
Digital Preservation of Manuscripts : A Case Study

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Abstract

This paper discusses the present situation of manuscripts and preservation steps, which has to be taken; to save the heritage the paper proposes a plan for digitization of these cultural heritages of India. The paper also discusses the history and technique of manuscript in India particularly SORI. Various institutions involved in archiving and preserving manuscript are also highlighted with historical backgrounds. Various efforts taken in preserving manuscript in digital format in India and abroad are also discussed. Maintains SORI as one of the front runner in the preservation process. Details on how manuscripts are digitized are also discussed and concludes with suggestions on various issues of manuscript digitization.

Keywords : Digital Preservation, Manuscripts

0. Introduction

During the history extending over 5000 years, India has produced a large wealth of literature. This vast knowledge treasure was written on different kinds of material like birch bark, palm leaf, cloth, wood, stone and paper etc. India perhaps has one of the oldest and largest collections of manuscripts in the world. They are in the custody of different institutions like libraries, museums, monasteries, mosque and individuals. Many of them have disappeared and a large number are in a state of damage/decay. We already have lost huge manuscript collection in Buddhist monasteries like Nalanda, Taxila & Vikramshila. Taxila at the North West front of India was destroyed by foreign aggression. Nalanda library known as Dharmganj had 3 sections Ratnadodhi, Ratnasagar and Ratna Rajak. Ratnadodhi was a 9 storied library. First Hun king Michirkul damage the library in 450-470 AD. In 1205 AD Bakhtiyar Khilji destroyed it completely and his soldiers use the manuscripts for boiling water [1].

Let us hope no more Khilji is born in modern time and let us take step to save these manuscripts for further decay and damage that will destroy them. The public access of older manuscripts also leads to substantially quicker disintegration of the originals. An appropriate alternative that could be the solution to the existing problem is preservation by way of microform or use of modern computer technology which is digitization of the manuscripts.

The manuscripts, besides having information (the image data) also have visual information (secondary image data). The information regarding physical form, binding, paper, history of manuscript, source of acquisition, its present market value which is often high, is called physical data. All these are very important in manuscripts.

There are many libraries in the world where rare manuscripts of Indian origin are preserved and some of them are [2]:

Copenhagen Royal Library (Denmark); Bibliotheque Nationale (France); Preussische States Bibliothek, Universitats Bibliothek, Staats Bibliothek ,Bayershe Staats Bibliothek(Germany); British Library, Royal Asiatic Society, Bodleian Library,India Institute, Cambridge University Library (United Kingdom); Darbar Library (Nepal); Punjab University Library (Pakistan); Museum Library (Sri Lanka).

In India Manuscripts are maintained usually by universities and research institutes. They are as follows [2]:

SL.	NAME OF THE INSTITUTIONS	MANUSCRIPTS
1	Sampurnanand Sankskrit University, Varanasi	1, 40,000
2	Rajasthan Oriental Research Institute, Jodhpur	1, 16,123
3	Govt. Oriental Manuscript Library Chennai	72,620
4	TSSM Library, Thanjavour	47,625
5	Adyar Library and Research Centre, Chennai	40,000
6	Orissa State Museum, Bhubaneswar	37,000
7	Asiatic Society, Kolkata	32,000
8	Andhra Pradesh Orinetal Main Library	23, 115
9	Khuda Baksh Oriental Public Library, Patna	20,060
10	Scindia Oriental Research Institute, Ujjain	18,695
11	Punjab University, Chandigarh	18,395
12	State Central Library, Hyderabad	17,000
13	Vishwabharati University, Shantiniketan	15,354
14	Rampur Raza Library, Rampur	15,000
15	Rajasthan State Archives, Bikaner	14,000
16	Kameshwar Singh Darbhanga Sanksrit University, Darbhanga	13,000
17	University of Calcutta, Kolkata	13,000
18	Aligarh Muslim University, Aligarh	12,000
19	Govt. Manuscript Library, Allahabad	11,000
20	Banaras Hindu University, Varanasi	10,500
21	Safdarjang Museum, Hyderabad	10,000
22	Central Institute of Buddhist Studies, Leh	10,000
23	Osmania University Library, Hyderabad	6,428
24	Shivaji University Library, Kolhapur	5,673
25	Kurukshetra University, Kurukshetra	5,500
26	Poona University, Poona	4,416
27	Patna University, Patna	3,700
28	Tamil University, Thanjavur	3,365
29	National Library, Kolkata	3,258
30	Guwahati University, Guwahati	3,248
31	Utkal University, Utkal	3,053
32	Andhra University Library, Hyderabad	3,000
33	Sanskrit Academy, Osmania University, Hyderabad	3,000

