CHAPTER – 3

DIGITIZATION OF MANUSCRIPTS

3.1 INTRODUCTION

Manuscripts provide rich, authentic information, facts and evidence for historical, legal and research reference. Physical condition of manuscripts has decayed due to factors such as climate, insects, acidified paper and old age. Physical preservation of manuscripts is a difficult task, even under the best of conditions, Indian paper manuscripts may last four hundred years while the palm leaf manuscripts under the best condition may last seven hundred years.\footnote{Menon, S., & Williams, G.M. (n.d.). Novel, cost effective method of archiving manuscripts. Retrieved April 27, 2010 from \url{http://www.ias.ac.in/currsci/may25/articles12.htm}} Ever since the efforts have been made to save and preserve the manuscripts for the present as well as for the use of future generation. In the past, scribes used to meticulously copy the manuscripts for future generation.

Modern technology has played a major role in preservation and promotion of cultural heritage. Multimedia encompasses all forms of materials, e.g. textual, visual and audio all together to represent the holistic form. The World Wide Web (www) is wide reaching medium through which anything and everything could be made available to anyone and everyone around the globe.

3.2 ERA OF TECHNOLOGY AND ITS IMPACT ON PRESERVATION OF MANUSCRIPTS

India has been the cradle of knowledge for thousands of years. The information technology oriented environment has brought in opportunities of a revolutionary nature in archiving and accessing knowledge in the digitized form, which were known to exist in conventional libraries mainly in the print form. Computers were introduced in library activities in 1980s in India but it was limited to creation of bibliographic database and house keeping operations. This conversion of bibliographic catalogue record into digital
format was the initial stage, but now it has been broadened by implementing it to conversion of full text, graphics, sound, video records, etc. The various types of media were used to preserve the digitized information. Different media used are as follows:

### 3.2.1 MICROFORM MEDIA

Microform media has two types of storage media which are:

**Microfilm**

A microfilm is prepared by microfilming camera in different size of film such as 16mm, 35mm, 70mm, or according to the size of paper. Microfilming provides a stable format, with a very long life. Microfilm is expected to last upto 500 years if it is stored and handled properly\(^2\). It is an independent platform and accessible via lens based hardware. It can be used as a source for remastering or digitizing throughout the course of its lifecycle, moreover, it does not require migration or refreshing\(^3\). The emergence of microfilming technology has alleviated two big problems encountered in the preservation of manuscripts, one is lifecycle and another is space. Nevertheless, it does not solve the problem of accessing and sharing.

**Microfiche**

A microfiche is a 4 by 5 inch (10.2 cm by 15.2 cm) piece of photographic film, containing printed information in a size too small to be seen by the naked eye. The major advantage of microfiche is its storage in a small space, stability of format, and does not require special knowledge to read it. As long as a microfiche machine is available to magnify the print to readable

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size, anyone who can read the language can read a microfiche. Because of its small size, microfiche can be archived in storage cabinets, saving floor space. It is not degraded by the constant use. One disadvantage of microfiche is that it requires a special reader to enlarge the typed size and these machines are expensive. Microfiche cannot be enlarged and copied on a photocopy machine. However, most microfiche machines can make copies from the film. Another disadvantage is that once microfiche is imprinted, it is unalterable. A digital information file can be changed or corrected, but microfiche cannot be changed or corrected\textsuperscript{4}.

3.2.2 MAGNETIC MEDIA

These are available in three types:

- Hard disk of a computer having data storage capacity 40 Gigabyte (GB) and above,
- floppy disk having the storage capacity of 100 Megabyte (MB) and more
- Cartridge Tape Disk (CTD) having storage capacity of 640 MB or more.

The long term storage of magnetic media is generally thought to be between fifty and one hundred years as far as proper storage conditions are used. Factors such as keeping the tapes away from magnets and other related machinery and reducing pollutants, moisture in the area where magnetic tapes are used will ensure that data can be used in the future\textsuperscript{5}.

