materials in selected Nigerian university libraries and stated that cleaning and dusting of library materials gained higher preference (3.00M) among Nigerian digitization projects, followed by photocopying (2.87 M) and binding of the documents (2.80M). Further results indicated the obstacles faced by staff, such as inadequate

funding, inadequate infrastructure, administrative bottlenecks and harsh environmental conditions accelerating library material depreciation, were the major obstacles.

Eyekpegba (2008) analysed the digitization projects in Nigerian university libraries and stated that 82.5% of the respondents agreed with the lack of infrastructure to facilitate libraries and 57.5% of respondents stated that there was no provision of a special budget for digitization initiatives. To enhance the digitization projects, 27.5% of respondents posited that the university or government should support the project effectively. The study also suggested collaboration among libraries for the sustainability of digitization programmes.

#### **2.4 Organisational or Institutional Project Studies**

A study conducted by Ahmad and Sharma (2021) showed that in the digitization programme of the National Archives of India they usually prefer 300 dpi for text and 300 dpi to 600 ppi for image capturing depending on the type of document. The derivative files for user access are in JPEG and PDF/A for images and text, respectively. For the digitization of collections, NAI prefers the well-known guidelines of the National Archives and Records Administration (NARA) and the Federal Agencies Digital Guidelines Initiative (FADGI) for the scanning and digitization of cultural objects.

Porte and Higgs (2019) investigated the digitization of cultural heritage material in memory institutions in the Western Cape province in South Africa. The study used a survey method and collected data from 28 memory institutions and found that 94% of institutions were engaged in digitization activities. It was also seen from the findings that 53% of the institutes used a hybrid of in-house and outsourced digitization and 47% did their own digitization activities. The majority of the libraries reported that their most

popular resource to be digitised was handwritten manuscript (18%), followed by newspapers (14.1%). On the other hand, in visual or graphic resources, 50% of the respondents preferred photographs and recordings, followed by maps and sound recordings. Further study highlighted that 9 institutions have a standard or policy for both record management, whereas respondents accepted the presence of a collection development policy in their institute. In the study, respondents were asked for the policy for metadata, and the result showed that none of the institutions have a policy for metadata. Regarding the access to the digitised collection, it was seen that only 24% of the respondents provide free and open access to their content on their institutes' websites, while only 18% provide access free of charge but restricted to members.

Mesui, Andrade and Waizenegger (2019) investigated the usage of ICT and the various challenges involved in the preservation of the cultural heritage in Tonga, a country in the south-western Pacific Ocean. In the study, it was found that despite the awareness of the potential of ICT to preserve cultural heritage, Tongans faced various obstacles in safeguarding their cultural heritage. The major constraints which were agreed upon by the majority of the respondents were the lack of ICT policy and a lack of leadership and direction at government and institutional level. It was observed during the survey that Tongans started a programme to protect and disseminate Tongan culture through the Naku film festival in 2015, which involves videos and story telling methods. Tongans also used social media platforms such as Facebook and Youtube to provide wider access to their people.

Kuswara (2018) discussed the efforts taken in the digital preservation of the manuscripts in the Indonesian heritage digital library. The study involves various aspects, such as how to collect material to be digitalised, digitization processes, storage, and the overall workflow of digital preservation of manuscripts. It was found from the

study that the national library of Indonesia has approximately 9870 titles of manuscripts and, due to the limited number of copies, it was difficult for the users to use these manuscripts in fulfilling their required information.

The study described the workflow of the national library of Indonesia in the process of preservation of library material, which follows several steps such as collecting and selecting the source material for the internal and external collection; clarifying the copyright and ownership of the source material; checking the physical condition of the documents; scanning of the various materials; after scanning the material, the creation of a master file in TIFF format or raw formats copied into JPEG format; editing of the document with the help of Adobe Photoshop; compiling of files of several images in pdf format; metadata input format; and uploading of digital files through the digital data management system for the easy management system.

In their study, Manivannan and Sutradhar (2018) discussed the technical requirements, guidelines for digitization and digital preservation of library materials, and technology used for long-term preservation at the central library of IIT Kharagpur and discussed the workflow and various steps taken during digitization and preservation. The Central Library has taken the initiative to digitise all the PhD theses and documents collected in the library and used Dspace Open Source Software to provide access to their users. It was indicated from the result that, at the initial stage, the institute aims to convert more than 3100 theses and provide access to them to the researcher community. The workflow diagram in the study comprises the following steps, ranging from selection to copy of preservation to a storage device. The first steps taken by experts were: a selection of documents to be digitised; inspection; preparation; choosing equipment; digitization; quality check; text or image enhancement; converting into machine-readable format, and finally a copy of preservation in a storage

device. After the conversion of the documents into machine-readable format, the scanned images were stored on hard drives or CD-ROM. Apart from all these steps, the library used Dspace open source repository software to make documents more retrievable and searchable. After the installation of Dspace software, the next step was the creation of metadata for digitally created documents. After the creation of metadata, the administrator and the authorised staff uploaded the full text and abstract of the digitised theses. After the uploading of theses, the description of metadata, uploading of text, review of final files, the agreement to licence text, the final submission can be done. For scanning, the documents library used an overhead book scanner to scan the documents at a maximum resolution of 600 dpi, and the master copy of the images was created in TIFF format. The library also used OCR technology to convert different types of documents into images, scanned documents, and PDF files in a scanner. The Dspace metadata of the institutional digital repository at the central library was harvested by the National Digital Library of India (NDLI). The study revealed that 80% of the old theses available in the library have been converted into digital format and uploaded to the institutional digital repository.

Mahmood and Khan (2017) examined the collection and methods used in the digital preservation of manuscripts in Khuda Bakhsh Oriental public library. The library has a vast collection of about 21,000 manuscripts in Arabic, Persian, Urdu, Turkish, Sanskrit, and Hindi languages, and they have about 2,000 paintings and 25,000 printed books in their collection. The library mainly used text transcription and the OCR method for the digitization of texts.

Sohal and Kaur (2017) aimed to highlight the efforts made by Dev Samaj, Chandigarh, in preserving the literature related to their society. The Dev Samaj religious society is primarily devoted to the cause of serving humanity. It was founded

in 1887 by the most worshipful Bhagwant, Dev Aatma. The literature related to Dev Samaj is published in several forms, such as magazines, e-books, newspapers, audio-visual resources, and photographs. The society initiated the digitization programme with the aid of the Punjab digital library and digitised over 32,000 folios till February 2017.

The digitised documents included scripts such as Gurumukhi, Hindi, English, Urdu, and Punjabi. The study recommended that there is a huge need for a policy for the preservation of the documents related to Dev Samaj.

Bakhshi (2016) focused on the collection of the Indira Gandhi National Centre for the Arts (IGNCA), an organisation under the Ministry of Culture, Government of India. The collection of IGNCA was composed of various kinds of heritage resources such as microfilms, microfiches, manuscripts, photographs, and it was found that 87.18% of the images in the collection were digitised, followed by microfilms (58.25%). The results of the study indicated that IGNCA has digitised its textual material by outsourcing agency and audiovisual resources within the premises of the centre. IGNCA used Adobe Photoshop for editing the digitised images; for audio editing, Nero Wave Editor 3; and for video editing, Nero Image Viewer. Like other organisations, IGNCA also faced several barriers in digitising their content, such as budget, infrastructure, storage capacity, and technological obsolescence. Under the National Mission for Manuscripts (NMM) programme, IGNCA created "KRITISAMPADA" a national manuscript database.

Seifi, Ahmadzadeh and Pordel (2015) highlighted the status of digital preservation of the old Persian periodicals in Iran with special reference to Iranian newspapers and the several challenges faced by libraries in preserving those

periodicals. The National Library of Iran developed a programme to preserve the digital objects in the library and named it Haram. The heritage institutions in Iran used descriptive metadata such as MODS, Dublin Core, and MARC to preserve their material. The major challenges faced by them were insufficient budget, lack of infrastructure for digitising the resources, legal issues and a lack of homogeneity in using the metadata standards.

Zamojska et al. (2014) presented the current state of the e-museums project proposed by NIMOZ under the ministry of culture and national heritage of Poland. The major objectives of the project were to improve access to cultural heritage housed in Polish museums and to provide long-term access to these documents. Out of 139 museums covered under the study, only 27 museums were operating under the ministry of culture and national heritage, and it was visible from the survey that, out of 27 museums, 8 % of the museum objects were recorded in the database system through digital imaging and 19% of the digital objects were accessed through websites. More research showed that 74% of Polish museums used digital inventory systems, 24% of the museums gave only partial access to the data, and only 12% of the museums had an online catalogue of their resources. For the completion of the project, NIMOZ appointed 40 specialists to different working groups, such as the metadata working group, Thesaurus working group , digital imaging working group, digital assets and archiving working group, and legal working group.

Based on the literature review and analysis of national digitization efforts in Eastern Africa, Mutula (2014) revealed the status of digital heritage preservation management in Eastern Africa. This paper analysed the digital preservation of the Eastern Africa region, which comprises different countries such as Kenya, Uganda, Uthopia, Sudan, and Somalia. The objectives of the study were addressed using

documents like the cycle and the World Summit on Information Society (WSIS). The document life cycle model in digitization includes creation, capturing, indexing, managing, accessing, retrieving, administering, repurposing, sharing, collaborating, distributing, retaining, disposing, and preserving. The WSIS action line focused on the issues of access, broad and network and ICT connectivity, and universal access, whereas action line three highlights digital public libraries, archives, public access to information, and open access.

On the contrary, action line 8 puts emphasis on cultural diversity and identity and diversity. The findings of the study revealed that there is a growing awareness in Eastern Africa regarding digital heritage preservation. Several workshops and seminars were conducted to understand and develop strategies for preservation. There were various e-resources developed in Eastern Africa, such as the PERI programme for the enhancement of research operations, the health internet network to access global online research in agriculture. It was also evident from the results that 35% of the institutions have in-house guidelines or policies on how to manage digital projects. The East African institutions have a lack of staff or policies, and the study recommended that there should be a need for policy in heritage institutions of Eastern Africa.

Krajina and Gacan (2014) aimed to highlight the importance of a partnership approach in the digitization of local cultural heritage in Croatia. The study includes the public library, state archive, and city museums of Croatia in creating the digital repository named “cultural heritage of Koprivincia”. The aim of this repository is to promote the local community and protect the heritage resources of the library and museums and archives in Croatia. The public libraries have a rich collection of 1.4 lakh books and 6,000 non-book materials with over 9,000 registered users. The cultural heritage of Koprivincia was launched in 2011 as a local and co-operative digital

repository. This repository advanced in terms of technology by utilising the OAI-PMH protocol, and its metadata model is compliant with European Cematic element specification version 3.4 standards. This repository has five categories of digital collections, namely: newspapers; yearbooks; postcards; history; and graphic collections. It is visible from the study that all the institutions, libraries, museums, and archives in Croatia City work collaboratively to digitise Croatian culture in a systematic manner. The archive pro local company also assisted them in digitising and scanning the documents involved in the digitization projects.

Deegan and Musa (2013) examine the various digitization programmes in developing the digital Sudan in collaboration with the national cultural heritage digitization team (NCHDT), the Sudanese association for the archiving of knowledge (SUDAAK), GLAMS, and different stakeholders. After the visit to several organisations, they found that the national archive has more than 76 million photographic negatives and a collection of manuscripts from the beginning of Islam. It was noticed that heritage institutions in Sudan have excellent telecommunication infrastructure, updated storage devices, and good bandwidth connectivity, but there were some problems also seen during work that they need more skilled staff, serious training programmes, and lack of coordination, so there is a high need for physical conservation of the analogue material because of its poor condition.

Singh (2012) conducted a study to analyse the government of India's programmes for the digital preservation of cultural heritage materials and manuscripts. After the investigation, it was found that the government has started the digital preservation programme in the country under the aegis of the Ministry of culture, and in the first phase of the digitization of manuscripts, they selected five institutes. Among these institutes, approximately 15000 manuscripts of Arabic, Persian, Sanskrit, Jain,

Odia, and many more languages have been digitised. In the second phase, the government selected 11 cultural heritage institutes and digitised more than 55 thousand manuscripts, consisting of 6.87 million pages. Along with these two phases, the ministry also established several institutions across the country for the digitization and preservation of cultural heritage resources, such as IGNCA, KALASAMPADA (Digital Library-Resources for Indian Cultural Heritage Project), Databank on Indian Art and Culture, National Mission for Manuscripts (NMM), Manuscripts Resource Centre (MRCs), Manuscript Conservation Centres (MCCs), Manuscript Conservation Partner Centres (MCPCs), Manuscript PartnerCentres, and KRITISAMPADA (a web-based national database of manuscripts).

Cakmak and Yilmaz (2012) pointed out in their study that digitization efforts and policies developed by the cultural memory institutions in Turkey. It was noted from the investigation that the National Library of Turkey and various memory institutions in Turkey have taken the initiative and invested in digitization projects to provide access to heritage resources to their users. The findings of the study indicated that there are significant differences in digitization practises in Turkey and other countries because they have good infrastructure and funds, but apart from all these, they do not have any national or institutional level policy for their digitization practises. They also initiated a library of Serbian mathematical journals to provide access across the world.

Gaur (2011) discussed the various initiatives by IGNCA and NMM in the field of preservation and access of manuscripts in India. IGNCA has microfilmed over 2.5 million manuscripts and provides access to these collections to scholars who are interested in this field. Along with IGNCA, NMM was established in 2003 with the objectives of providing access to manuscripts through digitization and compiling a national database of manuscripts. This study also highlighted the barriers to digitising

Indian cultural heritage, such as technological barriers, economic barriers, and language barriers.

Evens and Hautekeete (2011) described the four major issues within the cultural heritage institution using a case study method in the digitization of the audio-visual collection of performing art institutions in Belgium. The study includes four issues, namely digitization, metadata indexes, IPR management, and business models. From the study it was revealed that many performing art institutions have a lack of systematic preservation policy for safeguarding of their audio-visual collection, they don't have relevant knowledge and are unable to maintain their infrastructure. In the case of metadata indexes, it was observed that the majority of the institutions may lead to a lack of consistency and standardisation. Out of twenty-one performing art institutions, only three have developed their standardised metadata model.

Mijajlovic and Pejovic (2010) presented their research on the efforts made by Serbian scientists and mathematicians from the University of Belgrade faculty of mathematics and the mathematical institute of the Serbian Academy of science and art to digitise and preserve Serbia's scientific and cultural heritage. After the analysis, it was revealed that Serbian scientists and mathematicians gave preference to approximately 800 books, theses, manuscripts, and books on mathematics written in the Serbian language for digitization and preservation.

Lee (2010) evaluated the current status of collaboration in cultural heritage preservation in East Asia. The findings of the study indicated that East Asian countries such as Korea, China, and Japan have a common cultural background and they all have well-established digital libraries. China launched its national library in 2009, which provides well-established digital volumes of Chinese cultural heritage. Similarly, Japan

developed its own digital library named 'Kansai-Kan' at the national diet library in 2002, and they also launched a portal named 'PORTA' to provide access to digital content to their people in 2007, while the Korean government implemented the National Digital Library in 2008. The study advised that there should be cooperation and association among the East Asian countries in terms of economic and political aspects to develop collaboration among the projects in these countries. Furthermore, it was suggested that there is a need to bridge the cultural gap between East Asian countries.

Landguaf et al. (2010) discussed the digital preservation framework, goals, and challenges at the US Government Printing Office (GPO) through the Federal Depository Library Programme (FDLP) via the Federal Digital System (FDsys). FDLP is the primary source of freely accessible federal government publications administered by GPO. It is a network of more than 1200 public, academic, law and other libraries. It was revealed from the data that GPO faced obstacles in accessing federal publications. These were the publications that were not included in the FDLP, known as fugitive publications, and were published and produced by local federal agencies. The problem of file format was also seen in the case of digital access to the documents in the study. It was suggested that to overcome all these problems, there should be a centralised digital repository that ensures public access, file format, migration and enhanced access mechanisms.

Thomas (2010) examined the issues surrounding the digitization of traditional knowledge, taking the example of the Traditional Knowledge Digital Library (TKDL), India. The TKDL is a collaborative effort of the Council of Scientific and Industrial Research (CSIR), the National Institute of Science, Communication and Information Resources (NISCAIR), the Ministry of AYUSH and the Ministry of Health and Family Welfare. Their collection comprises fifteen thousand entries based on ayurveda, fifteen

hundred postures in yoga and textbooks. One of the major issues detected in the digitization of traditional knowledge was its ownership. Who owns traditional knowledge? It was recommended in the study to explore a nation-wide and centralised system which gives preference to the documentation of living traditions on the edge.

Manaf and Ismail (2010) explored the state of the art of managing digital resources and the issue of risk in digitization projects in cultural institutions in Malaysia. The analysis of the data study involves three major heritage institutions in Malaysia, namely the national archives, the national library, and the national art gallery. Basically, the study examined five contexts in each case: governance, resource description, archival, digital security, and digital risk. In the case of governance, it was examined that all three institutes have legislation and regulations for their digitization projects. In terms of archival, it was discovered that not all institutes have a clear preservation strategy. Regarding digital security, it was evident that all the institutions used password and restriction access and two of them had additional security and digitization policies. In the case of digital risk, the results indicated that none of the institutions had any digital risk.

Byamugisha (2010) mentioned the impediments related to the digital collection in Uganda and the major constraints, and the results emphasized the need for in-house training to upgrade the skills of the staff involved in digitization projects. Further, it was recommended that there should be a national information policy for digitization projects in Uganda.

Zaid and Abioye (2009) carried out a study to describe the preservation initiatives taken by Nigerian heritage institutions by adopting survey methods. The results of the survey showed that out of 46 institutions in Nigeria, 34 heritage institutes

have preservation programmes (73.9%) and 22 (47.8%) institutes accepted the existence of preservation policies in their institutes. The study also revealed that the major issues in digital preservation among Nigerian cultural heritage institutions were inadequate funding, absence of policy, lack of support from stakeholders, lack of awareness of ICT development and digital content creation, lack of expertise and infrastructure. It was also visible from the results that only 18% of the heritage institutions in Nigeria collaborated with other institutions, and the areas in which they most collaborated were training in preservation (32.6%), followed by technical knowledge (23.9%), and the formulation of preservation policy (17.4%). Instead of the availability of preservation policies, respondents agreed with the lack of a comprehensive and well-structured policy that takes care of all preservation issues. Regarding the collaboration among heritage institutes in preservation programmes, it was evident that only 39.1% of the institutions worked collaboratively. Further study revealed the major issues in heritage institutions in Nigeria, such as inadequate funding, absence of policy; lack of support from stakeholders, lack of awareness of ICT development and digital content creation, lack of expertise and infrastructure. The study also gave some suggestions to improve the preservation programme in Nigeria, such as the formulation of a national-level preservation policy, collaboration among heritage institutes, and the involvement of the government in heritage preservation programmes.

The study conducted by Tonta (2009) covers digital preservation projects in Turkey, Bulgaria, Greece, Romania, Croatia, Yugoslavia, Slovenia, and Albania. The primary data for the study was obtained from published resources and Thomson's Web of Science database. The result shows that 36.85% of the population in Balkan countries has internet access, whereas 61.4% in European countries. The Balkan countries are connected to GIANT, a high-speed European research network. The quality of life in

Balkan countries is much lower than that of the average of the European Union countries. The result shows that 36.85% of the population has internet access in Balkan countries, whereas in European countries it was 61.4%. The Balkan countries were connected to GIANT, a high-speed European research network. The Balkan countries are ranked low in the networked readiness index of 2007-2008, which compares 12 countries, and Turkey got the 55th rank, Greece 56th, Romania 61st, Bulgaria 68th, and Albania the 10th rank. On the contribution of publications in Balkan countries based on the publication listed in Thomson's ISI Web of Knowledge citation index it was observed that Turkey and Greece have more than 1 lakh publication and they got 21st and 22nd rank in the world list. Further the study also analysed that the scientific corporation among Balkan countries and depicts that Turkish scholars published 428 collaborative papers followed by Greece(267) and Bulgaria. Furthermore, the study examined scientific collaboration among Balkan countries and discovered that Turkish scholars published 428 collaborative papers, followed by Greece (267), and Bulgaria (214). Some of these Balkan countries have a rich cultural heritage, but the results of wars have been a significant impediment to preserving Balkan cultural heritage. More than 1.5 million books, including more than 4,000 rare books and manuscripts, were destroyed during the fire bombing. But in 2006, after the recommendation of the European commission to provide online access to Europe's cultural heritage and the 2005 convention on the protection and promotion of diversity of cultural heritage, UNESCO provided support to preserve and digitise the cultural heritage in the Balkan countries. The European Library provides access to the contents of only four Balkan national libraries, namely Croatia , Serbia, Greece and Slovenia.

Mazumdar (2009) displayed the initiative taken in Assam for the digital preservation of manuscripts. In Assam, the Satra Institute is the major custodian of the

rare manuscripts which play a significant role in Assamese literature. The two manuscripts named Chitra Bhagavata and Ratnamala Byakaran, written on Sanchi Patra, have been selected as the National Treasure of India. These two manuscripts are preserved by the Guwahati University library. Along with Guwahati University Library, Kaamrup Anusandhan Samiti, department of history, and the University of Guwahati are the main repositories of Assamese manuscripts. A pilot project to digitise the rare manuscript was started in 2000 by the National Archives of India. The national library of India also worked to preserve the assembly manuscripts, and they preserved more than 3600 rare manuscripts. The national library also initiated a project named “Down the Memory Lane” to digitise these manuscripts, scanning and archiving more than 6,600 books and manuscripts containing more than 2.5 million pages. Guwahati University developed a section named "Archived Cell" in the library for the preservation and conservation of manuscripts. The major problem detected in the preservation of manuscripts was deterioration. This archival cell digitised over 2000 manuscripts under the NMM programme.

Kalusopa and Zulu (2009) stated the findings of the UNESCO’s digital heritage preservation project on the state of digital material preservation in Africa, involving Ethiopia , Botswana and South Africa. Primary data for the study was obtained through a survey of 26 institutions in three countries. The study revealed that public heritage institutions such as archives , museums, and information centers were doing digitization in-house. On the other hand, private-sector organizations such as banks and insurance companies digitised their content through outsourced agencies. On the colour formats of their digitised content, it was observed that 57% of the organisation could not state the colour format in which their heritage content was digitised and 19.3% preferred the black and white format of digitization. In terms of

file format, 42.95 percent preferred JPEG, PDF, and MPEG. In the survey, respondents were asked about the selection plan on which the digital materials were preserved, and the findings showed that 28.6 institutions had a plan and they further asked who selected the material to be preserved, and they replied that it was up to the document creator (28.6%), record manager (14.3%), and IT department (57.1%) to be responsible for the selection of documents to be preserved. In terms of document preservation selection criteria, 56.1% of respondents prefer historical and cultural value of the material, followed by saving space and academic importance (42.9%), improvement of document delivery service, and access to information resources. Along with all these questions, respondents were asked about the standards on digital preservation, and it was found that 85.7% of the organisations didn't have any standards or didn't know the standards. It was also clear from the result that only 14.3% of the organisations have rules and regulations for preservation and selection of digital materials such as e-mail messages and electronic records. The study recommended that there should be a huge need for national policy , legislation , national coordination and standardisation in the field of digital preservation in all three African countries.

Ahsan (2009) reported the digitization initiatives taken in Pakistan and shows that the higher education commissions (HEC) have initiated the digitization of doctoral and post-doctoral theses and M.Phil and Master Dissertations of different universities by the end of 2008. Apart from these, the digital library is accessible to over 250 institutions, comprising public and private universities and R&D organisations. The National Library of Pakistan also worked in the field of digitization and digitised over ten thousand rare books, which were mostly in the Persian language. The University of Punjab (Lahore) collaborated with HEC and NCP to digitise manuscripts in Urdu, Persian, Arabic, and local languages. The Poshto Academy, a division of the University

of Peshawar, digitised the manuscripts in the Poshto language with the collaboration of the United States Agency for International Development.

Rosenblum (2008) stated the digitization activities in the Czech Republic based on the survey of selected projects. It was reported in the study that the major contribution was made by the National Library of the Czech Republic (NLCP), which was one of the top five most active national libraries, and which digitised over three million documents and, through the Manuscriptorium project, digitised the early printed books and manuscripts. NLCP has also made efforts in participation with UNESCO's Memory of the World Programme and won the first UNESCO Memory of the World "JiKji Prize" for its contribution to the preservation of the world's cultural heritage. Apart from NLCP, the three major projects in the Czech Republic were Manuscriptorium, Kramerius, and Webarchive. The Czech WebArchive aims to provide comprehensive ongoing archives of the Czech Republic's world wide web. Further, it was revealed that the Czech digital library and the Czeck digital mathematics library had also taken the initiative to digitise and preserve the cultural heritage of the Czech Republic.

Fleming and Spence (2008) analysed the long-term storage and preservation indices of the British Library newspaper collection and found that the library has a collection that dates from the sixteenth century. It comprises more than fifty-three thousand print titles and three hundred seventy thousand reels of microfilm. It was also noted in the study that by 2014, the library will end microfilming of the newspaper and will use digital technology for the collection and access of the newspaper. To achieve the same, the libraries will collaboratively work with publishers to enable the automatic ingest of all editions of newspapers through pdf and their full versions will be available

through subscription. Regarding the legal deposit legislation, the digital ingest or pdf of a newspaper will be deposited.

Besek (2008) investigated the impact of copyright law and related laws on digital preservation in the heritage institutions of the UK, USA, Australia, and the Netherlands. The findings indicated that none of the countries has a systematic process of digital material collection. It was also found in a study of partner countries in Australia, looking at initiatives such as LOCKSS, CLOCKSS, and Portico. There was inconsistency in digital preservation of material in many aspects, such as the nature and amount of copying allowed for preservation, the nature of access to preservation copies, and the type of material to be preserved. Along with these factors, orphan work was a barrier to digital preservation. An orphan work is one for which the owner of the rights cannot be identified or located. In the same way, this issue is applicable to letters, audiovisuals, photographs, and illustrations. Further, it was revealed from the study that the Netherlands had a policy of voluntary legal deposit, while all three countries had a law to deposit a copy of the material for the benefit of users. In addition, the legal review and reform activities have also been seen in the UK, which includes the UK Gowers Review of IPR; the USA, including the Section 108 group; and Australia, which has also taken several reviews but the Netherlands has no legal reform. It was recommended in the study that institutions should work with the right holders of the content for digital preservation.

Maltesh, Lahkar and Gajakose (2007) described the role of several organisations in digitising the cultural heritage of India and also discussed the various projects which worked under the UNESCO's Memory of the World programme. The major initiatives regarding the digitising of cultural heritage have been taken by the national library in Kolkata, the national manuscripts mission, Khuda Baksh Oriental Public Library,

Patna, and the Raza Rampur library. Apart from all these institutions, some projects were also discussed in studies which were involved in the digitization of Indian cultural heritage, such as the Kashmir University Project, the Punjab Language Department, and the Punjab University Project.

Ghobrial (2008) investigated the perception of Sudan memory institutions' and professionals' regarding the use of digital images in the digitization practice. Based on the finding, it was observed that the majority of professionals agreed with some advantages of digital images, such as saving research time and effort, ease of accessibility, easy manipulation and customisation. It was also noted that professionals use digital images as a tool to provide fast information and use digital images in other innovative ways, such as to visualize static work and animation for fast learning. The survey also identified some issues as barriers to using digital images, such as low image quality, resolution, ignorance of standards and policies, and inadequate infrastructure.

