CHALLENGES OF DIGITAL HERITAGE MATERIALS PRESERVATION IN BOTSWANA

Trywell Kalusopa
Department of Library & Information Studies,
University of Botswana
E-mail: Kalusopat@mopipi.ub.bw or tkalusopa@yahoo.com

Received: 19 May 2007
Revised: 15 December 2007
Accepted: 15 May 2008

Abstract

The media for recording information has evolved over time. In the past, stone, wood, metal, clay and paper served as information storage media. Developments in science and technology over the past two centuries have now necessitated the transition from paper-based formats to a variety of media and further deepened the challenges of materials preservation. Increasingly, information is now in electronic multi-media form occasioned by its creation, storage and dissemination in picture, sound, text or combination of these. Information resources in the electronic era now range or exist in the form of simple text-based files such as word processing files, to highly sophisticated web-based resources such as databases, websites, mails and storage mediums such as diskettes, flush drives, CD ROMs and others. This paper documents work undertaken to assess the current practices for heritage digital materials preservation in Botswana with a view to identifying strategies and policy issues for the long-term preservation of digital materials. The study sought to establish the current situation regarding digital materials preservation in national archives, libraries, museums, media organizations and other public institutions involved in the creation, collection, and storage of heritage materials. It also investigated the institutional capacities (human and material) for collection, storage and preservation, and provision of access to digital information in Botswana. The paper further makes several recommendations on the policies and

strategies for improving the state of national digital material preservation in Botswana.

Keywords: Botswana, National digital material, Preservation

Introduction

Digital materials comprise "texts, databases, still and moving images, audio, graphics, software and web pages, among a wide and growing range of formats" (UNESCO 2003). Most of these materials are "frequently ephemeral, and require purposeful production, maintenance and management to be retained" (UNESCO 2003). It has been acknowledged that such "resources have lasting value and significance, and therefore constitute heritage that should be protected and preserved for current and future generations" (UNESCO 2003). Thus, digital heritage "consists of unique resources of human knowledge and expression. It embraces cultural, educational, scientific and administrative resources, as well as technical, legal, medical and other kinds of information created digitally or converted into digital form from existing analog resources" (UNESCO 2003).

Preservation is an umbrella term under which most librarians and archivists cluster all the policies and options for action, including conservation treatments of different formats of information materials. 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 (digitisation) and those that are 'born digital' for which there has never been and is never intended to be an analog equivalent, and digital records. The phrase 'digital preservation' therefore, refers to or embraces two major categories based on the principle of how or the process by which digital materials came into existence or rather were created (Digital Preservation Coalition [DPC] 2002). Thus, 'born digital' refers to materials which were not intended to have an analog equivalent, either as the originating source as a result of conversion to analog form while 'made digital' refers to creating digital files by scanning or otherwise converting analog materials and the resulting digital copy are classed as a digital material (DPC 2002).

The terms digital preservation and digital archiving are often thought to be synonymous and therefore used interchangeably. However, there is a fundamental difference between the two. As defined by DPC (2002), digital preservation refers to a series of adopted management activities necessary to ensure a continued access to digital materials for as long as necessary while digital archiving is referred to as the process of creating backup as an ongoing maintenance as opposed to strategies for long-term digital preservation.

According to Hedstrom (1995), there are two perspectives of examining digital preservation requirements: from the perspective of users of digital materials and from the view of libraries, archives, and other custodians who assume responsibility for their maintenance, preservation and distribution. As echoed by Graham (1997), the most basic requirements from a user point of view include the ability to establish the authenticity and integrity of a source, document structures, metadata that document the maintenance and use history of the document, time and date stamps, and a series of references. Thus, though digital preservation requirements may be defined differently by archives, libraries, and other types of repositories, all these institutions, need storage systems capable of handling digital information (Rothenberg 1995).

Global status of initiatives in digital preservation

Different countries have made efforts to come up with strategies on how to combat or deal with digital preservation issues. Some of the initiatives on digital material preservation from selected countries are reviewed below.

The United Kingdom

In the United Kingdom (U.K) the first major point of focus on digital material preservation was the workshop under the theme "Challenges to Digital Preservation and Building Digital Libraries" which was held in 1993 which raised the awareness about the problems of digital preservation at the national level (National Archives, 2005). By the late 1990s, the UK had not come up with a national strategy on digital preservation. It is for this reason, that the Joint Information Systems Committee (JISC) of the Higher Education Funding Council (HEFCE)

and the British Library (BL) recognised the need for a British national policy and action on the long-term preservation of digital information. Thus by 2001, awareness about the need to address digital preservation had taken root in the UK resulting into several projects and initiatives. Some of these include the Digital Preservation Coalition (DPC), which was established in 2001 to foster joint action to address the urgent challenges of securing the preservation of digital resources and to work with others internationally to secure the global digital memory and knowledge base. Another effort to handle digital material preservation problems was the Copyright and Licensing for Digital Preservation (CLDP) project.

