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## Digitization of Archival Collections In Africa For Scholarly Communication: Issues, Strategies, and Challenges

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# Digitization of Archival Collections In Africa For Scholarly Communication: Issues, Strategies, and Challenges

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## Introduction

Experience and observations have revealed that most archives and libraries in Africa today are filled with materials recorded in analogue formats and the traditional or analogue librarians and archivists are those who are still carrying out the tasks of acquiring, organizing, and preserving the print documents and helping the readers in locating the information they need.

In developing countries this picture has rapidly changed due to the influence of advances in computer technology. The physical materials are gradually giving way to electronic print, and online public access catalogue (OPAC) is obliterating the needs for users to physically visit the library or archives buildings to access their collections. Traditionally, librarians and archivists have been analogue information providers for centuries, but today they have the opportunities to use modern technologies to provide quicker, accurate and more sophisticated services to users. Since then, archiving of digital materials as well as creating digital archives is an emerging practice of today's archival profession. This is made feasible by technological advancement which provides greater opportunities and challenges to librarians, archivists and information professionals. Technology has made information which was traditionally provided in paper prints to be digitized, preserved and made available and accessible to users in electronic format.

The proliferation of electronic information; the dwindling budget for acquisition of library stocks; the desire to access materials in remote locations; the quest for collaboration, partnerships and resource sharing; and the ever increasing cost of preserving analogue materials, and so on, are some of the forces that prompted digitization of archives and records. Omekwu (2009) aptly observed that the transient nature of many web resources calls for practice that ensure that information of instrumental value is accessed, acquired and archived electronically for reference and research purposes. This paradigm shift from traditional medium to electronic format has tasked modern archivists, especially with regard to digital preservation, accessibility, copyrights and the issue of intellectual property rights.

In view of this development, for archivists and librarians in Africa to keep afloat with this modern trends, they need to be prepared to embrace the new technology.

## Background of Digital Libraries/Archives

It was Scholler (1984) who reveals that Thomas A. Edison that invented phonograph more than 120 years ago, and in 1899 the Academy of Science in Vienna founded the phonograph-archives which was the first archives of the world.

Hughes (2004); Mutula & Ojedokun (2008) reports that the foundation of modern archives (the Internet, electronic libraries and archives) was laid in 1945 when Vannevar Bush envisioned an automated system that would store information. Bush articulated a system known as a memex machine which he envisaged would allow a user to view stored information from several different access points and look at several items simultaneously. In 1950 Douglas Engelbert "hypothesized that computers could be used to automate symbol-handling tasks, and thus help people think faster and better about more complex problems"(Mutula & Ojedokun, 2008).

The idea of Bush and Engelbert inspired and motivated Ted Nelson to coin the term hypertext to describe a system that linked bits of knowledge in ways that people think. Since Bush anticipated the notion of scholars having access to infinite quantities of information at the desktop, "it has led to a sea change in the accessibility, affordability and ease of use of computing and networked digital information" (Hughes, 2004). Right from then, the evolution of digital libraries and archives in the 1990s is tied to hypertext searching and advances in computer technology. Since the evolution, many digital library projects such as that of the Association of Africa Universities(AAU), the Rhodes University in South Africa, the University of Nigeria Nsukka, and the African Digital Library (ADL), are some of the digital library projects being implemented in Africa.

In addition to using technology for administrative and academic purposes, digitized collections can be made accessible in a reformatted/refined way which allows faster browsing simultaneously on the Internet by millions of users in different and remote locations. As is becoming the emerging practice of archivists, electronic preservation, and the best way to make archival resources available and accessible to users, has been the greatest worries of modern archives professionals.,

## Contemporary Issues and Problems

Information emanating from governments, institutions, organizations, scholars as well as private individuals are increasingly appearing online and being demanded electronically thereby creating a new environment and challenging to library and archival profession. It is placing greater pressure on information professionals and the urgent needs to be abreast with developments in the global archival environment.

The issue is that as Witten & Bainbridge, (2003) correctly observed "new strategic vision and economic models are emerging" and modern archivists are operating in a context of new social, political, economic, and technological milieu which impact on *institutions*, administrators, archivists, librarians, genealogists, historians, lawyers, and scholars' needs and the uses they make of archives. This therefore, changes the mission of the archivists and their priorities for service delivery. It touches on *the economy* of archival institutions and changed or brings about changes associated with the context and nature of the resources that librarians and archivists have in their collections and therefore, affects their attitudes and priorities for collection development, storage and use. It changes *the technology* of the archival institutions which simultaneously changes the tools and systems with which archivists work with and, therefore impinge on the frameworks and tools by

which their services are delivered. The *political change* which links together all the above process of making choice about policy, priorities, and resource allocation, is not left out either.

The implications are that all the forces for change in the politics and government in Africa, are influencing the internal management dynamic of museum, archives and their parent's institutions. As the information future of technology is abysmally unpredictable, it affects the way and manner information is created, managed, processed, archived and made accessible for scholarly communication.

In view of this shift in paradigms, the use of "technology has become a fundamental part of the institutional mission of archives, museums and libraries" (McKay,2003). Technology and its impacts on archives and libraries is one example of the rapid and pervasive changes that has affected work, life and scholarly communications today. It is making computer-based archiving system an imperative for many operations in memory institutions (Smith, 2000). In addition to the use of technology for administrative purposes and scholarly communications, more institutions are developing digitization initiative, and hundreds of libraries, museums, history, and archives have launched projects designed to digitize their collections and place them on the web (University of Illinois Library 2001).