Reimo (2006) aimed to introduce the preservation of printed cultural heritage in Estonia, a country in northern Europe. The study involves a survey of Estonian memory institutions carried out by the Council of Preservation under the Ministry of Culture, Government of Estonia. The findings indicated that there were no unified standards for digitization processes and metadata preservation and selection of documents to be digitised and preserved. Estonian archives started the project "Red Book of the National Archive" in 2005 to assess the physical condition of the records in all archives of Estonia, and they adopted a digital archiving strategy that regulates the long-term preservation and use of digital records. Furthermore, it was revealed that Estonian libraries lack funds.

Kumar and Shah (2004) described the historical overview of manuscripts available in India and found that Sindhia Oriental Research Institute (SORI), Ujjain (M.P), was established in October 1931 and had a collection of more than 18,000 manuscripts till 2003. Basically, they have palm leaf manuscripts, birch bark manuscripts, and paper manuscripts. SORI was also one of the important manuscript resource centres (MRC) in India.

Solimine and Abadal (2002) discussed the digitization initiatives currently in place in two European countries, namely Spain and Italy. From the study, it was revealed that two major projects were initiated, namely MINERVA and MIACHEL. The purpose of the MINERVA project was to conduct a national programme and provide guidelines for best practises in digitization. The MIACHEL project, on the other hand, aimed to integrate national cultural portals that promote access to European cultural heritage. The European Union created the following policies: the telematics for libraries programme, which aided in the digitization of European libraries, and the electronic libraries programme, which provided a forecast for the future of digital libraries in European countries. In the case of Italy, the National Union Catalogue (ICCU) has developed the guidelines for scanning, creating, or archiving the metadata, digitization policies, and the institute also established the same models as the Open Archive Information System(OAIS) and the Metadata Encoding and Transmission Standard (METS). On the other hand, in Spain, several local digitization projects were initiated, mainly Spanish public libraries.

## **2.5 Impediments in digitization and digital preservation**

It is clear from the existing literature that there were several obstacles faced by library professionals, digitization project heads, archivists, curators, and the

professionals involved in the digitization and preservation programmes. In the present study, these barriers are divided into four categories: financial issues, technical issues, legal issues, and managerial issues.

### ***2.5.1 Financial Issues:***

Financial aid plays a significant role in beginning and completing any digitization project. From the review, it was revealed that most of the digitization projects faced the problem of a lack of insufficient initial funding as well as a lack of finance for sustaining the project.

### ***2.5.2 Technical Issues:***

The process of digitization and digital preservation involves various technical problems such as missing standards and guidelines, storage or digital media deterioration, variation in file format, and problems in assessing the digital material by users.

### ***2.5.3 Legal Issues:***

It was found from the literature that intellectual property rights issues are one of the major problems in digitising heritage resources.

### ***2.5.4 Managerial Issues:***

After analysing the literature, it was found that digitization programmes faced several administrative problems: lack of expertise in digitization, insufficient skilled staff, difficulty in selecting material to be digitised or preserved, lack of training programs, lack of awareness and support and lack of proper motivation and leadership.

Table 2.1

**Impediments to digitization and digital preservation**

Category	Challenge	Sources
Financial Issue	Insufficient initial funding	Basuki (2004), Manaf (2006), Singh (2006), Iwhiwhu and Eyekpegaha (2008), Olatokun (2008), Lampert and Vaughn (2009), Manzuch (2009), Zaid and Abioye (2009), Evens and Hauttekeete (2011), Gaur (2011), Gbaje (2011), Smith and Rowley (2012), Deegan and Musa (2013), Gbaje and Mohammed (2013), Ifijeh (2014), Pandey and Misra (2014), Dadzie and Walt (2015), Baro, Oyeniran and Ateboh (2016), Bakshi (2016), Mutula (2014), Khan, Shafi and Ahangar (2018), Rafeeq, Ameen and Jabeen (2018).
Technical Issues	Missing standards and guidelines	Jiazhen and Daoling (2007), Manaf (2006), Ghobiral (2008), Manaf (2008), Reimo(2006), Kalusopa and Zulu (2009), Mutula (2014), Oehlerts and Liu (2013).
	Digital media deterioration	Arora (2009), Majumdar (2005), Pandey and Misra (2014)
	Variety of file formats	Jiazhen and Daoling (2007)
	Accessibility of digitised content	Rosenblum (2008), Singh (2009), Kalusopa and Zulu (2009), Seifi (2011)
Legal Issues	Intellectual Property Right issues	Joint (2006), Abd Manaf (2007), Ghobiral (2008), Nakata et al. (2008), Rosenblum (2008),(Abd Manaf 2008), Ravenwood, Matthews, and Muir (2013), (Dowding 2014), Pandey and Misra (2014)

Category	Challenge	Sources
Managerial Issues	Infrastructure/ Equipment shortfall	Basuki (2004), Manaf (2006), (Rosenberg 2006) (2006), Eykpeggha (2008), Ghobiral (2008), Olatokun (2008), Zaid and Abioye (2009), Byamugisha (2010), Gaur (2011), Gbaje and Mohammed (2013), Sujatha (2008), Ifijeh (2014), Ateboh (2016), Bakshi (2016), Stephen (2016)
	Selecting materials to be digitised	Astle and Muir (2002), Basuki (2004), Lor (2005), Chhatwal, Kanwal, and Lal (2009), Singh (2006), Ezeani and Ezema (2009), Ravenwood, Matthews, and Muir (2013), Baro, Oyeniran, and Ateboh (2013)
	Lack of competent staff	Basuki (2004), Lampert and Vaughan (2009), Philips and Koerbin (2009), Gbaje (2011), Deegan and Musa (2013), Mutula (2014), Gbaje and Mohammed (2013)
	Lack of training	Iwhiwu and Eyekpeggha (2009), Gbaje (2011),
	Lack of support from top management or administration	Manaf (2007), Olatokun (2008), Erima, Masai, and Wosyanju (2016)
	Negligence towards metadata standards	Evens and Hauttekeete (2011)
	Lack of proper motivation and leadership	Mesui, Andrade, and Waizenegger (2019)
	Lack of a degree programme in digital librarianship	Thomas (2015)

Apart from the above discussed literature and impediments related to digitization and digital preservation, it is also essential to know the trend in the institution of digitally preserved research publications, the prominent types of documents in digital preservation, the focussed area of the highly cited research papers and the most productive country in the field of digital preservation. On the basis of the findings of the study conducted by Patra, Sahoo and Mohanty (2021), it was found that an average of 37 research papers per year were published in the last two decades. Regarding the prominent document type, the results indicated that research papers were highly contributed (46.6%), followed by articles published in conference proceedings (40.6%). Furthermore, it was revealed from the study that the USA has contributed highly (44%), followed by the UK and Austria (46.6%),

## **2.6 Conclusion**

On the basis of the availability of literature in the field of digitization and digital preservation, it can be stated that this field has the potential to attract researchers across the globe over the last two decades due to a wide range of advantages such as involvement of technology, helping to know our heritage, the transformation of ancient period documents into digital format, easy access to documents, and help in increasing the visibility of our cultural heritage institutions. The existing literature shows that there are a number of studies conducted in last two decades that highlight the status of digitization and preservation of heritage resources in CHIs and the practices followed by them in their digitization projects, but there is a need to highlight the digitization and preservation efforts taken by various CHIs on a single platform, which will be helpful for professionals and researchers in understanding the trends and major practices followed by CHIs in the field of digitization and preservation of cultural materials.

**References**

- Abdulkareem, M. Y., Isah, A., & Issa, A. O. (2012). Challenges of Digital Preservation of Manuscripts to the Nigerian Education and Information Systems. *Library & Archival Security*, 25(2), 119–131. <https://doi.org/10.1080/01960075.2011.570199>
- Ahmad, A and Sharma, S. (2021). Digitization of Archival Records at National Archives of India and Department of Delhi Archives: A Detailed Study of methods, standards and protocols. *Nat. Volatiles & Essent. Oils*, 8(5), 5169 – 5177.
- Ahsan, Muhammad (2009). Digital Divide and Digitization Initiatives in Pakistan: A Bird’s Eye View. In *Rethinking Electronic Publishing: Innovation in Communication Paradigms and Technologies: proceedings of the 13th International Conference on Electronic Publishing, Milano, Italy, June 10–12, 2009*, 515–520. Milan: ELPUB.
- Akinwale, A. A. (2012). Digitization of Indigenous Knowledge for Natural Resources Management in Africa. *Proceedings of the 2012 Summit of the African Educational Research Network*, North Carolina State University & DoubleTree Hilton, Raleigh Brownstone University.
- Arora, J. (2009). Digitization and Digital Preservation. *DESIDOC Journal of Library & Information Technology*, 29(2), 82–84. <https://doi.org/10.14429/djlit.29.245>
- Astle, Peter J., & Adrienne Muir (2002). Digitization and Preservation in Public Libraries and Archives. *Journal of Librarianship and Information Science* 34.(2), 67–79.

- Bakhshi, S. I. (2016). Digitization and Digital Preservation of Cultural Heritage in India with Special Reference to IGNCA, *Asian Journal of Information Science and Technology*, 6 (2), 1-7
- Balogun, T. (2018). The Nexus Between Digitization, Preservation, and Access in the Context of Selection of Materials for Archives. *Library Philosophy and Practice* (e-journal.1893<https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=5237&context=libphilprac>.
- Baro, E., Oyeniran, G. K., & Ateboh, B. (2013). Digitization projects in university libraries in Nigeria: the journey so far. *Library Hi Tech News*, 30(9), 21–26. <https://doi.org/10.1108/LHTN-09-2013-0049>
- Basuki, S. L. (2004). Digitization of collections in Indonesian academic libraries. *Program*, 38(3), 194–200. <https://doi.org/10.1108/00330330410547241>
- Belhi, A., Foufou, S., Bouras, A., & Sadka, A. H. (2017). Digitization and Preservation of Cultural Heritage Products. In J. Ríos, A. Bernard, A. Bouras, & S. Foufou (Eds.), *Product Lifecycle Management and the Industry of the Future* (Vol. 517, pp. 241–253). Springer International Publishing. [https://doi.org/10.1007/978-3-319-72905-3\\_22](https://doi.org/10.1007/978-3-319-72905-3_22)
- Besek, J. M., Coates, J., Fitzgerald, B., Mossink, W., LeFurgy, W. G., Muir, A., Rasenberger, M., & Weston, C. D. (2008). Digital Preservation and Copyright: An International Study. *International Journal of Digital Curation*, 3(2), 103–111. <https://doi.org/10.2218/ijdc.v3i2.61>

- Bishi, A. (2015). Digital archiving - the current state at the National Archives of Zimbabwe. *Digital Heritage*, 403–404. <https://doi.org/10.1109/DigitalHeritage.2015.7419534>
- Byamugisha, Helen M. (2010). Digitizing Library Resources for New Modes of Information Use in Uganda. *Library Management* 31(1/2), 42–56.
- Çakmak, T., & Yılmaz, B. (2012). Overview of the Digitization Policies in Cultural Memory Institutions in Turkey. In S. Kurbanoglu, U. Al, P. L. Erdoğan, Y. Tonta, & N. Uçak (Eds.), *E-Science and Information Management* (Vol. 317, pp. 150–163). Springer Berlin Heidelberg. [https://doi.org/10.1007/978-3-642-33299-9\\_17](https://doi.org/10.1007/978-3-642-33299-9_17)
- Chhatwal, A., Kanwal, P., & Lal, P. (2009). Digital Heritage Archiving in India: A Case Study of Panjab University Library, Chandigarh. Professional paper in INFUTURE2009: *Digital Resources and Knowledge Sharing*, 145-153.
- Dadzie, P. S., and Walt T. D. (2015). Planning for Digitization of University Libraries in Ghana: Challenges and Prospects. *Library Philosophy and Practice*, 1206. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=3247&context=libphilprac>
- Deegan, M., & Musa, B. E. (2013). Preserving the cultural heritage of Sudan through digitization: developing digital sudan. *Digital Heritage International Congress (DigitalHeritage)*, 485–487. <https://doi.org/10.1109/DigitalHeritage.2013.6744817>
- Dowding, H. (2014). The Role of the National University in Developing Nations' Digital Cultural Heritage Projects: A Perspective from Kazakhstan. *OCLC Systems & Services*, 30(1),52–61.

- Erima, J., Masai, W., & Wosyanju, M. G. (2016). Preservation of digital research content in academic institutions: a case study of Moi University, Kenya. *2016 IST-Africa Week Conference*, 1–11. Retrieved from: <https://doi.org/10.1109/ISTAFRICA.2016.7530620>
- Evens, T., & Hauttekeete, L. (2011). Challenges of digital preservation for cultural heritage institutions. *Journal of Librarianship and Information Science*, *43*(3), 157–165. <https://doi.org/10.1177/0961000611410585>
- Erima, Juliet, Winnie Masai, and Mary Goretti Wosyanju. (2016). Preservation of Digital Research Content in Academic Institutions: a Case Study of Moi University, Kenya.” *2016 IST-Africa Week Conference, 11–13 May 2016, Durban, South Africa*, 1–11. N.p.: IEEE.
- Gaur, R. C. (2011). Preservation and access to manuscript heritage in india. *International Journal of Information Research* 1.1-15.
- Fleming, Patrick, & Phil Spence. (2008). The British Library Newspaper Collection: long term storage, preservation, and access. *LIBER Quarterly* *18*(3–4), 377–393
- Gbaje, E. S.. (2011). Digital Preservation Strategies: A Case Study of Nigerian National Information Centers.” *IFLA Journal*, *37*(11), 218–227.
- Gbaje, Shiloba E., & Mohammed, Z. (2013). Digital preservation policy in National Information Centres in Nigeria. *The Electronic Library*, *31*(4), 483–492. <https://doi.org/10.1108/EL-01-2012-0011>
- Ghobrial, Rafea Ashamallah. (2008). Perceptions of Sudan Memory Institutions [SMIs] Professionals to Digital Technology. *3<sup>rd</sup> International Conference on Information and Communication Technologies: From Theory to Applications, Damascus, Syria*, 17–20. Piscataway, NJ: IEEE.

- Gurram, S. (2008). Digital library initiatives in India: a proposal for open distance learning. *Proceedings of the IATUL Conferences*. Paper 25. Retrieved from: <http://docs.lib.purdue.edu/iatul/2008/papers/25>
- Ifijeh, G. (2014). Adoption of Digital Preservation Methods for Theses in Nigerian Academic Libraries: Applications and Implications. *The Journal of Academic Librarianship*, 40(3–4), 399–404. <https://doi.org/10.1016/j.acalib.2014.06.008>
- Iwhiwhu, B., and Eyekpegba, Oviotobore E. (2009). Digitization of Nigerian university libraries: From technology challenge to effective information delivery. *The Electronic Library*, 27(3), 529–536. <https://doi.org/10.1108/02640470910966943>
- Janowska, A. A., & Malik, R. (2020). Digitization in museums: Between a fashionable trend and market awareness. *Studia z Polityki Publicznej*, 3(27), 31–45. <https://doi.org/10.33119/KSzPP/2020.3.2>
- Jiazhen, L., & Daoling, Y. (2007). Status of the preservation of digital resources in China: results of a survey. *Program*, 41(1), 35–46. <https://doi.org/10.1108/00330330710724872>
- Joint, Nicholas (2006). Digital Library Futures: Collection Development or Collection Preservation? *Library Review*, 55(5) 285–290.
- Kaddu, S. (2015). Collaboration in Digitising Cultural Heritage as a strategy to sustain access and sharing of cultural heritage information in Uganda. licensed under the Creative Commons Attribution 3.0 (Unported) licence <http://creativecommons.org/licenses/by/3.0> 14.

- Kalusopa, T., & Zulu, S. (2009). Digital heritage material preservation in Botswana: problems and prospects. *Collection Building*, 28(3), 98–107. <https://doi.org/10.1108/01604950910971125>
- Kováčik, J. (2017). The national project Digital Library and Digital Archives: Mass digitization of printed cultural heritage materials in Slovakia. *Alexandria: The Journal of National and International Library and Information Issues*, 27(3), 163–174. <https://doi.org/10.1177/0955749018763720>
- Khan, N. A., Shafi, S. M., & Ahangar, H. (2018). Digitization of Cultural Heritage: Global Initiatives, Opportunities and Challenges. *Journal of Cases on Information Technology*, 20(4), 1–16. <https://doi.org/10.4018/JCIT.2018100101>
- Kumar, Sudhir, and Shah L. (2004). Digital Preservation of Manuscripts: A Case Study. Paper presented at 2nd Convention PLANNER, Imphal, India, November 4–5, 2004. Retrieved from: [http://ir.inflibnet.ac.in:8080/ir/bitstream/1944/419/1/04Planner\\_5.pdf](http://ir.inflibnet.ac.in:8080/ir/bitstream/1944/419/1/04Planner_5.pdf)
- Kuswara, R. (2018). Digital Preservation Effort of Manuscripts Collection: Case Studies of pustakabudaya.id as Indonesia Heritage Digital Library. In M. Dobrevá, A. Hinze, & M. Žumer (Eds.), *Maturity and Innovation in Digital Libraries* (Vol. 11279, pp. 195–200). Springer International Publishing. [https://doi.org/10.1007/978-3-030-04257-8\\_20](https://doi.org/10.1007/978-3-030-04257-8_20)
- Laine-Zamojska, M., Zielonka, K., Kuśmidrowicz-Król, A., & De Rosset, A. (2014). E-Museums Project. Making Polish Cultural Heritage. *International Journal of Heritage in the Digital Era*, 3(4), 701–711. <https://doi.org/10.1260/2047-4970.3.4.701>

- Lampert, C., & Vaughan, J. (2009). Success Factors and Strategic Planning: Rebuilding an Academic Library Digitization Program. *Information Technology and Libraries*, 28(3), 116. <https://doi.org/10.6017/ital.v28i3.3220>
- Landgraf, M. R., Zwaard, K., Haun-Mohamed, R., & Mauldin, J. (2010). Digital preservation framework, goals, and challenges at the U. S. Government Printing Office. *Proceedings of the 2010 Roadmap for Digital Preservation Interoperability Framework Workshop on - US-DPIF '10*, 1–6. <https://doi.org/10.1145/2039274.2039280>
- Lawrenz, S. (2017). Building a national heritage registry for the sudan: the friedrich w. Hinkel archive digitization project. *Isprs - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 42(2/W5), 435–438. <https://doi.org/10.5194/isprs-archives-XLII-2-W5-435-2017>
- Lee, H. (2010). Collaboration in cultural heritage digitization in East Asia. *Program*, 44(4), 357–373. <https://doi.org/10.1108/00330331011083248>
- Lor, Peter Johan. (2005). Preserving African Digital Resources: Is There a Role for Repository Libraries? *Library Management*, 26(1/2) 63–72.
- Mahmood, Z., & Khan, H. R. (2017). Digital Preservation of Rare Manuscripts in Khuda Bakhsh Oriental Public Library, Patna. *Pearl : A Journal of Library and Information Science*, 11(1), 55. <https://doi.org/10.5958/0975-6922.2017.00008.0>
- Maltesh, M., Lahkar, N., & Gajakose, S. (2007). Digitization of culture. Retrieved from: <https://www.researchgate.net/publication/215664896>.

- Manaf, Z. A & Ismail, A. (2010). Malaysian cultural heritage at risk? A case study of digitization projects. *Library Review*, 59(2), 107–116.  
<https://doi.org/10.1108/00242531011023862>
- Manaf, Z. A (2007). The state of digitization initiatives by cultural institutions in Malaysia: an exploratory survey. *Library Review*, 56(1), 45–60.  
<https://doi.org/10.1108/00242530710722014>
- Manaf, Z. A. (2008). Establishing the national digital cultural heritage repository in Malaysia. *Library Review*, 57(7), 537–548.  
<https://doi.org/10.1108/00242530810894059>
- Manivannan, M., and B. Sutradhar (2018). Digital Conversion and Preservation of old Ph.D. Theses: A Study at Central Library, IIT Kharagpur. Paper presented at 11th Convention PLANNER 2018, Tripura University, Agartala, Tripura, November 15–17, 2018. Retrieved from:  
<https://ir.inflibnet.ac.in/ir/bitstream/1944/2297/1/11.pdf>
- Manžuch, Z. (2009). Monitoring digitization: lessons from previous experiences. *Journal of Documentation*, 65(5), 768–796.  
<https://doi.org/10.1108/00220410910983100>
- Mazumdar, S (2005). Preservation and conservation of literary heritage: a case study of India. *The International Information & Library Review*, 37, 179–187
- Mazumdar, N.R. (2009). Digital Preservation of Rare Manuscripts in Assam. Paper presented at 7th International CALIBER-2009, Pondicherry University, Puducherry, 14–19
- Mesui, ‘Anau, Andrade, A. D., & Waizenegger, L. (2019). Digital Technology for Preserving Cultural Heritage in Tonga. In P. Nielsen & H. C. Kimaro (Eds.),

*Information and Communication Technologies for Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D* (Vol. 552, pp. 215–226). Springer International Publishing. [https://doi.org/10.1007/978-3-030-19115-3\\_18](https://doi.org/10.1007/978-3-030-19115-3_18)

Mijajlovic, Z.& Pajovic, N. (2010). National serbian digitization project: its achievements and activities. In M. K. Tsvetkov, M. S. Dimitrijeviü, K. Tsvetkova, O. Kounchev, & Ž. Mijajloviü (Eds.), *Proceedings of the VII Bulgarian-Serbian Astronomical Conference (VII BSAC)* (Vol.11, pp.75-81). Publ. Astron. Soc. Rudjer Boškoviü..

Mutula, Mudogo S. (2014). Status of digital heritage preservation management in Eastern Africa. *The Electronic Library*, 32(3), 363–374. <https://doi.org/10.1108/EL-01-2013-0003>

Nakata, M., Nakata, V., Gardiner, G., McKeough, J., Byrne, A., and Gibson, J. (2008). Indigenous Digital Collections: An Early Look at the Organisation and Culture Interface. *Australian Academic & Research Libraries*, 39(4), 223–236. <https://doi.org/10.1080/00048623.2008.10721360>


Oehlerts, B., & Liu, S. (2013). Digital preservation strategies at Colorado State University Libraries. *Library Management*, 34(1/2), 83–95. <https://doi.org/10.1108/01435121311298298>

Ogbu, K. N., Abubakar, A., & Batagarawa, S. A. (2021). Digitization of Information Resources in Public Libraries and Museums in South-East, Nigeria: Problems and Prospects. *Information Impact: Journal of Information and Knowledge Management*, 11(4). <https://doi.org/10.4314/ijikm.v11i4.13>

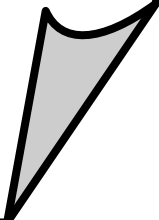

- Olatokun, W. M. (2008). A Survey of Preservation and Conservation Practices and Techniques in Nigerian University Libraries. *LIBRES*, 18(2), 1-18.
- Pandey, P., and Misra, R. (2014). Digitization of Library Materials in Academic Libraries: Issues and Challenges. *Journal of Industrial and Intelligent Information*, 2(2), 136–141. <https://doi.org/10.12720/jiii.2.2.136-141>
- Poll, R. (2010). NUMERIC: statistics for the digitization of European cultural heritage. *Program*, 44(2), 122–131. <https://doi.org/10.1108/00330331011039481>
- Porte, B., and Higgs, R. (2019). Challenges in digitization of cultural heritage material in the Western Cape, South Africa. *Journal of Information Management*, 21(1). <https://doi.org/10.4102/sajim.v21i1.1104>
- Rafiq, M., Ameen, K., & Jabeen, M. (2018). Barriers to digitization in university libraries of Pakistan: a developing country's perspective. *The Electronic Library*, 36(3), 457–470. <https://doi.org/10.1108/EL-01-2017-0012>
- Ravenwood, C., Matthews, G., & Muir, A. (2013). Selection of digital material for preservation in libraries. *Journal of Librarianship and Information Science*, 45(4), 294–308. <https://doi.org/10.1177/0961000612452030>
- Rosenblum, B. (2008). Digital Access to Cultural Heritage and Scholarship in the Czech Republic. *Slavic & East European Information Resources*, 9(1), 12–29. <https://doi.org/10.1080/15228880802104637>
- Seifi, L. (2011). Digitization and Digital Preservation of Manuscripts and Access in Organization of Libraries, Museums and Documents Centre of Astan Quds Razavi Library in IRAN: A Case Study In 8th International CALIBER - 2011, Goa University, Goa, March 02-04.

- Seifi, L., Nashmil A., & Fatemeh P. (2015) Digital Preservation of Old Persian Periodicals in Iran with Special Reference to Iranian Newspapers: *Strategies and Challenges*. In *4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), Noida, India, January 6–8, 2015*, 81–85. N.p.: IEEE
- Singh, A. (2012). Digital preservation of cultural heritage resources and manuscripts: An Indian government initiative. *IFLA Journal*, 38(4), 289–296. <https://doi.org/10.1177/0340035212463139>
- Singh, S. N. (2006). Digitization initiatives and university libraries in India. In 4th Convention PLANNER -2006, Mizoram University, Aizawl.09-10 November.
- Smith, L., & Rowley, J. (2012). Digitization of local heritage: Local studies collections and digitization in public libraries. *Journal of Librarianship and Information Science*, 44(4), 272–280. <https://doi.org/10.1177/0961000611434760>
- Sohal, Gurpreet Singh, and Jaspal Kaur (2017). Digital Preservation of Cultural Heritage: A Case Study of Dev Samaj. Paper presented at 6th International Library and Information Professionals Summit 2017 at Indian Institute of Science Education and Research (IISER), Mohali, India, April 6–8, 2017
- Solimine, G. (2002). Digital library development in Italy and Spain. Retrieved from <https://www.researchgate.net/publication/229025749>
- Thomas, B. (2015). The issues and challenges facing a digital library with a special focus on the University of Calgary. *Library Review*, 64(8/9), 533–551. <https://doi.org/10.1108/LR-11-2014-0125>

- Thomas, P. N. (2010). Traditional knowledge and the Traditional Knowledge Digital Library: Digital quandaries and other concerns. *International Communication Gazette*, 72(8), 659–673. <https://doi.org/10.1177/1748048510380799>
- Tonta, Y. (2009). Preservation of scientific and cultural heritage in Balkan countries. *Program*, 43(4), 419–429. <https://doi.org/10.1108/00330330910998066>
- Voutssas, Juan. (2012). Long-Term Digital Information Preservation: Challenges in Latin America. *Aslib Proceedings*, 64(1), 83–96.
- Zaid, Yetunde, and Abiola Abioye. (2009). Museums, Libraries, and Archives: Collaborating for the Preservation of Heritage Materials in Nigeria. Paper presented at the World Library and Information Congress (75th IFLA General Conference and Council), Milan, Italy.



*Chapter 3*  
*Methodology*



# CHAPTER 3

## METHODOLOGY

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### 3.1 Introduction

Galleries, Libraries, Archives and Museums (GLAMs) work collaboratively to provide access to cultural heritage resources in their collection by distributing them in digital formats through the World Wide Web. Digitization enables GLAMs to convert their analogue material into digital formats. The digitization and preservation of that heritage material are also significant in providing wider and long-term access to heritage resources.