The CLDP was funded to investigate whether and how copyright legislation and licensed access to digital content affect the ability of libraries to provide long-term access to that content, and to suggest solutions for any problems identified. The CLDP project clarified what the rights issues of digital preservation are and recommended ways in which these issues can be resolved (National Archives, 2005). Other efforts in the UK over the past decades have been, for example, the creation of a digital preservation bibliography, which now includes thousands of articles, items of grey literature, and project websites. It has also resulted in raising awareness of many professionals such as librarians and other cultural specialists who now recognize that access to and preservation of digital resources are crucial activities to the preservation of contemporary culture for posterity (National Archives 2005).

United States of America

The preservation of digital content was recognised as a major challenge in the 1990's in the US. The Library of Congress (LC) has been a pioneer in the field of digital information preservation. Even before the onset of the World Wide Web (WWW), the LC was digitizing and making selected items from its collections available in electronic form. This programme which was called the American Memory, began as a pilot in 1990 under the National Digital Information Infrastructure and Preservation Program (NDIIPP). In 1998, the LC assembled a National Digital Strategy Advisory Board to guide the Library and its partners as they worked towards developing a strategy and plan. (Library of Congress, 2005). As a consequence, the LC

commissioned the National Research Council Computer Science and Telecommunications Board of the National Academy of Sciences (NAS) to evaluate the Library's readiness to meet the challenges of the digital world. The NAS report, *LC 21: A Digital Strategy for the Library of Congress*, recommended that the Library, working with other federal and non-federal institutions, take the lead in a national, cooperative effort to archive and preserve digital information. This effort resulted in the US Congress passing special legislation (Public Law 106-554) in December 2000 in recognition of the importance of preserving digital content for future generations.

Other US initiatives include the activities of the Digital Library Federation (DFL) whose mission is to bring together, from across the nation and beyond, digitised materials that will be made accessible to students, scholars, and citizens.

The DFL has also established the Global Digital Format Registry initiatives which is aimed at encouraging academic institutions to create digital institutional repositories into which the intellectual capital of a college or university can be preserved for reuse – gathering up not just the articles and books of the completed scholarly endeavour but also the data sets, presentations, and course-related materials that faculty generate (DFL 2005).

Australia

In Australia, concerted efforts aimed at digital preservation began almost at the same time as in the UK. The first major meetings that spurred the drive towards articulating the need for a nationwide approach to digital preservation started in 1993. The National Archives and the National Library have been spearheading digital preservation efforts (National Library of Australia, 2003).

In 2001 the National Archives of Australian drafted a Green Paper, which outlined strategies for the preservation of digital records. Agency to Researcher Digital Preservation Project is part of the outcome of the Green Paper (National Library of Australia 2003).

Another project in Australia that was also formed to confront the digital preservation issue is the Digital Preservation Project (DPP).

This is a research and development project being carried out by the Preservation Section of the Collection Management Branch of the National Archives. The project began in July 2001. Its objective is to create a way of storing Commonwealth agency electronic records that are assessed as being 'national archives' and preserving them so that they can be made available to researchers in the future.

The other notable efforts in Australia came out of the Secretariat of the Department of the Prime Minister and Cabinet that launched the Digital Recordkeeping Initiative, on behalf of the National Archives in 2004. The Initiative works towards developing and promoting a single Australasian approach to digital public recordkeeping across all jurisdictions and provides a space for communication and information sharing between the members (National Archives 2005).

There is also the National Library of Australia's Preserving Access to Digital Information (PADI) initiative which aims to provide mechanisms that will help to ensure that information in digital form is managed with appropriate consideration for preservation and future access. PADI advocates for the use of standards as one strategy, which may be used to assist in preserving the integrity of and access to digital information (National Archives 2005).

Other countries such as New Zealand have taken similar national digital material preservation initiatives as Australia, the UK and the U.SA (New Zealand National Library 2005).

Africa

According to Tsebe (2005), the National Library of South Africa was tasked by IFLA in its project "Networking Cultural Heritage" with reporting on digitisation activities on the African continent. The project was to investigate digitisation activities at national libraries and to encourage cooperation amongst heritage institutions (libraries, archives and museums) at either the national or the international level.

The major findings, according to Tsebe (2005) were:

- that the need for preservation of digital collections in the long-term had been mentioned at workshops and in recent articles by African authors.
- the realisation of the establishment of de-centralized repositories of digital libraries through collaborative programmes still had a long way to go.
- few libraries had attained ICT levels required for adequate connectivity.
- libraries were at different stages of digital development, with very different needs.
- there was a need for country-level bodies, which understand the requirements of libraries and that could drive forward digital development.

The centre piece of digital preservation in South Africa is the Digital Imaging Project of South Africa (DISA) which was established in 1997. DISA aimed at investigating and implementing digital technologies to enable scholars and researchers from around the world to access South African material of high socio-political interest that would otherwise be difficult to locate and use. In addition, DISA aimed to provide South African archivists and librarians with knowledge of, and expertise in, digital imaging. To date DISA has hosted various workshops in Southern Africa on digital imaging, managing digital libraries, and metadata.