A Survey made by Indian National Trust for Art and Cultural Heritage (INTACH) under National Manuscript Mission in the year 1988-90 found that there were various types of manuscripts [2]:

Sl.	Types of Manuscripts	No. of Manuscripts
1	Manuscripts in India (estimated)	5,000,000
2	Indian manuscripts available in European countries	60,000
3	Indian manuscripts in South Asia and Asian Countries	150,000
4	Number of manuscripts recorded in catalogues	1,000,000 (approx.)

Percentage of Manuscripts Language Wise

Sanskrit	67%
Other Indian Languages	25%
Arabic/Persian/Tibetan	8%

1. Historical Background of Ujjain City

Ujjain is an ancient, historical pilgrimage city of India. It is known as cultural capital of India. Ujjain was called by ancient people Vishala, Kanak Shiringa, Amaravati, Pratikalpa Awantika, Ujjaini, etc. It is situated on the fertile land of Malwa. Ujjain which has always been known for its sanctity stands on the right bank of river Shipra. This city is one of the seven sacred cities of the Hindus. Where one of the JyotirlingMahakal rests and during 'Simhstha Mela' or 'Kumbh Mela', a festival held in every twelfth years, people went there to have a dip in the holy water of 'Shipra' on the auspicious days. Also known as city of Mahakavi Kalidasa is also famous for Guru Sandipani Ashram where lord Krishna completed his education. Historically, this city was the capital of the famous king Vikramaditya who was famous for his judgment and Navratna of scholars. Sawai Jaising of Jaipur had erected here an observatory which is still standing.

2. Scindia Oriental Research Institute (SORI)

Scindia Oriental Research Institute, Ujjain a pioneer manuscript library of India, was ranked 11th in India as per the Indian National Trust for Art and Cultural Heritage (INTACH) survey [3].

2.1 Establishment

The history of Oriental Institutes begins with establishment of Asiatic Society of Bengal in 1789. Royal Asiatic Society of London was established much later to it in 1823. Its Bombay branch was established in 1829. These institutes were established with an aim to collect manuscript. After that many institutions started collecting rare manuscripts in India and abroad. In India Baroda, Mysore, Kashmir, Kochin and Travancore etc., started collecting manuscripts. Bhandarkar Oriental Research Centre, Poona was established.

In Madhya Pradesh, Bhelsa (Vidisha), Maheswar, Mandesaur, Ujjain, Dhar and Chanderi had rare manuscript collections but in neglected state. The manuscript from Ujjain were being sent out of Ujjain, a few of them to Oriental Institute, Baroda. In 1931, king of Baroda, Maharaja Siyaji Rao Gaekwad wrote to Regency Council of Gwalior State about scattered manuscripts in Ujjain and recommended its collection and preservation. On this, a manuscript library named Oriental Book Collection was established on 20th October, 1931. It was started with only 11 manuscripts in a rental house in Pan Dariba. This was increased to 2000 by July 1933. On 1st July, 1933, it was transferred to Madhav College, Ujjain. A gallery was constructed for their display which is still in very good condition. Dr. Divakar started caring these manuscripts. In 1936 and 1941 the manuscript catalogues were published.