On the basis of existing literature in the field of digitization and digital preservation, it was observed that the majority of the studies highlighted the overview of digitization and digital preservation (Sadiku, Shadare and Musa, 2017; Shigwan, 2015; Lakshminarsimhappa and Veena, 2014; Pandey and Misra, 2014); national digitization project related studies (Kovacik, 2018; Lawrenz, 2017; Ringel and Ribak, 2015); organisational digitization project related studies (Balogun, 2018; Mahmood and Khan, 2017; Bakhshi, 2016) and academic library digitization related studies (Manivannan and Sutradhar, 2018; Rafeeq, Ameen and Janeeb, 2017; Chmielewska and Wrobel, 2013).

The scope of the present study is not limited to any specific organisation's digitization and digital preservation status, issues in digitising their content, or experience of any organisation's digitization initiative, but the objective of this study ranges from investigating the status of digitization and digital preservation of the

tangible cultural heritage of India, identifying the major reasons to digitise their collection, and the major obstacles in digitising their collection and many more aspects related to digitization and digital preservation of heritage resources.

To achieve the objectives of the study, the researcher first visited the official website of the Ministry of Culture, Government of India (<https://www.indiaculture.nic.in/>) to identify the existing cultural heritage institutions in India. Under the Ministry of Culture, cultural heritage can be divided into two parts: tangible cultural heritage and intangible cultural heritage. Tangible cultural heritage includes artistic creations, built heritage such as buildings and monuments, and other physical or tangible products of human creativity that are invested with cultural significance in society. Intangible cultural heritage refers to the practises, expressions, rituals, habits, and knowledge that we inherit from our past generations, and always try to learn something new from all those.

In the study, we only collect tangible cultural heritage because the major goal of the study is to assess the status of digitization and digital preservation of tangible cultural heritage resources and to know the several types of art objects available in various CHIs of India. These kinds of art objects are available in the tangible CHIs so we include this heritage in our study.

### **3.2 Population and sample of the study**

Under the Ministry of Culture, Government of India, there are 13 tangible CHIs and one national culture fund which are working towards the digitization and digital preservation of diverse cultural heritage resources available across the country. Out of these 13 CHIs, there are museums of national importance, national missions, galleries of modern art, and a council of museums is involved. In the present study, we exclude

the national culture fund (NCF) from the study because NCF is a funding agency that approves the proposals of cultural heritage and provides them with financial aid to achieve their goals. In the study, we included 13 CHIs, and the details of these cultural CHIs are as below:

**Table 3.1 Name of CHIs and their official websites**

S. No.	Name of CHI	Acronym	Year of establishment	Official website
1	Indian Museum	IM	1814	<a href="https://indianmuseumkolkata.org/">https://indianmuseumkolkata.org/</a>
2	Archaeological Survey of India	ASI	1861	<a href="https://asi.nic.in/">https://asi.nic.in/</a>
3	Victoria Memorial Hall	VMH	1921	<a href="https://www.victoriameorial-cal.org/home/content/en">https://www.victoriameorial-cal.org/home/content/en</a>
4	Allahabad Museum	AM	1931	<a href="https://theallahabadmuseum.com/">https://theallahabadmuseum.com/</a>
5	National Museum	NM	1949	<a href="http://www.nationalmuseumindia.gov.in/en">http://www.nationalmuseumindia.gov.in/en</a>
6	Salar Jung Museum	SJM	1951	<a href="https://salarjungmuseum.in/">https://salarjungmuseum.in/</a>
7	National Gallery of Modern Art	NGMA	1954	<a href="http://ngmaindia.gov.in/">http://ngmaindia.gov.in/</a>
8	National Research Laboratory for the Conservation of Cultural Property	NRLC	1976	<a href="http://www.nrlc.gov.in/">http://www.nrlc.gov.in/</a>
9	National Science Museum Council	NCSM	1978	<a href="https://ncsm.gov.in/">https://ncsm.gov.in/</a>
10	National	NMI	1989	<a href="http://nmi.gov.in/">http://nmi.gov.in/</a>

	Museum Institute of Art History, Conservation, and Museology			
11	National Mission for Manuscript	NMM	2003	<a href="https://www.namami.gov.in/">https://www.namami.gov.in/</a>
12	National Mission on Monuments and Antiquities	NMMA	2007	<a href="http://nmma.nic.in/nmma/indexAction.do">http://nmma.nic.in/nmma/index Action.do</a>
13	Gandhi Heritage Site Mission	GHSM	2013	<a href="https://www.indiaculture.nic.in/gandhian-heritage">https://www.indiaculture.nic.in/ gandhian-heritage</a>

### 3.3 Data Collection

The present study has been conducted in three phases to achieve the objectives of the study. The details of these phases are as below-

#### 3.3.1 Phase I

A researcher conducted a systematic review of previous studies related to digitization and digital preservation in GLAMs around the world and country during the first phase of the study. This review helped in understanding the concept, the nature of studies available in the literature, and the research gap in the selected field.

#### 3.3.2 Phase II:

In the second phase of the study, the researcher prepared a structured questionnaire comprised of open-ended, close-ended, ranking-based questions and Likert scale-based questions. For the data collection, a survey method was used, and for the secondary data, researcher collected data from the annual report of the cultural heritage institutions, official websites of the cultural heritage institutions, and from the

National Portal and Digital Repository for Museums of India (<http://museumsfindia.gov.in>).

### **3.3.3 Phase III:**

In the third phase of the study, the researcher analysed the collected data using MS Excel and tabulated the responses for better understanding and study used the American Psychological Association (6<sup>th</sup> ed.) citation style wherever the citations are required.

### **3.4 Elements of the Questionnaire**

For the data collection in the study, two structured questionnaires were prepared, one for the digitization project in-charge of the museums and the second for the Human-Centred Design and Computing (HCDC) Group at the Centre for Development of Advanced Computing (C-DAC) Pune. The reason behind preparing the questionnaire for CDAC Pune was that during data collection it was told by administrators/digitization in-charge of the cultural heritage institutions that they scanned their selected collections and sent them to C-DAC Pune for uploading on the National Portal and Digital Repository for Museums of India (<http://museumsfindia.gov.in>) to make available their collection online. Apart from the discussed reasons, the Ministry of Electronics and Information Technology (MeitY), Government of India designated C-DAC Pune as Centre of Excellence for Digital Preservation. This centre is accountable for tools, techniques, standards and guidelines required for the digital preservation program in the country. In 2013, the Ministry of Culture started the Vivekananda Memorial Museum Excellence Program in collaboration with the Chicago Institute of Art, USA. As part of this program, various existing software solutions available in India were evaluated, and finally C-DAC's

JATAN: Virtual Museum Builder was selected for standardized implementation across national museums.

Both of the questionnaires included several kinds of questions, such as close-ended, Likert scale, ranking questions, and open-ended questions, to know the opinions and suggestions of respondents.

### **3.4.1 Questionnaire for digitization project in-charge**

A detailed overview of a questionnaire for the digitization project in-charge of the museums has been discussed as follows (see Appendix A):

- The questionnaire for the digitization Incharge/ digitization project manager has been divided into six sections.
- Section I of the questionnaire deals with the personnel profile of the respondents/ digitization project in-charge of the concerned heritage institute. In this section, a total of 8 questions have been asked, of which some are close-ended and some are open-ended in nature. In these questions, respondents have to fill in the name of their museum, year of establishment, name and designation of digitization person-in-charge, educational qualification, details regarding any specific training course which the respondent has done, email id, age and experience.
- Section II deals with the basic queries related to the digitization programme of the institute and consists of eight questions to know which museums are involved in the digitization programme, along with the date of starting the program.
- The second question of the section was asking about the availability of guidelines/policy for digitising and preserving the documents and the factors

that have been considered in that policy. This will help in assessing the significant factors considered by different museums in digitising and preserving heritage resources.

- The next question of this section provides an overview of various kinds of documents available in several CHIs of the country and which types of art objects they digitise and preserve under their digitization program. The findings of this question will help in achieving one of the objectives of the study.
- In the fourth question of this section, respondents were asked about the major reasons for digitising their heritage collection. It is a five-point Likert scale question, and the output of the responses to this question will be beneficial for professionals who are involved in any digitization programme or want to work in this field.
- The fifth question in the section is related to the major criteria being used by museums in selecting any document for digitization. In this question, respondents were asked to give a rank to the criteria from 1 to 10, where 1 represents "highly considerable" and 10 for "least considerable".
- The sixth question deals with the management of the digitization programme in the institute. In this question, respondents were asked how they manage their digitization programme either in-house or through any outsourcing agency.
- The next question in this section is related to the significant challenges faced by the various museums in digitising their collections. The results of this question will be helpful to the digitization managers and the professionals working in GLAMs who want to digitise their collections.
- The last question in this section deals with the involvement of heritage institutions in collaborative digital activities. With the help of this question, we

can identify the highly preferable collaborative digital activities among heritage institutions in different parts of the country.

- Section III of the questionnaire consists of 3 questions and deals with the questions related to the infrastructure available in the museum to digitise the documents.
- In the first question of this section, respondents were asked to give details of the number of computers, types of scanners, digital cameras and printers they used in their museum to digitise their heritage collection.
- In the second question, respondents were asked about the Digital Asset Management System (DAMS) used in their museum and the scanning and OCR software which they used to digitise their heritage material.
- The third question of this section deals with the preferred master file format in a museum.
- Section IV of the questionnaire deals with the metadata-related queries and consists of four questions.
- In the first question, respondents were asked what type of metadata their museum created for their digital items.
- The next question deals with the metadata schemas being used by museums for the resource descriptions.
- The third question of the section deals with the cataloging standards and controlled vocabulary used in preparing descriptive metadata in museums.
- The fourth question of this section deals with the metadata elements which have been used by any institute to describe any specific type of art object.
- The fifth section of the questionnaire deals with the questions related to preservation and involves a total of four questions.

- In the first question of this section, respondents were asked to give information regarding whether their museum was involved in any kind of preservation programme or not.
- In the second question, respondents were asked about the preservation strategy followed by their museum.
- The third question in this section is associated with the backup policy followed by the particular museum. If they follow any policy, how frequently do they backup their preserved data.
- The fourth question was related to the storage media used by museums to store their digitised content.
- The sixth section of the questionnaire deals with the existing access policy followed by museums. In this section, respondents were asked to provide information regarding the access of their digitised content by their users, such as who can view only the documents, who can view and download both, and how they access them via only intranet/LAN or through the internet.
- Along with all these close-ended, rating-based, and Likert scale questions, there were also open-ended questions also in the questionnaire and in these questions respondents were requested to give their suggestions, opinions or any comment regarding the study.

### **3.4.2 Questionnaire for Human-Center (HCDC)) Group at Center for Development of Advanced Computing (C-DAC) Pune.**

The questionnaire for the Human-Centered Design and Computing (HCDC) Group at the Centre for Development of Advanced Computing (C-DAC) Pune has been discussed as follows (see Appendix B):

- The questionnaire consists of seven sections.

- Section I of the questionnaire deals with the general information such as the name of the digitization project in-charge, qualification, email id, experience.
- Section II deals with the questions related to digitization activities and consists of 11 questions.
- The first three questions of this section were asked about the existence of a digitization programme in their centre, when they began the programme, and how many documents they have digitised so far. The next three questions asked about the staff details involved in digitization work and training programmes for the staff.
- The eighth question of this section deals with the existence of any guidelines or policies for digitising and preserving documents and the factors considered in that policy.
- In the ninth question, the respondent was asked whether their centre prepared any flow chart for initiating the digitization process or not, and if so, which steps they considered in the flow chart.
- The next question in this section deals with the language of the document selected for digitization. In this question, respondents were asked whether they digitise documents in regional languages or prefer only English-language documents.
- The last question in this section was related to the significant challenges faced by the centre in digitising the documents, and respondents were asked to give their opinion on a 5-point Likert scale.
- Section III of the questionnaire deals with the questions related to the scanning activity in digitising the documents and includes six questions.


- In the first question of this section, respondents were asked to provide information regarding various software used in the centre in digitising their documents, such as image editing software, OCR software, PDF software and scanning software.
- In the second question of this section, the respondent was asked about the preferred master file format.
- The third question of this section was related to the resolutions used by a centre in digitising several kinds of art objects. By asking this question, we can know the preferred resolutions for specific art objects, which will be helpful for professionals who are engaged in any kind of digitization programme. The last question of this section deals with the salient feature covered by the centre in the creation of a master image. The result of this question will help in deciding the significant factors to be involved in the master file.
- Section IV of the questionnaire deals with the queries associated with the file naming conventions followed by the center and this section consists of five questions.
- The first question was about the various factors followed by the centre while framing the file name of any document.
- The second question of the section related to the various characteristics of the filename of a particular document or object.
- In the next three questions, respondents were asked about different aspects associated with the file naming, such as whether there were limitations on the length of the file name, whether they were migrated from one location to another or from one server to another, and if the document migrated from one to another storage device, could these changes affect the naming strategy.

- The fifth section of the questionnaire deals with the question related to metadata and consists of three questions in which respondents were asked what kind of metadata their centre created for the digital items. In the second and third questions, they asked about the metadata schemas used in the centre and the kinds of cataloguing standards and vocabulary used in preparing descriptive metadata.
- The sixth section of the questionnaire deals with the questions related to the storage of the digitised content in the centre and it consists of two questions.
- The first question of the section is based on the file format used by the centre and the second question was about the features covered under the master image created by the centre.
- The VII section deals with the questions related to the digital preservation activities conducted by the centre and it consists of four questions.
- The first question of this section deals with the existence of a preservation policy in the centre, and in the second question, the respondent was asked to give details of the preservation strategy followed by the centre.
- In the third question, they were asked about the backup policy, followed by a check in which they asked how frequently they back up their digitised content.
- The last question of this section deals with the preferred media by the centre to store their digitised content.
- The last section (VIII) of the questionnaire consists of close and open-ended questions, and the first question deals with the searching approaches available by the centre to search for specific documents by any user.

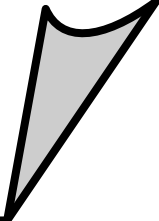

- In the second and third questions, respondents were asked to give their suggestions regarding digitization and digital preservation and any comment or remark regarding the study or questionnaire.

### **3.5 Conclusion**

The selection of an appropriate methodology leads to successful research. This chapter highlights the methodology adopted to achieve the objectives of the research and the data collection tools used to collect primary and secondary data from the respondents. The next chapter will impart the analysis and interpretation of data in the form of tables and graphs.



*Chapter 4*  
*Data Analysis and*  
*Interpretation*



## CHAPTER 4

### DATA ANALYSIS AND INTERPRETATION

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#### 4.1 Introduction

The previous chapter of the study highlighted the research methodology used to conduct the study. The present chapter deals with the responses obtained from the respondents and presents the analysis. For the data collection in the study, the researcher used a survey method followed by a structured questionnaire. To achieve the objectives of the study, two questionnaires have been prepared, one for the digitization in-charge or digitization project heads in cultural heritage institutions and another for the Human-Centered Design and Computing (HCDC) Group at the Centre for Development of Advanced Computing (C-DAC) Pune.

The questionnaire for the digitization project head was designed to uncover broadly the diverse collection available in the various CHIs and the issues related to digitization and digital preservation. On the other hand, the questionnaire for CDAC Pune focused on the technical aspects related to digitization such as the file naming policy, metadata practices, backup strategy, and access policy followed by the center in digitizing and preserving the cultural heritage resources. The reason behind preparing the questionnaire for CDAC Pune was that during data collection the administrators/digitization in-charge of the cultural heritage institutions told that they scanned their selected collections and sent them to C-DAC Pune for uploading on the National Portal and Digital Repository for Museums of India (<http://museumsfindia.gov.in>) to make available their collection online. Apart from the discussed reasons, the Ministry of Electronics and Information Technology (MeitY), Government of India designated C-DAC Pune as Centre of Excellence for

Digital Preservation. This centre is accountable for tools, techniques, standards and guidelines required for the digital preservation program in the country. To analyze the collected data, researcher used MS Excel, tables, and graphs to summarize the data and make it easier to understand.

#### **4.2 Response rate of questionnaire distributed to digitization project in-charge**

The present study was conducted on the CHIs of India as listed on the official website of the Ministry of culture, Government of India (<https://www.indiaculture.nic.in/>). Under the ministry of culture, there were 13 tangible CHIs and one national culture fund. The questionnaire was distributed to the digitization project head or curator or Deputy Curator or coordinator of the digitization cell in all the 13 CHIs except the national culture fund, and out of 13 distributed questionnaires, 11 questionnaires were received back. The questionnaire was also distributed to the CDAC Pune and received back. In total, 14 questionnaires were distributed, and 12 questionnaires were received back (85.70%).

#### **4.3 General information about the respondents**

##### **4.3.1 Educational qualification of the respondents**

It was revealed from the results that out of 11 respondents, four of the respondents have doctoral degrees, six respondents have master's degrees, and 1 respondent has an MPhil degree.

##### **4.3.2 Designation of the respondents**

The results of the study indicated that out of 11 respondents, 7 respondents were curators, 2 respondents were deputy curators, 1 respondent was Assistant library and Information Officer (ALIO) and 1 respondent had not responded.

### **4.3.3 Experience of the respondents**

Out of 11 respondents in the study, 50% of the respondents (6) have experience of more than 20 years, three respondents (25%) have experience of 15-20 years, two respondents have experience of 10-15 years.

## **4.4 Cultural heritage resources/art objects available in the cultural heritage institutions**

In the study researcher examines the cultural heritage resources available in the CHIs of India in different sections. There are 13 CHIs working under the Ministry of Culture, GOI and among them museums, national galleries, national missions and the museum council is working. In the first section researcher described the cultural heritage resources available in the museums of India and these five museums are of national importance and plays a significant role in representing the heritage of India. In the second section, the collection of National Galleries of Modern Art (NGMA) was described and in the third section the collection of Archeological Survey of India (ASI) and National Council of Science Museums (NCSM) is discussed. The last section discusses the collection of the National missions working towards the digitization of the cultural heritage.

### **4.4.1 Section I: Museums**

#### **4.4.1.1 Cultural heritage resources/art objects available in the museums**

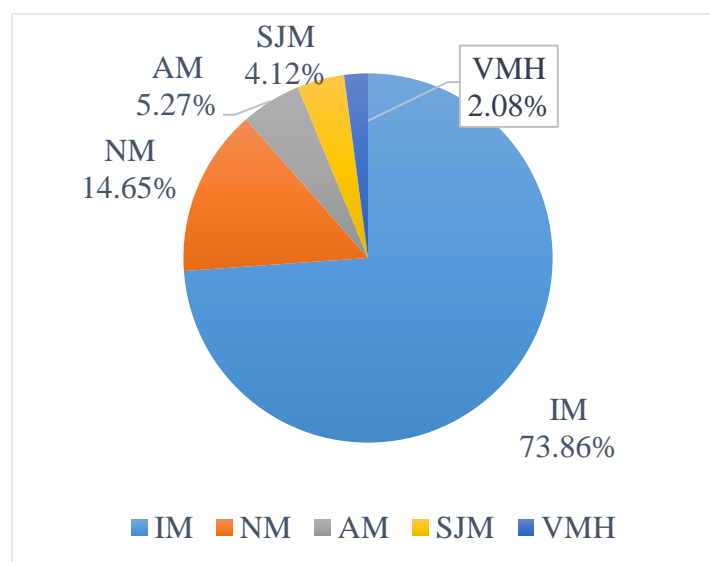
This section consists of descriptions of the art objects available in National Museum (NM), Indian Museum (IM), Allahabad Museum (AM), Salar Jung Museum (SJM) and Victoria Memorial Hall (VMH).

Table (4.1) depicts the cultural heritage resources available in the museums of India and these five museums are of national importance in the country. It is visible

from the table that a total of 1364627 art objects are available in these museums and among them, IM holds the maximum number of art objects (10.08 Lakhs) followed by NM (200000), AM (72000), SJM (56233) and VMH (28394). Figure (4.1) displays that the collection of IM represents 73.86% of the total art objects available in the museums followed by NM (14.65%), AM (5.27%) while SJM (4.12%) and VMH (2.08%) have the least number of objects.

**Table 4.1 Art objects available in the museums**

Museum	Art objects	Percentage
IM	10.08 Lakhs	73.86
NM	2 Lakhs	14.65
AM	72000	5.27
SJM	56233	4.12
VMH	28394	2.08
<b>Total</b>	<b>1364627</b>	<b>100</b>



**Figure 4.1 Art objects available in museums**

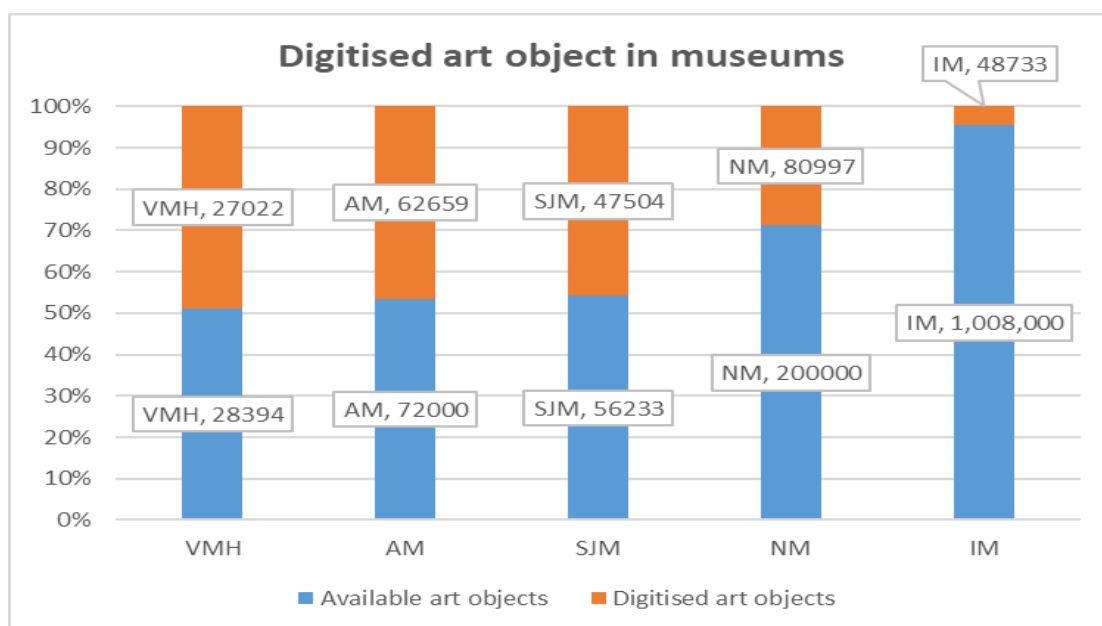
#### 4.4.1.2 Digitised art objects in museums

Table (4.2) and Figure (4.2) analysed the digitised content available by a particular museum and it is visible from the table that out of total available artefacts in

museums 19.55% of the heritage resources are available online for users. Out of these museums, NM provides access to a maximum number of digitised content (80997) followed by AM (62659), SJM (47504) and VMH (27022). On the other hand, when researcher observe the percentage of digitised collections out of a total collection in a particular museum it was found that VMH has digitised its maximum heritage resources (95.16%) followed by AM (87.02%), SJM (84.47%), NM (40.49%) and IM (4.83%).

**Table 4.2 Digitised art object in museums**

Museum	Available art objects	Digitised art objects	Percentage
VMH	28394	27022	95.16
AM	72000	62659	87.02
SJM	56233	47504	84.47
NM	200000	80997	40.49
IM	10.08 Lakhs	48733	4.83
<b>Total</b>	<b>1364627</b>	<b>266915</b>	<b>19.55</b>



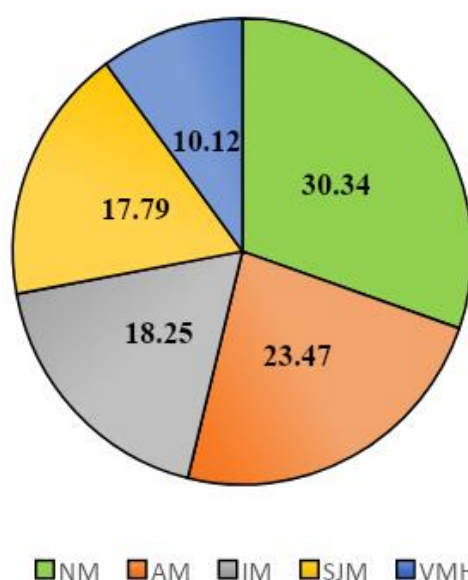
**Figure 4.2 Digitised art objects in museums**

#### 4.4.1.3 Museum wise contribution in digitization

The Table 4.3 and Figure 4.3 represents the museum wise contribution in the digitization of the heritage resources available in the country. It is observed from the table and Figure that out of five museums, NM has the largest digitised collection (80997) followed by AM (62659) and IM (48733). The collection of NM represents 30.34% of the total online available collection in Indian heritage institutions followed by AM (23.47%) and IM (18.25%) and on the other hand, SJM (17.79%) and VMH (10.12%) have the minimum number of art objects.

**Table 4.3 Museum wise contribution in digitization**

Museum	Collection	Percentage
NM	80997	30.34
AM	62659	23.47
IM	48733	18.25
SJM	47504	17.79
VMH	27022	10.12
<b>Total</b>	<b>266915</b>	<b>100</b>



**Figure 4.3 Museum wise contribution in digitization**

#### 4.4.1.4 Category wise availability of art objects in museums

##### 4.4.1.4a Cultural heritage resources available in National Museum

Table (4.4) represents the art objects digitised and available online by National Museum (NM) and it is visible from the table that NM has categorized its diverse collection in 11 major categories. The top three-heritage resources category in NM was Numismatic and Epigraphy (59.33%) followed by anthropology collection (6.91%) and decorative art objects (6.44%). On the other hand, the jewellery (0.56%), PCWA (1.46%) and Prehistory collection (2.10%) of the museum have the least number of art objects.

**Table 4.4 Collection of National Museum**

Category	NM	Percentage
Numismatic and Epigraphy	48056	59.33
Anthropology	5597	6.91
Decorative art	5223	6.44
Paintings	5200	6.41
Arms armour	4462	5.50
Archaeology	3727	4.60
Central Asian Antiquities	3032	3.74
Manuscript	2347	2.89
Pre-history	1707	2.10
Pre Colombian and western art (PCWA)	1189	1.46
Jewelery	457	0.56

##### 4.4.1.4b Cultural Heritage resources available in Indian Museum

The Table (4.5) represents the collection of IM and shows that Coin (39.06), tools (10.90%) and ornament category (8.65%) in the museum have the maximum number of art objects while bones tool (0.02%) have the minimum number of objects followed by jewellery (0.03%) and patachitra (0.05%).