Other efforts in South Africa are demonstrated by Sabinet Online, which has been digitizing more than 180 online versions of South African journals, which were originally published in hard copy. This service (SA ePublications) was launched in June 2002 with 40 online journals. Sabinet has also made huge investments in the digitisation of South African official (government) publications (Tsebe 2005).

Universal efforts in digital material preservation

There have also been several universal initiatives to deal with digital material preservation. Among the major international organisations that are concerned with digital preservation are the International

Federation of Libraries Associations and Institutions (IFLA) and UNESCO.

In 2003, UNESCO's General Conference adopted a Draft Charter on the Preservation of the Digital Heritage. The Charter is a declaration of principles to assist Member States in preparation of national policies to preserve and provide access to digital heritage. The Charter describes the digital heritage as those unique resources of human knowledge and expression in digital form, and recognizes both the risk to this material through technological obsolescence and the urgency required to ensure its preservation (UNESCO, 2003).

IFLA's Core Programme for Preservation and Conservation focuses "efforts on issues of preservation and initiates worldwide cooperation for the preservation of library materials." IFLA, in collaboration with the International Council on Archives (ICA), has produced guidelines for digitisation programmes for collections and holdings in the public domain (IFLA, 2005). The IFLA guidelines identify and discuss the key issues involved in the conceptualization, planning and implementation of a digitisation project, with recommendations for "best practice" to be followed at each stage of the process (UNESCO, 2003).

Digital heritage material preservation in Botswana

Over the past years, the production or creation of records in electronic form has been on the rise in Botswana following different strategies and efforts put up by the government to use ICTs in most government offices to achieve high productivity and efficiency. There has also been progressive investment in ICT in Botswana since the 1990s which has resulted in the establishment of a basic ICT infrastructure. Expenditure on ICT projects represented 0.2% of the NDP7 capital expenditure compared to 1.9% of the development budget during NDP8, a tenfold increase. This commitment to ICT use in government is expected to grow to about 3.7% during NDP9 (Government Computer Bureau 2003).

Government has also put in place an ICT policy which is designed to guide the ICT environment. It is also putting in place attendant pieces of legislation to backup the implementation of the ICT policy.

Like in any other country, the increasing production of electronic records in Botswana in government departments and elsewhere has undoubtedly raised issues of challenges of preservation of digital heritage materials from archivists and librarians. The question has been, what are the existing strategies pertaining to preservation of digital heritage materials that have been put in place in Botswana.

To date, there has been only one significant study that was initiated by the Eastern and Southern African Regional Branch of the International Council on Archives (ESARBICA). This study which observed that, that in as much as electronic records are being created daily in public institutions in a variety of formats, archival institutions in the ESARBICA region have in most cases, lagged behind in formulating strategies for managing them. The survey further indicated that the amount of progress made in the area of managing electronic records created by public institutions in ESARBICA member states, including Botswana, has been limited (Mutiti 2001). The survey further found that hardly any digital material preservation programmes were in place and that only one country was undertaking a photograph-imaging project whilst another country had identified the need for document conversion and had planned a feasibility study.

It is in this context that UNESCO commissioned the study on digital heritage preservation in the three countries: Botswana, South Africa and Ethiopia. This paper thus attempts to presents some of the findings on the current status of digital heritage material preservation in Botswana and suggests some recommendations thereof.

Methodology and research design

The main objectives of the study were to assess the current practices for digital heritage material preservation in Botswana and to identify strategies and policy issues for the long-term preservation of digital materials.

The study used the survey method consisting of various components such as field work, document research, observations and the holding of a national consultative seminar as final data input.

The field study involved visiting conveniently sampled national heritage institutions (such as national archives, libraries, museums, hospitals, media organisations) that had the potential of applying digital technology for the preservation of information materials (artefacts, maps, documents, audio visual and other materials), administering questionnaires, and conducting interviews at each of the institutions with those tasked with the preservation of materials. This was done in order to understand the current state of digital heritage material preservation in Botswana.

There were thirty-five (35) institutions that were identified as having the actual or potential of managing heritage materials in the country. Of these, twenty-nine institutions (29) were visited. Two categories of institutions that were surveyed included the users and potential users of digital materials (26 institutions) and the service providers of digitisation systems (3 institutions).

The distribution of users of digital systems were mainly government departments whose areas of operation were in library services, archives and records management, museums, geological surveys, health, legal, education, research, revenue collection authorities, financial service sector, media organisations (radio, TV and newspapers). Most of the organisations had an average employee size of about 350 staff.

At the time of the study, there were three main privately-owned commercial digital preservation service providers in the country:

- Kingsley Associates. This organisation mainly specialises in the provision of records management and printing stationery and storage of paper-based documents.
- Document Bank. This is the largest commercial digital service provider in the country. It provides microfilming, digitalisation and document storage services (hard and electronic copies). It also provides document delivery service both on-line and off-line. Its clientele is both public and private companies.
- Document Management Systems (DMS). This is a new entrant in the digital preservation market in Botswana. It procures and supplies digitisation equipment, file management systems for

electronic records and digitisation of hard copy documents. It also provides onsite storage for hard copy as well as electronic documents. Its clientele is both public and private companies.

