Journal of Information and Knowledge Management
ISSN: 2141 - 4297 (PRINT)
ISSN: 2360 - 994X (ELECTRONIC)
Information Impact
VOL. 4, NO. 2 (DEC 2013)

PRESERVATION AND CONSERVATION OF LIBRARY MATERIALS IN THE DIGITAL AGE

Victoria A. Iyishu; William O. Nkanu Ph.D
And
Frederick O. Ogar

Abstract

The paper attempts to explain preservation and conservation as measures for achieving sustainability of library materials as long as possible in their original format. In order to achieve this, causes of deterioration of library materials such as poor paper manufacture, improper storage, rough handling, pests and knowledge of disaster occurrence, electronic means of preservation, challenges and strategies for digital materials preservation have been examined.

Keywords: preservation, conservation, library materials, digital age, digital materials

Introduction

The print and electronic materials are vital and delicate. The way they are handled can affect the life span of the records contained in them. Records must be preserved and conserved for future use. The process of encoding and recording information has evolved over a thousand years. The way in which generations expressed their ideas, skills, emotions, etc, has led to the production of information materials since time immemorial. Every generation desires to leave a mark of documented issues, concerns, ideas, discourse and events, and the only way to do this was by leaving a legacy in the form of documented matter. One of the earliest forms of recording human experiences on earth has been through rock paintings found in most parts of the world (National Research Council, 1986).

The media of recording information, has however, evolved overtime. In the past, stone, wood, metal, clay and paper served as information storage media. The written heritage of human kind, found in libraries, museum, temples, monasteries, and private collections, consists of different types of cultural materials incised or written with ink on palm leaf, bark, wooden tablets and traditional paper. These information media, however, posed different challenges at efforts to preserve them in the face of harsh elements of nature (Morrow, 1983).

The challenges of preserving paper-based information materials increased with the discovery of the fourdrinier machine in 1806, which was designed to meet the high demand for paper. The demand for paper caused alkaline or 'traditional' paper, which was long-fibre, stable and durable, to be supplanted by modern mass production methods, based on materials other than rags. These paper making materials have an inbuilt decay factor, due to the nature of the raw materials adopted and extensive use of chemicals. The use of machines, which mechanically ground wood into pulp, also greatly reduced the wood fibres. This caused paper to be vulnerable to deterioration and decay, because the chemicals induced deterioration and

shortened its capacity to bond together. The result is weak paper, which posed preservation problems (Harvey, 1994).

However, owing to developments in science and technology over the past two centuries, we are now in the midst of transition from essentially output of information in paper format to output in a variety of media. We are now increasingly in the multi-media era, where information is output as picture, sound, text or a combination of these and increasingly being stored in electronic media (Zulu, 2005). Information resources in electronic era, ranging from simple text based files such as word processed files to highly sophisticated web-based resources such as databases, websites mails are preserved in a wide range of storage media such as, flash drives, CD ROM and others. Preservation and conservation is one of the most urgent issues to be tackled by libraries all over the world. The preservation and conservation issue is complicated by the diverse nature of library materials, both in composition and structure. Fortunately, librarians, information scientists, manufacturers, conservators and publishers are becoming more cognizant of preservation and conservation issue and as such, they are gradually resolving them.

The concept preservation, in this paper is used to refer to all necessary strategies, measures and steps invested into prolonging the lives of library information resources. As supported by Lasisi (1999), preservation is used to denote all those activities and measures intended at conserving library materials for posterity. Murray (2005) explained that preservation is an indirect method of treatment in which the environment around an item is changed. This includes stabilizing, maintaining and monitoring temperature, humidity, light exposure, air pollution, dirt, dust and mold. preservation also includes surveying the proper storage and handling techniques, security, including theft, vandalism, disaster prevention, education, training and out reach programs for staff, patrons, clients, and the public, while conservation is a direct method of treatment in which an item is physically or chemically changed. This includes cleaning, repairing, rebinding and reformatting. All conservation treatments entail the least intrusive methods possible and use of acid-neutral materials.