Table 4.5 Collection of Indian Museum

Category	No. of art object	Percentage
Coin	19039	39.06
Tool	5315	10.90
Ornament	4218	8.65
Decorative art	3846	7.89
Sculpture	1956	4.01
Seals and sealings	1742	3.57
Painting	1516	3.11
Dress and head gear	1240	2.54
Manuscript	1120	2.29
Domestic appliances	1067	2.18
Household objects	973	1.99
Textile	868	1.78
Arms & armoury	788	1.61
Toy	787	1.61
Pottery	507	1.04
Musical Instrument	411	0.84
Effigy	352	0.72
Mask	312	0.64
Bead	303	0.62
Gem	299	0.61
Ornamental Plaque	294	0.60
Basketry	292	0.59
Agricultural Implement	256	0.52
Religious artefacts	206	0.42
Educational artefacts	202	0.41
Metal cast	198	0.40
Fishing implement	147	0.30
Epigraph	124	0.25
Gaming tool	112	0.22
Plaque	106	0.21
Postherd	84	0.17
Figurine	63	0.12
Patachitra	28	0.05
Jewellery	19	0.03
Bones tool	14	0.02

#### 4.4.1.4c Cultural Heritage resources available in Allahabad Museum

Table (4.6) depicts the collection of AM and found that among the available 20 categories museum have a maximum number of beads (35.14%) in their collection followed by coins (31.49%) and terracotta (9.49%). On the contrary, the least digitised categories in the museum were the bronze collection (0.11%) followed by literary art objects (0.13%) and jewellery (0.16%).

**Table 4.6 Collection of Allahabad Museum**

Category	No. of art object	Percentage
Beads	22022	35.14
Coins	19734	31.49
Terracotta	5951	9.49
Manuscript	5876	9.37
Paintings	2462	3.92
Sculpture	1306	2.08
Miss. objects	1132	1.79
Nehru collection	890	1.42
Textile	703	1.12
Archival	629	1.03
Decorative Art	594	0.94
Seals & Sealing	564	0.90
Farman	520	0.82
Archaeological	267	0.42
Arms and armour	207	0.33
Thangaka	138	0.22
Jewelery	102	0.16
Literary	84	0.13
Bronze collection	72	0.11

#### 4.4.1.4d Cultural heritage resources available in Salar Jung Museum

Table (4.7) shows the variety of cultural heritage resources available in SJM and it is visible from the table that the museum has different kinds of art objects which are unique and no other museum of national importance have these kind of objects. This museum has more than 150 kinds of art object categories but here in this table researcher discuss that categories which have more than 100 art objects because it is not possible to represent all the categories in this table. Even more, than 10 art object categories in the museum have only one object. From the table it is visible that Porcelain category holds the maximum number of art objects (13.38%) followed by soldier (9.56%) and toy army collection (9.28%).

**Table 4.7 Collection of Salar Jung Museum**

Category of art object	No. of art objects	Percentage
Porcelain	6358	13.38
Soldier	4542	9.56
Toy army	4413	9.28
Metal	3006	6.32
Miniature painting	2824	5.94
Glass	2761	5.81
Coin	2666	5.61
Wood	2481	5.22
Ivory	1996	4.20
Arms and armour	1650	3.47
Clay	1037	2.18
Textile	864	1.81
Bronze	789	1.66
Silver	731	1.53
Manuscript	715	1.50
Metalware	442	0.93

Category of art object	No. of art objects	Percentage
Bidriware	431	0.90
Enamel	428	0.90
Brass	383	0.80
European painting	379	0.79
Plaster of Paris	351	0.73
Modern painting	324	0.68
Marble	327	0.68
Furniture	269	0.56
Shell	261	0.54
Terracotta	256	0.53
Enamelware	254	0.53
Carpet	214	0.45
Clock	203	0.42
Drawing	124	0.26
Medal	117	0.24
Embroidery	114	0.23
Carnelian	109	0.22
Stone Sculpture	100	0.21

#### 4.4.4e Cultural Heritage resources available in Victoria Memorial Hall

Table (4.8) indicated the availability of art objects in VMH and it was found from the table that museum have the maximum number of resources in the Philately category (48.69%) followed by painting (30.26%) and documents (6.35%). On the other hand the categories which have the least number of objects are busts and statuary (0.18%) followed by manuscript (0.38%) and textile (0.41%).

Table 4.8 Collection of Victoria Memorial Hall

Category	No. of art object	Percentage
Philately	13158	48.69
Painting	8179	30.26
Documents (Letters and treaties)	1718	6.35
Photograph	1326	4.90
Maps and Plan	1046	3.87
Coins and Token	1017	3.76
Arms and armour	237	0.87
Medal and badges	279	1.03
Textile	112	0.41
Manuscript	103	0.38
Busts and statuary	50	0.18

#### 4.4.1.5 Availability of common digital art objects in museums

It is visible from the Table (4.9) and Figure (4.4) that among the numerous cultural heritage object categories available in the five museums of national importance, 14 categories are common which are available in at least two museums. It is found from the table that coin, painting, manuscript and arms and armour art object category are available in all the five museums. The textile art object category is available in four museums except NM while decorative art, sculpture, jewellery and seals and sealing art object category is available in three museums. further this table depicts that the bead, bronze collection, terracotta and toy art object category is available in only two museums.

Table 4.9 Common digital art objects in museums

Category	Category available in a number of museums
Coin	05
Painting	05
Manuscript	05
Arms and armour	05
Textile	04
Decorative art	03
Sculpture	03
Seals and sealing	03
Jewelery	03
Bead	02
Terracotta	02
Toy	02
Farman (Letters and treaties)	02
Photographs	02
Bronze collection	02

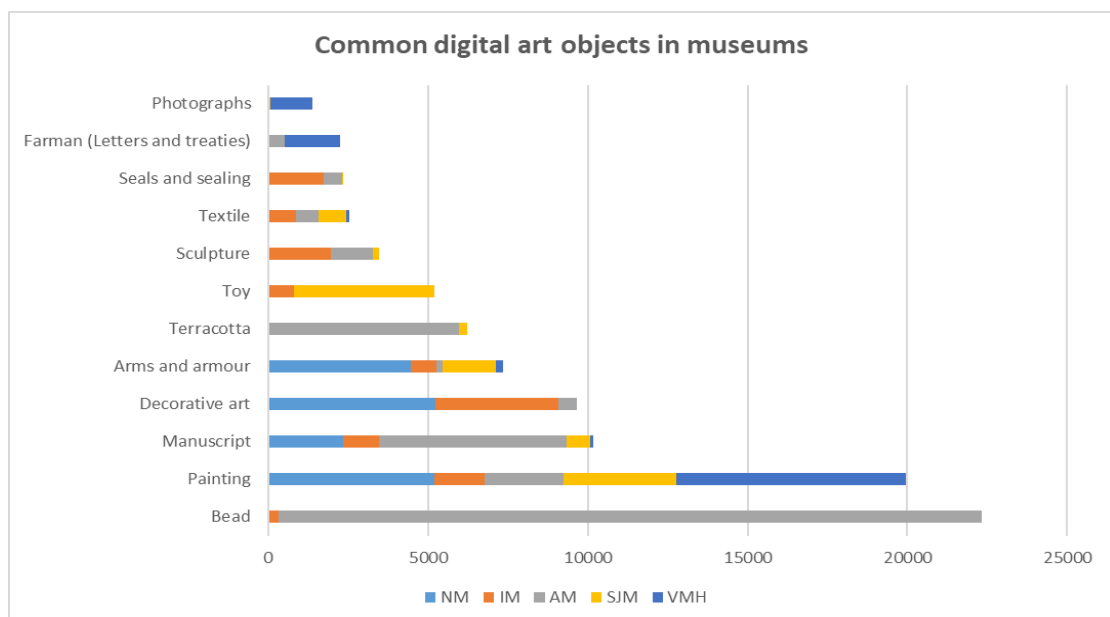


Figure: 4.4 Common digital art objects in museums

#### 4.4.1.6 Category wise available digital common art objects in museums

From the Table (4.10) one can easily assess the category which holds the maximum number of digitised art objects and which museum has the highest collection of that specific art object. Regarding the maximum number of art objects in any category, the table represents that the coin category has the maximum number of art objects and coins were available in all five museums. Out of the total digitised collection in five museums (266915) the collection of coins was 90512 (33.91%) and among all the museums NM has the maximum number of coins (48056, 53%) among all the digitised coins available in five museums followed by AM (21.80%), IM (21.03%), SJM (2.94%) and VMH (1.12%). The second highest art object category among the digitised content available in museums were beads (22325, 8.36%) and this category is available in only two museums namely AM and IM . Out of total bead collection AM has (98.64%) and IM has only (1.36%). The third highest art object category was painting (19884, 7.44%) and it was available in all five museums. The VMH has the maximum number of paintings (36.10%) among all the museums followed by NM (26.15%), SJM (17.73%), AM (12.38%) and IM (7.92%). The collection of manuscripts has the fourth-highest (10161, 3.80%) available collection in museums and it was disclosed from the table that AM (57.82%) has the maximum number of digitised manuscripts followed by NM (23.09%), IM (11.02%), SJM (7.03%) and VMH (1.01%). The fifth category which holds maximum digitised art objects was decorative art (9663, 3.62%) and 54.05% of the decorative pieces were available in NM followed by IM (39.80%) and AM (6.14%). The sixth category which holds the maximum digitised art objects was arms and armour (7344, 2.75%) and 60.75% of the arms were available in NM followed by SJM (22.46%), IM (10.72%), VMH (3.22%) and AM (2.81%). The seventh highest art object category among the

digitised content available in museums was terracotta (2.32%) and this category is available in only two museums namely AM and SJM . Out of total terracotta collection AM has (95.87%) and SJM has only (4.12%). The eight highest art object category was toy collection (5200, 1.94%) and it was available in only two museums. The SJM has 84.86% of the total toy collection while IM has 15.13%.

**Table 4.10 Percentage of Common digital art objects in museums**

Category	NM	IM	AM	SJM	VMH	Total
Coin	48056 (53%)	19039 (21.03%)	19734 (21.80%)	2666 (2.94%)	1017 (1.12%)	90512 (33.91%)
Bead	NA	303 (1.35%)	22022 (98.64%)	NA	NA	22325 (8.36%)
Painting	5200 (26.15%)	1576 (7.92%)	2462 (12.38%)	3527 (17.73%)	7179 (36.10%)	19884 (7.44%)
Manuscript	2347 (23.09%)	1120 (11.02%)	5876 (57.82%)	715 (7.03%)	103 (1.01%)	10161 (3.80%)
Decorative art	5223 (54.05%)	3846 (39.80%)	594 (6.14%)	NA	NA	9663 (3.62%)
Arms and armour	4462 (60.75%)	788 (10.72%)	207 (2.81%)	1650 (22.46%)	237 (3.22%)	7344 (2.75%)
Terracotta	NA	NA	5951 (95.87%)	256 (4.12%)	NA	6207 (2.32%)
Toy	NA	787 (15.13%)	NA	4413 (84.86%)	NA	5200 (1.94%)
Sculpture	NA	1956 (56.46%)	1306 (37.70%)	202 (5.83%)	NA	3464 (1.29%)
Textile	NA	868 (34.07%)	703 (27.60%)	864 (33.92%)	112 (4.39%)	2547 (0.95%)
Seals and sealing	NA	1742 (75.15%)	564 (24.33%)	12 (0.5%)	NA	2318 (0.86%)
Farman (Letters and treaties)	NA	NA	520 (23.23%)	NA	1718 (76.76%)	2238 (0.83%)

Category	NM	IM	AM	SJM	VMH	Total
Photographs	NA	NA	NA	66 (4.75%)	1326 (95.25%)	1392 (0.52%)
Bronze collection	NA	NA	72 (8.36%)	789 (91.63%)	NA	861 (0.32%)
Jewellery	457 (79.06%)	19 (3.28%)	102 (17.64%)	NA	NA	578 (0.21%)

#### 4.4.1.7 Proportion of digitally available art objects in museums

The Table (4.10) represents the various art objects available in the museums and describe the percentage of an individual art object which helps us in understanding that which museum has the maximum number of a particular art object and the minimum number of art objects. However, in the present Table (4.11) researcher calculated the proportion of particular museums in the total available art object among five museums.

**Table 4.11 Proportion of digitally available art objects in museums**

Category	NM	IM	AM	SJM	VMH
Coin	0.59	0.39	0.31	0.05	0.037
Bead	NA	0.006	0.35	NA	NA
Painting	0.06	0.03	0.03	0.07	0.26
Manuscript	0.02	0.02	0.09	0.01	0.003
Decorative art	0.06	0.07	0.009	NA	NA
Arms and armour	0.05	0.01	0.003	0.03	0.008
Terracotta	NA	NA	0.09	0.005	NA
Toy	NA	0.01	NA	0.09	NA
Sculpture	NA	0.04	0.02	0.004	NA
Textile	NA	0.01	0.01	0.01	0.004
Farman (Letters and treaties)	NA	NA	0.008	NA	0.06
Seals and sealing	NA	0.03	0.009	0.0002	NA
Photographs	NA	NA	NA	0.001	0.04
Bronze collection	NA	NA	0.001	0.01	NA
Jewellery	0.005	0.0003	0.001	NA	NA

#### 4.4.1.8 Section II: National Galleries

This section consists of the description of the art objects available in National Gallery of Modern Art (NGMA). The NGMA is working with its head office in New Delhi and two branches in Bengaluru and Mumbai respectively. The art objects available in head office and both branches has discussed in this section.

##### 4.4.1.8.1 Cultural Heritage resources available in National Gallery of Modern Art (NGMA)

The Table (4.12) displayed the collection of NGMA including the collection of head office and both branches. From the table, it was observed that the national galleries of India hold 17000 art objects and among them 14541 objects (85.53%) has been digitised. The table further reveals that out of total digitised collection (14541) NGMA NewDelhi has 86.31% followed by NGMA Mumbai (10.04%) and NGMA Bengaluru (3.64%).

**Table 4.12 Available and digitised art objects in NGMA**

Total available art objects in NGMA	17000
Digitised and available online	14541
Percentage of digitised collection in NGMA	85.53%
Digitised collection in NGMA New Delhi	12551
Digitised collection in NGMA Bengaluru	530
Digitised collection in NGMA Mumbai	1460

##### 4.4.1.8.2 Category wise digitised art objects in NGMA

The Table (4.13) represented that NGMA New Delhi has the maximum digitised art objects (12551) and among them, 57.19% are paintings followed by drawing (15.16%) and sketches (11.70%). The collection of NGMA Bengaluru is very

less (530) and their painting category has the maximum number of objects (75.09%). Regarding the collection of NGMA Mumbai, it was found that they have 1460 of the total digitised objects and they have maximum number of painting collection (95.41%).

**Table 4.13 Category wise digitised art objects in NGMA**

Category	No. of art object			
	NGMA New Delhi	NGMA Bengaluru	NGMA Mumbai	Total
Painting	7179	398	1393	8970
Sketches	1469	NA	NA	1469
Sculpture	102	53	63	218
Drawing	1903	15	04	1922
Print	1142	NA	NA	1142
Collage	46	NA	NA	46
Graphic art	NA	28	NA	28
Ganjifa	NA	19	NA	19
Photograph	710	17	NA	727
<b>Total</b>	<b>12551</b>	<b>530</b>	<b>1460</b>	<b>14541</b>

#### 4.4.1.9 Section III: ASI and NCSM

This section includes the description of art objects available in Archeological Survey of India (ASI) and National Council of Science Museums.

##### 4.4.1.9.1 Archeological Survey of India (ASI)

ASI is engaged in the protection, preservation and conservation of 3693 centrally protected monuments/sites of national importance including 24 World Heritage Property, 52 site museums spread all over India which are directly under the ASI. For the present study, data has been collected by library of ASI situated in New Delhi. ASI started its first phase of digitization in 2007, second phase in 2011 (2011-13) and presently they are working in their III phase and till march 2021 they digitised

18000 books out of 1.20 lakhs (15%) of their collection while they have not digitised their heritage collection consist of manuscripts, rare books, maps and photographs. The collection of ASI has been discussed in the Table (4.14) given below:

**Table 4.14 Collection of ASI**

<b>Art object/ document category</b>	<b>Available art objects/ documents</b>	<b>No. of objects available in digital form</b>
Books	120000	18000
Journals	78	0
Manuscripts	6000	0
Rare books	7200	0
Newspaper	25	0
Maps and atlas	6300	0
Photographs	500000	N.R.

Presently ASI digitised the art objects of its two site museums namely ASI Nagarjunakonda and ASI Goa. The detailed collection of these museums is described in tables as below:

**Table 4.15 Collection of ASI Nagarjunakonda**

<b>Category</b>	<b>No. of art objects</b>
Coin	3636
Pottery	1905
Terracotta	1057
Bead	728
Sculpture	517
Craft object	199
Iron object	134
Shell object	133
Ornament	64
Metal object	10
<b>Total</b>	<b>8450</b>

**Table 4.16 Collection of ASI Goa**

<b>Category</b>	<b>No. of art objects</b>
Coin	200
Sculpture	193
Painting	172
Philately	63
Architecture	38
Arms	36
<b>Total</b>	<b>723</b>

**4.4.1.9.2 National Council of Science Museums (NCSM)**

NCSM was developed with a view to creating awareness on Science & Technology and developing a spirit of scientific inquiry among the people. The Council is the largest network of Science Centres/Museums in the world functioning under a single administrative control. It engages over 14.5 million people annually through its interactive and innovative exhibition units. Regarding the digitization of the collection of NCSM it was found that they do not have historical or cultural objects but NCSM signed a Memorandum of Understanding (MoU) with IIT Kharagpur and IIT Gandhinagar to develop a one-stop Artificial Intelligence (AI) based portal named ‘Gandhipedia’ of works of Mahatma Gandhi to commemorate his 150th birth anniversary. This repository consists of the books, speeches and letters of Gandhi ji. For the portal, NCSM and two other IITs digitised 40 books and 28531 letters from the Collected Work of Mahatama Gandhi (CWMG). The collection of NCSM is given in Table 4.17

**Table 4.17 Collection of NCSM**

<b>Art object/ document category</b>	<b>Available art objects/ documents</b>	<b>No. of objects available in digital form</b>
Books	6293	0
Maps and atlases	86	0

**4.4.1.10 Section IV: NMM, NMMA and GHSM**

In this section, researcher discussed about the three national missions named National Mission for Manuscripts (NMM), National Mission on Monuments and Antiquities (NMMA) and Gandhi Heritage Sites Mission (GHSM). The Ministry of Culture with different objectives started these missions but the major aim of these missions is to digitise and preserve the cultural heritage resources available across the country and make them available online for everyone. The detail of the missions is as follows:

**4.4.1.10.1 National Mission for Manuscripts (NMM)**

One of the major objectives of NMM is to document the manuscripts available in different repositories across the country and develop the largest database of manuscripts in the world. To achieve their aim NMM started its first phase of digitization in 2005 and presently its fifth phase is in progress and until March 2021, they documented 44.07 lakhs manuscripts. They also developed a National database of manuscripts known as “Kritisampada”.

*Phase wise digitization of manuscripts by NMM*

The Table (4.18) revealed the phase wise digitization of manuscripts completed by NMM and it is visible from the table that in the beginning phase NMM planned their digitization program for three years and after that phase every phase has a five-year duration. In their first phase, NMM digitised 17210 manuscripts consists of 2618346 pages and from then they work continuously till the fourth phase they digitised approximately three lakhs (296585) manuscripts consisting more than 2.61 crore (26157821) pages.

Table 4.18 Phase wise digitization of manuscripts

Phase	Duration	No. of digitised manuscripts	No. of digitised pages
I	2005-2007	17210	2618346
II	2007-2012	89994	7944457
III	2012-2014	102912	8019401
IV	2014-2018	86469	7575617
V	2018- march 2021	33415	6842179
<b>Total</b>		<b>330000</b>	<b>33000000</b>

#### *National database of manuscript*

The NMM has uploaded the information of 3.4 million manuscripts on KRITISAMPADA a database of the national manuscripts (<https://www.bharatiyakritisampada.nic.in/>).

#### **4.4.1.10.2 National Mission on Monuments and Antiquities (NMMA)**

The NMMA has created a database of antiquities and built heritage sites with the help of State Departments, Local bodies, NGOs, Universities, Museums and Local communities. Till march 2021 mission uploaded the images and detailed information of 1259866 antiquities and 11406 built heritage on their portal (<http://nmma.nic.in/nmma/aboutNmma.do>). With the help of their portal, anyone can easily assess the valuable and historical antiquities and heritage sites available across the country on a single platform.

#### **4.4.1.10.3 Gandhi Heritage Sites Mission (GHSM)**

The major aim of GHSM is the preservation of literary and visual heritage associated with the father of nation ‘Mahatma Gandhi’ and to achieve the goal mission developed a portal named “Gandhi Heritage Portal” with the collaboration of Sabarmati Ashram Preservation and Memorial Trust, Ahmedabad (SAPMT).

*Gandhi Heritage Portal*

This portal provides a piece of brief information about the fundamental works, speeches, videos, audios, photos and stamps related to Gandhi ji. The detailed description of uploaded until december 2021 on Gandhi heritage Portal is discussed in Table 4.19 as follows

**Table 4.19 Uploaded content on Gandhi Heritage Portal**

<b>Section</b>	<b>Type of data</b>	<b>Pages</b>	<b>Books</b>
Thought of Mahatma Gandhi	Record	1719	-
Photos	Photo	725	-
Videos	Video	45	-
Cartoons	Photo	224	-
Audio	Audio	161	-
Posters	Photo	156	-
Stamps	Photo	728	-
Gandhi heritage sites	Records and files	98	-
Day to Day chronology	Pages	2944	07
Event chronology	Record	07	
Collected works of Mahatma Gandhi	Pages	318336	558
Key text of Mahamta Gandhi	Pages	13480	52
Journals	Pages	415122	14989
Tributes to Gandhiji	Record	255	
Fundamental works	Pages	290460	950
Other books	Pages	315242	1322
MKG collection- Seth MJ Library	Pages	796700	3303
Family Tree	Record	1	
Site language translation	Record	17	
<b>Total content uploaded</b>		<b>2156420</b>	<b>21181</b>

#### **4.5 Reasons for digitising the heritage collection**

The Table (4.20) shows the significant reasons for the digitization and digital preservation of cultural heritage resources in cultural heritage institutions and it was found that among eight reasons most of the administrators/ digitization project heads were strongly agreed or agreed with the given reasons. The first reason for digitising the cultural heritage was to preserve the heritage material for a future generation and it is visible from the table that regarding the preservation of the heritage material for a future generation more than 70% of the respondents were strongly agreed and 27.27% were agreed. The reason behind these responses is that the major objective of CHIs is to preserve the heritage of the country for upcoming generations to know the culture, customs and lifestyle of our ancestors.

The second reason raised in the questionnaire was high demand of users to make these cultural resources online and it can be seen from the table that whether the high demand from users for heritage material in a digital format more than half of the respondents (54.54%) strongly agreed and the remaining digitization project heads agreed with this reason.

The third reason behind digitising the cultural heritage is to save space by replacing the printed material and the opinions of respondents, for this reason, were different. Only 18.18% of the respondents agreed with this reason while 27.27% and 36.36% of the respondents strongly disagreed and disagreed respectively with this reason and two respondents were not responded. The responses received regarding this reason showed that the space acquired by the physical artefacts was not a major reason behind digitising the heritage material because after the digitization of any object museums cannot weed out that object from their museum due to several reasons such as historical value, cost and uniqueness. The major goal behind digitising the maximum

art objects was to increase the access of that object to the maximum users it was accepted by a majority of the respondents.

The fourth reason for digitising the cultural material was to reduce the wear and tear of rare material and out of total responses 54.54% of the respondents agreed with this reason and 36.36% were strongly agreed. The collection of the museums consists of manuscripts, sculptures, drawings, paintings and all these objects required more care in placing them in museums but some times due to mishandling of staff these unique and valuable objects are broken.

The next reason was to enhance the accessibility of art objects 24\*7 from anywhere and this is the very prime reason to digitise the heritage material. In this digital age, everyone wants to access their required information in digital format and at their convenience. The responses obtained in the study also shows that out of 11 respondents 7 (63.63%) were agreed that access to heritage material anytime and from anywhere is one of the major reason for digitizing the cultural resources.

The sixth reason was to make heritage material more discoverable to the broader audience and it is visible from the responses that 45.45% of the respondents were strongly agreed and 54.54% were agreed with this reason. The next reason listed in the table was multiple users can use art objects simultaneously and the responses given to respondents showed that this is one of the major reasons behind digitising the heritage resources because 72.72% of the respondents were strongly agreed and 27.27% were agreed with this reason. It is the advantage of the digital format of any document or art object that many persons at a same can access that specific art object and fulfil their information needs on the contrary in a physical visit to the museums few people can access any object or it is not possible for everyone to visit the museum physically.

The eighth reason was to increase the collaboration for resource sharing and out of total responses 36.36% of respondents were strongly agreed and 54.54% were agreed with this reason. The respondents told that they organised exhibitions collaboratively to represent the various kinds of collections of their museums.

**Table 4.20 - Reasons for digitising the heritage collection**

<b>Reasons for digitizing the heritage collection</b>	<b>Strongly Agree</b>	<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Strongly disagree</b>	<b>Disagree</b>
To preserve the heritage material for future generations	8 (72.72%)	3 (27.27%)	0	0	0
High demand from users for heritage material in digital format	6 (54.54%)	5 (45.45%)	0	0	0
To save space by replacing the printed material	0	2 (18.18%)	2 (18.18%)	3 (27.27%)	4 (36.36%)
To reduce the wear and tear of rare material	4 (36.36%)	6 (54.54%)	1 (9.09%)	0	0
To enhance the accessibility of document/ object 24*7 from anywhere	7 (63.63%)	4 (36.36%)	0	0	0
To make art objects more discoverable to a broader audience	5 (45.45%)	6 (54.54%)	0	0	0
Multiple users can access the information simultaneously	8 (72.72%)	3 (27.27%)	0	0	0
To increase the collaboration for resource sharing	4 (36.36%)	6 (54.54%)	1 (9.09%)	0	0

#### 4.6 Factors considered by CHIs in digitization policy

The Table (4.21) depicts the significant factors considered by heritage institutions in their digitization policy and the results showed that the highly significant factor among the cultural heritage was digital preservation and access to that digitised content to users (81.81%) followed by a selection of material and metadata creation (72.72%). On the other hand quality control (45.45%) and copyright (54.54%) has secured the least consideration in the digitization policy.

**Table 4.21- Factors considered by CHIs in digitization policy**

<b>Factors</b>	<b>Frequency</b>	<b>Percentage</b>
Selection of material	8	72.72%
Metadata creation	8	72.72%
Content creation	7	63.63%
Quality control	5	45.45%
Digital preservation	9	81.81%
Copyright	6	54.54%
Access	9	81.81%

#### 4.7 Criteria used by the cultural heritage institutions while selecting any material for digitization

Table (4.22) represents the frequency of major criteria preferred by CHIs and the Table 4.23 represents rank of the the major criteria used by institutions in the selection of material to be digitised. The selection of material for digitization depends on various factors such as what kind of heritage resources are available in their collection, who are the users of their collection and what are the needs of their users. After getting answers of all the questions authorities of any heritage institute to finalise the major criteria to select any art object to be digitised. In the present study, the researcher enlisted 10 criteria and the respondents were asked to give their opinion in 1

to 5 where 5 is highly considerable and 1 is least considerable. To identify the preferred criteria by respondents here researcher compiled the responses of all the five categories for specific criteria and then calculate the average score. From the responses, it was found that for the preservation for future generation 11 responses were recorded with a maximum of 55 marks and this criterion obtained 48 marks and the highest average score (4.36). On the other hand, providing document delivery service criteria got only 9 responses with an average of 2.33 and obtained only 21 marks out of 45 maximum marks.