In the study, observations were also used to gain insights into the environment in which digital heritage material preservation was taking place or was supposed to take place. Document research was done to inform on national and international experiences in the application of digital technology in the preservation of materials. The draft report on the findings and recommendations of the study was presented at a national consultative seminar. Participants at the seminar were drawn from various stakeholder institutions. The purpose of the seminar was to solicit additional input into the findings.

Findings and discussions

The findings cover the following areas of focus of the study:

- document production;
- digital heritage material preservation;
- selection criteria used
- standards on digitisation;
- storage of digital resources
- methods of storage of digital heritage materials
- accessing digital heritage materials
- staffing and training for digitisation;
- policy and responsibility;
- future digital material preservation plans.

Document Production

With regards to document production, the study sought to establish the following:

- types of documents produced, received and stored and the technologies used in their production;
- volume of document output in the organisation (paper and electronic and other media);
- existence of electronic databases in the organisation;
- staff access to e-mail communication; and
- whether the organisation maintains a website.

Respondents were asked to state what type of documents they produced, received and stored. Table 1 below provides a summary of the findings.

Table 1: Types of documents produced in organizations

Types of Documents	Response (N =26)
Letters	100%
Reports	85.7%
Publishing (newsletter)	85.7%
Staff records	71.4%
Internet	71.4%
Scanned documents	71.4%
Books	57.1%

From Table 1 above, all organisations (100%) indicated that the major types of documents that were produced, received or stored consist of correspondence materials. Reports and publication of newsletters constituted the next largest category (85.7%); followed by staff records, Internet-sourced and scanned documents (71.4%); while books were the least produced, received or stored documents (57.1%).

The study showed that most organisations surveyed employed electronic technologies in document production. Typewritten documents were still being produced although this is no longer predominant. Another significant observation is that most staff records in organisations are not fully electronically produced – their production is partially electronic and typewritten. Internet and scanning technologies were also identified as significant methods of document production in most organisations surveyed as shown in Table 2 below.

Table 2: Methods of document production

Type of document	Method of production with response in percentage				
	Fully electronic (using computers)	Mostly electronic	Mostly typewritten & handwritten	Only typewritten & handwritten	No Response
Letters	57.1	28.6	14.3	0	0
Reports	42.9	28.6	14.4	0	14.2
Publishing (newsletters)	57.1	14.3	14.3	0	14.3
Books	14.3	14.3	28.6	0	42.9
Staff records	0	42.9	28.6	0	28.6
Internet (Information obtained)	71.4	0	0	0	28.6
Scanned document	71.4	0	0	0	28.6

In terms of volume of output, most of organisations surveyed (over 57.1%) failed to quantify the volume of their document production (both electronic and paper documents). This means that most organisations cannot adequately articulate their needs in terms of equipment and space for the storage of documents.

Among the institutions surveyed, 57.1% indicated that they maintained some form of electronic databases. Most of these data-bases contained business transaction information such as financial data, staff records, and to a lesser extent, collection management information (such as case records). This seems to indicate the existence of a basic foundation and potential for harnessing digital technology for document management in Botswana.

All the survey organisations indicated that their staff members had access to electronic communication facilities such as electronic mail, which they used for internal and external communication. This shows

that the infrastructure for electronic data exchange exists in Botswana. This is so, because Botswana has a comparatively higher tele-density and has one of the most developed telephone infrastructures on the continent. This is a reflection of the investments which Botswana has put into the ICT sector since the 1980s. To date, several ICT systems have been implemented in the country. An International Telecommunication Union (ITU) study of selected telecommunications countries and IT indicators for the Southern African Development Community (SADC), also ranks Botswana being second to South Africa with respect to tele-density, Integrated Services Digital Network (ISDN) and Internet users (World Telecommunications Indicator ITU 1998).

Over half of the organisations (57.1%) indicated that they maintained some kind of websites. Except for one organisation, most of the websites contained static information about the organisation and the websites were infrequently updated. This finding shows that there is potential for using web technology in sharing and exchange of digital heritage material in Botswana.

Digital heritage material preservation

Organizations were asked to provide information on the following:

- when they started digital heritage preservation;
- why they embarked on digital heritage preservation;
- where the digitisation is done;
- the cost of digitisation;
- the colour and file formats of digitised materials;
- digital storage compression methods used, and;
- what strategies that they had put in place regarding preservation of digital materials.

The study reveals that there was lack of clarity as to when organisations actually started digital material preservation. Although the maintenance of electronic documents started in the 1990s, digital preservation is a recent phenomenon which is still in its infancy in most organizations in Botswana. Most of the organisations (85.7%) indicated that they had embarked on digital preservation in order to facilitate easy access to documents and to save space. The study

also revealed digital preservation tends to be IT-vendor driven and impulsive, where for example, heads of institutions impose such programme without conscious and comprehensive professional considerations of digitisation for the organisation.