Maharaja Jiwaji Rao Scindia set up a committee in 1938 under the Chairmanship of Sir Manu Bhai Desai with Dr. Radhankrishnan, Dr. Amarnath Jha and Professor Paranjbe as its members to establish permanent memory of Maharaja Vikram celebrating Vikram era festival. The committee recommended establishment of Vikram University, Vikram Kirti Mandir including Archeological Museum, Scindia Oriental Research Institute and a Conference hall. During independence movement, it was delayed. In 1941, Vikram Bi-Centenary festival was organised in Ujjain when the earlier oriental book collection was renamed as Scindia Oriental Institute and was included in normal budget of education department of Gwalior State for financial help. President of India Dr. Rajendra Prasad lay foundations of Vikram Kirti Mandir on 8th May, 1951. But due to delay in its progress, the Scindia Oriental Research Institute was transferred in a rental house- Nawab Saheb Bangla near Madhav Club.

After state reorganisation in 1956 and establishment of newly carved Madhya Pradesh, the SORI was transferred to the control of Deputy Director of School Education in M.P. Government. Finally Vikram University was established in 1957 and on 06/11/1960 an Memorandum of Understanding (MoU) was signed between M.P Govt. and Vikram University. On 26/06/1961 the institute was transferred to the Vikram University. In 1966, it was shifted to newly constructed Jiwaji Rao Library building. In August 1968, after construction of some parts of Vikram Kirti Mandir, the institute was shifted to its own place.

2.2 Staff

In the beginning (till 1956) the institute has the post of one Curator, one Shastri, one Librarian, one assistant cataloguer and one clerk. The following posts are sanctioned posts and their designations with grades are given below:

Table 1: Staff & Designation

Sl. No	Class	Designation	No. of Posts	Grade
1	I	Director (Vacant) *	One	16000-19500
2	I	Joint Director (Vacant)	One	12000-15990
3.	II	Lecturer (Vacant)	One	8000-13500
4.	III	Curator (Vacant)	One	Not available
5.	III	Sastri	One	4500-7000
6.	III	Research Assistant	One	8000-13500
7.	III	Upper Division Clerk	One	4500-7000
8.	III	Archivist	One	4000-6000
9.	III	Cataloguer (Vacant)	One	950-1530
10	III	Assistant Cataloguer	One	3050-4590
11	III	Microfilm Operator	One	5000-8000
12	IV	Khallasi/Daftari	One	2550-3200
13	IV	Sweeper	One	2550-3200
14	IV	Servant/Peon	One	daily wage
15	IV	Chowkidar	One	daily wage

*Acting Director working from Sanskrit Department.

2.3 Budget

The expenditure/budget of the institute in 2002-2003 and 2003-2004 are as follows [8]:

Table-2: Expenditure and Budget

Sr. No.	Items	Actual Exp. 2001-02	Original Budget 2002-03	Revised Estimate 2002-03	Original Budget 2003-04
1	Contingency	7000	10,000	10,000	10,000
2	Books and Megazines	-	30,000	30,000	20,000
3	Furniture and Equipments	2000	25,000	20,000	20,000
4	Water and Electricity	2000	20,000	20,000	25,000
5	Microfilm Unit	-	10,000	10,000	10,000
6	Maint. & repair of old and rare manuscripts	-	10,000	10,000	40,000
Total Rs.		11,000	1,45,000	1,40,000	1,75,000

Salaries are not included in this which is high as compared to other heads.

2.4 Collection

Collections of this institute are very rare and important. Only a small portion of the present collection of manuscripts was made available from Ujjain. Remaining collection was brought from different places mainly from Lashkar, Gwalior, Mandasaur, Poona, Jalgaon, Sagar, Ratnagiri, Banaras, Jalone, Indore and Srinagar (Kashmir). After the establishment of SORI in 1931 the growth of manuscripts is shown in the table [9].