**Table 4.22 - Frequency of Criteria used in selecting material for digitisation**

Criteria	Significance					Not responded	Total
	5	4	3	2	1		
Physical condition of a document	5	4	2	0	0	0	47
Cost of the document	2	3	1	3	2	0	33
Demand of the users	3	3	2	1	1	1	36
Academic importance	3	1	2	3	2	0	33
Preservation for a future generation	6	4	0	1	0	0	48
To save the physical Space	0	2	3	2	3	1	24
To increase access to the documents	3	2	3	3	0	0	38
Historical/ cultural value of a document	4	3	2	1	1	0	41
Commercial exploitation/use	0	0	3	4	2	3	19
Providing document delivery service	0	0	5	2	2	2	21

**Table 4.23- Rank-wise Criteria used in selecting material for digitisation**

Criteria	Number of Responses	Maximum Marks (Number of Responses *5)	Marks Obtained	Average marks out of 5
Physical condition of a document	11	55	47	4.27
Cost of the document	11	55	33	3
Demand of the users	10	55	36	3.60
Academic importance	11	55	33	3
Preservation for a future generation	11	55	48	4.36
To save the physical Space	10	55	24	2.40
To increase access to the documents	11	55	38	3.45
Historical/ cultural value of a document	11	55	41	3.72
Commercial exploitation/use	08	40	19	2.37
Providing document delivery service	09	45	21	2.33

#### **4.8 Major challenges faced by heritage institutions in digitising heritage collection**

It is visible from the Table (4.24) that regarding the challenges faced by digitization professionals in cultural heritage the majority of respondents were strongly disagreed or disagreed with the given reasons. From the table, it was found that out of seven listed reasons respondents agreed with four reasons and among them infrastructure /equipment shortfall was the most prominent impediment which was accepted by 5 respondents out of 11 while lack of expertise and selection of material to

be digitised got only 3 and 2 response respectively. For the remaining reasons, the responses were strongly disagreed, disagreed and in some cases, they neither agree nor disagree.

**Table 4.24- Challenges faced by CHIs in digitising heritage collection**

<b>Challenges</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Not responded</b>
Insufficient initial funding	0	0	3	0	1	7
Infrastructure/ equipment shortfall	0	5	2	0	4	0
Lack of expertise	0	3	1	0	5	2
Selection of materials to be digitised	0	1	0	0	6	4
Intellectual Property Rights issues	0	0	1	3	4	3
Lack of training	0	2	3	1	3	2
Storage or Digital Media deterioration	0	0	0	4	5	2

#### **4.9 Preferred collaborative digital activities among the cultural heritage institutions**

The Table (4.25) represents the involvement of CHIs in different collaborative digital activities and regarding this question, all the respondents gave their responses

and out of 11 respondents, the majority of the respondents (81.81%) agreed that their institute is engaged in digital collaborative activities while only 18.18% are not engaged in any collaborative digital activity.

**Table 4.25- Cultural heritage institutes involved in collaborative digital activities**

Name of Institutions	Collaborative digitization activities	
	Yes	No
ASI	✓	
NM	✓	
VMH	✓	
SJM		✓
AM		✓
NCSM	✓	
NMM	✓	
NMMA	✓	
NGMA	✓	
GHSM	✓	
IM	✓	
<b>Total</b>	<b>09</b>	<b>02</b>

The Table 4.25 described the CHIs involved in collaborative digital activities and found that 63.63% of heritage institutes were engaged in any collaborative digital activity but from the above Table (4.26) one can assess that which kind of digital activities was highly preferred by institutes. It was visible from the table that the majority of the respondents accepted that their institute is engaged in the promotion of shared collection (63.63%) followed by creating exhibits from a shared collection (54.54%).

**Table 4.26- Preference of collaborative digital activity by CHIs**

<b>Collaborative digital activity</b>	<b>Frequency</b>
Promotion of Shared Collections	7
Using common sets of standards and best practices for metadata	0
Using a common set of standards and best practices for content creation	0
Submitting collaborative grant proposals	0
Shared digital asset management systems	0
Shared digital preservation programs	4
Creating exhibits from shared collections	6
Shared institutional repositories	1

#### **4.10 Major practices followed for the digital storage and digital preservation of cultural heritage resources**

Table (4.27) shows the preferred master file format in CHIs and it was seen from the responses that more than 50% of institutes prefer TIFF format for their master file. Along with the tiff format, 4 (36.36%) institutes also prefer JPEG format and PDF/PDF-A format in their institute for master files.

**Table 4.27- Preference of master file format by CHIs**

<b>Name of CHI</b>	<b>File Format</b>		
	<b>TIFF</b>	<b>JPEG</b>	<b>PDF/PDF-A</b>
AM	✓	✓	
NM	✓	✓	
IM	NR		
VMH		✓	
SJM	✓		✓

Name of CHI	File Format		
	TIFF	JPEG	PDF/PDF-A
NGMA	✓		
NMM	✓	✓	✓
NMMA	✓		
NCSM			✓
GHSM	NR		
ASI			✓
<b>Total</b>	<b>06</b>	<b>04</b>	<b>04</b>

\*NR= Not Responded

#### 4.10.1 Preferred storage media by CHIs

The storage of digitised content is a very significant task in any cultural heritage and from the Table (4.28) it can be seen that the preferred media for the storage of digitised content. There are various storage mediums were preferred by heritage institutes and they preferred more than one medium of storage to store their content. In the present study, it was found that the majority of institutes prefer online magnetic media/cloud storage to store their digitised material (54.54%) whereas 27.27% institutes prefer optical media and removable magnetic media. It was also found from the table that VMH is the only institute that used all the three mediums of storage (Cloud storage, optical media and removable magnetic media), and SJM, NMM and NCSM prefer two mediums while AM, NM and ASI prefer only one media to store their digitised content.

Table 4.28 Preference of storage media by CHIs

Name of CHI	Storage media		
	Online magnetic media (servers, networked hard drives)/ Cloud storage	Optical media (CD, DVD)	Removable magnetic media (disks, zip disks, HDD)
AM	✓		
NM	✓		
IM	NR		
VMH	✓	✓	✓
SJM	✓		✓
NGMA	NR		
NMM	✓	✓	
NMMA	NR		
NCSM		✓	✓
GHSM	NR		
ASI	✓		
Total	06	03	03

\*NR= Not Responded

#### 4.10.2 Resolutions of access image used by CHI's for specific art object category

The access image resolution used by every museum for any art object varies from one another. To know the preferences of museums for access image resolution, the researcher randomly downloaded 10 images of each type of art object from the collection of every museum. After downloading the image, the properties of every file was opened and under the property, detail menu was opened and information regarding the horizontal resolution and vertical resolution of every image was checked under the image information.

The Table (4.29) discussed the resolution used by cultural heritage institutions in access images. It was observed that for any specific art object category these CHIs used different resolutions in. There are different parameters for scanning the documents of various categories, the majority of the institutes prefer 72 DPI (Dots per Inches) for cultural objects while in some cases they also used 96 DPI, 240 DPI, 300 DPI and 600 DPI. Regarding the collection of painting out of 5 museums, 4 museums used 72 DPI while only SJM used 96 DPI to describe the details of their digitised paintings. In the case of AM it was observed that they used 72 DPI and 240 DPI both to describe the digital paintings. The collection of coins was mostly captured by institutes in 72 DPI but only SJM used 96 DPI. The AM and IM along with 72 DPI also used 300 DPI for coins. The majority of the manuscripts in the heritage institutes were scanned in 72 DPI while only two museums AM also used 300 DPI and SJM used 96 DPI for their manuscripts. Arms and armour were available in all the 5 museums and out of 5 museums 4 museums digitised their arms on 72 DPI while AM used 300 DPI. It was observed from the table that VMH and SJM used 96 DPI to scan their arms collection. The collection of sculptures was also available in all the 5 museums and 4 museums used 72 DPI to digitise their sculptures while AM and NGMA used 300 DPI for sculptures but SJM used different DPI from others and they used 96 DPI for sculptures. The collection of jewellery is also available in four museums and in digitising the jewellery only two museums (NM and VMH) used 72 DPI but NM also used 240 DPI in some cases. The AM used 350 DPI for their jewellery collection while SJM used 96 DPI to scan their jewellery collection. The decorative art collection is available in the three CHIs (AM, NM and IM) and they all used 72 DPI to scan their decorative pieces. The collection of beads is available in only two museums (AM and NM) but these museums used different DPI's to describe their bead collection. The bronze collection

has been collected by the two museums (AM and SJM) and they both used 72 DPI to scan these collections but AM also used 300 DPI for some bronze objects similarly SJM also used 96 and 300 DPI in some cases. The photographs are available in the three CHIs (VMH, SJM and NGMA) and two of them (VMH and NGMA) used 72 DPI for photographs, while SJM used 96 DPI for scanning the photographs. The collection of seals and sealings is available in only two museums (AM and NM) and both museums used 72 DPI in scanning the seals and sealings. But in some cases, SJM used 96 and 300 DPI for seals and sealings. Regarding the collection of drawings, it was observed that only two museums (NGMA and SJM) have this collection and both museums used 72 DPI while also using 96 DPI in digitizing their drawing collection.

The resolution used by different CHIs for several categories of art objects, it was found that there is not a uniform standard followed by CHIs during the scanning of the documents to be digitised. The Library of Congress (LOC) and The National Library of Australia (NLA) have recommended the image capture standard/ image quality standard for digitizing the documents (NLA, 2021). The Library of Congress (LOC,n.d.) recommended the use of 8-bit grayscale and 24-bit colour for the documents and they used 300 PPI for image printed text document and 400 PPI for OCR text. In the case of the manuscript, LOC used 300ppi for access files and for the maps they prefer 250ppi and for the photographs they used 300ppi. On the contrary, NLA used different bit scales for grey and coloured images, NLA used 48 bits per pixel and for the greyscale 24 bits per pixel. Regarding the usage of the resolution, NLA used 400 PPI for larger than A4 images and in the case of maps 600ppi. For the documents between A5 and A4, they prefer 600ppi; for A7 to A6 size documents, they used 1200ppi; and under A7, documents are scanned at 2000 ppi. For more details of standards please see appendices.

Table 4.29 Resolutions used by CHI's

S. No.	Object Type	Museums					
		AM	IM	NM	VMH	SJM	NGMA
1	Painting	72/240	72	72	72	96	72
2	Coin	72/300	72/300	72	72	96	NA
3	Manuscript	72/300	72	72	72	72/96	NA
4	Arms and Armour	300	72	72	72/96	72/96	NA
5	Sculpture	300	72	NA	72	72/96	72/300
6	Jewellery	350	72/240	72	NA	96	NA
7	Decorative Art	72/300/400	72	72	NA	NA	NA
8	Textile	300	72/300	NA	72	96	NA
9	Bead	300/350	72/240/300	NA	NA	NA	NA
10	Bronze Collection	72/300	NA	NA	NA	72/96/300	NA
11	Photographs	NA	NA	NA	72/96	96/300	72/300
12	Seals and sealings	72	72/96/300	NA	NA	NA	NA
13	Terracotta	72/300	NA	NA	NA	96	NA
14	Drawing	NA	NA	NA	NA	72/96	72

\*All numbers are in Dot per Inches (DPI).

\*NA= Not Applicable

#### 4.11 File naming convention

File naming is a significant task in any institute that holds a vast collection and it is also essential for the staff of organisations in many ways. By following the proper file naming convention, one can easily search their required files among the database or on their computer helps in better retrieval. In the present study, researcher had go through the several access images of different art objects and downloaded them. In that

case, the automatically saved file name has been taken as its original file name under the file naming convention. CHIs have a huge collection consisting of a variety of art objects and it is essential for them to follow the file naming conventions for easier reach to the required files.

The Table (4.30) displays the file naming convention followed by the museums and it was observed from the table that every museum used the basic guidelines for naming convention which include a to z character, 0-9 number, hyphen and underscore. The common element among the file name followed by museums is the location of the museum in the second element of every museum file and it can easily recognize in the file name. In the files of Allahabad Museum, researcher can see their location in the filename as 'ald', 'kol' in the files of Indian Museum and Victoria Memorial Hall Museum, 'del' in the files of National Museum and 'hyd' in the files of Salajung Museum. From the above-discussed table, it was also visible that only AM used the characters in file naming related to the art object category such as files related to coin category includes COIN character in file name similarly in painting related file they include MIN which means miniature painting, regarding the file related to the manuscript they used MSS, for textile-related files AM used TXT and for the files related to arms and armour collection AM used ARM character. Other than AM, every museum used a different file naming convention as per their standards. Further, it was observed that each museum used different elements in their file naming.

Above table depicts that there is a lack of uniformity in file naming conventions used by CHIs. The National Archives and Records Administration (NARA Bulletins, 2015), US developed a standard for the file naming and the major points considered by them in file naming are as follows:

- File names should contribute to a file path that contains no more than 255 characters in total length.

- Folders should include only combinations of the characters a-z, the numbers 0-9, and underscores (\_) and hyphens (-).
- File names should not contain spaces.

**Table 4.30 CHIs and file naming convention**

Art object category	Name of cultural heritage	File naming convention
Coin	AM	alh_ald-AM-COIN-18801-30794_01_h
	IM	im_kol-1-Ahmad-Shah-I--63113_01_h
	NM	nat_del-51-50-1-4961_01_h
	SJM	sjm_hyd-ACQ-67-20-2-11-48999_01_h
	VMH	vmh_kol-R1050-106_01_h
Painting	AM	alh_ald-AM-MIN-647-1132_01_h
	IM	im_kol-AT-66-3-48054_01_h
	NM	nat_del-47-110-411-46905_01_h
	SJM	sjm_hyd-CS-II-45-48539_01_h
	VMH	vmh_kol-C179-16721_01_h
Manuscript	AM	alh_ald-1AM-MSS-64-224-16901_01_h
	IM	im_kol-AT-6-30-P--34441_01_h
	NM	nat_del-M-81-234-51-8976_01_h
	SJM	sjm_hyd-ACQ-73-83-2587_01_h
	VMH	vmh_kol-R431-C230-2569_01_h
Arms and armour	AM	alh_ald-AM-ARM-659-7675_01_h
	IM	im_kol-1663-18001_01_h
	NM	nat_del-L-77-10-14688_01_h
	SJM	sjm_hyd-ACQ-62-206-6-889_01_h
	VMH	vmh_kol-R2050-1740_01_h
Textile	AM	alh_ald-AM-TXT-628-19778_01_h
	IM	im_kol-9139-10405_01_h
	SJM	sjm_hyd-ACQ-85-154-3332_01_h
	VMH	vmh_kol-C977-20610_01_h

#### 4.12 Preferred metadata entry elements by CHIs

National Information Standards Organization (NISO) defined metadata as “structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource” (NISO, 2004). To make heritage documents more useful, informative and accessible CHIs used various metadata entry elements such as title, accession number, museum name, gallery name, object type, manufacturing technique, main material, component material, main artist or author, country, origin place, find place, provenance, patron or dynasty, brief description and detailed description associated with object such as painting, sculpture, manuscript, beads, decorative art and textile. The information covered by these metadata entry elements are capable to fulfil the queries related to historical, cultural, management and bibliographical aspects of the associated art object.

##### 4.12.1 Metadata entry elements used for painting

Table 4.31 represents the metadata elements used for the paintings in various museums of India and it was found that a maximum of 27 elements were used for paintings in AM followed by NM (19), IM (15), SJM (15) and VMH (14).

**Table 4.31 Art object category: Painting**

Element	AM	NM	VMH	IM	SJM
Title	✓	✓	✓	✓	✓
Accession Number	✓	✓	✓	✓	✓
Museum Name	✓	✓	✓	✓	✓
Gallery Name	✓	✓		✓	✓
Object Type	✓	✓	✓	✓	✓
Main Material	✓	✓		✓	✓
Component Material II	✓				

Element	AM	NM	VMH	IM	SJM
Manufacturing Technique	✓		✓		
Medium	✓	✓	✓	✓	
Main Artist	✓	✓	✓	✓	✓
Artist's Nationality	✓	✓	✓	✓	✓
Artist's Life Date/Biodata	✓		✓		✓
Country	✓	✓		✓	✓
Provenance	✓	✓	✓		✓
Origin Place	✓	✓			✓
Find Place		✓		✓	
Period/Year of work	✓	✓	✓		✓
Patron/Dynasty	✓				
Style	✓	✓	✓		
School	✓	✓		✓	
Culture	✓				
Inscription	✓	✓		✓	
Tribe	✓				
Costume	✓				
Dimension	✓	✓	✓	✓	✓
Historical Note	✓				
Brief Description	✓	✓	✓	✓	✓
Detailed Description	✓				
<b>Total</b>	<b>28</b>	<b>19</b>	<b>14</b>	<b>15</b>	<b>15</b>

#### 4.12.2 Metadata entry elements used for coin

Table 4.32 describes the metadata elements used for the coins in CHIs and shows that the AM used the maximum number (34) of elements to describe their coins while the least records were used by VMH (9).

Table 4.32 Art object category: Coin

Element	AM	NM	VMH	IM	SJM
Title	✓	✓	✓	✓	✓
Title 2	✓				
Accession Number	✓	✓	✓	✓	✓
Museum Name	✓	✓	✓	✓	✓
Gallery Name	✓	✓			✓
Object Type	✓	✓	✓	✓	✓
Main Material	✓	✓	✓	✓	✓
Component Material II	✓				
Manufacturing Technique	✓	✓			
Medium	✓				
Main Artist	✓				
Artist's Nationality	✓	✓			
Artist's Life Date/Biodata	✓				
Author	✓				
Country	✓	✓		✓	✓
Provenance	✓		✓		✓
Origin Place	✓				✓
Find Place	✓				
Period/Year of work	✓	✓	✓	✓	✓
Patron/Dynasty	✓	✓		✓	✓
Style	✓	✓			
School	✓				
Scribe	✓				
Script	✓	✓			
Culture	✓	✓			
Inscription	✓	✓			

Element	AM	NM	VMH	IM	SJM
Mint	✓		✓		
Denomination	✓				
Weight	✓			✓	✓
Dimension	✓	✓		✓	✓
Brief Description	✓	✓	✓		✓
Detailed Description	✓				
Coin Description Obverse	✓			✓	✓
Coin Description Reverse	✓			✓	✓
<b>Total</b>	<b>34</b>	<b>17</b>	<b>9</b>	<b>12</b>	<b>16</b>

#### 4.12.3 Metadata entry elements used for manuscript

Table 4.33 depicts that the maximum number of metadata elements for manuscripts were used in AM (30) followed by VMH (21) and NM (19).

**Table 4.33 Art object category: Manuscript**

Element	AM	NM	VMH	IM	SJM
Title	✓	✓	✓	✓	✓
Title 2	✓		✓		
Accession Number	✓	✓	✓	✓	✓
Museum Name	✓	✓	✓	✓	✓
Gallery Name	✓	✓	✓		✓
Object Type	✓	✓	✓	✓	✓
Main Material	✓	✓	✓	✓	✓
Component Material II	✓	✓	✓	✓	
Manufacturing Technique		✓			
Medium	✓		✓		
Main Artist	✓				
Author	✓	✓	✓		
Artist's Nationality	✓			✓	
Artist's Life Date/Biodata	✓		✓		

Element	AM	NM	VMH	IM	SJM
Country				✓	✓
Provenance	✓		✓	✓	✓
Language	✓	✓	✓		
Origin Place	✓			✓	✓
Find Place	✓				
Period/Year of work	✓	✓		✓	✓
Patron/Dynasty	✓	✓			
Style	✓	✓			
School	✓			✓	
Scribe	✓	✓	✓		
Script	✓	✓	✓		✓
Subject	✓	✓	✓		
No. of folios	✓	✓	✓		
No. of illustrations	✓		✓		
Inscription	✓		✓	✓	
Dimension	✓	✓	✓	✓	✓
Brief Description	✓	✓	✓	✓	✓
Detailed Description	✓				
<b>Total</b>	<b>30</b>	<b>19</b>	<b>21</b>	<b>15</b>	<b>13</b>

#### 4.12.4 Metadata entry elements used by NMM for manuscripts

From the Table (4.33) it was found that manuscript is available in all the five museums of national importance but apart from these museums, the National Mission for Manuscripts also plays a significant role in documenting and cataloguing Indian manuscripts. From the table (4.33) it was revealed that AM used 30 metadata elements to describe their manuscripts followed by VMH (21), NM (19), IM (15) and SJM (13) but NMM is specific program dedicated toward the digitization of manuscripts so there metadata entry elements are different from other museums and they have a huge list of elements to describe their manuscripts.

The table 4.34 depicts the metadata elements used by NMM for manuscript and it was found that NMM used 51 metadata entry elements to describe their manuscripts. Table also revealed that there are only 17 common metadata elements that are used by other CHIs in describing their manuscripts.

**Table 4.34 Metadata elements used by NMM for manuscripts**

S.No.	Name of metadata element	Availability of metadata element in manuscripts of museums
1	Manus Id	-
2	MRC Name (Manuscript Resource Centre)	-
3	Institute name	AM, NM, VMH, IM, SJM
4	Title of the text	AM, NM, VMH, IM, SJM
5	Other Title	AM, VMH
6	Title in other languages	-
7	Record No.	-
8	Author	AM, NM, VMH
9	Scribe	AM, NM, VMH
10	Language	AM, NM, VMH
11	Script	AM, NM, VMH, SJM
12	Commentary	-
13	Commentator	-
14	Language of the commentary	-
15	Script commentary	-
16	Sub-commentary	-
17	Sub-commentator	-
18	Language of the Sub-commentary	-
19	Script of the sub-commentary	-
20	Bundle No.	-
21	Acc.No. / Man No.	AM, NM, VMH, IM, SJM
22	digitization	-

S.No.	Name of metadata element	Availability of metadata element in manuscripts of museums
23	Complete/Incomplete	-
24	No. of folios	AM, NM, VMH
25	No. of Pages	-
26	Size length	AM, NM, VMH, IM, SJM
27	Size width	AM, NM, VMH, IM, SJM
28	Size height	AM, NM, VMH, IM, SJM
29	Material	AM, NM, VMH, IM, SJM
30	Condition	-
31	Subject 1	AM, NM, VMH
32	Subject 2	-
33	Subject 3	-
34	Date of data collection	-
35	Date of manuscript – Samvat	-
36	Date of manuscript - Century	AM, NM, IM, SJM
37	Illustrations	-
38	Illustrations type	-
39	No. of illustrations	AM, VMH
40	Illustrations quality	-
41	Manuscript type	-
42	Awarded manuscript	-
43	Landscape view	-
44	Awarded manuscript order	-
45	No. of lines per page	-
46	Beginning line	-
47	End line	-
48	Colophon	-
49	Description	AM, NM, VMH, IM, SJM
50	Christian Era	-
51	Extra Remarks	-

*Technical specification used by NMM*

Regarding the technical specification for the digitization of manuscripts NMM used the following specifications:

*File Type*

For raw master image NMM prefer Tiff (uncompressed) 300 DPI, for clean master image they prefer Tiff (compressed) 300 DPI and for access image they used JPEG/PDF-A 1024\*768 pixels

*File naming-*

NMM named their images/files according to Manus Id generated by the cataloguing software of NMM called Manus Granthavali. Manus Granthavali is based on Dublin Core Metadata Standards that are universally accepted.

*Storage of digitised content-*

NMM used DVD's and hard disks for the short-term storage and for long-term storage they prefer cloud storage.

**4.12.5 Metadata entry elements used for arms and armour**

It is visible from Table 4.35 that the maximum number of metadata elements for arms and armour were used by IM (16) while AM and VMH both used 11 records to describe their arms and armour collection objects.

Table 4.35 Art object category: Arms and Armour

Element	AM	NM	VMH	IM	SJM
Title	✓	✓	✓	✓	✓
Accession Number	✓	✓	✓	✓	✓
Museum Name	✓	✓	✓	✓	✓
Gallery Name	✓	✓		✓	✓
Object Type	✓	✓	✓	✓	✓
Main Material	✓	✓	✓	✓	✓
Component Material II		✓		✓	✓
Manufacturing Technique	✓	✓			
Main Artist			✓		
Artist's Nationality			✓		
Country		✓		✓	✓
Provenance			✓	✓	✓
Origin Place		✓		✓	✓
Find Place				✓	
Period/Year of work	✓	✓	✓	✓	✓
Inscription				✓	
Tribe				✓	
Dimension	✓	✓	✓	✓	✓
Brief Description	✓	✓		✓	✓
Detailed Description	✓		✓		
<b>Total</b>	<b>11</b>	<b>13</b>	<b>11</b>	<b>16</b>	<b>13</b>

#### 4.12.6 Metadata entry elements used for sculpture

Table 4.36 discussed the details of metadata elements used to describe the sculptures available in several museums and found that the maximum number of records were used by AM (18) followed by SJM (15) and IM (11).

Table 4.36 Art object category: Sculpture

Element	AM	IM	SJM
Title	✓	✓	✓
Accession Number	✓	✓	✓
Museum Name	✓	✓	✓
Gallery Name	✓	✓	✓
Object Type	✓	✓	✓
Main Material	✓	✓	✓
Component Material II	✓		
Manufacturing Technique	✓		
Main Artist	✓		
Country		✓	✓
Provenance	✓		✓
Origin Place	✓	✓	✓
Find Place	✓		✓
Period/Year of work	✓	✓	✓
Patron/Dynasty	✓		✓
Style	✓		
School			✓
Dimension	✓	✓	✓
Brief Description	✓	✓	✓
Detailed Description	✓		
<b>Total</b>	<b>18</b>	<b>11</b>	<b>15</b>

#### 4.12.7 Metadata entry elements used for textile

It was found from the above Table (4.37) that to briefly describe the textile art objects available in museums the maximum number of metadata elements were used by IM (17) while least by VMH (9).

Table 4.37 Art object category: Textile

Element	AM	VMH	IM	SJM
Title	✓	✓	✓	✓
Accession Number	✓	✓	✓	✓
Museum Name	✓	✓	✓	✓
Gallery Name	✓	✓	✓	✓
Object Type	✓	✓	✓	✓
Main Material	✓	✓	✓	✓
Component Material II			✓	✓
Manufacturing Technique	✓			
Country	✓		✓	✓
Provenance	✓	✓	✓	✓
Origin Place			✓	✓
Find Place			✓	
Period/Year of work			✓	✓
School			✓	
Inscription			✓	
Tribe			✓	
Dimension	✓	✓	✓	✓
Brief Description	✓	✓	✓	✓
Detailed Description	✓			
<b>Total</b>	<b>12</b>	<b>9</b>	<b>17</b>	<b>13</b>

#### 4.12.8 Metadata entry elements used for jewellery

Table 4.38 expressed that to describe the jewellery art object NM used 13 metadata elements while AM and IM both used 11 elements.