Alegbeleye (2002) on the other hand, clearly states that there are few misconceptions in the use of preservation and conservation. He explains that the terms preservation and conservation are used interchangeably. But strictly speaking experts in the field draw a distinction between the two words. Preservation includes all the managerial and financial considerations, including storage and accommodation provisions, staffing levels, policies, techniques and methods involved in preserving library and archival materials and information contained in them. Conservation on the other hand, refers to specific practices taken to slow deterioration and prolong the life of an object by directly intervening in its physical or chemical make-up. Examples of the latter are the repair of damaged books, binding or the de-acidification of paper. From the above explanation, one would deduce that preservation of library materials refers to the activities associated with maintaining library materials for use, either in their original physical format or in some other format. This includes a number of procedures from control of the environment to conservation treatment. Conservation therefore, is the treatment of library materials to stabilize their physical structure in order to sustain their survival as long as possible in their original format.

At a higher level, preservation connotes far more than keeping a material in its original form or being familiar with all reformatting technologies available. It also means accessibility; when a user needs it, he gets it. Hence, the whole process of security, shelving, shelf-reading and circulation are actually preservation techniques. Preservation from abuses like mutilation,

defacing and or stealing of materials are preservation tenets. These are done to ensure longevity of the lifespan of library materials. According to Hornby (1976), preservation implies the state of being or remaining in a stated condition after a longtime while conservation refers to the controlled use of a limited supply of materials to prevent waste or loss so as to facilitate its use in the future. According to Digital Preservation Coalition (DPC 2002) the term 'preservation' is an umbrella word or concept under which most librarians and archivists cluster all the policies and options for the managing, including conservation treatments of different formats of information material. Digital material preservation therefore is a way of preserving information materials, which refers to digital surrogates created as a result of converting analog materials to digital form (digitization), as well as those that are "born digital" for which there has never been, and is never intended to be analog equivalent, and digital records.

Nature of Library Materials

Library materials are in wide variety of sizes, shapes and formats which often present problems in relation to library storage and access procedures. Some of the materials like television sets, cassettes, cartridges, film recording, computers etc can prove heavy and cumbersome for handling, while others like slides, filmstrips and multi-media kits can prove very difficult to organize, shelve and control.

Media records quite often have standards laid down that are associated with storage and control. Enright (1972) stated that playing a videotape removes minute layers of the original, and a librarian concerned with media records has to be aware of the point at which the technical condition of an item will militate against its effective use. It is necessary to mention that many media materials are more vulnerable to careless treatment and abuses than books. The annoyance and frustration caused to users and audience by providing damaged or defective materials can dent the reputation of a library and deflect a user's confidence in its services. And, this can be very monumental indeed.

Causes of Deterioration of Library Materials

Materials deteriorate as a result of:

(i) Internal or inherent vices and
(ii) External agents of deterioration

i. Internal or inherent vices are caused by weakness in the chemical or physical make-up of an object introduced during its manufacture. Early paper was made from clean lines, cotton, flax and strong fibers. It was not treated with bleaching agents and was not sized with rosin and alum. This type of paper was permanent, durable and was chemically and physically strong enough to endure the wear and tear of the ages. Modern paper (paper produced since 19^{th} century) has wood pulp as its basic raw materials instead of cotton and line rages. The wood pulp is bleached with chlorine and the paper sized with alum and rosin. This makes the paper acidic thereby placing the paper in a low PH condition Ph is a symbol used to signify the degree of acidity or alkalinity of any organic material.

i. The external agents can be classified as:

a. Biological causes
b. Environmental causes
c. Chemical causes
d. Mechanical causes

Biological Causes: Mold, mildew can cause serious, often irreparable damage to paper materials. The most common species affecting library and archives materials are silver fish, bookworms, booklice and cockroaches. Most insects are not attracted to the paper, but rather to sizing, adhesives and starches that are dark, wet, dirty, clustered and undisturbed. Mold and mildew are types of fungi, micro organisms that depend on other organisms for sustenance. Molds excrete enzymes that allow them to digest organic materials such as paper and book bindings, altering and weakening those materials. Harvey (1993) suggested that a clean, well-ventilated and climate-controlled environment goes a long way toward preventing infestation by any of these pests.