The progress made by the institute is as under:

Table - 3: Growth of Manuscripts

Sl.no	Year	No. of Manuscripts	Sl.no	Year	No. of Manuscripts
1	1931	11	12	1942	6160
2	1932	58	13	1943	7033
3	1933	483	14	1944	7369
4	1934	1891	15	1954	9794
5	1935	2700	16	1969	14146
6	1936	4459	17	1986	18122
7	1937	4853	18	1989	18122
8	1938	5392	19	1990	18562
9	1939	6057	20	1991	18695
10	1940	6090	21	1993	18695
11	1941	6125	22	2003	18695

Here we can see that only 473 manuscripts have been added since 1986. There are various kinds of manuscripts in the institutes. More than enough manuscripts are collected in Sanskrit language but the other manuscripts are written in many languages like Marathi, Hindi, Gujrati, Aarabic, Persian, Bengali, Maithali and Telegu etc. Many kinds of writing materials can be seen here like papers, palm leaves, birch barks, metal plates etc. There are also manuscripts which are written in different kind of scripts. The scripts are Devanagari, Brahmi, Gupta, Jain, Maithili, Modi, Sharada, Muriya, Farasi, Bangla, Telegu, Tamil etc.

2.5 Acquiring Manuscripts

Whether it becomes known that a particular manuscript is being sold the 'Sastri' and other staff members of the institute goes to the place to purchase and study the manuscripts. The 'Sastri' knows about the collection of manuscripts in the institute and after seeing the catalogues it is decided whether or not the manuscript is useful for the institute. The pages are checked if found useful. It is checked whether the pages are in agreeable state and written by a single person or two or more persons. Thereafter, meeting is convened and the draft for purchase is proposed before the committee. If the proposal is assed then the cost of the manuscript is assessed and after due assent of the seller and the manuscript.

2.6 Types of Manuscript available in SORI

- (a) Palm leaf Manuscript: In India maximum manuscripts of ancient period are written on palm leaves. Palm leaves are usually 37 inch in length and 3 inch in width. The palm leaves were boiled and then were rubbed by couch shell for smoothness. Then with the help of iron pen, letters were scratched and ink was pasted on them- simultaneously. This method was popular in South India. Hot atmosphere is harmful for palm leaves. The palm leaf manuscripts if kept in paper or cloth, is mutilated. In SORI only 3 palm leaf manuscripts are available.
- (b) Birch Barks Manuscripts: Birch tree is found in Himachal Pradesh. Its inner bark is just like papers which were used for writing. Some times its length is found to be 60'. These were cut into pieces as per requirement and then were written with different inks. The manuscripts written on birch barks are generally found in Kashmir and north India. In SORI only 3 manuscripts of this type are available.
- (c) Paper Manuscripts: It is said, that first of all, the paper was made by Chinese peoples. In ancient India also the paper was made. In our country, many types of papers are famous for writing, like Kashmiri, Moghulai, Ahmadabedi, Daulatabadi, etc. The paper used, was prepared by hand using different raw material like bamboo, cotton, etc. In SORI most of the manuscripts available are on paper. Leather, Cloth and Wooden manuscripts are not available at SORI.

2.7 Publications of Scindia Oriental Research Institute

The institute has published the following titles under the 'Scindia Oriental Series'

1. Tattvasara (Marathi), 1936, 414p.
2. Alankara Manjusha (Scindia Oriental Series no.1), 1940, 384p.
3. Ancient Jaina Hymns (Scindia Oriental Series no.2), 1951, 178p.
4. Sastrattva Vinirnaya (Scindia Oriental Series no.3), 1952, 136p.
5. Chikitsa Manjari (Scindia Oriental Series no.4), 1959, 206p.
6. Journal of Scindia Oriental Institute, Vol. I (1955) and Vol. II (1956).

7. A descriptive catalogue of manuscripts in the Scindia Oriental Institute, Vol. II, (literature), Part-I, 1983, 282p.
8. A descriptive catalogue of manuscripts in the Scindia Oriental Institute, Vol. II, (literature), Part-II, 1985, 414p.

It may be noted that for some reasons Volume I (Vedic Sahitya) is not published and Volume III to XII ready but yet to publish.

In addition the following three Vikram volumes have been published in commemoration on the completion of 2000 years of Vikram era.