Table 4.38 Art object category: Jewellery

Element	AM	NM	IM
Title	✓	✓	✓
Title 2		✓	
Accession Number	✓	✓	✓
Museum Name	✓	✓	✓
Gallery Name	✓	✓	
Object Type	✓	✓	✓
Main Material	✓	✓	✓
Manufacturing Technique	✓	✓	
Artist's Nationality		✓	
Country	✓	✓	✓
Provenance			✓
Origin Place			✓
Period/Year of work	✓	✓	✓
Dimension	✓	✓	✓
Brief Description		✓	✓
Detailed Description	✓		
<b>Total</b>	<b>11</b>	<b>13</b>	<b>11</b>

#### 4.12.9 Metadata entry elements used for decorative art

To describe the decorative art objects AM used 26 metadata elements (from Table 4.39) on the other hand NM and IM used only 12 aspects to describe their decorative art objects.

Table 4.39 Art object category: Decorative Art

Element	AM	NM	IM
Title	✓	✓	✓
Title 2	✓		
Accession Number	✓	✓	✓
Museum Name	✓	✓	✓
Gallery Name	✓	✓	
Object Type	✓	✓	✓
Main Material	✓	✓	✓
Component Material II	✓		
Manufacturing Technique	✓	✓	✓
Main Artist	✓		
Artist's Nationality	✓		
Country	✓	✓	✓
Provenance	✓		✓
Origin Place	✓	✓	✓
Find Place	✓		
Period/Year of work	✓	✓	✓
Patron/Dynasty	✓		
Style	✓		
School	✓		
Scribe	✓		
Culture	✓		
Inscription	✓		
Tribe	✓		
Costume	✓		
Dimension	✓	✓	✓
Brief Description		✓	✓
Detailed Description	✓		
<b>Total</b>	<b>26</b>	<b>12</b>	<b>12</b>

## 4.12.10 Metadata entry elements used for bead

It is visible from the Table 4.40 that to describe the bead art object AM used 24 metadata elements while IM used only 12 elements.

Table 4.40 Art object category: Bead

Element	AM	IM
Title	✓	✓
Title 2	✓	
Accession Number	✓	✓
Museum Name	✓	✓
Gallery Name	✓	
Object Type	✓	✓
Main Material	✓	✓
Component Material II	✓	
Manufacturing Technique	✓	
Main Artist	✓	
Author	✓	
Country	✓	✓
Provenance	✓	✓
Origin Place	✓	✓
Find Place	✓	
Period/Year of work	✓	✓
Patron/Dynasty	✓	
School	✓	
Scribe	✓	
Culture	✓	✓

Element	AM	IM
Inscription	✓	
Costume	✓	
Dimension		✓
Brief Description	✓	✓
Detailed Description	✓	
<b>Total</b>	<b>24</b>	<b>12</b>

#### 4.12.11 Metadata entry elements used for bronze collection

Table 4.41 discussed the elements used to describe the bronze collection available in heritage institutions and found that AM used 28 metadata elements while SJM used only 18 elements to describe their bronze collection objects.

**Table 4.41 Art object category: Bronze Collection**

Element	AM	SJM
Title	✓	✓
Title 2	✓	✓
Accession Number	✓	✓
Museum Name	✓	✓
Gallery Name	✓	✓
Object Type	✓	✓
Main Material	✓	✓
Manufacturing Technique	✓	
Main Artist	✓	
Artist's Nationality	✓	
Artist's Life Date/Biodata	✓	

Element	AM	SJM
Author	✓	
Country	✓	✓
Provenance	✓	✓
Origin Place	✓	✓
Find Place	✓	✓
Period/Year of work	✓	✓
Patron/Dynasty	✓	✓
Style	✓	✓
School	✓	✓
Scribe	✓	
Culture	✓	
Inscription	✓	✓
Tribe	✓	
Costume	✓	
Dimension	✓	✓
Brief Description	✓	✓
Detailed Description	✓	
<b>Total</b>	<b>28</b>	<b>18</b>

#### 4.12.12 Metadata entry elements used for seals and sealing

Table 4.42 depicts the metadata elements to describe the seals and sealing collection available in museums and shows that AM and SJM used 12 elements to describe tier seals and sealing art objects while IM used 11 elements.

Table 4.42 Art object category: Seals and sealing

Element	AM	IM	SJM
Title	✓	✓	✓
Accession Number	✓	✓	✓
Museum Name	✓	✓	✓
Gallery Name			✓
Object Type	✓	✓	✓
Main Material	✓	✓	✓
Country	✓	✓	✓
Provenance		✓	✓
Origin Place	✓	✓	✓
Find Place	✓		
Period/Year of work	✓	✓	✓
Dimension	✓	✓	✓
Brief Description	✓	✓	✓
Detailed Description	✓		
<b>Total</b>	<b>12</b>	<b>11</b>	<b>12</b>

#### 4.12.13 Metadata entry elements used for terracotta

To describe the terracotta art objects AM used 17 (from Table 4.43) metadata elements, on the other hand, SJM used only 12 aspects to describe their terracotta art objects.

Table 4.43 Art object category: Terracotta

Element	AM	SJM
Title	✓	✓
Accession Number	✓	✓
Museum Name	✓	✓
Gallery Name	✓	✓
Object Type	✓	✓
Main Material		✓
Manufacturing Technique	✓	
Artist's Nationality	✓	
Country	✓	✓
Provenance		✓
Origin Place	✓	✓
Find Place	✓	
Period/Year of work	✓	✓
Patron/Dynasty	✓	
Style	✓	
School	✓	
Dimension	✓	✓
Brief Description	✓	✓
Detailed Description	✓	
<b>Total</b>	<b>17</b>	<b>12</b>

#### 4.12.14 Metadata entry elements used for toy

It is visible from Table 4.44 that the maximum number of metadata elements for toy collection was used by IM (15) while SJM used 12 records to describe their toy collection objects.

Table 4.44 Art object category: Toy

Element	IM	SJM
Title	✓	✓
Accession Number	✓	✓
Museum Name	✓	✓
Gallery Name	✓	✓
Object Type	✓	✓
Main Material	✓	✓
Country	✓	✓
Provenance	✓	✓
Origin Place	✓	✓
Find Place	✓	
Period/Year of work	✓	✓
Inscription	✓	
Tribe	✓	
Dimension	✓	✓
Brief Description	✓	✓
<b>Total</b>	<b>15</b>	<b>12</b>

#### 4.13 Number of metadata entry elements used different by museums for art objects

Table (4.45) displays the number of metadata entry elements used by museums to describe the art objects of various categories. It is visible from the table that each museum used a different number of metadata elements to describe specific art objects. The painting category art objects were available in all the five museums and AM used the maximum number of metadata elements (28) to describe art objects under the painting collection whereas NM used 19 metadata elements, IM and SJM both used 15 elements and the least number of metadata elements were used by VMH (14).

Regarding the collection of coins it was revealed from the table that the maximum number of metadata elements used to describe the coin category was used by AM (34) followed by NM (17), SJM (16), IM (12) and VMH (09). To describe the manuscript collection museums used a different number of metadata elements and the maximum elements were used by AM (30) followed by VMH (21), NM (19), IM (15) and SJM (13). The maximum number of metadata elements used to describe the arms and armor collection was used by IM (16) on the other hand VMH and SJM used 13 elements while AM and VMH both used 11 elements. The textile art object category was available in four museums and the maximum number of metadata elements used to describe the textile art objects was used by IM (17) followed by SJM (13), AM (12) and VMH (09). The sculpture art object category was available in only three museums and AM used the maximum number (18) of metadata elements to describe their sculpture collection followed by SJM (15) and IM (11). To describe the jewellery collection AM and IM both the museums used 11 metadata elements while NM used 13 elements. The decorative art collection was available in the three museums and the maximum number of art objects to describe decorative art pieces was used by AM (26) on the other hand NM and IM both museums used only 12 metadata elements. The bead art object category was available in only two museums of national importance and AM used 24 metadata elements to describe their bead collection while IM used only 12 elements. Regarding the bronze collection it was revealed from the table that only two museums have this category and AM used the maximum number (28) of metadata elements to describe their bronze collection followed by SJM (18). The seals and sealings collection was available in the three museums and two museums namely AM and SJM both used 12 elements to describe their seals and sealing collection whereas IM used 11 elements. To describe the terracotta collection of AM used 17 metadata elements while SJM used only 12 elements. The toy collection is available in only two

museums and both museums used a different number of metadata elements and the maximum elements were used by IM (15) followed by SJM (12)

**Table (4.45) Number of metadata entry elements used by museums**

Art object category	No. of metadata entry elements used by museums				
	AM	NM	VMH	IM	SJM
<b>Painting</b>	28	19	14	15	15
<b>Coin</b>	34	17	09	12	16
<b>Manuscript</b>	30	19	21	15	13
<b>Arms &amp; Armour</b>	11	13	11	16	13
<b>Sculpture</b>	18	NA	NA	11	15
<b>Textile</b>	12	NA	09	17	13
<b>Jewellery</b>	11	13	NA	11	NA
<b>Decorative art</b>	26	12	NA	12	NA
<b>Bead</b>	24	NA	NA	12	NA
<b>Bronze collection</b>	28	NA	NA	NA	18
<b>Seals and sealings</b>	12	NA	NA	11	12
<b>Terracotta</b>	17	NA	NA	NA	12
<b>Toy</b>	NA	NA	NA	15	12

#### 4.14 Conclusion

This chapter deals with the analysis of the data collected from the respondents of the study. The analysis will help in figure out the status of digitization and digital preservation in CHIs and the different aspects related to the cultural heritage resources such as major reasons to digitize these resources, barriers in digitising these resources, major digital collaborative activities and the major practices followed CHIs in their digitization initiatives. The next chapter will elaborates the major finding drawn from the analysis.

**References**

National Library of Australia (2021). Image capture standards. Retrieved from:

<https://www.nla.gov.au/about-us/corporate-documents/policy-and-planning/standards/digitization-guidelines/image-capture>

Library of congress (n.d.). Image standard Retrieved from:

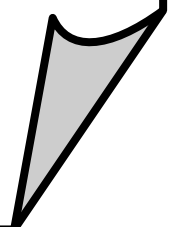
<https://memory.loc.gov/ammem/about/techStandards.pdf>

NARA Bulletines (2015). Bulletin 2015-04 Appendix B Retrieved from

<https://www.archives.gov/records-mgmt/bulletins/2015/2015-04-appendix-b.html>



*Chapter 5*  
*Findings, Suggestions, and*  
*Conclusion*



## CHAPTER 5

### **FINDINGS, SUGGESTIONS, AND CONCLUSION**

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#### **5.1 Introduction**

The present study was conducted to represent the actual picture of the digitization and preservation of heritage materials available in the cultural heritage institutions across the country. This chapter explains the findings of the study concerning the objectives of the survey with conclusions and suggestions that can be drawn from the analysis and interpretation of data. The study also highlighted the rich cultural heritage available in the museums, national galleries, and the national missions, with the aim of digitising and preserving the manuscripts, antiquities, and the fundamental works of Mahatma Gandhi. This chapter concludes with suggestions and recommendations based on the responses and the content analysis of the official websites of the cultural heritage institutions. The following findings are purely based on data collected through questionnaires and observations from the administrators/digitization project heads in the CHIs.

#### **5.2 General information about the respondents**

##### ***5.2.1 Educational qualification of the respondents***

It was revealed from the results that out of 11 respondents, 36.36% have doctoral degrees, 58.33% have master's degrees, and 8.33% have an MPhil degree.

##### ***5.2.2 Designation of the respondents***

It was indicated from the analysis that 7 respondents (63.63%) were curators, 2 respondents were deputy curators (16.66%), 1 respondent was Assistant library and Information Officer (ALIO) in the CHIs.

### 5.2.3 Experience of the respondents

Out of 11 respondents in the study, 50% of the respondents (6) have experience of more than 20 years, three respondents (25%) have experience of 15-20 years, and two respondents have experience of 10-15 years.

### 5.3 Objective wise findings

In this section, the findings of the study have been discussed in the light of the objectives taken at the beginning of the study. The first objective of the study was:

*Objective 1: To identify the types of cultural heritage resources available in the cultural heritage institutions of India.*

Regarding the available cultural heritage resources in the museums, the results of the study indicated that a more than 13.64 lakhs (1364627) art objects are available in the five museums, and among them, IM holds the maximum number of art objects (10.08 lakhs), followed by NM (200000), AM (72000), SJM (56233) and VMH (28394). Further the study revealed that out of total cultural heritage resources IM have 73.86% of the total art objects available in these museums, followed by NM (14.65%), AM (5.27%), SJM (4.12%) and VMH (2.08%).

Above paragraph indicated the overall availability of art object in museums. Here researcher explained the category wise availability of art objects in each museum and found that among the collections of NM, the Numismatic and Epigraphy (59.33%) category has the highest number of artefacts, followed by the anthropology collection (6.91%) and decorative art objects (6.44%). On the other hand, jewellery (0.56%), PCWA (1.46%) and Prehistory collection (2.10%) of the museum have the least number of art objects.

Under the collection of IM again, the coin category has the maximum number of objects (39.06%), while tools (10.90%) and ornaments (8.65%) categories have the second and third highest object category and jewellery (0.03%) category has the minimum number of objects. Further, it was viewed that AM has more than 20 categories of objects and among them beads (35.14%) have the maximum number of objects followed by coins (31.49%) and terracotta (9.49%). On the contrary, the least digitised categories in the museum were the bronze collection (0.11%) followed by literary art objects (0.13%) and jewellery (0.16%).

In case of SJM, it was seen from the analysis that more than 150 kinds of art object categories and among them Porcelain category holds the maximum number of art objects (13.38%), followed by soldiers (9.56%) and toy army collection (9.28%). Whereas, VMH has the largest collection in the philately category (48.69%), followed by paintings (30.26%), and documents (6.35%). On the other hand, the categories which have the least number of objects are busts and statuary (0.18%), followed by manuscripts (0.38%) and textiles (0.41%).

Likewise museums are the hub of different types of cultural heritage resources in the same way, national galleries, and national missions have also valuable cultural heritage resources and it was observed that NGMA has a collection of over 17,000 objects, including its head office and two branches (Mumbai and Bengaluru), and they digitised 85.53% of their collection. Regarding the maximum number of objects, it was found that NGMA has 57.19% of paintings, followed by drawings (15.16%) and sketches (11.70%). In the case of ASI study revealed that there are 52 archaeological site museums under ASI out of which 02 ASI museums namely ASI Nagarjunakonda and ASI Goa have been digitizing their resources and the digitization of the rest 50 museums is being done in a phase-wise manner.

Along with museums and galleries, the national level missions and the council of science museum also have the collection of heritage resources and regarding the NMM, it was found from the study that it has digitised 44.07 million manuscripts till March 2021. They are working in the 5<sup>th</sup> phase from 2018 and till March 2021 they digitised 3.30 lakhs of manuscripts consisting of 3.3 crore pages. Along with the digitization of manuscripts, NMM also developed a national database of manuscripts known as KRITISAMPADA, and till the end of March 2021, they had uploaded 3.4 million manuscripts to the repository. Similarly, NMMA has also uploaded the images and detailed information of 1259866 antiquities and 11406 built heritage on their portal until March 2021. Whereas, GHSM has uploaded 2156420 pages and 21181 books on their Gandhi Heritage Portal until 2021.

In case of National Council of Science Museum, it was found that they do not have archaeological and historical artifacts but they are engaged in the digitization program with IIT Kharagpur and IIT Gandhinagar to develop a one-stop Artificial Intelligence (AI) based portal named ‘Gandhipedia’ of works of Mahatma Gandhi to commemorate his 150th birth anniversary. This repository consists of the books, speeches and letters of Gandhi ji. For the portal, NCSM and two other IITs digitised 40 books and 28531 letters from the Collected Works of Mahatma Gandhi (CWMG).

*Objective 2: To assess the status of digitization of cultural heritage resources available in the cultural heritage institutions of India.*

The findings associated with the first objective of the study revealed the availability of various kind of cultural heritage resources in CHIs of country. Whereas, second objective highlights the status of digitization of heritage resources in CHIs and it was found from the study that out of five museums, the contribution of NM was

highest (80997) among all the five museums, followed by AM (62659) and IM (48733). The collection of NM represents 30.34% of the total online available collection in museums, followed by AM (23.47%) and IM (18.25%), and on the other hand, SJM (17.79%) and VMH (10.12%) have the minimum number of digitised art objects. In connection to the status of digitized art objects in museums, results showed that only 19.55% of the heritage resources available in the museums were digitised and available online for users, and VMH has digitised its maximum heritage resources (95.16%) followed by AM (87.02%), SJM (84.47%), NM ((40.49%),and IM (4.83%). On the other hand in the terms of the maximum number of art objects digitised by individual museum, it was seen found NM provides access to the maximum number of digitised objects (80997) because they have the maximum number of physical objects followed by AM provides (62659), IM (48733), SJM (47504), and VMH (27022).

It was found that 14 categories were common and available in at least two museums, and among them, four categories, namely coin, painting, manuscript, arms, and armour, were available in all five museums. While the textile category was found in four museums, the sculpture and decorative art categories were in three museums, and the remaining categories were found only in two museums. It was also found that among the top five digitised object categories the coin category has got the first rank with 33.91% followed by beads (8.36%), painting (7.44%), manuscripts (3.80%) and decorative art objects (3.82%).

*Objective 3: To find out the underlying reasons for the digitization and digital preservation of cultural heritage resources in the cultural heritage institutions of India.*

Preserve the heritage material for future generations, high demand from users for heritage material in digital format, to enhance the accessibility of document/ object

24\*7 from anywhere, to make art objects more discoverable to a broader audience and multiple users can access the information simultaneously were the major reasons for digitising the heritage collection among the CHIs.

*Objective 4: To identify the factors considered by cultural heritage institutions in digitization policy.*

It was found from study that the digital preservation and access to the digitised content to users is the highly significant factor (81.81%) considered by institutions in their digitization policy followed by a selection of material and metadata creation (72.72%), while copyright (54.54%) and quality control (45.45%) have secured the least consideration in the digitization policy.

*Objective 5: To analyze the different criteria used by cultural heritage institutions while selecting any material for digitization.*

The study found in case of highly preferred criteria for selecting material for digitization, respondents highly prefer the Preservation for a future generation criteria with the average score of 4.36 followed by physical condition of document (4.27) and historical/ cultural value of the document (3.72).

*Objective 6: To assess the significant challenges faced by the cultural heritage institutions in digitizing and preserving their heritage collection.*

It was observed from the study that majority of the respondents (27%) faced the problem of infrastructure/ equipment shortfall followed by lack of expertise and selection of material to be digitised.

*Objective 7: To understand the preferred collaborative digital activities among the cultural heritage institutions of India.*

It is indicated from the results that among the cultural heritage institutions of the country 81.81% of the CHIs are working collaboratively with other CHIs while only 18.18% are not engaged in any collaborative digital activity. The majority of the respondents accepted that their institute is engaged in the promotion of shared collection (63.63%) followed by creating exhibits from a shared collection (54.54%).

*Objective 8: To identify the practices followed for the digital storage and digital preservation of cultural heritage resources by the cultural heritage institutions.*

To sustain a well digitization and preservation projects there is a need to pay attention on major practices followed by the CHIs such as master file format, storage media, access image resolution, file naming convention, digital preservation strategies and access points for their collection. In connection to the preferred master file format, it was seen from the responses that more than 50% of institutes prefer TIFF format for their master file and 36.36% institutes prefer JPEG format and PDF/PDF-A format in their institute for storing the digital files. On the other hand, the response from CDAC Pune showed that to store the digital records center used different file format for variety of art objects such as for text-based products they prefer PDF, for images TIFF, for sound and multimedia MP3 and MP4. In view of storage media study found that the majority of institutions prefer online magnetic media/cloud storage to store their digitised material (54.54%) followed by optical media and removable magnetic media (27.27%).

After assessing the preferred master file format and storage media, results revealed the preferred backup policy and it was found that CDAC Pune has the monthly backup policy to store their digitised content. It was also observed that while creating the master image CDAC Pune is primarily taking care of following features; image

should be unedited, high quality, stored in TIFF format, supports long-term fidelity and long-term preservation of image.

It was found from the study that the CHI's used different resolutions for the access images for users of art objects, the majority of the institutes prefer 72 DPI (Dots per Inches) for cultural objects while in some cases they also used 96 DPI, 240 DPI, 300 DPI and 600 DPI.

Apart from the findings of museums, it was found that the persistence over a time, access and ease of use and ease of administration were the prime factors considered by CDAC Pune in framing the file name. The center followed the different characteristics in creating a file name for a particular content such as: date of creation, version number, and name of the creator, description of content, release date, publication date, project number, department number, records series and name of the group associated with the record. The study found that in the CHIs, every institution was following the basic guidelines recommended by the National Archives and Record Management (NARA). Each museum heritage starts the file name with the abbreviation of name of the museum and ends with 'h' character that denotes Heritage and includes common elements such as acronym of museum name in three letters and acronym of location of museum in three letters.

Regarding the digital preservation strategies study found that data backup, migration, replication and integrity check at regular intervals were the preservation strategies followed by the center. CDAC Pune has following the **eGOV-PID: Preservation Metadata & Schema**, a e-Governance Standard for Preservation Information Documentation (eGOV-PID) of Electronic Records developed in 2013 by Centre of Excellence for Digital Preservation, established at CDAC Pune and sponsored

by Department of Electronics and Information Technology (DeitY), Ministry of Communications & Information Technology (MCIT), Government of India (GoI). CDAC Pune provides various access points for their collection to their users and they are author, title, keyword, subject and publishers.

*Objective 9: To study the different metadata elements used to describe the particular art object available in the cultural heritage institutions.*

It was found from the study that each museum uses a different number of metadata elements to describe specific art objects. On an average 20 elements are used to describe the art objects and under the painting collection, AM used 28 metadata elements. whereas NM used 19 metadata elements, IM and SJM both used 15 elements and the least number of metadata elements were used by VMH (14). It was also found that the CDAC has created several kinds of metadata for their digital records, such as descriptive, administrative, technical, and structural metadata, and for resource description they used several metadata schemas such as Dublin Core, MARC21, METS, MODS, EAD, CCO, CDWA, and PREMIS.

#### **5.4 Testing of hypotheses**

**H1- Among all the cultural heritage institutions in the country, the National Museum has digitised the most art objects.**

The result of the study shows that among all the cultural heritage institutions, NM has digitised 80997 art objects out of a total of 2 lakh art objects (40.49%) available in the museum, whereas VMH has digitised 95.16% of its collection, so it is proved that NM has not digitised its maximum art objects (see Table 4.2). Hence, the hypothesis has been rejected.

**H2- To provide long-term access to the heritage collection for future generations is one of the major reasons for digitizing the cultural resources.**

Through the analysis, it is evident that out of 11 respondents, 100% (see Table 4.19) of the respondents agreed that providing long-term access to the heritage collection for future generations is one of the major reasons for digitizing the cultural resources. Hence, the hypothesis has been accepted (see Table 4.20).

**H3- There is no uniformity in the application of the number of metadata entry elements used by different cultural heritage institutions in describing their art objects.**

This hypothesis was based on the metadata elements used by the cultural heritage institutions in India and it was found from the analysis of Table 4.31- 4.44 that all the heritage institutions are using different metadata entry elements for describing their art objects. Hence, it is proved and accepted that there is no uniformity in the application of metadata entry elements by cultural heritage institutions in various art object categories.

## **5.5 Discussion**

The aim of the present study is to investigate the rich cultural heritage preserved or available in the cultural heritage institutions (CHI's) across the country and the major practices followed by these CHI's in the digitization and digital preservation of heritage material. The data obtained from the different cultural heritage institutions has been categorized in the form of museums, galleries, and national missions and analyzed separately for easy understanding using tables and graphs.

The first question that arises in everyone's mind is why we digitise the heritage collection available in the CHI's. The respondents of the study accepted several

reasons, ranging from preserving the heritage material for a future generation, high demand of users to make these cultural resources online or in digital format; saving space by replacing the printed material; enhancing the accessibility of art objects; making heritage material more discoverable to the broader audience; multiple users can use art objects simultaneously; and increasing the collaboration for resource sharing. This finding is similar to the studies published by Rafiq and Ameen (2013) and Manaf (2007), which found that the major reasons for digitising documents were to increase access to the collection, preserve material of importance or value, and save space in the library.

The results of the study indicated that overall 19% of the collection available in museums has been digitised and available online to the public however when we observe on the level of per museum we found that the percentage of digitised collection varies. Possible reasons include collection size, type and variety of art objects available in museums, lack of appropriate technology and lack of staff. Comparing the results of the study with the similar findings of the Europeana ENUMERATE Core survey 4, it was found that the museums of Europe have digitised overall 31 % of their collection and 57% still need to be digitised and they pointed out that 12% of the collection needs not to be digitised (Nauta et.al, 2017).

The analysis of this study has clearly indicated that digital preservation and access to digitised material were the prior factors which have been considered by the respondents in this study, followed by selection of material, quality control, and metadata creation, and the results are similar to the findings of the studies of Astle and Muir (2002) and Gbaje (2011).

All the CHI's in the country hold a very huge collection, and it is not possible for all the organisations to digitise their whole collection. To overcome these issues, each heritage institution has some predefined criteria for the selection of material to be digitised. This study investigated the preferable criteria by cultural heritage institutions in selecting any material to be digitised and found that preservation for future generations; physical condition of the document, historical or cultural value of the document; increasing access to the documents; and demand of the users are the most preferred criteria in the selection of digitalization of any document (Astle and Muir, 2002; Manaf, 2007; Kalusopa and Zulu, 2009; Baro, Oyeniran and Ateboh, 2013, Rafiq and Ameen, 2013).

Likewise, to initiate and sustain a project, there were a lot of difficulties faced by the professionals in any organisation. In the same way, library professionals, digitization project managers, archivists, and curators also faced several impediments while digitising and preserving their heritage material. The major challenges accepted by the staff of GLAMs are insufficient initial funding (Gbaje and Mohammed, 2013; Ifijeh, 2014; Pandey and Misra, 2014; Dadzie and Walt, 2015; Baro, Oyeniran and Ateboh, 2016; Bakshi, 2016; Mutula, 2014; Khan, Shafi and Ahangar, 2018; Rafeeq, 2018); absence of national digitization policy (Chattwal, 2009; Zaid and Abioye, 2009; Ravenwood, Matthews and Muir, 2012; Rafeeq and Ameen, 2013) infrastructure or equipment shortfall (Basuki, 2004; Manaf, 2006; Rosenberg, 2006) lack of expertise (Lampert and Zaid and Abioye, 2009) missing standards and guidelines (Kalusopa and Zulu 2009; Mutula, 2014; Oehlerts and Liu, 2013) selecting material to be digitised (Lor, 2005; Chhatwal, Kanwal, and Lal, 2009; Singh, 2006; Ezeani and Ezema, 2009) intellectual property right issues (Joint, 2006; Abd Manaf, 2007; Ghobiral, 2008; Nakata et al., 2008) lack of competent staff (Lampert and Vaughan, 2009; Gbaje, 2011)

lack of training (Gbaje, 2011) Lack of support from top management or administration (Manaf, 2007); storage or digital media deterioration (Arora, 2009; Majumdar, 2005; Pandey and Misra, 2014); variety of file formats (Jiazhen and Daoling, 2007); Lack of proper motivation and leadership (Mesui, Andrade, and Waizenegger, 2019). The NEMO (The Network of European Museum Organisation) survey of digitization and copyright (2020) reported that three out of four museums in Europe lack insufficient funds and insufficient staff. On the other hand, around 30% of the museums agreed that the lack of proper equipment was a hindrance in digitising and online accessibility of cultural material.