Environmental Causes: Researches indicate that cooler temperatures are preferred for library materials. According to Library of Congress preservation recommendations, an ideal environment for books is 55^0F storage areas. Mixed use storage areas should be kept at 70^0F. If library materials are stored separately from use areas, the temperature can be brought down further to 65^0F or less. Uncontrolled humidity levels can cause mechanical damage. If conditions are too humid, material will swell and warp, resulting in cockling and other physical distortions. These dimensional changes weaken physical bonds and set up stresses that can shorten the life of most materials. If conditions are too dry, materials will become brittle and more susceptible to cracking, particularly during handling. Light is very vital in the provision of library services since materials have to be identified and read. On the other hand, it is one of the greatest enemies of library materials, especially paper. Evans (1995) explained that non-print materials are particularly sensitive to the effects of ultraviolet light, so videotapes and microforms should never be shelved near a window.

Chemical causes: Airborne contaminants in the form of gases and particulates can jeopardize the preservation of library materials. Gaseous pollutants can originate indoors from photocopiers, painting, cleaning supplies, untreated wood and certain kinds of adhesives and plastics. Particulate pollution is also a great concern. Particulates come in the form of tiny solid substance from smoke, dust and vehicle engines. The library should be fully air-conditioned, air conditioners are highly recommended for books. Air conditioners help in stabilizing the temperature and humidity for libraries. They also help to filter out particulates and chemical pollutants.

Mechanical causes: Mechanical damage to library materials includes the human factor and natural disaster. Alegbeleye (1993) argues that archives and libraries are prone to disasters that can be classified broadly as natural and man-made. Natural damage to materials can be caused by earthquakes, fire, flood or water, while the human factors include careless handling, vandalism and improper support during storage.

The Need for Preservation and Conservation

The deterioration of library materials form the basic problem of libraries and given rise to preservation and conservation needs. In the course of preserving materials, there is need to adequately consider the value of records in terms of its educational, socio-political and economic impact on society, and decide the period during which each class of documents might be kept for use and then destroyed or permanently preserved for future use. However, no library material is infinite. By their very nature, they are susceptible to deterioration, hence preserving and conserving them become ultra-important. In order to retain the information contained in all media of communication for effective use by future generations, there is the need to preserve, conserve or effect both activities on them. There is a need to preserve titles which have arte-actual, biographical or intellectual values. It is instructive to note that paper,

for instance, deteriorates very fast because of their ephemeral nature. Machine-made paper is made of wood, pulp containing harmful acids that cause it to deteriorate fast. Materials used for binding also contain harmful ingredients that cause deterioration. Environmental factors like high temperature and relative humidity, exposure to light, air pollution, and careless handling by increasing number of users in open access repositories cause deterioration and object damage to materials that are very valuable. Three main factors are important in the process of taking decisions regarding preservation and conservation. They are:

i. The building: To identify potential hazard arising from security, fire, flood and other natural disasters.
ii. The interior building: Including reading and storage areas, to assess the environmental conditions and the physical state of shelving units, taking measurements of lighting levels, temperature and humidity, and assessing levels of dust and atmospheric pollution, and
iii. The collection: To identity the scale of damage to paper including assessment of paper embitterment, damage due to mould or insect and damage to bindings, etc.

Electronic Means of Preservation

For some decades now, there has been a revolution in information storage media. Data is now stored electronically in digitized formats. Computers are presently very basic to library functions and services. Mostly, they act as gateways in libraries and information can only be accessed, nay retrieved through them. Physical materials are of lesser interest to the end – users in an environment where information is electronically accessible. The problem of storage, and practically that of preservation of information is removed from the point of use (where it has traditionally been located) to the point of supply. The information producer bothers about location of extensive databases for storage and preservation from where users can access whatever they needed. According to Feather (1996), there has been exponential growth in the creation, use and significance of electronic data and there has been great diversification of its sources of origin. Until about 1990, librarians had little need to concern themselves with the preservation of electronic data, they were merely interested in the means of keeping out-put media like audio- CDs and CD – ROM in a usable condition for a reasonable length of time. The concept and development of electronic library has changed this attitude. This is not surprising because, automation brings with it a lot of dynamism and we must try to keep pace with the changes.