3.2.3 OPTICAL MEDIA

In optical technology area, a few years ago, CD-ROM capable of storing 600 MB of textual information were available but now DVDs with the increased storage capacity are available. Optical storage devices make use of laser beams and can both record and read back data stored on a sensitive medium of a disc. It is also called laser beam technology, because the laser is


used to burn pits in a spiral path for storage of data in binary form. Due to number of advantages like fast retrieval, large storage capacity, easy to use, portable, durable, very low cost, etc., is the best storage medium for preservation of information.

Optical media is also having the same long term storage as of magnetic media, i.e., between fifty and one hundred years. Compact disks are subject to scratches, therefore, careful handling is important to ensure their utility in future.

Different techniques are adopted to preserve the documents, all are having their own advantages and disadvantages. Photocopying sometimes damage the originals, have always been costly-and offer only a few decades of preservation. Manuscripts could also get damaged during microfilming. Scanners are also relatively slow and can damage the manuscripts, especially ones that are deteriorating. A far more expensive approach is first to microfilm the manuscripts, and then to use a medical or high-definition film scanner to digitize the manuscripts as images. This expensive method can be used only by the best-subsidized archives in the world.

The most significant development in the recent times is to digitize the manuscripts for better access, storage, preservation and dissemination. Digitization is an important aspect of developing digital libraries as it opens up new avenues of access, use, research and preservation of valued information resources. With the development of digital technology, the later problem is fully resolved. Digitization can provide effective tools and methods to the retrieval and use of information through the change in preserving, managing, disseminating and using of resources with the transmission of documents via Internet. As a result it expands the scope of information retrieval and improves the efficiency of information dissemination.

3.2.4 DIGITIZATION

Digitization means acquiring, converting, storing and providing information in a digital format that is standardized, organized and available on demand from common system.
Digitization is defined as conversion of analog items into a digital format for the purpose of extending access and where appropriate to assist with preservation. Digitization is not an activity which can be seen in isolation. It is linked to all aspects of services provided by library. In simple words digitization means acquiring, converting, storing and retaining information in standardized and organized manner with technology support. With specialized scanners documents are converted into digital formats and stored for further reference via CDs or Web based application.

Digital Preservation Coalition defines "digitization as the process of creating digital files by scanning or otherwise converting analog materials. The resulting digital copy, or digital surrogate, would then be classed as digital material and then subject to the same broad challenges involved in preserving access to it, as "born digital" materials".  

3.2.4.1 NEED OF DIGITIZATION

The old manuscripts are deteriorating day-by-day due to various reasons such as humidity, dust, environmental pollution, physical handling, brittleness, microbiological agents, physico-chemical reaction, etc. From the care and preservation point of view hardly any manuscripts library is fully air-conditioned, so digitization is the only solution to preserve the manuscripts for future use. Some sources are too fragile to be consulted. Aging newspapers or palm leaf manuscripts that break at the slightest flex simply cannot be

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browsed. In such cases, a digital copy should be provided to improve access. There is a dire need to digitize in order to:

**Make Use Possible**

For a very small subset of valuable but deteriorated documents, digital imaging technology is a viable, and possibly the only, cost-effective mechanism for facilitating its use for researchers.

**Protect Original Items**

Digital image technology can be used to create a high-quality copy of an original item. By limiting direct physical access to valuable documents, digital imaging becomes a preservation application as distinct from an access application. Preservation via digital copying is the most compelling force motivating archives and libraries to experiment with hardware and software capabilities.

**Easy Access to Digital Objects**

Digital technologies present a preservation solution for the documents in the libraries with increased access to them over the data networks. Digital preservation activities, therefore, are not confined to the simply act of preservation of contents. The goal of digital preservation is to extend easy access. Digital preservation activities, therefore, include creation of descriptive metadata of digital contents being preserved so as to facilitate access.

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3.2.4.2 PROCESS OF DIGITIZATION

The process of digitization involves two main sets of activities:

1. The process of digital conversion where by source material are converted into digital form; and
2. The process of digitized information, which involves several activities related to storage, organization, processing and retrieval of digitized information.