The digitization of documents in any CHI is not enough to make them available for the upcoming generation, but the proper storage is also an essential aspect of digitization projects. In this context, the responses showed that heritage institutions used different file formats for a variety of art objects such as PDF/PDF-A is preferred for text based objects, TIFF and JPEG for images, MP3 and MP4 for multimedia objects. these findings are similar with the survey conducted in the Florida CHIs, which states that the memory institutions in Florida prefer a variety of file formats for the creation of master files, such as TIFF (preferred by 72.3%), PDF/PDF-A (preferred by 59.2%) and JPEG (preferred by 47.2%). To store the digitised content for the long term, more than 50% of respondents used cloud storage or online magnetic media. Similarly, a survey on digital preservation at Canadian Memory Institutions found that 50% of the respondents' organisations make use of cloud storage services (Hurley and Shearer, 2019).

The above-discussed paragraph represents the scenario of digitization and preservation in CHIs of the country and the major practices followed by them. In the same context, CDAC Pune also plays a significant role in the digitization and

preservation of heritage material by designing a National portal and digital repository for Museums of India to make available their collection online. This center provides tools and techniques as well as standards guidelines for digital preservation programmes across the country. Regarding the structuring and managing the digital preservation metadata, center has created several kind of metadata for their digital records such as descriptive, administrative, structural and technical metadata and for resource sharing description they prefer Dublin Core, MARC 21, METS, MODS and PREMIS metadata schemas. It shows that Indian museums are following the international standards such as the majority (51%) of the heritage institutions involved in digitization activities in European countries used descriptive metadata for general use. (Nauta et al., 2017). For digital preservation activities, 40% of the Canadian memory institutions also prefer METS/ PREMIS (Hurley and Shearer, 2019).

### **5.6 Suggestions and Recommendations**

To better preserve the cultural heritage of the nation the following suggestions are given:

1. To further optimise the utilisation of cultural heritage by the community, especially among the younger generation there is a need for awareness of the importance of conserving the nation's noble heritage by way of knowing and understanding either through formal study or forums or communities.
2. The study suggests that there should be a concrete set of guidelines/ national policy for the digitization and digital preservation of cultural heritage that can be used by organisations wishing to make information more valuable.
3. There should be a proper training programme arranged for the staff to make the digitization process more effective/sustainable.

4. Further, it is suggested that there is a need to conduct periodic workshops and training sessions to create awareness among the users with respect to the availability of rare and cultural resources.
5. Many of the digitised resources are stored as computer files, external hard discs, or CD/DVDs in TIFF and JPEG formats. There must be a proper storage policy and space for digital information storage following preservation standard practices.

### **5.7 Conclusion**

Cultural heritage is a determining factor in linking people to their history and their past generations. The digitization of that cultural heritage is identified as a practical and sustainable solution for long term preservation and access to information resources. The digitization or conversion of cultural materials is the most suitable alternative for dissemination, preservation, and archiving and to provide ease of access to print materials. It is very crucial for preserving and disseminating information and knowledge more effectively and efficiently. The cultural heritage institutions of the country have a larger responsibility and accountability for protecting the nation's cultural collection. Today, the cultural heritage of the country is scattered in several Galleries, Libraries, Archives and Museums (GLAMs) of the country and it is represented in various art forms such as manuscripts, paintings, coins, sculpture, drawings, beads, and many more. With the rapid popularisation of electronic documents, electronic publications, Web resources, and network communication, more and more GLAMs have begun collecting and preserving digital resources and providing online access for all.

In the present study, the rich cultural heritage resources available in different CHIs of the country and their status of digitization have been represented. For the conversion of the physical artefacts into digital format in the museums of national importance, the digitization initiatives have been taken in different phases, and every museum is involved in these initiatives effectively. Different national-level missions are ongoing, and they continuously digitise, preserve, and upload the content to their portals for wider access to users. Apart from these, a museum builder software: JATAN, developed by CDAC Pune, is playing a significant role in the process of digitising the Indian cultural heritage. Generally, museums across the world, including India, show only a small percentage of their collections to visitors in their galleries, and a major chunk of their collections are kept in storage. However, the portal Museums of India: National Portal and digital repository is depicting the collections of the museums to the public, including their reserve collections, for the first time.

The present study has been carried out with several objectives ranging from the identification of types of cultural heritage resources (CHR's) available in the CHI's, reasons for the digitization and digital preservation of CHR's, factors considered by CHI's in their digitization policy, different criteria used by CHI's while selecting any material for digitization, significant challenges faced by the CHI's in their digitization programs, preferred collaborative digital activities among the CHI's, practices followed for the digital storage and the different metadata elements used by CHI's to describe any art object. To fulfill the objectives of the study, the research has been conducted in three phases, and the first phase is dedicated towards the systematic review of the existing studies in the field of digitization and preservation. In the second phase, two structured questionnaires were prepared, first for the digitization project heads, curators, and deputy curators working in CHI's under the Ministry of Culture,

Government of India and another for the Human-Centered Design and Computing (HCDC) Group at Center for Development of Advanced Computing (C-DAC) Pune. The questionnaire related to CHI's was drafted with the aim to analyse the diverse collection available in the various CHIs, barriers in digitization and digital preservation and number aspects related to the digitization programs. On the other hand the questionnaire of CDAC Pune focused on the technical aspects related to digitization such as the file naming policy, metadata practices, backup strategy and access policy followed by the center in digitizing and preserving the cultural heritage resources. For the data collection study used survey methods to collect the primary data and content analysis for the secondary data from the official websites of CHI's, annual reports and from the National Portal and Digital Repository for Museums of India (<http://museumsfindia.gov.in>). The findings of the study reveal that the Indian cultural heritage institutions have a rich and unique collection of different forms such as paintings, manuscripts, sculptures, beads, terracotta and decorative art pieces. These resources represented traditions, customs, culture, and the living patterns of our past generations. The majority of the CHIs stated that the prime objective to digitise and preserve the heritage material is to save the heritage of the country for future generations and all the CHI's having their digitization and preservation programs are working continuously for wider access to the heritage collection in collaboration with CDAC Pune. The results of the CDAC Pune showed that they are taking care of some features when creating the master image, such as the image should be unedited, high quality, stored in TIFF format, and support long-term fidelity and long-term preservation of the image. Regarding the backup policy to store their digitised content, CDAC Pune prefers a monthly backup policy and cloud storage media has been followed by the center to store their digitised content. They provide various access

points for their collection to their users, such as author, title, keyword, subject, and publishers.

### **5.8 Limitations of the study and areas for future research**

- The present research work covers the CHIs working directly under the Ministry of Culture, Govt. of India but in the future by increasing the scope from national or centrally funded heritage institutions to the heritage institutions working at state or regional level, which will represent the cultural heritage in a better way and readers will be aware of the rich and unique resources available in our country.
- As the tangible cultural heritage institutions of a country collect, store, preserve and disseminate the tangible cultural heritage resources and work towards the digitization and preservation of these resources, similarly, in the future, a study can be conducted on intangible cultural heritage institutions, which should highlight the importance of digitization and preservation of intangible cultural heritage resources.
- The tangible cultural heritage resources available in CHIs are in different forms, such as coins, sculptures, paintings, manuscripts, arms and armour, and decorative pieces, which provide information on several aspects of our past generations. In the same way, the performing arts, local knowledge and languages, skills for making handicrafts, and traditions of past generations will also be helpful for users in understanding the practices and customs followed by our ancestors. A similar study covering these may also be taken by researchers.
- This study highlighted the digitised cultural resources available in cultural heritage institutions of a country and the practices followed by them in their

digitization initiatives, but in the future, a comparative study may be conducted to determine the heritage material available in cultural heritage institutions of another country and practices followed there which will be beneficial for users in understanding the difference between the resources and the traditions of different countries. The findings of this kind of study will enable us to assess the existing gaps in the practices followed in our country compared with other countries in the world.

- This research work includes an overview of heritage documents available in different institutions across the country, but students, researchers, and faculty working in this field can undertake an in-depth study in the future on the usage pattern of these cultural heritage resources.
- Regarding the cultural resources, especially manuscripts, which are available in various languages and scripts, the study, provides information on their availability in different organisations but by increasing the scope of the study, a detailed study may be undertaken to analyse these manuscripts on the basis of languages that will be helpful for users in searching for information in regional language.
- The study used questionnaire and content analysis, an in-depth interview with curators will help in getting deeper insights about the problems and requirements for digital activities of cultural heritage of our country.

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**Reference**

- Arora, J. (2009). Digitization and Digital Preservation. *DESIDOC Journal of Library & Information Technology*, 29(2), 82–84.  
<https://doi.org/10.14429/djlit.29.245>
- Astle, Peter J., & Adrienne Muir (2002). Digitization and Preservation in Public Libraries and Archives. *Journal of Librarianship and Information Science* 34.(2), 67–79.
- Bakhshi, S. I. (2016). Digitization and Digital Preservation of Cultural Heritage in India with Special Reference to IGNCA, *Asian Journal of Information Science and Technology*, 6 (2), 1-7
- Baro, E., Oyeniran, G. K., & Ateboh, B. (2013). Digitization projects in university libraries in Nigeria: the journey so far. *Library Hi Tech News*, 30(9), 21–26. <https://doi.org/10.1108/LHTN-09-2013-0049>
- Gbaje, E. S.. (2011). Digital Preservation Strategies: A Case Study of Nigerian National Information Centers.” *IFLA Journal*, 37(11), 218–227
- Hurley, Grant & Shearer, Kathleen (2019). Final report of the survey on digital preservation capacity and needs at canadian memory institutions, 2017-18. *CARL & ABRC*. DOI: 10.5683/SP2/8KLEPP.
- Jiazhen, L., & Daoling, Y. (2007). Status of the preservation of digital resources in China: results of a survey. *Program*, 41(1), 35–46.  
<https://doi.org/10.1108/00330330710724872>
- Kalusopa, T., & Zulu, S. (2009). Digital heritage material preservation in Botswana: problems and prospects. *Collection Building*, 28(3), 98–107.  
<https://doi.org/10.1108/01604950910971125>

- Lampert, C., & Vaughan, J. (2009). Success Factors and Strategic Planning: Rebuilding an Academic Library Digitization Program. *Information Technology and Libraries*, 28(3), 116.  
<https://doi.org/10.6017/ital.v28i3.3220>
- Manaf, Z. A (2007). The state of digitization initiatives by cultural institutions in Malaysia: an exploratory survey. *Library Review*, 56(1), 45–60.  
<https://doi.org/10.1108/00242530710722014>
- Mazumdar, S (2005). Preservation and conservation of literary heritage: a case study of India. *The International Information & Library Review*, 37, 179–187
- Mesui, 'Anau, Andrade, A. D., & Waizenegger, L. (2019). Digital Technology for Preserving Cultural Heritage in Tonga. In P. Nielsen & H. C. Kimaro (Eds.), *Information and Communication Technologies for Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D* (Vol. 552, pp. 215–226). Springer International Publishing.  
[https://doi.org/10.1007/978-3-030-19115-3\\_18](https://doi.org/10.1007/978-3-030-19115-3_18)
- Mutula, Mudogo S. (2014). Status of digital heritage preservation management in Eastern Africa. *The Electronic Library*, 32(3), 363–374.  
<https://doi.org/10.1108/EL-01-2013-0003>
- Nauta, Gerhard Jan, Heuvel, Wietske van den, Teunisse, Stephanie & DEN Foundation (NL) (2017). Europeana DSI 2– access to digital resources of European heritage: report on ENUMERATE core survey 4: Europeana Foundation. Retrieved from:  
[https://pro.europeana.eu/files/Europeana\\_Professional/Projects/Project\\_list/ENUMERATE/deliverables/DSI-](https://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/ENUMERATE/deliverables/DSI-)

2\_Deliverable%20D4.4\_Europeana\_Report%20on%20ENUMERATE%20Core%20Survey%204.pdf

Oehlerts, B., & Liu, S. (2013). Digital preservation strategies at Colorado State University Libraries. *Library Management*, 34(1/2), 83–95. <https://doi.org/10.1108/01435121311298298>

Pandey, P., and Misra, R. (2014). Digitization of Library Materials in Academic Libraries: Issues and Challenges. *Journal of Industrial and Intelligent Information*, 2(2), 136–141. <https://doi.org/10.12720/jiii.2.2.136-141>

Rafiq, M., Ameen, K., & Jabeen, M. (2018). Barriers to digitization in university libraries of Pakistan: a developing country's perspective. *The Electronic Library*, 36(3), 457–470. <https://doi.org/10.1108/EL-01-2017-0012>

Ravenwood, C., Matthews, G., & Muir, A. (2013). Selection of digital material for preservation in libraries. *Journal of Librarianship and Information Science*, 45(4), 294–308. <https://doi.org/10.1177/0961000612452030>

Rosenblum, B. (2008). Digital Access to Cultural Heritage and Scholarship in the Czech Republic. *Slavic & East European Information Resources*, 9(1), 12–29. <https://doi.org/10.1080/15228880802104637>

Zaid, Yetunde, & Abiola Abioye. (2009). Museums, Libraries, and Archives: Collaborating for the Preservation of Heritage Materials in Nigeria. Paper presented at the World Library and Information Congress (75th IFLA General Conference and Council), Milan, Italy.



# *Bibliography*

## BIBLIOGRAPHY

---

- Abdulkareem, M. Y., Isah, A., & Issa, A. O. (2012). Challenges of Digital Preservation of Manuscripts to the Nigerian Education and Information Systems. *Library & Archival Security*, 25(2), 119–131. <https://doi.org/10.1080/01960075.2011.570199>
- Ahmad, A and Sharma, S. (2021). Digitization of Archival Records at National Archives of India and Department of Delhi Archives: A Detailed Study of methods, standards and protocols. *Nat. Volatiles & Essent. Oils*, 8(5), 5169 – 5177.
- Akinwale, A. A. (2012). Digitization of Indigenous Knowledge for Natural Resources Management in Africa. *Proceedings of the 2012 Summit of the African Educational Research Network*, North Carolina State University & DoubleTree Hilton, Raleigh Brownstone University.
- Arora, J. (2009). Digitization and Digital Preservation. *DESIDOC Journal of Library & Information Technology*, 29(2), 82–84. <https://doi.org/10.14429/djlit.29.245>
- Astle, Peter J., & Adrienne Muir (2002). Digitization and Preservation in Public Libraries and Archives. *Journal of Librarianship and Information Science* 34.(2), 67–79.
- Baro, E., Oyeniran, G. K., & Ateboh, B. (2013). Digitization projects in university libraries in Nigeria: the journey so far. *Library Hi Tech News*, 30(9), 21–26. <https://doi.org/10.1108/LHTN-09-2013-0049>
- Basuki, S. L. (2004). Digitization of collections in Indonesian academic libraries. *Program*, 38(3), 194–200. <https://doi.org/10.1108/00330330410547241>

- Bishi, A. (2015). Digital archiving - the current state at the National Archives of Zimbabwe. *Digital Heritage*, 403–404. <https://doi.org/10.1109/DigitalHeritage.2015.7419534>
- Bhattacharya, P. (2004). Advances in digital library initiatives: a developing country perspective. *International Information & Library Review*, 36 (3), 165-175.
- Byamugisha, Helen M. (2010). Digitizing Library Resources for New Modes of Information Use in Uganda. *Library Management* 31(1/2), 42–56.
- Çakmak, T., & Yılmaz, B. (2012). Overview of the Digitization Policies in Cultural Memory Institutions in Turkey. In S. Kurbanoglu, U. Al, P. L. Erdoğan, Y. Tonta, & N. Uçak (Eds.), *E-Science and Information Management* (Vol. 317, pp. 150–163). Springer Berlin Heidelberg. [https://doi.org/10.1007/978-3-642-33299-9\\_17](https://doi.org/10.1007/978-3-642-33299-9_17)
- Chhatwal, A., Kanwal, P., & Lal, P. (2009). Digital Heritage Archiving in India: A Case Study of Panjab University Library, Chandigarh. Professional paper in INFUTURE2009: *Digital Resources and Knowledge Sharing*, 145-153.
- Conway, D. R. D. P. (2010). Implementing PREMIS: a case study of the Florida Digital Archive. *Library Hi Tech*, 28(2), 273 – 289 DOI: <http://dx.doi.org/10.1108/07378831011047677>
- Dowding, H. (2014). The Role of the National University in Developing Nations' Digital Cultural Heritage Projects: A Perspective from Kazakhstan. *OCLC Systems & Services*, 30(1),52–61.
- Erima, J., Masai, W., & Wosyanju, M. G. (2016). Preservation of digital research content in academic institutions: a case study of Moi University, Kenya. *2016 IST-Africa Week Conference*, 1–11. Retrieved from: <https://doi.org/10.1109/ISTAFRICA.2016.7530620>

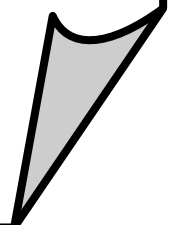
- Evens, T., & Hauttekeete, L. (2011). Challenges of digital preservation for cultural heritage institutions. *Journal of Librarianship and Information Science*, 43(3), 157–165. <https://doi.org/10.1177/0961000611410585>
- Fleming, Patrick, & Phil Spence. (2008). The British Library Newspaper Collection: long term storage, preservation, and access. *LIBER Quarterly* 18(3–4), 377–393
- Fabunmi, B.A., Paris, M. & Fabunmi, M. (2006). Digitization of library resources: Challenges and implications for policy and planning. *International Journal of African & African American Studies* 5(2), 23–36.
- Gurram, S. (2008). Digital library initiatives in India: a proposal for open distance learning. *Proceedings of the IATUL Conferences*. Paper 25. Retrieved from: <http://docs.lib.purdue.edu/iatul/2008/papers/25>
- Hurley, Grant & Shearer, Kathleen (2019). Final report of the survey on digital preservation capacity and needs at canadian memory institutions, 2017-18. *CARL & ABRC*. DOI: 10.5683/SP2/8KLEPP.
- Iwhiwhu, B., and Eyekpegaha, Ovietobore E. (2009). Digitization of Nigerian university libraries: From technology challenge to effective information delivery. *The Electronic Library*, 27(3), 529–536. <https://doi.org/10.1108/02640470910966943>
- Janowska, A. A., & Malik, R. (2020). Digitization in museums: Between a fashionable trend and market awareness. *Studia z Polityki Publicznej*, 3(27), 31–45. <https://doi.org/10.33119/KSzPP/2020.3.2>
- Jiazhen, L., & Daoling, Y. (2007). Status of the preservation of digital resources in China: results of a survey. *Program*, 41(1), 35–46. <https://doi.org/10.1108/00330330710724872>

- Joint, Nicholas (2006). Digital Library Futures: Collection Development or Collection Preservation? *Library Review*, 55(5) 285–290.
- Kaddu, S. (2015). Collaboration in Digitising Cultural Heritage as a strategy to sustain access and sharing of cultural heritage information in Uganda. licensed under the Creative Commons Attribution 3.0 (Unported) licence <http://creativecommons.org/licenses/by/3.0> 14.
- Khan, N. A., Shafi, S. M., & Ahangar, H. (2018). Digitization of Cultural Heritage: Global Initiatives, Opportunities and Challenges. *Journal of Cases on Information Technology*, 20(4), 1–16. <https://doi.org/10.4018/JCIT.2018100101>
- Kováčik, J. (2017). The national project Digital Library and Digital Archives: Mass digitization of printed cultural heritage materials in Slovakia. *Alexandria: The Journal of National and International Library and Information Issues*, 27(3), 163–174. <https://doi.org/10.1177/0955749018763720>
- Kumar, Sudhir, and Shah L. (2004). Digital Preservation of Manuscripts: A Case Study. Paper presented at 2nd Convention PLANNER, Imphal, India, November 4–5, 2004. Retrieved from: [http://ir.inflibnet.ac.in:8080/ir/bitstream/1944/419/1/04Planner\\_5.pdf](http://ir.inflibnet.ac.in:8080/ir/bitstream/1944/419/1/04Planner_5.pdf)
- Kuswara, R. (2018). Digital Preservation Effort of Manuscripts Collection: Case Studies of pustakabudaya.id as Indonesia Heritage Digital Library. In M. Dobreva, A. Hinze, & M. Žumer (Eds.), *Maturity and Innovation in Digital Libraries* (Vol. 11279, pp. 195–200). Springer International Publishing. [https://doi.org/10.1007/978-3-030-04257-8\\_20](https://doi.org/10.1007/978-3-030-04257-8_20)
- Lawrenz, S. (2017). Building a national heritage registry for the sudan: the friedrich w. Hinkel archive digitization project. *Isprs - International Archives of the*

- Photogrammetry, Remote Sensing and Spatial Information Sciences*, 42(2/W5), 435–438. <https://doi.org/10.5194/isprs-archives-XLII-2-W5-435-2017>
- Manaf, Z. A. (2007). The state of digitization initiatives by cultural institutions in Malaysia: an exploratory survey. *Library Review*, 56(1), 45–60. <https://doi.org/10.1108/00242530710722014>
- Manaf, Z. A. (2008). Establishing the national digital cultural heritage repository in Malaysia. *Library Review*, 57(7), 537–548. <https://doi.org/10.1108/00242530810894059>
- Manivannan, M., and B. Sutradhar (2018). Digital Conversion and Preservation of old Ph.D. Theses: A Study at Central Library, IIT Kharagpur. Paper presented at 11th Convention PLANNER 2018, Tripura University, Agartala, Tripura, November 15–17, 2018. Retrieved from: <https://ir.inflibnet.ac.in/ir/bitstream/1944/2297/1/11.pdf>
- Manžuch, Z. (2009). Monitoring digitization: lessons from previous experiences. *Journal of Documentation*, 65(5), 768–796. <https://doi.org/10.1108/00220410910983100>
- Nakata, M., Nakata, V., Gardiner, G., McKeough, J., Byrne, A., and Gibson, J. (2008). Indigenous Digital Collections: An Early Look at the Organisation and Culture Interface. *Australian Academic & Research Libraries*, 39(4), 223–236. <https://doi.org/10.1080/00048623.2008.10721360>
- Olatokun, W. M. (2008). A Survey of Preservation and Conservation Practices and Techniques in Nigerian University Libraries. *LIBRES*, 18(2), 1-18.
- Pandey, P., and Misra, R. (2014). Digitization of Library Materials in Academic Libraries: Issues and Challenges. *Journal of Industrial and Intelligent Information*, 2(2), 136–141. <https://doi.org/10.12720/jiii.2.2.136-141>

- Poll, R. (2010). NUMERIC: statistics for the digitization of European cultural heritage. *Program*, 44(2), 122–131. <https://doi.org/10.1108/00330331011039481>
- Rosenblum, B. (2008). Digital Access to Cultural Heritage and Scholarship in the Czech Republic. *Slavic & East European Information Resources*, 9(1), 12–29. <https://doi.org/10.1080/15228880802104637>
- Seifi, L. (2011). Digitization and Digital Preservation of Manuscripts and Access in Organization of Libraries, Museums and Documents Centre of Astan Quds Razavi Library in IRAN: A Case Study In 8th International CALIBER - 2011, Goa University, Goa, March 02-04.
- Smith, L., & Rowley, J. (2012). Digitization of local heritage: Local studies collections and digitization in public libraries. *Journal of Librarianship and Information Science*, 44(4), 272–280. <https://doi.org/10.1177/0961000611434760>
- Solimine, G. (2002). Digital library development in Italy and Spain. Retrieved from <https://www.researchgate.net/publication/229025749>
- Thomas, B. (2015). The issues and challenges facing a digital library with a special focus on the University of Calgary. *Library Review*, 64(8/9), 533–551. <https://doi.org/10.1108/LR-11-2014-0125>
- Tonta, Y. (2009). Preservation of scientific and cultural heritage in Balkan countries. *Program*, 43(4), 419–429. <https://doi.org/10.1108/00330330910998066>
- Zaid, Yetunde, and Abiola Abioye. (2009). Museums, Libraries, and Archives: Collaborating for the Preservation of Heritage Materials in Nigeria. Paper presented at the World Library and Information Congress (75th IFLA General Conference and Council), Milan, Italy.

# *Appendices*



# APPENDICES

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## Appendix A

### (Questionnaire for Digitization project-In-charge)

Dear Sir/Madam,

I am carrying out a doctoral programme on the title “Status of digitization and digital preservation of cultural heritage resources in the cultural heritage institutions of India” under the supervision of Dr. Vinit Kumar, Department of Library and Information Science, Babasaheb Bhimrao Ambedkar University, Lucknow. Your reply to this questionnaire is highly valuable and extremely important to assess and evaluate the state of the digitization and preservation activities in cultural heritage institutions of India. Information given here will be kept confidential and used for academic purposes only. I shall be grateful if you could kindly spare some time from your busy schedule to fill up this questionnaire.

I solicit your kind co-operation.

Thanking you

**Please tick mark [√] to indicate answers wherever mentioned.**

#### Section A      General Information

Name of the library/ organisation/ institute/ museum

.....

Name and the designation of person-in-charge to library/ organisation/ institute/ museum

.....

Email id: .....

Year of the establishment of the library.....

Age: Below 30 Years	[    ]	30-35 Years	[    ]
35-40 Years	[    ]	40-45 Years	[    ]
45-50 Years	[    ]	Above 50	[    ]

Experience in years:

Below 5 Years	[    ]	5-10 Years	[    ]
10-15 Years	[    ]	15-20 Years	[    ]

Above 20 Years      [      ]

**Section B      Digitization Programme**

1. Does your institution have a program for digitising collection?

Yes                              [      ]      No                                              [      ]

If yes, when your institution began the programme (year)?

.....

If no, does your institution have a plan to undertake such a programme shortly?

In the same year      [      ]      Next year                                      [      ]

In next three years      [      ]      Would not digitize                              [      ]

Do not know                      [      ]

2. Please give the details of the various kind of documents available in your institution

<b>Collection type</b>	<b>Objects type</b>	<b>No. of total documents</b>	<b>No. of documents available in analogue</b>	<b>No. of documents available in digital</b>	<b>No. of documents available in born digital</b>
<b>Text based resources</b>	Books				
	Journals				
	Manuscripts				
	Rare books				
	E-books				
	Newspaper				
	Microforms and microfilms				

	Other text based resources (Please specify)				
<b>Visual (2D) resources</b>	Drawings				
	Engraving				
	Maps and Atlases				
	Paintings				
	Miniature paintings				
	Rare Photographs				
	Photographs				
	Posters				
	Sketches				
	Collage				
	Slides				
	Other visual resources (Please specify)				
<b>Archival records</b>	Government documents				
	Other archival records				
<b>Man-made movable objects</b>	Coins				
	Sculptures				
	Artefacts				
	Arms and armour				

	Antiquities				
	Decorative art				
	Jewelry				
	Beads				
	Terracotta				
	Textile				
	Any other (Please specify)				
	Audio files				
<b>Time-based resources</b>	Digital audiobooks				
	Video recordings				
	Any other (Please specify)				

3. What are the major reasons for the digitising the heritage collection in your institution? (Multiple Choice)

- i. Mushrooming growth of digital material [    ]
- ii. To save space by replacing the printed material [    ]
- iii. To reduce handling of fragile material [    ]
- iv. To enhance the accessibility of documents 24\*7 from anywhere[    ]
- v. To make documents more discoverable and interoperable [    ]
- vi. Multiple users can access the information simultaneously [    ]
- vii. To increase the collaboration for resource sharing [    ]
- viii. To preserve the heritage documents for future generations [    ]
- ix. High risk of being destroyed due to fragility of document [    ]
- x. The old age of the document [    ]

Any other (please specify)

.....