In situations where the preservation responsibilities rest absolutely on the information producer, the librarian or information provider, who is the interface between the producer and the end – user, need only to contend with making his output media survive in usable condition for at least the period when updated versions of the output would be produced. Then, the librarian subscribes to the latest versions of the out- put media. The problem of long-term survival stays with the data producer, of course, this can only be appropriate in a network environment. Digitisation as a tool for the preservation of information originally created in conventional formats, especially newpapers, has been canvassed widely in recent years Feather (1996). Convertion to a digital format gives the user a whole range of new search tools, since what is created is a file that is flexible and can be manipulated just like any other electronic data file. Digitization is an expensive option for preservation though legitimately viable.

Challenges of Digital Material Preservation: Challenges of preserving or archiving digital information are not new, and have been explored at many force over the last five decades. Several scholars and institutions, respectively, such as Garret and Walter (1996), Lin, Ramah

and Wal (2003), Caplan (2004), Wamukoga and Mutual (2005) and the national library of Ausralia (2003), have cited the following challenges to the preservation of digital materials:

- Technological obsolescence;
- Continous migration;
- Lack of legislation, policy and strategy
- Lack of awareness
- Lack of collaboration and partnership;
- Deterioration of the digital media
- Disaster planning and recovery

Each of these challenges faced in preserving digital materials are briefly discussed below:

Technological Obsolescence

Markets are full of a variety of digital formats that continually change from time to time with some formats getting obsolete (Caplan, 2004). Format obsolescence is complemented by rapid hardware and software obsolescence, which is a significant threat to digital preservation, as it causes the loss of the means of access (Wamukoya & Mutual, 2005). This comes as a result of the continuous upgrade of operating systems, programming languages, applications and storage media (Lin, Ramiah & Wal, 2003). Such loss of access makes preservation of digital materials meaningless since the main purpose of preserving digital materials is to maintain accessibility.

Continuous Migration

Another challenge of digital preservation, which arises from the challenge of rapid technological obsolescence, is the need for continuous migration. Migration is a means of overcoming technological obsolescence by transferring digital resources from one hardware/ software generation to the next. The purpose of migration is to preserve the intellectual content of digital objects and to retain the ability for clients to retrieve, display, and otherwise use them in the face of constantly changing technology (National Library of Australia, 2003).

Lack of Legislation, Policy and Strategy: According to National library of Australia (2003), lack of supportive legislation is a major challenge of preservation of digital materials. Besides, since legislators are usually neither aware nor conversant with the requirements of digital preservation, they make legislations that either ignore or inadequately cover digital preservation issues (Wamukoya & Mutual, 2005), further, internet links bring additional challenge in terms of copyright legislation in that the copyright of software required to access digital files, and the right to copy for preservation has not been adequately articulated in most national legislations. For instance, the current practice is that due to copyright requirements, a subscriber to an internet-based information service requires to continuously renew the access licence, even for materials long paid for, in order to continue accessing the same information. An additional challenge is that digital evolution has been too rapid and costly for governments and institutions to develop timely and informed preservation strategies.

Lack of Awareness about Digital Material Preservation: The UNESCO draft charter on the preservation of digital heritage stresses the need for urgent awareness raising and advocacy in favour of preservation of digital materials. It proposes for the alerting of policy makers and sensitizing the public to both the potential of the digital media and the practicalities of digital preservation.

Lack of Collaboration and Partnership: Another major challenge of digital preservation is lack of collaboration and partnership among stakeholders, as well as "Lack of clearly assigned responsibilities and resources for the long term preservation" of digital materials (Wamukoya & Mutual, 2005). Such absence of collaboration and partnership exists among governments, creators, publishers, relevant industries and heritage institutions. There is also need for partnerships between archivists, information technology personnel, systems analysts, records managers and other information management staff to come up with holistic strategies on how to deal with digital preservation issues (Lin, Ramiah and Wal, 2003).