There are four steps involved in the process of digitization: scanning, indexing, storage and retrieval.

Scanning

The scanning process involves acquisition of an electronic image through its original, that may be a photograph, text, manuscript, etc. into the computer using an electronic image scanner.

Indexing

Indexing of a document converted into an image or text file is the second step in the process of document imaging. The process of indexing scanned image involves linking of database of scanned images to a text database.

Storage

The most tenacious problem of a document image relates to its file size and therefore, to its storage. Every part of an electronic page image is saved regardless of presence or absence of link. The file size varies directly with scanning resolution, the size of the area being digitized, compression ratio, content and the style of graphic file format used to save the image.

Retrieval

Once scanned images and OCR text documents have been saved as a file, a database is needed for selective retrieval of data contained in one or more fields within each record in the database.
3.2.4.3 SELECTION OF MANUSCRIPTS FOR DIGITIZATION

While selecting the material for digitization a balance is to be maintained between competing requirements and demands. Selection should be based on:

Use

Materials that are used frequently are at higher risk than others. Therefore, items that are used frequently for research purposes should be given priority in comparison to those that are consulted occasionally while selecting the manuscripts for digitization.

Condition

The condition of the manuscripts should also be considered while selecting the manuscript for digitization. Manuscripts in a poor or fragile condition and are used heavily are at higher risk of damage and need attention. They should be given high priority for implementation of digitization.

Value

The nature of the value of the items, their rarity, their provenance, and their significance to the library need to be considered while selection.

3.2.4.4 HANDLING AND PREPARATION OF MANUSCRIPTS

The manuscripts being old and fragile need to be handled properly to avoid further damage. Improper handling and digitizing without special care may lead to further damage and deterioration of manuscripts. Therefore, prior to and while digitizing manuscripts the following practices should be implemented:

- Manuscripts taken up for digitization should have undergone necessary conservation process.
• Manuscripts should be handled in best possible way while placing the manuscripts on scanning, filming platform. Long horizontal format requires special handling considerations.
• Scanners and camera operators should wear surgical gloves so as not to damage any of the manuscripts.
• Soft bristled paint brush should be used to wipe away the accumulated dust and dirt.
• To maintain the sequence of lose leaf manuscripts pages should be enumerate and record of the missing folios should be maintained and finally the manuscripts should be rethread after digitization.

3.2.4.5. IMAGE CAPTURING

Capturing of images in such a way that all the information contents of the manuscripts are available in the image is very essential. Touch devices and non touch devices are available to capture the image.

3.2. 4.5.1 TYPE OF IMAGE

Every digital image is composed of a fixed number of pixels which are small cells or blocks of tone. By type of toning, images may be categorized into following three types:

1-Bit (Monochrome or Black and White) or Bi-Tonal

Information is generated in black and white only in this type of image. Bi-tonal information is conveyed by using this type of image. The image produces the smallest possible file. In other words, the file occupies the smallest space.\(^\text{10}\)

Grey Scale Image

Grey scale image requires 8 bits to represent each pixel. It represents up to 256 shades ranging from pure white through grey to pure black. This type of image is usually recommended for representing black and white photographs, half-tone illustration and two-dimensional material.

Colour Image

Colour is best represented by using 24 bits per pixel which provides about 16 million different colours. The file size of colour image is longer than 1-bit and grey scale image.\(^\text{11}\)

3.2.4.5.2 EQUIPMENTS FOR IMAGE CAPTURING

Scanners are used to transfer the existing paper image or document into a digital format after which a scanned document can be manipulated using an imaging software programme. The different types of scanner used to scan the documents are:

Drum Scanner

Drum scanner provides high quality scans. This scanner works with a rotating drum that scans the object with an intricate array of sensors.

Flatbed Scanner

This is a scanner that can fit on the top of the desk. The document to be scanned is placed on the top of a sheet of a glass inside the scanner and then the lid is shut. A small scanning sensor, like a digital camera, moves back and forth inside the scanner, taking pictures of a document and compiling them into a large picture of the entire document that appears on the computer screen. Flatbed scanners produce medium quality images.