4. Which criteria are being used by your institution in selecting any material for digitization? (Multiple choice)

- i. Physical condition of document [    ]
  - ii. Cost of the document [    ]
  - iii. Demand of the users [    ]
  - iv. Academic importance [    ]
  - v. Preservation for future generation [    ]
  - vi. To save the physical Space [    ]
  - vii. To increase access to the documents [    ]
  - viii. Historical/ cultural value of document [    ]
  - ix. Commercial exploitation/use [    ]
  - x. Providing document delivery service [    ]
- Any other (please specify)
- .....

5. Have you incorporated any documented policy to digitise the collection?

Yes [    ]      No [    ]

6. If yes, please tick the following factors, which have been considered in that policy?

- i. Selection of Materials [    ]
- ii. Metadata Creation [    ]
- iii. Content Creation (scanning, digital capture etc.) [    ]
- iv. Quality Control [    ]
- v. Digital preservation [    ]
- vi. Copyright [    ]
- vii. Access [    ]
- viii. Website Management [    ]

7. Do you accept the outsourcing of the personnel for the project?

Yes [    ]      No [    ]

If Yes, Details of the outsourcing agency:

.....

8. How does your institution manage cultural heritage information?

- (i) Folders [    ]      (ii) In-house servers [    ]
- (iii) Personal Computer [    ]      (iv) Cloud [    ]

(v) Hard disk [      ]

9. Do you have the specialised technical staff for digitising the collection?

Yes [      ]                      No [      ]

If no, are you willing to provide training for your staff in digitization?

Yes [      ]                      No [      ]

10. What are the significant challenges that your organisation faced in digitising heritage collection?

- i. Insufficient initial funding [      ]
- ii. Absence of national digitization policy [      ]
- iii. Infrastructure/ Equipment shortfall [      ]
- iv. Lack of Expertise [      ]
- v. Missing standards and guidelines [      ]
- vi. Selection of materials to be digitized [      ]
- vii. Intellectual Property Right issues [      ]
- viii. Lack of competent staff [      ]
- ix. Lack of training [      ]
- x. Lack of support from top management or administration [      ]
- xi. Storage or Digital Media deterioration [      ]
- xii. Accessibility of digitized content [      ]
- xiii. Negligence towards metadata standards [      ]
- xiv. Variety of file formats [      ]
- xv. Lack of proper motivation and leadership [      ]

Any other (Please specify).....

11. Does your organization follows the collaborative digital activities?

Yes [      ]                      No [      ]

If yes, what type of activities?

- i. Promotion of Shared Collections [      ]
- ii. Using common sets of standards and best practices for metadata [      ]
- iii. Using common set of standards and best practices for content creation [      ]
- iv. Submitting collaborative grant proposals [      ]
- v. Shared digital asset management systems [      ]

- vi. Shared digital preservation programs [    ]
- vii. Creating exhibits from shared collections [    ]
- viii. Shared institutional repositories [    ]
- Any other (please specify).....

**Section C    ICT Infrastructure**

12. How your organisation access the network?

- (i) LAN [    ]                      (ii) MAN [    ]
- (ii) WAN [    ]                    (iv) Not at all access [    ]

13. Please indicate the total number of hardware available in your organisation used for digitising the collection?

- (i) Computers .....
- (ii) Scanners
  - a. Flatbed scanners [    ]
  - b. Hand held scanners [    ]
  - c. Drum scanners [    ]
  - d. Sheet fed scanners [    ]
  - e. Overhead scanners [    ]
  - f. Microfilm scanners [    ]
  - Any other (please specify) .....
- (iii) Printers .....

**14. Which kind of software is being used in your organisation?**

**(A) Digital Asset Management System (DAMS)**

- i. OCLC's CONTENTdm [    ]                      vii. Islandora [    ]
- ii. PastPerfect [    ]                              viii. Omeka [    ]
- iii. ExLibris DigiTool [    ]                      ix. GSDL [    ]
- iv. Fedora [    ]                                    x. Dspace [    ]
- v. Eprint [    ]                                      xi. JATAN [    ]
- vi. Locally developed systems [    ]
- Any other (Please specify).....

**(B) Scanning software**

- |                                 |                       |
|---------------------------------|-----------------------|
| i. docWorks [ ]                 | v. LIMB [ ]           |
| ii. Virtual Film [ ]            | vi. NextStar Plus [ ] |
| iii. Smartworks Pro [ ]         | vii. Book Expert [ ]  |
| iv. Tocosa EasyScan Plus II [ ] |                       |

Any other (please specify).....

**(C). OCR software**

- |                                       |                   |
|---------------------------------------|-------------------|
| i. Google Drive OCR/ Cloud Vision [ ] | iv. Tesseract [ ] |
| ii. ABBYY Finereader [ ]              | vi. OmniPage [ ]  |
| iii. GOCR [ ]                         | vii. OCRopus [ ]  |
| iv. Ocrad [ ]                         |                   |

Any other (please specify).....

15. What type of Digital file format for the creation of master files are preferred in your organisations?

- |              |                    |
|--------------|--------------------|
| i. TIFF [ ]  | iv. PDF/ PDF-A [ ] |
| ii. JPEG [ ] | v. AVI [ ]         |
| iii. WAV [ ] |                    |

Any other (please specify).....

**Section D Metadata**

**16. What types of metadata your institution created for their digital item?**

- |                                 |                              |
|---------------------------------|------------------------------|
| i. Descriptive Metadata [ ]     | iv. Structural Metadata [ ]  |
| ii. Administrative Metadata [ ] | v. Preservation Metadata [ ] |
| iii. Technical Metadata [ ]     | vi. None [ ]                 |
| vii. Do not know [ ]            |                              |

**17. Which metadata schemas are being used in your organization for digitization work?**

- |                                                    |
|----------------------------------------------------|
| i. Dublin Core [ ]                                 |
| ii. MARC [ ]                                       |
| iii. Metadata Object Descriptive Schema (MODS) [ ] |

- iv. Encoded Archival Description (EAD) [     ]
- v. Cataloguing of Cultural Objects (CCO) [     ]
- vi. Categories for the Description of Works of Art (CDWA) [     ]
- vii. Metadata Encoding Transmission Standard (METS) [     ]
- viii. Preservation Metadata: Implementation Strategies (PREMIS) [     ]
- ix. NISO Draft Standard: Data Dictionary – Technical Metadata for Digital Still Images [     ]
- x. Visual Resources Association Core (VRA Core) [     ]
- xi. Public Broadcasting Core (PB Core) [     ]
- xii. Darwin Core [     ]
- xiii. None [     ]
- xiv. Don't know [     ]
- Any other (Please specify).....

**18. What kind of cataloguing standards and controlled vocabularies used in preparing descriptive metadata?**

- i. Library of Congress Subject Headings (LCSH) [     ]
- ii. Anglo-American Cataloging Rules - 2(AACR-2)/ Resource Descriptive and Access (RDA) [     ]
- iii. Art and Architecture Thesaurus (AAT)
- iv. Local Rules
- v. Describing Archives – A Content Standard (DACS)
- vi. Thesaurus of Graphic Materials I and II (TGM I & II)
- vii. Chenhall Nomenclature for Museum Cataloging
- viii. Cataloging Cultural Objects (CCO)
- ix. None
- x. Do not know
- Any other (please specify).....

**19. What kind of metadata harvesting protocol are being used in your organization?**

- i. Open Archival Information Protocol for Metadata Harvesting (OAI-PMH) [     ]

- ii. Open archives initiative protocol for object reuse and exchange(OAI-ORE) [    ]
  - iii. HTML (data export) [    ]
  - iv. File Transfer Protocol (FTP) [    ]
  - v. Z39.50 [    ]
  - vi. Organizations does not support any metadata harvesting capability [    ]
  - vii. Don't know [    ]
- Any other (please specify).....

20. Which tool your institute is using for OAI data harvesting and does that tool provide OAI data?

S.No	Software Name	OAI Data harvester	OAI Data Provider
1	Dspace		
2	Eprint		
3	GSDL		
4	MARC Edit		
5	PKP harvester		
6	Drupal- OAI		
7	Vufind-OAI		

21. What type of challenges you faced in data harvesting?

- i. Untitled Metadata [    ]
  - ii. Incomplete Harvest [    ]
  - iii. Connection Time out [    ]
  - iv. Junked Unicode Character[    ]
  - v. OAI Index Error [    ]
- Any other (please specify).....

**Section D Digital Preservation**

22. Does your organization have a digital preservation programme?

- Yes [    ]                      No [    ]



.....  
.....  
.....  
.....  
.....

28. Any comment

.....  
.....  
.....  
.....

Thank You

---

**Appendix B**

**Questionnaire for Centre for Development of Advanced Computing  
(C-DAC), Pune**

**General Information**

Name of the digitization project In-charge .....

Email id .....

Qualification .....

Special training of digitization (if any).....

Experience (Years) .....

**Section A- Digitization**

1. Does your centre have a program for digitizing the cultural heritage resources?  
Yes [ ] No [ ]
2. When your centre started the digitization of heritage collection?  
.....

3. How many documents have you digitized so far?  
.....

4. What kind of documents your centre digitized? (Check all that applies)

**Text based resources**

- |                 |     |                               |     |
|-----------------|-----|-------------------------------|-----|
| (a) Books       | [ ] | (b) Journals                  | [ ] |
| (c) Manuscripts | [ ] | (d) Rare books                | [ ] |
| (e) Newspapers  | [ ] | (f) Microforms and microfilms | [ ] |

Any other (Please specify).....

**Visual resources**

- |                         |     |                      |     |
|-------------------------|-----|----------------------|-----|
| (a) Drawings            | [ ] | (b) Paintings        | [ ] |
| (c) Engravings          | [ ] | (d) Maps and Atlases | [ ] |
| (e) Miniature paintings | [ ] | (f) Photographs      | [ ] |

- |                                  |     |             |     |
|----------------------------------|-----|-------------|-----|
| (g) Rare Photographs             | [ ] | (h) Posters | [ ] |
| (i) Sketches                     | [ ] | (j) Collage | [ ] |
| (k) Slides                       | [ ] |             |     |
| Any other (Please specify) ..... |     |             |     |

**Objects**

- |                                 |     |                     |     |
|---------------------------------|-----|---------------------|-----|
| (a) Coins                       | [ ] | (b) Sculptures      | [ ] |
| (c) Artefacts                   | [ ] | (d) Arms and Armour | [ ] |
| (e) Antiquities                 | [ ] | (f) Decorative Arts | [ ] |
| (g) Jewelry                     | [ ] | (h) Beads           | [ ] |
| (i) Terracotta                  | [ ] | (j) Textile         | [ ] |
| Any other (Please specify)..... |     |                     |     |

5. What is the total number of staff involved in the digitization in your centre?  
 .....

6. C-DAC has expertise in digitization and preservation, so whether the staff deployed in digitization project have received specialized training in a particular field?

Yes [ ] No [ ]

If yes, Please specify

.....

7. When you receive the documents from various organizations’/ museums, how you manage that content and whether you check the quality of that content?

.....  
 .....  
 .....  
 .....

8. Does your centre have any guideline/policy for digitizing and preserving the documents?

Yes [ ] No [ ]

If yes, please tick the following factors, which have been considered in that policy? (Check all that applies)

- |                                                         |     |
|---------------------------------------------------------|-----|
| (i) Selection of Materials                              | [ ] |
| (ii) Metadata Creation                                  | [ ] |
| (iii) Content Creation (scanning, digital capture etc.) | [ ] |

- (iv) Quality Control [     ]
- (v) Digital preservation [     ]
- (vi) Copyright [     ]
- (vii) Access [     ]

9. Does your centre follow any flow chart/workflow for the digitization process?  
 Yes [     ]     No [     ]

If yes, does the workflow related to digitization involve the following steps?  
 (Check all that applies)

- (i) Image creation (using scanners etc.) [     ]
- (ii) File/image processing operations [     ]
- (iii) File management (File Naming & Saving etc.) [     ]
- (iv) Creation of Image Databases [     ]
- (v) Storage [     ]
- (vi) Mass storage system [     ]
- (vii) Image delivery through networks, monitors, printers [     ]
- Any other (Please specify).....

10. Do you digitize documents containing Indian regional languages or other than English language?

Yes [     ]     No [     ]

If 'Yes', which other scripts (please list the most important)

.....

Please give details of any particular software used to digitize Indian scripts?

.....

11. What are the significant challenges that your organization face in digitizing heritage collection?

S. No.	Challenges in digitizing heritage collection	Strongly agree	Agree	Neither agree nor disagree	Strongly disagree	Disagree
1	Insufficient initial funding					

2	Absence of national digitization policy					
3	Infrastructure/ equipment shortfall					
4	Lack of expertise					
5	Missing standards and guidelines					
6	Selection of materials to be digitized					
7	Intellectual Property Right issues					
8	Lack of Training					
9	Lack of support from top management or administration					
10	Storage or Digital Media deterioration					
11	Variety of file formats					
12	Lack of proper motivation and leadership					
Any other (Please specify)						

**Section B- Scanning**

12. Which kind of software is being used in your organisation?

- a. HTML Editor .....
- b. XML Editor .....
- c. Text Editor.....
- d. Image Editor .....
- e. Scanning Software .....
- f. OCR Software .....
- g. FTP Software .....
- h. Page layout and Design Software .....
- i. PDF Software.....

13. What type of Digital file format are preferred in your centre for the creation of master files?

- |          |        |                |        |
|----------|--------|----------------|--------|
| i. TIFF  | [    ] | iv. PDF/ PDF-A | [    ] |
| ii. JPEG | [    ] | v. AVI         | [    ] |
| iii. WAV | [    ] |                |        |

Any other (please specify).....

14. At what resolution the images/text is captured for digitization?

a) Text

- |                       |        |                        |        |
|-----------------------|--------|------------------------|--------|
| (i) Less than 100dpi. | [    ] | (ii) 100-200dpi        | [    ] |
| (iii) 200-300dpi.     | [    ] | (iv) 300-400dpi.       | [    ] |
| (v) 400-500dpi.       | [    ] | (vi) More than 500dpi. | [    ] |

b) Images

- |              |        |               |        |
|--------------|--------|---------------|--------|
| (i) 100 dpi. | [    ] | (ii) 300dpi   | [    ] |
| (iii) 600dpi | [    ] | (iv) 1200dpi. | [    ] |

15. Have documents undergone special treatment before OCR processing?

- Yes [    ]      No [    ]

16. Which of the following features are covered in the creation of the master image files? (Check all that applies)

- a) Represents as closely as possible the information contains in the original[    ]
- b) Uncompressed [    ]
- c) Unedited [    ]
- d) Serves as long term source for derivate files [    ]

- e) Can serve as a surrogate for the original [    ]
  - f) High quality [    ]
  - g) Very large file size [    ]
  - h) Used for creating high-quality print [    ]
  - i) Stored in TIFF format [    ]
  - j) Ability to capture technical metadata as part of the file structure [    ]
  - k) Non-proprietary/open-source format [    ]
  - l) Lossless compression [    ]
  - m) Supports long term fidelity and long term preservation of image [    ]
  - n) Stored on a stable medium and remain in a controlled environment [    ]
- Any other (Please specify).....

17 Have you carried out any post-digitization improvements in image mode or text/OCR mode?

Yes     [    ]     No     [    ]

If so, which ones .....

### **Section- C File Naming**

18. Which of the following factors are considered for choosing the file names?

(Check all that applies)

- (a) Persistence over time [    ] (f) Universal retrieval [    ]
- (b) Access and ease of use [    ] (g) Determining official copy [    ]
- (c) Ease of administration [    ] (h) Determining file naming boundaries [    ]
- (d) Scalability [    ] (i) Relationship and connection with paper [    ]

Any other (please specify).....

19. What kind of characteristics are followed by your centre in creating file names?

(Check all that applies)

- (a) Version Number [    ] (g) Release data [    ]
- (b) Date of creation [    ] (h) Publication date [    ]
- (c) Name of the creator [    ] (i) Project number [    ]
- (d) Description of content [    ] (j) Department number [    ]

(e) Name of intended audience [ ] (k) Records series [ ]

(f) Name of group associated with the record [ ]

Any other (please specify).....

**Section D- Metadata**

20. What types of metadata your centre created for their digital item? (Check all that applies)

- |                                |                              |
|--------------------------------|------------------------------|
| i.Descriptive Metadata [ ]     | iv. Structural Metadata [ ]  |
| ii.Administrative Metadata [ ] | v. Preservation Metadata [ ] |
| iii.Technical Metadata [ ]     |                              |

21. Which metadata schemas are being used in your organization for the resource description? (Check all that applies)

- |                                                                                           |     |
|-------------------------------------------------------------------------------------------|-----|
| i. Dublin Core                                                                            | [ ] |
| ii. MARC 21                                                                               | [ ] |
| iii. Metadata Object Descriptive Schema (MODS)                                            | [ ] |
| iv. Encoded Archival Description (EAD)                                                    | [ ] |
| v. Cataloguing of Cultural Objects (CCO)                                                  | [ ] |
| vi. Categories for the Description of Works of Art (CDWA)                                 | [ ] |
| vii. Metadata Encoding Transmission Standard (METS)                                       | [ ] |
| viii. Preservation Metadata: Implementation Strategies (PREMIS)                           | [ ] |
| ix. NISO Draft Standard: Data Dictionary – Technical Metadata for Digital Still Images[ ] |     |
| x. Visual Resources Association Core (VRA Core)                                           | [ ] |
| xi. Public Broadcasting Core (PB Core)                                                    | [ ] |
| xii. Darwin Core                                                                          | [ ] |

Any other (Please specify).....

22. What kind of cataloguing standards and controlled vocabularies are used in preparing descriptive metadata? (Check all that applies)

- |                                                                                          |     |
|------------------------------------------------------------------------------------------|-----|
| i. Library of Congress Subject Headings (LCSH)                                           | [ ] |
| ii. Anglo-American Cataloging Rules – 2 (AACR-2) / Resource Descriptive and Access (RDA) | [ ] |
| iii. Art and Architecture Thesaurus (AAT)                                                | [ ] |
| iv. Local Rules                                                                          | [ ] |

- v. Describing Archives – A Content Standard (DACCS) [     ]
- vi. Thesaurus of Graphic Materials I and II (TGM I & II) [     ]
- vii. Chenhall Nomenclature for Museum Cataloging [     ]
- viii. Cataloging Cultural Objects (CCO) [     ]
- Any other (please specify).....

**Section E- Storage**

23. Which file format is used to create/store the digital product? (Check all that applies)

**(1) Text based products**

(a) .html [     ]                      (b) .sgml [     ]

(c) .pdf [     ]                        (d) .txt [     ]

(e) postscript [     ]

Any other (please specify).....

**(2) Image based products**

(a) .gif [     ]                        (b) .jpeg [     ]

(c) .tiff [     ]

Any other (Please specify).....

**(3) Sound based products**

(a) .wav [     ]                        (b) .mid [     ]

(c) .ra [     ]                         (d) .au [     ]

Any other (Please specify).....

**(4) Multimedia based products**

(a) .avi [     ]                        (b) .mpeg [     ]

(c) .inor [     ]                        (d) .mov [     ]

(e) .wri [     ]

Any other (Please specify).....



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Any comments

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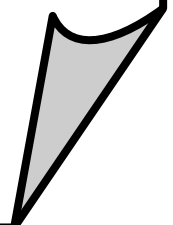
Thank you so much for your kind help and courtesy.

After filling up please, return to-

Rahul Pandey  
DLIS, BBAU LUCKNOW



# *List of Publications*



## LIST OF PUBLICATIONS

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- Kumar, V. and Pandey, R. (2021). Exploring the information needs of competition inclined university students. *Library Philosophy and Practice (e-journal)*. 5773.  
<https://digitalcommons.unl.edu/libphilprac/5773>.
- Pandey, R. and Awasthi, S. (2021). Research Publication Pattern of Journal of Indian Library Association (JILA): A Bibliometric Analysis during 2015-2019. *Library Philosophy and Practice (e-journal)*. 4733.  
<https://digitalcommons.unl.edu/libphilprac/4733>
- Pandey, R. and Kumar, V. (2020). Exploring the impediments to digitization and digital preservation of cultural heritage resources: A selective review. *Preservation, Digital Technology & Culture*, 49 (1), 26-37.
- Pandey, R. and Kumar, V. (2019). Problems in utilizing LIS resources: a perspective of LIS students. *SRELS Journal of Information Management*, 56(3), 144-147.

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

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Library Philosophy and Practice (e-journal)

Libraries at University of Nebraska-Lincoln

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July 2021

## Exploring the information needs of competition inclined university students

VINIT KUMAR

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KUMAR, VINIT and PANDEY, RAHUL, "Exploring the information needs of competition inclined university students" (2021). *Library Philosophy and Practice (e-journal)*. 5773.

<https://digitalcommons.unl.edu/libphilprac/5773>

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

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Library Philosophy and Practice (e-journal)

Libraries at University of Nebraska-Lincoln

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January 2021

## Research Publication Pattern of Journal of Indian Library Association (JILA): A Bibliometric Analysis during 2015-2019

RAHUL PANDEY

*Babasaheb Bhimrao Ambedkar University, Lucknow, shikhaawasthi1991@gmail.com*

Shikha Awasthi

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PANDEY, RAHUL and Awasthi, Shikha, "Research Publication Pattern of Journal of Indian Library Association (JILA): A Bibliometric Analysis during 2015-2019" (2021). *Library Philosophy and Practice (e-journal)*. 4733.

<https://digitalcommons.unl.edu/libphilprac/4733>

Rahul Pandey\* and Vinit Kumar\*

# Exploring the Impediments to Digitization and Digital Preservation of Cultural Heritage Resources: A Selective Review

<https://doi.org/10.1515/pdtc-2020-0006>

**Abstract:** This paper presents a careful review of studies underlining the impediments in digitization and digital preservation of cultural heritage resources faced by library professionals, archivists and project managers in digitization projects. A systematic and structured literature review based on the conceptual and empirical published studies on digitization and digital preservation is done to sieve out the barriers and challenges of digitization projects. The findings of the study revealed that most digitization projects suffer with impediments such as, inadequate funding, lack of national-level digital preservation policy and absence of technical infrastructure while digitizing and preserving the cultural and heritage resources. The originality of the paper lies in presenting the prominent constraints in digitization and preservation of cultural and heritage resources in consolidated manner otherwise scattered in several case studies. The findings will be of high significance for librarians and digitization project managers at the planning stage of their digitization projects.

**Keywords:** Digitization; Digital preservation; Digitization challenges; Digitization Issues; Culture; Heritage.

## 1 Introduction

Culture and heritage of a geographical place are stored in the form of cultural and heritage resources such as manuscripts, artefacts, rare books and rare photographs. With the availability of digital technology, most of the most recent literature is born-digital, but there is still a lot of writing available in analog form only. To communicate the culture and heritage to coming generations Libraries, Archives, and Museums (LAMs) work collaboratively to provide access to cultural heritage resources

in their collections by distributing them in digital formats via the World Wide Web. Digitization enables archives and museums to convert their analog materials into digital formats.

Both analog and digital materials are fragile and are prone to deterioration over time. Consequently, to provide long term access to analog and digital information for future generations, the preservation of cultural material is required. Although there is a high need to digitize as well as to preserve the cultural and heritage resources, several challenges are involved in the digitization and digital preservation of documents. Many digitization and preservation projects are running across the world by archivists, project managers, curators, librarians and digitization enthusiasts, however, it is complicated for project managers and professionals to cope with technological changes and other challenges. They face several hindrances in providing access to resources in digital formats.

This paper highlights a careful review of studies conducted in the field of digitization and digital preservation in LAMs. The study further presents the various barriers faced by digitization enthusiasts, archivists, and library professionals during digitization and digital preservation activities of cultural heritage resources available in their organizations. The results of the study also give an overview of the geographic focus of digitization and digital preservation publications, and the preferred publication venues of contributors.

## 2 Data

The existing literature was searched using queries such as “Digitisation OR Digitization”, “Preservation OR Digital preservation”, “Digitisation AND Digital Preservation”, “Digitisation Challenges”, “Digitisation Issues”, “Digitisation Barriers”, “Cultural Heritage Resources”, “Cultural Heritage Institutions” during May 2019 to Dec 2019 in scholarly databases such as Scopus and Google Scholar. The collected articles were critically reviewed to assess their relevance to the chosen topic based on the scope, objectives, type of study. After analysis of the collected studies, only relevant articles which focused on the

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# Problems in Utilizing LIS Resources: A Perspective of LIS Students

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## Abstract

A multitude of content is generated by library and information science professionals. On the other hand LIS students struggle to find content which meets curricular needs. It becomes important to understand the issues being faced by LIS students while consulting their required documents. Similarly it is also important to understand the various factors that motivate LIS students to select any document for meeting their academic needs. The aim of this paper is to examine the issues faced by LIS students while consulting books and journals and to identify the factors which motivate them for selecting any document. The present study is a survey-based work in which the data was collected using a structured questionnaire. The result of the study revealed some major issues faced by LIS students while consulting books and journals and factors motivating selection of documents for study.

**Keywords:** Academic Libraries, Book Selection, Motivating Factors, Reading Preferences

## 1. Introduction

Just as education in any other field LIS education is also experiencing challenges in recent decades. These challenges range from curriculum, library practices, implementation of technologies in libraries to issues faced by LIS students while consulting required documents for their academic needs (Xue et al. (n.d.)). With the advent of technology it is very difficult for LIS students to access the relevant and pin pointed information published in books and journals. On the basis of previous studies (Pareek & Rana, 2013; Akanda et al., 2013) it is observed that library students face several issues like 'do not know how to use e-resources', 'do not know how to use OPAC', lack of interesting reading material and unavailability of books. The present study focuses on the issues faced by LIS students while consulting books and journals for fulfilling their academic needs. Study also investigates the factors which motivate students to select any particular document.

## 2. Literature Review

Most of the studies related to reading preferences of

LIS students focused on library visit frequency (Pareek & Rana, 2013; Rani, 2009), preferred place of reading (Mishra & Yadav, 2013), library use patterns (Basu & Das, 2012; Collins & Stone, 2014; Franklin & Plum, 2004), time spent in the library (Mishra, 2014; Thanuskodi, 2011), It was observed that there were few studies which examine the problems faced by LIS students in utilizing LIS resources in fulfilling their academic needs; this paper mainly focused on these problems.

### 2.1 Reading Behaviour of University Students

Skenderi and Ejupi (2018) conducted a study in University of North-Western Macedonia to know the purpose of reading books; It was found that 34.9% of total respondents read books for their personal satisfaction. Vellaichamy and Jeyshankar (2014) noted that 35.33% users read books for education purposes. Pareek and Rana (2013) surveyed research scholars in Banasthali university; examined that during library visit and consulting books they found lack of latest information materials (32 % of sample) followed by problems related to 'how to use e-resources' (28%). On the other hand Vellaichamy and

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