The study revealed that most public heritage organisations such as the National Archives, National Museum, National Geological Information Centre, Department of Information Services were doing digitisation in-house, whereas private sector organisations such as banks, insurance companies, and parastatal organizations, were using commercial service providers to undertake digitisation work on their behalf. For example, two of the major digitisation service providers indicated their customer base as follows:

- **Document Bank**: 10% government; 15% parastatal; 70% private; and 5% others
- **Document Management Systems (DMS):** 20% government; 20% parastatal; 50% private; and 10% non-governmental organisations

Those organisations that indicated preference for in-house digitisation cited availability of already trained personnel, easy access to information, and the need to protect confidential documents as reasons for undertaking digitisation in-house.

In terms of cost, organizations surveyed could not quantify the actual cost of digital preservation. While most of the organizations have budgets for the computerization of their business processes, there were no specific costings attached to digital preservation. This is an indication that organizations place more focus on computerization without any well thought out digitization program for material preservation.

In addition, most of organisations (57.1%) could not state the colour format in which their materials were digitised. Only 28.6% cited colour and 14.3% cited black and white formats of digitisation.

In terms of file formats of digitised materials, the following were cited as the most commonly used for digital preservation by organisations:

- 42.9% cited GIF, JPEG, PDF and MPEG;

- 28.6% cited text files with mark up (HTML, SGML, XML) and WMF;
- 14.3% cited ASCII, ESP, TIFF, WAV, real audio and video, and ImagePac.

The major service providers indicated the following digital file formats which they are producing for clients:

- Document Bank: text files with mark up (HTML, SGML, XML), WMF, TIFF and GIF;
- Document Management Systems (DMS): TIFF, JPEG, and PDF. DMS also stated that they could digitise in any format as specified by the client.

On how materials were selected for preservation, 28.6% of the organisations surveyed indicated that they had a selection plan on which digital materials to preserve, while the rest either kept all materials in digital (electronic) or had no clearly defined plan for retention and preservation. This finding reinforces the observation made elsewhere in the paper regarding the lack of policies and regulations on the management of digital resources in most organisations.

Those institutions that had indicated that they had a selection plan for the preservation of digital materials were further asked to indicate who selected materials for preservation. 28.6% said that the document creator selected materials for document preservation; 14.3% said the records manager selected the materials for document preservation; 57.1% said the IT department was responsible for selecting the materials for preservation. This shows that document creators, users and information managers such as record managers, librarians, and curators play a very little role in selecting materials in electronic form for digital preservation. However, most organisations have erroneously surrendered the role of identifying and selecting digital materials for preservation to IT professionals who are not trained for this purpose. Most them argued that they were trained to provide systems for information flow and not for information management thus insisting it was the responsibility of the user departments.

Methods of preservation used: traditional vs. digital environment

Organisations were requested to compare document preservation strategies and practices used between paper-based and digital documents. The findings are presented in Table 3.

Table 3: Traditional and digital preservation environments

Comparative strategies	**On Paper (responses in %)**			**Electronic (responses in %)**		
	Yes for all	Yes for some	No	Yes for all	Yes for some	No
Is there a department / person that is given the responsibility to register and keep copies of letters	28.6	42.9	28.6	14.3	28.6	57.1
Old documents are separated from active documents and put in a safe place (archive)	0	57.1	42.9	0	42.9	57.1
There are rules/ regulations that specify documents should be saved and where	0	42.9	57.1	0	28.6	71.4
There are limitation on the period of storing documents	0	42.9	57.1	0	28.6	71.4

The following can be observed from Table 3:

- on the responsible department or person for keeping track of documents that are produced or received in an organisation, it is clear that while the areas of responsibility are clearly defined for paper documents that was not the case for electronic documents. When the two were compared, it was found that 71.4% of organisations have indicated that there is a department or unit responsible for management of paper based documents. The comparable figure for electronic/ digital documents is 42.9%;
- on archiving practices, paper-based documents were better taken care of than digital/electronic documents. For instance,

archiving for paper was cited by 57.1% of the organisations, while for electronic documents it is 42.9%;

- on rules and regulations on document management, 42.9% indicated that rules and regulations existed for paper management while for electronic/digital it was 28.6%, and;
- on the retention period for documents, 42.9% of the organisations indicated that they had defined retention periods for paper documents, while for electronic/digital documents it was 28.6%.

Regarding the existence of a comprehensive preservation programme for digitised materials, only 28.6% indicated that they had such a programme in place. On migration strategies in place, 42.9% indicated that they had a programme for the migration of digitised materials in line with changes in hardware and software technologies.

These findings lend support to the assertions elsewhere in the paper that there was lack of policy on the management of digital documents in organisations. However, even for the management of paper documents, the picture was still unsatisfactory since paper, having a long history of use in organisations, was expected to have been scoring 100% in all the areas of assessment above.

Selection criteria used for preservation

Using a multi-response list, organisations were asked to indicate the selection criteria used for identifying materials for preservation. They identified the following:

- 57.1% cited historical and cultural values of the materials;
- 42.9% identified the need to save space;
- 42.9% cited academic importance of the materials;
- 14.3% cited reduced damage to the materials;
- 57.1% cited preservation of information content;
- 28.6% commercial exploitation of the materials;
- 42.9% cited increased access to the information resource;
- 42.9% cited improvement of document delivery services.