Sheet Fed Scanner
This scanner scans several documents at once. A stack of papers can be placed in scanner and the scanner will scan them all at a time in order. The sheet fed scanner use the same technology as flatbed scanners except that the document moves over the sources of light and charge-coupled device (CCD).

Face Up Scanner
Face up scanner is a non touch device to scan the document. It does not require any computer or monitor to operate. Face up scanner scan at a true optical resolution of 300 ppi.\(^{12}\)

Digital Camera
Digital cameras are the combination of scanning technology and camera optics. They have the capacity to set the resolution based on the size of the documents. Document of any size can be scanned with it. Digital camera has a series of lenses that focus light to create an image of a scene; it focuses it into a semi-conductor device that records light electronically. A computer then breaks this electronic information down into digital data.\(^{13}\)

The equipment used for scanning has an important impact on the quality of image. Face up scanner and digital camera is the better options to capture images of manuscripts as other touch device may harm the original state of manuscripts.

3.2A5.3 COMPRESSION
Compression is a technique used to reduce the size of digital files. Scanned images require a substantial amount of memory for storage. In order to economize on storage space, images are stored in compressed form. There are two forms of compression, lossless and lossy. Standards by which compressions are achieved are:

\(^{12}\)Ibid.

Joint Photographic Experts Group (JPEG)

JPEG standard is used to deliver images across networks, such as internet or local networks. JPEG file uses a lossy compression to reduce the file size, while retaining a reasonable looking image. JPEG is suitable for scanned photographs and complex images.

Graphics Interchange Format (GIF)

GIF format is used to deliver images over networks, usually the internet. GIF files utilize lossless file compression to reduce the size of the file. GIF files are created by image processing software, which imports a TIFF file and exports a GIF image.

Moving Picture Experts Group (MPEG)

MPEG format is used for the publication of video on the internet, as it uses the short download time. MPEG files can be highly compressed, while still maintaining a reasonable quality.

Temporary Image File Format (TIFF)

TIFF format is used for creating images for long term use and for maximum information capture. It does not use compressions, or if compressed form is used, it will be lossless, so files saved in the TIFF format are large, high resolution and high quality files. This format is recommended as the acceptable format for saving archival master copies of digital images.

Portable Network Graphics (PNG)

PNG files have more efficient compression than GIF or JPEG, and images may look better in this format, but they have a larger file size.

Digitization of manuscripts is essential as it improves access, protect the originals but precautions must be taken while digitizing so that the original manuscripts are not damaged. Faceup scanners and digital cameras should be preferably used to digitize the manuscripts and files should be compressed using TIFF standard to achieve the best result.
3.2.5 DIGITIZATION AND PRESERVATION

Digitization should not be regarded as a viable preservation format. When digital technologies first emerged, it was expected that digitization would solve all known preservation problems. At present long-term access to digital resources is not assured. Therefore, digital images cannot serve to replace the original materials. Except in so far as surrogates can lessen or eliminate risk to original documents, digitization is not a preservation medium.¹⁴

Completion of digitization will be at the ‘bleeding edge’ of new technologies. Re-digitization is the likelihood that the electronic resources created in previous year using older technology may not be accessible, or compatible with new technologies¹⁵. Once digital conversion of the original document has been completed, the challenge of protecting the digital contents from corruption or destruction becomes the preservation focus. This facet, called “digital preservation”, typically centers on the choice of interim storage media, the life expectancy of a digital imaging system, and the concern for migrating the digital files to future systems as a way of ensuring future access.

Undoubtedly, digital resources have several advantages over its print counterpart, however, preservation is definitively not one of them. The fact is that the risk of loss of data in digital form is much greater than any other physical form. Digitization apart from giving a solution gives rise to another problem, i.e. digital preservation.