1. Vikram Volume (English), 768p.
2. Vikram Smriti Grantha (Hindi), 927p.
3. Vikram Smriti Grantha (Marathi), 568p.

2.8 Microfilming of Manuscript

Some 4190 manuscripts of importance have been microfilmed by Indira Gandhi National Centre for Arts (IGNCA) at SORI. One copy of the microfilm is available with SORI. The IGNCA has microfilmed 2, 50,000 manuscripts in 66 libraries running to 11 million folio [2]. Other manuscripts at SORI are yet to be microfilmed due to lack of staff though a microfilm processing unit is available.

Department of culture, Govt. of India has started National Mission for Manuscripts which will convert manuscripts into electronic record as one of the activities. Besides preparation of catalogue, search of manuscript in society through surveys and building up of a National Manuscript Library. The institutions have been provided fund to start the mission. Rs.10 millions has been allocated to launch the mission. A total of Rs.265 million is estimated for building, cataloguing, conservation, microfilming, and digitization starting from the year 2002-2007. Besides Rs. 25 million will be spent on purchase of manuscript from the customers.

SORI is recognized as Manuscript Resource Centre (MRC) for all Madhya Pradesh for the preparation of accession catalogue, launch awareness programme in society. In total 23 such MRCs have been recognized in India. Under the project SORI is getting grants and the preliminary work has started.

3. Manuscripts Digitization Process

The digitization process at SORI is yet to start. In this section we have studied technologies available at present so that options can be selected at final stage.

There are various options available for digitization of reading material. The re-typing is not possible in case of manuscripts. Scanning is the only possibility in case of manuscripts. It is nothing more than a picture of printed page in digital form. Digital imaging technology convert manuscripts into digital images and can be made available over electronic networks- a digital image is composed of set of pixels. The text can be retrieved, printed and modified using appropriate software. The scanning of manuscripts using computer image scanner is done carefully due to variations in text and colour and images. Aperture of can also be made by digital camera or other feasible imaging devices.

The digital images can be captured at varied of density or bits pixel. Simple binary scanning in black and white is not always complete in digitizing manuscripts as colored illustrations are also valuable with texts. Light and darkness of document is to be considered before digitization. Color images are more complex because they need encoding of shades.

Resolution of image is measured in dot per inch (dpi). Higher dpi leads to better resolution and quality of image but larger image file. 300 to 600 dpi are recommended for better resolutions. File compression is another important aspect because image capturing takes more space. Various types of scanners such as Flatbed, sheet feed, drum scanners and digital cameras are available to scan manuscripts. Microfilm scanners are used to convert roll film, fiche into digitized form. Video Digitizer are also available now a days which may be also used for scanning [3].

4. Digitization Experiences

There have been few manuscripts digitization projects in the world to point problems and solutions of digitization of manuscripts. The experiences may be helpful in deciding technological options. A few experiences are given here [4].

UNESCO project entitled "The Memory of the World" aim to initiate to support the safeguarding of existing document for future. Under the programme in 1993 first memory disk was published on two CD ROMs having digital form of two entire manuscripts that National Library of Czech Republic to test the possibility of digitization of manuscripts. Latter more CDs were made. These two projects studied the problems of manuscripts digitization. Each image 2.40 MB and display of original image was very time consuming. More such experience was made to get high resolution. The present technology has enabled approximately 100 on a CD ROM with full preservation of color and passed resolutions. Manuscript digitization demonstration Project sponsored by Library of Congress is carried out in cooperation with National Library Digitization act.