From the above, it can be seen that the major criteria used for selection of digital heritage materials for preservation are cultural/ historical values and the main reason is for document preservation.

Standards on digital preservation

Using a multi-response list, organisations were asked to indicate standards which they had adopted for:

- digital document generation (word processing);
- database management;
- electronic communications;
- website development software;
- web development language;
- imaging software;
- audio recording software, and;
- video recording software and hardware storage devices.

On standards for word-processing 14.3% of the organisations indicated that they had a de-facto standard while 85.7% either did not have a standard or did not know the standard, while only 28.6% indicated that they had a standard for word processing. In practice, most of the organisations have adopted Microsoft Word as the main software for word processing. Of interest here is the high level of ignorance expressed by 71.4% of the respondent organisations on the need to have standard software for document generation to facilitate the sharing and exchange of documents at institutional level.

On the standards for database management systems software, 14.3% of the organisations indicated having identified a standard for database management systems. The rest expressed ignorance on the existence of such a standard in their organisation. The implication of this is that there is a plethora of database management software that might "not talk to each other" within the organisation, with its attendant problem of impeding access to information across organisational units.

On standards for e-mail software, 28.6% of the organisations indicated the existence of a de-facto or written standard. The rest of the organisations (71.4%), expressed ignorance about the existence

of such a standard. Although email technology is such that systems are able to communicate to different communication software, it is interesting to note that organisations are ignorant about the need to standardise electronic communication software at institutional level.

With regard to website development tools and website development language, all organisations indicated that they had no de-facto or written standards in these areas. The reason for this could be that website technology is a fairly new area which has not yet caught on in most organisations. It clear that if the issue of use of standards when developing websites is not addressed most organisations run the risk of developing websites that are not accessible.

With respect to standards for document imaging software, only 14.3% of the organisations indicated that they had adopted an imaging standard; while the rest expressed ignorance about having any imaging standard at all. The lack of standard imaging software at institutional level makes it difficult to access digital images at organisation level, let alone at national or inter-institutional levels.

For audio-video materials all organisations indicated that there was no standard digitisation software in place. This has implications for the exchange and sharing of these heritage resources as materials recorded on different standards may not be played on hardware which is tuned to a particular standard.

On storage media hardware standards, only 14.3% of the organisations indicated that they had in place a standard for procuring hardware storage devices. The ambivalence on a standard storage media in this area is understandable owing to the fluidity and rapid changes taking place in the development of storage media, where new storage media are always being introduced. This, however, calls for vigilance for constant migration into newer storage media in line with technological changes.

It was also observed at the National Consultative Seminar that metadata standards are IT driven (i.e. they are defined by IT professionals who work in isolation of heritage institutions personnel such as records managers, curators and librarians. This makes it difficult to access and share these digital resources. In general, the issue of

digital standards remains to be addressed by the concerned institutions in Botswana.

Storage of digital heritage resources

The study sought to establish the following aspects of storage of digital resources in organizations:

- other formats of documents that they have in their holdings;
- whether they have a programme for the digitisation of audio-visual materials;
- management of electronic documents ('born digital');
- retention periods for electronic documents, and;
- storage of digital materials.

Organisations were requested to state, besides paper and electronic documents, the various formats of documents which they have in their holdings. They identified the following:

- image documents (pictures) were cited by 85.7% of the organisation;
- audio recordings were cited by 57.1%, and;
- video recordings were cited by 42.9%.

This finding shows that besides paper and electronic documents, organisations in Botswana hold documents in other formats. These documents are largely in analog form. As such, retrospective digitisation of heritage materials will have to take into account these non-book and non-electronic formats. In addition, the study revealed that there was no systematic documentation of oral history and other indigenous knowledge forms. The study also revealed that ownership of this heritage resource was also not well articulated.

On the question as to whether organisations had a programme for digitisation of audio-visual materials, only 28.6% indicated that they had such a programme in place. This shows that despite most organisations having audio-visual recordings, they did not have a comprehensive programme for digital preservation of these materials.

Organizations were asked to state where they kept electronically generated documents. 28.6% indicated that they kept them in a

central location (in a central server in IT departments); while 57.1% indicated that they kept them both in a central server as well as on individual staff members' workstations. The rest did not know where the records were kept. This finding seems to indicate lack of clear policy guidelines as to how electronic documents should be managed and stored.

In terms of the retention periods for electronic documents, 14.3% indicated that records were discarded after a "certain" period which they could not specify; another 14.3% indicated that they discarded the electronic version but they kept a printed copy of the document; the rest (71.4%) had no information regarding the retention periods. This state of affairs shows that there is no policy on retention of electronic documents in most organisations.

Methods of storage of digital heritage materials

About 14.3% of the organisations surveyed indicated that all the digitised materials were stored off-site at service providers' servers and access to the same was via networks; 71.4% indicated that the materials were kept in an in-house facility. This shows that the preference by most of the organisations is to maintain their digital materials in-house. As cited elsewhere in the report, the main reason for preferring this mode of storage is to facilitate access and ensuring security of the materials. This is largely the case for public heritage organisations. This preference for in-house storage has implications for higher capacity storage equipment should these organisations embark on large scale digital preservation programmes.