3.2.6 DIGITAL PRESERVATION

Digital preservation refers to the series of managed activities necessary to ensure continued access to digital materials for as long as necessary. It addresses the issue of adapting concepts of preservation to manage risk in the midst of rapid technological advancements. With rapid developments in imaging, storage and communication technology, it is


believed that while the quality of image produced would improve manifold, the
cost and space requirement for image would reduce drastically with
proportionate increase in capacity of networks to transmit high quality images.
However, the issues of digital preservation that are relevant now would
remain relevant. Digital documents are vulnerable to loss because of decay
and obsolescence of the media on which they are stored, and they become
inaccessible and unreadable when the software needed to interpret them, or
the hardware on which that software runs, becomes obsolete and is lost.
Preserving digital documents may require substantial new investments. The
digital preservation involves a variety of issues and challenges including
policy issues, institutional commitments, legal and IPR issues and metadata16.

The term “digital preservation” refers to preservation of materials that
are created originally in digital form and never existed in print or analogue
form (also called “born-digital”) as well as those converted from legacy
documents and artifacts (printed documents, pictures, photographs or
physical objects) into images using scanners, digital cameras, or other
imaging technologies for access and preservation purposes. Digital
preservation refers to a series of managed activities designed to ensure
continuing access to all kinds of records in digital formats for as long as
necessary and to protect them from media failure, physical loss and
obsolescence17.

Wikipedia defines “digital preservation as long-term, error-free storage
of digital information, with means for retrieval and interpretation, for the entire
time span that the information is required for”. Long-term is defined as long
enough to be concerned with the impacts of changing technologies, including

(Ed.), 4th Convention PLANNERS: Digital Preservation, Management and Access to
Information in the Twenty First Century, 9-10 November 2006 (pp.1-20). Ahmedabad:
INFLIBNET.

support for new media and data formats, or with the changing user community.
"Retrieval" means obtaining required digital files from the long-term, error-free
digital storage, without corrupting the error-free stored digital files and
"interpretation" means that the retrieved digital files, which may be texts,
charts, images or sounds, are decoded and transformed into usable
representations for access to human.\textsuperscript{18}

Digital Preservation Coalition \textsuperscript{19}defines digital preservation as "all of
the actions required to maintain access to digital materials beyond the limits of
media failure or technological change. Those materials may be records
created during the day-to-day business of an organization; "born-digital"
materials created for a specific purpose; or the products of digitization
projects".

3.2.6.1 NEED OF DIGITAL PRESERVATION

The traditional libraries are increasingly getting transformed into
digital libraries, at least partially. The availability of web-based digital
information products are exerting ever-increasing pressure on the traditional
libraries, which, in turn, are utilizing larger portions of their budgetary
allocation for either procuring or accessing web-based online or full-text
search services, CD-ROM products, online databases, multi-media products,
etc. The availability of digital information products and services, in turn, has
triggered a major shift in the traditional practices and policies from buying and
storing information services to accessing them. Besides, acquiring and buying
access to digital collections, libraries are exerting efforts on initiating digital
library projects in their respective institutions to build their own digital
collections.

The libraries are increasingly converting their existing print collections
into digital formats or are increasingly capturing collections that are "born

\textsuperscript{18}Digital Preservation (n.d). In Wikipedia. Retrieved October 10, 2008 from

from http://www.dpconline.org/graphics/intro/definitions.html
digital”. Preservation and archiving of digital contents is one of the most serious concerns of libraries, whether acquired through subscription, purchased in digital media or converted in-house. Moreover, the academic community looks upon libraries to preserve a material that was ever accessible to them on Internet at least in an offline digital format, such as CD-ROM. While access to digital collection has definite advantages over its paper-based or microform-based counter-part in terms of convenience of usage, accessibility and functionality, however, long-term preservation of digital information is plagued by short media life, obsolete hardware and software, slow read times of old media, and defunct web sites.\(^\text{20}\) The exponential growth in digital information and its ephemeral nature, as well as considerable challenges associated with ensuring its continued access, necessitate that rigorous efforts be made to overcome these challenges.

Digital preservation is the planning, resource allocation and application of preservation methods and technologies necessary to ensure the digital recordings of materials and to maintain the ability to display, retrieve and use digital collection. Therefore, digital preservation is need of the hour to ensure the availability of digital materials alive into the future.