Deterioration of the Digital Media

One of the challenges of digital preservation is th deterioration of the digital media. This is becoming a cause for the disappearance or inaccessibility of digital information (Lin, Ramiah and Wal, 2003), as the media usually deteriorate within a few years or decades at most. Another challenge to digital preservation is the possibility of digital media getting lost in the event of disasters such as fire, flood, equipment failure, or virus attack.

Disaster Planning and Recovery

The other challenge relates to lack of disaster planning and mitigation strategies for digital materials at institutional, as well as national levels. The effect of the absence of disaster planning and mitigatory measures results in unnecessary and sometimes, permanent loss of valuable information resources.

Strategies for Digital Materials Preservation

Russell, (1999) has identified some of the strategies or methods that could be adopted to help preserve digital materials. These strategies are briefly presented below.

Reliance on Hard Copy Media

This strategy also known as "change media" involves printing out digital materials and preserving the hard copy.

Technology Preservation

This involves preserving the technology that was used to create the digital material, including hardware and software. This strategy ensures access to the digital material.

Technology Emulation

This involves using the existing technology that is able to mimic the old technology, thereby creating the original technical environment for the preserved item to be read or viewed.

Migration

Whereas technological preservation and technology emulation focus on the environment of the object and preserving the resource through re-creating or preserving necessary operating environment a different strategy for digital preservation is what has been called "migration". Migration is a means of overcoming technological obsolescence by transferring digital resources from one hardware/software generation to the next.

Encapsulation

The other preservation strategy is encapsulation which involves the grouping together of resources and whatever is necessary to maintain access to it. This can include metadata, software viewers, and discrete files forming the digital resource (Haag, 2002). He further says that in contrast to the migration approach, the encapsulation approach retains the record in its

original form, but encapsulates it with a set of instruction on how the original should be interpreted. Encapsulation is considered a key element of emulation.

Conclusion

Materials are the heart of libraries. They are vital access to learning and information, and in the future sustain knowledge and allow interpretation of the past. Every library, large or small should have a well defined programme for preserving the materials which it houses. In planning for preventive preservation, users and staff should be aware of their roles in the preservation programme. S.R. Ranganathan in one of his five law of library science postulates that, “books are for use”. if the materials are not well kept, they cannot provide that function because the most effective way to establish longevity of books/ materials is to prevent or retard deterioration. It is no gainsaying that information is as old as the age of humanity, hence it is highly vital that information sources should be adequately preserved and conserved for all spheres of human development- intellectual, political, social, cultural development, etc, and for posterity. Having seen preservation and conservation in a pervasive sense and having observed the need for policies to be designed in order to maintain a reasonable level of standardization that will compare with what is obtainable universally, it is imperative to mention that in preserving media materials/ records, it is important to keep them under conducive conditions devoid of dust. It should be ensured that they are properly cleaned and taken care of. Dust can inflict a lot of damages on any media. Elaturoti (1982) stated that media materials should be prevented from water which can soak books and other printed materials. It can also cause audio-visual equipment to corrode. Insecticides should be used with caution as they can cause damage to non-book materials.

Due to limited resources and the state of preservation in most libraries, it is impossible to keep all documents or recorded materials in their original format or even transfer the intellectual contents to other media for conservation. Selection and priorities are vital. Cooperation is the key to successful preservation initiatives. No one library can preserve everything. Through cooperation, mass treatment techniques such as de-acidification of books and papers are being developed. Cooperative programmes to preserve valid collection on microfilm have been successful in North America and Europe. Today, countries are working together to preserve documentary heritage through such efforts as the European Register of Microfilm Masters (EROMM) and increased bibliographic control assisted by internet. Indeed, optical digital technologies, preserving and transmitting information electronically offer both solution and real challenges for the preservation of documentary heritage (Feather and Sturges, 1997)

Finally, libraries should not only strive to acquire materials but should ensure that the materials acquired are preserved and conserved in a usable condition for generations of users. Libraries should be air-conditioned as its importance to library materials cannot be over-emphasized. Though damage to library materials are sometimes unavoidable, but with careful preventive measures, deterioration of the materials may be lessened or prevented as the old adage says “prevention is better than cure”.