On the other hand, parastatal and private organisations prefer to keep most of their digital documents at service providers' premises either on-line or off-line. Service providers were able to provide on-line servers as well as storing data on CD-ROMs.

Accessing digital heritage materials

Organisations were asked to comment on the following aspects with regards to accessing digital materials:

- whether they had access policies;
- whether they charged access fees;

- whether they had access tools (or aids) to digital materials, and;
- problems being faced in accessing digital resources.

Only 14.3% of the organisations surveyed indicated that they had an access policy in place for digital resources. The rest had not put in place any policy at the time of the survey. The implication of this is that terms of access to digital resources by members of the general public in most heritage organisations are still undefined.

On access fees, only 14.3% of the organisations surveyed indicated that they charged fees; 57.1% said that access was free, while 28.6% did not respond to the question. This means that generally access to digital resources by members of the general public is still free in heritage institutions in Botswana.

The study revealed that:

- only 14.3% of the organisations surveyed had access tools to digital collections;
- 57.1% said that they did not have finding aids in place, and;
- 28.6% did not respond to the question.

The implication of this finding is that intellectual access to digital resources in heritage institutions in Botswana is problematic.

Problem of accessing digital heritage materials

Using a multi-response list, organisations were asked to identify the problems that they faced in accessing digital materials. The results of the findings are summarised in Table 4.

Table 4: The common problems of accessing documents

Problem Area	*Response in percentages*			
	Very Often	Some-times	Ne-ver	No Res-ponse
Electronic version of a document is not found for reuse	0	71.4	14.3	14.3
Electronic version of a document is found but is stored in media for which there is no more reading/accessing equipment	14.3	71.4	0	14.3
The older electronic version of a document cannot be read by current software	14.3	57.1	14.3	14.3
A document is protected by a password that is not known	0	42.9	42.9	14.3
A document is found but you do not know whether it is a final version of the document	0	28.6	42.9	28.6
Current stored documents cannot be accessed due to defective storage media	42.9	28.6	14.3	14.3

From the Table 4 above, access to digital documents is a significant problem in most organisations. The major problems, in order of gravity are: poor storage of electronic versions of documents; poor migration strategies to newer hardware and software technologies; poor management of access control (passwords); poor management of electronic versions of documents; and use of defective storage media.

Organisations were also asked to state whether they were aware of the problems cited above. The responses show that 57.1% had discussed these problems at organizational level. When further asked on what measures they had taken to resolve the problems of access identified above, 71.4% indicated they had attempted to resolve the problems. However, when asked which specific measures they had taken, only 14.3% indicated that they had embarked on the development of digitisation standards; 42.9% indicated that they had assign-

ed personnel for digital preservation;14.3% had embarked on staff training in digitisation; 14.3% had assigned a safe place for digital materials; 14.3% had assigned a specific budget for digitisation; 28.6% indicated that they had embarked on a study on digitisation with a view to devising strategies on how go about digital processes, and 14.1% had developed a migration strategy for digital preservation (in terms of hardware, software as well as well as from paper to electronic).

This finding shows that while most organisations are aware about the problems of access to digitised materials, they seem not to have clear strategies of how they could resolve them. The study revealed that at the technical/operational level, 43% of the organisations lacked quailfied staff that would articulate the problems of access. Interviews with senior organizational officials further revealed that they were not aware about the concept of digital preservation. This lack of awareness was evidenced by lack of budgetary support for digital preservation activities and the absence of organisation-wide policies on digital preservation in most organizations.

Policy and responsibility

With respect to policy and responsibility for digital preservation, organisations were asked to comment on the following aspects:

- existence of rules and regulations on digital preservation with regards to selection, classification, retention and disposal, and access.

The findings show that only 14.3% of the organisations had rules and regulations in place for preservation and selection of digital materials such as e-mail messages and electronic records. The rest of the respondents had no policy in place at the time of conducting the study. This finding shows that by and large organisations have still not yet realized the importance of managing digital materials. Materials in digital formats are being created or collected without policy guidelines. This makes the digital materials susceptible to being lost, damaged or kept in unsafe conditions for preservation.

Staffing and training for digital preservation

Organisations were requested to state the following regarding their staffing for digital preservation activities:

- the highest qualifications available in-house for digital preservation;
- whether they had any training programmes for staff in digital preservation; and
- whether they used outside expertise for digital preservation.

The results revealed that the highest in-house qualifications available were:

- Masters level were cited by 14.3% of the organisations;
- degree level were cited by 42.9% of the organisations;
- diploma level was cited by 14.3% of the organisations; and
- 28.6% of the respondents did not state the available qualified staff for digital preservation in their organisations.

Further inquiry revealed that while staff members who were assigned to undertake digital preservation work had qualifications in IT, none of them had specialist qualification in digital preservation.

57.1% of the organisations indicated that they had undertaken training programmes in digital preservation for staff. The rest of the respondents had either not undertaken any training at all or did not respond to the question.