Digitization of Manuscript of the National Library of India undertook a pilot project entitled "Down Memory Lane" to digitize its rare and brittle books in 90's. A local private agency was given the responsibility to scan and clean the documents. Between the year 1999 and 2001 approximately 6601 books/manuscripts containing 2.5 million pages were scanned and archived in 548 CD-ROMs. National Library has 3000 volume of paper manuscripts and 334 palm leaf manuscripts in Arabic, Persian, Urdu, Bengali, English, Hindi, Tamil and Sanskrit language. Many of them with beautiful illustrations fine epigraphy and elegant bindings. The sample project was undertaken for the digitization of these manuscripts. The project was undertaken in collaboration with Trinetrix Technologies, Calcutta. A Persian Manuscript –Tutinamah was sample project. The image was captured by a digital camera (Nikon D100 with bayonet mount 28-70mm f/2.8 ED – IF AF-S Zoom- Nikon lens) mounted vertically on the photographic copy stand (Bojen System 800 Repro Copy Stand W/bb 1740), with side illumination through 40 watts incandescent lamp. The background was chosen to be slightly lighter than the document color in order to minimize shadow and optimize digital transfer. The digital camera had special color metric filter that enabled the camera to capture a broader spectrum of color than most digital scanners. The lighting was also provided selectively from by two 1000-watt Elinchrome Strobe lights (daylight balance) at 45% angle to copy surface, with multiple diffusion filters between copy surface and light to soften shadows and reduce glare for specific pages with illustrations.

The image processing station was a HP Brio, PC with Pentium IV processor, 128 MB DDRAM. The workstation had the image processing software like Kodak Imaging, Adobe Photoshop 6. There was an image transfer device connected to the USB port, which gathered images from the memory card of the digital camera. The lighting environment was adjusted as per the specific requirement document using light meter. The manuscript was set on the Photography copy stand bed opening it at angle of 120 degree to avoid the stress to the binding of the manuscript. The image was captured from the manuscript at the different aperture, focal length and shutter speed and the captured images were transferred to the image processing Station. Final images were at suitable Aperture Focal length shutter speed. First for all right hand side pose and then for all left hand side pages in color as uncompressed 8 bit per channel (24 bit RGB) TIFF files at 300 dpi. The images were then transferred to the Image Processing Station.

The files were converted to three basic formats as per the requirements namely, PDF, TIFF and JPEG. The individual image PDF files were tagged and a composite PDF file was prepared as per the original document pagination and sequence. The images were stored in CD-ROMs and were made resident in hard disk of the central server. The images produced have minute tonal variations due to shade of colour and illustration. A white light is more helpful to minimize tonal variations. Software Adobe Photoshop version 6 is very resource consuming.

From the above experiment it is clear that digitization of manuscript is not as simple as one can understand as photocopying and scanning. It is much more complicated need expertise, costly and time consuming. It requires costly digital cameras, work stations and high quality hardware and software. The images need to be as close to the original as possible, with removal of worm marks, stain marks. The images need to be clear and the details of the illustrations of pages have to be captured to the best possible extent. Cost-benefit analysis on the project with the long-term view on the scope of project in large scale is to be considered. The project estimations and determination of the time frame of completion of digitization of the entire collections of manuscripts is to be decided.

5. Conclusion

Every digitization program of manuscripts should be feasible. The technical requirements need hardware, software, storage and staff. The digital capture, metadata, access should meet international and national standards. The budget is very important. Digitization need huge amount to purchase high quality hardware and software, lighting equipments. Software for data capturing of high quality are also costly. The digitization should also be very clear. It is never need based but value added.

India's most valuable and precious gift to humanity is its profound and timeless heritage. This heritage encompasses almost every aspect of human enquiry. Today, this heritage is scattered in libraries and in individual possessions. Much of India's heritage, in its physical form, has unfortunately got mutilated and destroyed through successive invasions, some of which is still being stolen; books manuscripts are decaying. The preservation of "Indian Heritage" presents a great challenge. Fortunately indeed, the merging information technology can offer a solution not only for preservation, but also for enhancement and for its wide scale access. One of the greatest contributions of Indian libraries could be to bring the precious, oriental and timeless Indian Heritage on the Internet.

6. Suggestions

1. SORI must start a time frame for digitization of manuscripts.
2. Manuscripts must be selected, classified into various categories to plan digitization programme.
3. Latest technology should be made available with national and international standards.
4. A separate digitization section with technical staff be sanctioned
5. Training should be imparted to existing staff for the progress of digitization.

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