REFERENCES

Alegbeleye, B. (1993). *Disaster control planning for libraries, archives and electronic data processing centres in Africa*. Ibadan: Options Books and information Services.

Alegbeleye, B. (2002). Preservation and conservation rationale, procedure, trends and benefits for research and scholarship being paper presented at the seminar organized by the National Library of Nigerian and UNESCO 4th – 5th June, p 10 -11

Caplan, P. (2004). Building a digital preservation archives: tales from the front. *The journal of Information and knowledge Management Systems*, 34, (1) 38 – 42

Digital Preservation Coalition (2002).DPC History. available at *http://www.dpconline.* Org/graphics/about/history.html:Accessed 1st Sept. 2008

Elaturoti, D. F. (1982). Management of media centres in Nigeria: the Abadina media resource centre experience. *Lagos Librarian*, 9 (1); pp 77 – 80

Enright, B. J. (1972). *New media and library in education*: London: Clive Bingley

Evans, G. E. (1995). *Developing library and information centre Collection* 3rd ed. Englewood, Colorado: Libraries Unlimited, Inc.

Feather, J. and Sturges, P. (1997). *International encyclopedia of Information and library science*. London: Routledge p 371

Garret, S and Walters, O. (1996). Preservation and digital information: Report of the Task force on Archiving of digital Information. Available at : *http://www.digital* . Accessed 1st September 2008.

Haag, O. (2002). Digital preservation Testbed white paper XML and digital preservation. Available at: *http://www.digitall*/bibliotheek/docs/white-paper-xml.en.pdf# . Accessed October 2007.

Harvey, V. (1993). *Preservation in libraries: Principles, strategies and practices forlibraries*. London; Bowker.

Hornby, A.s (1976*).Longman Dictionary of Contemporary English*. London; Longman.

Laisis, 3. (1999). Handling and care of library materials Being paper presented at the workshop organized by the Department of Administration, National Library of Nigeria, on 20th-24 Sept. pp.2-4.

Lin, LS, Ramiah, K and Wal, P. Kuan (2003). Problems in the preservation of electronic Records*. Library Review*,52 (3) 117—125.

Mohammad, U.N (2006). Preservation and conservation of library materials; The situation in the National Library of Nigeria. *Nigerbiblios* (182) Jan- Dec. pp 116-138.

Morrow, C. C. (1983). *The preservation challenge: a guide to conserving library materials*. New York: knowledge Industry.

National Library of Australia (2003*). Guideline for the preservation of digital heritage.* Netherland:. Unesco.

National Research Council, (1986). *Preservation of historical records*. Washington: National Academy press

Odogwu, N. J. (2008). Preservation and conservation of school library materials. *Owena Journal of library and information science.* Vol. 3 (1) pp 54 – 61

Ola, C. O. O. (2004). Preservation and conservation of library materials in the age of information technology *In Modern libraries and Information Centres in Developing Countries* edited by Evarest C. madu. Ibadan :Evi- Coleman

Russell, K. (1999). Digital preservation: ensuring access to digital materials into the future.Available at htt://www.leads.ac.uk/cedars/chapter.htm.Accessed 1st Sept. 2008

Saul, F. C., Zulu and Kalusopa T. (2008).Frame work for digital preservation in Africa. In *Information and knowledge Management in the Digital Age, concepts, Technologies and African Perspectives*. Ibadan: Third World Information Services Ltd.

Wamukoya, J. and Mutula, S. M. (2005). Capacity – building requirements for e-records management: the case in East and Southern Africa. *Records Management Journal*, 15 (2) 71 – 79

Zulu, S. F. C. (2005). Issues in managing electronic records (University of Botswana unpublished paper). Gaborone.

Victoria A. Iyishu; Dr William O. Nkanu and Frederick O. Ogar *are with the University Library, Cross River University of Technology, Calabar, Nigeria.*