3.2.6.2 DIMENSIONS OF DIGITAL PRESERVATION

Digital preservation activities can broadly be divided into two components\(^\text{21}\):

i. Activities that promote the long-term maintenance of digital image;

ii. Activities that provide continued accessibility of its contents.

Standards and formats, software technology, upgrade path, staff and technological resources necessary to manage the digital objects depend on

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the life-span of a digital object as mentioned below, determines preservation strategies:

- Long-term preservation: Continued access to digital materials, or at least to the information contained in them, indefinitely.
- Medium-term preservation: Continued access to digital materials beyond changes in technology for a defined period of time but not indefinitely.
- Short-term preservation: Access to digital materials either for a defined period of time while use is predicted but which does not extend beyond the foreseeable future and/or until it becomes inaccessible because of changes in technology.

3.2.6.3 DIGITAL PRESERVATION STRATEGIES

Preservation of digital information is complex because of the dependency of digital information on its technical environment. Furthermore, as new digital technology appear and older once are discontinued, information that relies on obsolete technologies soon become inaccessible. In order to preserve digital information many digital preservation strategies have been proposed, but no single strategy is appropriate for all data types, situations, or institutions. Various techniques for digital preservation are as following:

Bit-Stream Copying

Bit-stream copying, commonly known as "backing up data" refers to the process of making an exact duplicate of a digital object. Bit-stream copying in itself is not a long-term maintenance technique, since it deals only with the question of data loss due to hardware and media failure, whether resulting from normal malfunction and decay, malicious destruction or natural disaster. Bit-stream copying is often combined with remote storage so that the original and the copy are not victims of the same disastrous event.

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22 Ibid.
Refreshing

Refreshing means copying digital information from one long-term storage medium to another of the same type. It is a short term solution to protect the data until it is migrated to another media.\textsuperscript{24}

Technology Preservation

Technological preservation is based on preserving the technical environment that runs the system, including operating systems, original application software, media drives, etc. It is sometimes called the "computer museum solution". Technology preservation is more of a disaster recovery strategy for use on digital objects that have not been subjected to a proper digital preservation strategy.

Digital Archaeology

Digital archaeology includes methods and procedures to rescue content from damaged media or from obsolete or damaged hardware and software environments. Digital archaeology is explicitly an emergency recovery strategy and usually involves specialized techniques to recover bit-streams from media that has been rendered unreadable, either due to physical damage or hardware failure such as head crashes or magnetic tape crinkling.\textsuperscript{25}

Analogue Backups

Analogue backups combine the conversion of digital objects into analogue form with the use of durable analogue media, e.g., taking high-quality printouts or the creation of silver halide microfilm from digital images.


An analogue copy of a digital object can, in some respects, preserve its content and protect it from obsolescence, without sacrificing any digital qualities, including sharability and lossless transferability.

**Migration**

Migration is a broader and richer concept than refreshing for identifying the range of options for digital preservation. Migration is a set of organized tasks designed to achieve the periodic transfer of digital materials from one hardware/software configuration to another, or from one generation of computer technology to a subsequent generation.

**Replication**

Replication is used to represent multiple digital preservation strategies. Bit-stream copying is a form of replication. LOCKSS (Lots of Copies Keeps Stuff Safe) is a consortia form of replication, while peer-to-peer data trading is an open, free-market form of replication. In each case, the intention is to enhance the longevity of digital documents while maintaining their authenticity and integrity through copying and the use of multiple storage locations.\(^{26}\)

**Canonicalization**

Canonicalization is a technique designed to allow determination of whether the essential characteristics of a document have remained intact through a conversion from one format to another. Canonicalization relies on the creation of a representation of a type of digital object that conveys all its key aspects in a highly deterministic manner.