On the use of outside expertise to undertake digitisation work for the organisation, 57.1% indicated that they had used outside expertise. Interviews further revealed that while most heritage organisations were generally understaffed in other areas of operations, they faced acute shortages of appropriately trained specialists in digital preservation.

In general, it can be observed from the above that lack of appropriately trained staff in digital preservation is one of the major problems which most organisations are facing in Botswana.

Future digital preservation plans

Organisations were asked on whether they had any future plans to embark on digital preservation projects. 42.9% of the organisations indicated that they had plans while the rest did not have any immediate plans.

Those organizations that had plans were further asked to state as to when they intended to embark on digital preservation. The responses ranged from one to three years time.

It would appear from the above that while some organisations had plans to embark on digital preservation within the next three years, the majority of the organisations had no plans for digital preservation. This, to some extent, underscores the ignorance that pervades organizations as regards the potential of digital technology in the preservation of heritage materials.

Summary of digital heritage materials preservation challenges in Botswana

In all, the study revealed the following gaps regarding the status of digital heritage materials preservation in Botswana:

- lack of a national policy framework on digital heritage material preservation;
- relevant legislation on ICTs, especially on digital material preservation, is yet to be drawn and enacted;
- lack of clearly defined national heritage institution(s) responsible for digital material preservation;
- absence of coordinated national initiatives and programmes on digitization;
- gaps in the necessary human resource requirements in terms of knowledge, skills and competencies to drive digital heritage material preservation in heritage institutions;
- lack of standards in digital heritage material preservation in terms of hardware, software, storage media and metadata;
- haphazard approach to digital heritage material preservation in most heritage institutions;

- absence of local institutions that could serve as models for 'best practices' (or centres of excellence) in digital heritage material preservation;
- the management of indigenous knowledge systems, in terms of their digitization, remains to be addressed, and;
- disaster planning and recovery in most heritage organizations remains to be addressed.

Recommendations and strategies

It is evident that a conducive framework for sustainable digital heritage material preservation in Botswana should be anchored on the following (Tembo, Kalusopa & Zulu 2006):

- National policies
- Legislation
- National coordination
- Human resource capacity building
- Standardization
- Research and development
- Disaster planning and recovery

These issues are briefly discussed below.

1. National policies on digital material preservation should be formulated. Among the objectives of the national digital heritage material preservation policy will be to:
    - identify institution(s) that will be responsible for driving digitisation initiatives at national, regional as well as international levels
    - stipulate the preservation and accessibility of digital materials
    - ensure the authenticity of preserved digital materials
    - stipulate national digitisation standards in terms of hardware, software, processes and procedures to ensure compatibility and easy migration of digital materials
2. National policies on digital material preservation should be backed by relevant legislation. Legislation is important because it provides the legal framework and stipulates the specific responsibility on the management and preservation of digital materials.

3. National Heritage Institutions should come up with co-ordinated digital material preservation initiatives or programmes. Among objectives of such initiatives would be to:
    - raise national awareness and advocacy on digital material preservation. This should be done at various levels: strategic, technical as well as end-user levels.
    - promote research on digital material preservation
    - spearhead training in digital material preservation
    - create national databases on digitisation
    - document indigenous knowledge systems and oral history
    - provide technical assistance to institutions on selection and retention digital materials.
4. National Heritage institutions in Botswana should address the human resource gaps in digital material preservation by recruiting, developing (through various short-term and long term training strategies) as well putting measures in place for the retention of personnel.
5. Standards on hardware, software, storage media and metadata should be implemented at institutional level. National heritage institutions such as the National Archives should be consulted when such standards are being implemented. In addition, national heritage institutions at regional levels such as SADC should strive to articulate common standards on digital material preservation based on international norms such as the Open Archival Information System. This will enhance the exchange and sharing of heritage material within the region.
6. Digital material preservation programmes should be preceded by detailed studies on needs and re-organisation of analog systems for identification, selection, classification of materials for digitisation. Further, organisations should include in their digital material preservation plans, all heritage materials that are produced and received, including grey literature.
7. Botswana should develop Centres of Excellence on digital preservation. Among the functions of such centres would be:
    - Development of standards in hardware, software as well as metadata.
    - Research in digital material preservation.
    - Adaptation and testing of digital technologies.

8. National Museum institutions should take a lead in the documentation of indigenous knowledge, including heritage sites and their digitisation. In addition, legislative and policy issues on copyrights and intellectual property rights on indigenous knowledge should be addressed.
9. National Heritage Institutions should put in place strategies for disaster planning, mitigation and recovery of digital materials in their holdings.

Conclusion

This paper has attempted to present part of the United Nations Educational, Scientific and Cultural Organization (UNESCO) three-country Digital Heritage Project (Botswana, Ethiopia and South Africa) commissioned to collect baseline information on the state of digital heritage material preservation in Botswana.

Findings indicated weak policy formulation, weak legislative framework, ill-defined national co-ordination, lack of awareness, lack of human resources development and lack of depth of standards on digital heritage materials preservation in Botswana. Appropriate recommendations and implementation such as enhancing national policies, legislation, national coordination, human resource capacity building, standardization, research and development, disaster planning and recovery the strategies have been suggested.

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