**Emulation**

Emulation uses a special type of software, called an emulator, to translate instructions from original software to execute on new platforms. The old software is said to run in emulation on newer platforms. This method attempts to simplify digital preservation by eliminating the need to keep old

\(^{26}\)Ibid.
hardware working. Emulation is the process of bringing digital objects back to life in their original environment on top of a different computer environment, usually newer environment.\textsuperscript{27}

**Encapsulation**

Encapsulation is a technique of grouping together a digital object and metadata necessary to provide access to that object. Encapsulation is considered a key element of emulation.\textsuperscript{28}

**Universal Virtual Computer**

Universal virtual computer is a form of emulation. It requires the development of a computer program independent of any existing hardware or software that could simulate the basic architecture of every computer since the beginning, including memory, a sequence of registers, and rules for how to move information among them. Users could create and save digital files using the application software of their choice, but all files would also be backed up in a way that could be read by the universal computer.

Undoubtedly, digitization of documents has the potential to revolutionize the way in which information is reported, accessed, stored, and maintained. It is time efficient, storage space will diminish, and accessibility will be improved. As a method of preservation digitization can not be trusted as the risk of loss of data in digital form is much greater than physical form. Digitization apart from giving a solution gives rise to digital preservation, which require continuous efforts. Therefore, requirements of a preservation system are best met with a combination of technologies.


3.2.7 MICROFILMING AND DIGITIZATION: A HYBRID SOLUTION

Microfilming is a tried and tested technology for preservation of documents with proven longevity. The life expectancy of microfilm is in the 500+ year range. Microfilm master, if stored properly, is quite simply the most stable reformatting method available. Microfilming and digitization have their own qualities and purposes: microfilming is well suited as a surrogating method for preservation. It is reliable and relatively cheap. From the beginning, digitization is mostly applied in the field of accessibility as it has capability to improve access, transmission, and distribution of preserved images. It is relatively expensive, but it offers a number of new features, such as color, Internet browsing and search facilities. It is not considered as a useful preservation method because of the rapid obsolescence of maintaining and retrieving techniques. Also the durability of digital storage mediums has yet to be proven. Therefore, microfilming and digitization both can be embedded in the strategy of libraries and other heritage institutions. This demands a holistic approach. Ultimately, despite the seeming contradictions, microfilming and digitization complemented after all.

Don Willis29 in a report published by the Commission on Preservation and Access, argued convincingly for the creation of both microfilm for preservation and digital images for access. The proposed hybrid solution suggests microfilming of document as first step and then digitized from the film master. It is argued that for a computer image to match the resolution of high-resolution microfilm, the item would need to be scanned at over 5,000 dpi, which is practically impossible with prevailing scanning technology as it would require incredible scanning time and storage space. Moreover, neither the scanners are designed to scan at such a high resolution nor the documents scanned at such a high resolution can be displayed using present day technology. The hybrid solution provides the best of both worlds. The high-resolution microfilm masters can be safely archived, and retrieved when

needed to generate new high-use, highly accessible digital version. The process also serves to circumvent the problems with digital technology, i.e. constant migration. New digital files in successive software generations could be created as required from the microfilm master.

3.3 CONCLUSION

Manuscripts are important source of invaluable information and need to be preserved for the present as well as future generations. Ever since efforts are being made in one way or the other to preserve the valuable collection. With the advent of information technology, the use of latest technologies of reformatting i.e digitization, microfilm, microfiche, to preserve the collection, is looked upon as a solution to the problems of preservation of the manuscripts. Digitization, no doubt has its own advantages as it improve the access, limit the handling of the original document. Digitization can not be relied upon as preservation medium. After digitizing the collection, preservation of the digitized collection i.e., digital preservation, becomes more important. Digital preservation does not end with the careful storage of the digital objects. In order to keep these objects accessible, a continuous effort toward the development of strategies for the permanent access is required. The usability of the digital object is threatened by rapid innovations, new systems, new software, and making the existing technologies obsolete. The innovations are done for the betterment of the system and to give better services but long term preservation is not assured. Digital preservation is thus a problem specifically for the cultural heritage sector, where long term preservation is the main and only focus. In order to achieve the target of preservation, a hybrid solution, digitizing as well as microfilming of the manuscripts can be trusted.