## Purpose of the Study

This paper examines and discusses

1. How information technology answers the questions of what, why, how and the gains of digitization project in Africa.
2. The rules or principles and basic approaches Africa should know about digitalization of their archival collections.
3. The gains or reasons why cultural institutions in African and the developing world should digitize and preserve their archival collections in digital formats.
4. And the challenges facing African archivists in their efforts to digitize their cultural heritage collections.

## Methodology

Literature review of current issues and developments in archives, archiving, preservation, and digitization was carried. This made the author to have an added insight into some of the basic concepts, issues, and techniques that might have made a better comprehension of the paper ambiguous. The ideas and knowledge obtained from reviewing the literature was used in discussing the concepts, issues, strategies and challenges of digitalization in the archival profession.

## Digitization

Digitization is "the process by which analogue contents is converted into a sequence of 1s (ones) and 0s (zeros) and put into a binary code to be readable by computer" (Hughes, 2004). It is the transformation of analogue information from whatever form and from whatever support to digital code using computer technologies. This may "include electronic snapshots taken of a scene or photographs, films, manuscripts, printed texts and artworks scanned from documents" (Cornell University Library, 2001). Digitization process converts archival materials from formats that can be read by people (analogue) to a format that can be read only with the help of machines (digital). It is a process of taking a physical object (analogue contents), and taking photographs of or scanning the item and transferring the photographs into a digital medium. It is also a process of archiving born digitals into the institutions collections.

The concept of digital archives may therefore be referred to as both collections of electronic resources consisting of 'born digital' (i.e. archival materials which originally was not intended to have analogue equivalent) and, 'made digital' (i.e. creating digital files of archival collections by conversion or scanning the analogue materials such as texts, audio, visual, graphics, animations and other documents) generated in the day-to-day administration of an institution that are made accessible through the aid of digital technologies. One great advantage digital archives has over analogue collection is that digital files may be read, reformatted, compressed, transferred and retrieved over computer networks. It is made accessible and viewed on computer monitors. It can be accessed over the Internet simultaneously by millions of users in different locations in Africa and beyond without degradation of the contents, and can also be copied limitless times with just a click of the computer mouse.

## Principles of Digitization

For archivists undertaking digitization initiative of their collections, the following principles which had been confirmed by the preservation Committee of the Canadian Council of Archives (2001), should never be ignored.

As part of an access strategy, the process of digitization must not place original records at risk of damage from handling or use. This means that establishment of digitization service must strive to preserve the authenticity and integrity of the original information and not violate the physical or intellectual rights (property rights, copyright or privacy) of persons (Zulu, 2008). During digitization, digital enhancements may be performed on copies to improve access, but unaltered version, the original analogue document or a digital version must always be kept. Archival institutions in Africa must define clearly the objectives such as access or a combination of access and preservation, before implementing a digitization programme. Records to be digitized should be chosen only after a careful selection process and the technological approach to digitization must satisfy project objectives and must accommodate the characteristics of the records, such as the principle provenance or the sanctity of the original order. In addition, search tools are an essential part of a digitization project, and must meet the needs of users.

Since digital information is at the risk of loss due to technological obsolescence (physical supports, logical formats, as well as software for searching and displaying the information), institutions in Africa embarking on a programme for long-term preservation of digital records must be aware of these archival digitization principles, the dangers, the complexity of such a program, and the costs that are implied. These institutions must not neglect other activities when allocating resources for the establishment and maintenance of a digitization service. Realizing the costs and complexities inherent in the development of a digitization program, archival institutions in Africa should try to share resources (financial, material, human) and collaborate with others, where possible.

## The Why of Digitalization

Cultural institutions in many parts of the world are investing on digital projects for several reasons which may include; providing access, reduction of over-handling of materials, and assisting in promoting the collections and visibility of the institutions. In an answer to the question 'Why digitize (archival collections in Africa)', Trevor Jones, project coordinator, Illinois Digitization Institute (2003) writes that digitization enhances access and improves preservation. By digitizing their collections, cultural heritage institutions in Africa can make information that was previously available to only selected localized group of researchers accessible to many. Digitization of inactive but valuable documents allow users in Africa and beyond to search collections rapidly and comprehensively from anywhere at any time of the day. Some institutions in advanced countries ( example, the National Gallery in London,

[www.nationalgallery.org.uk/](http://www.nationalgallery.org.uk/) , and the British Library, [www.bl.uk/](http://www.bl.uk/)) have created an electronic images of every item in their collections and place them on their websites. Another example is the *Making of American Website* (<http://www.hti.umic.edu/m/mao.new/>) where entire books about the continent can be searched for specific information. Another example is the Library of Congress's American Memory Page (<http://memory.loc.gov/ammem/edhtml/edsndhm.html>) where one can listen to recordings made by Thomas Edison. These allow simultaneous and speedy access to institutional collections and reduces loss rates by theft, and so on.

Digital files are suitable for improving access and usability, and for reducing handling of original materials. The creation of digital/online archives enables creation of new space, significant changes in the delivery of scholarly contents and shifts in the relationships between content creators and users (Deegam & Tanner, 2002). Digitization also help to preserve precious materials, make high quality digital images available electronically and can reduce wears and tears on fragile items (Jones, 2001). In an archival environment digitized materials can be linked to other materials to create multimedia. It can be stored and delivered in a variety of ways; and can be browsed easily and speedily and be searched or accessed simultaneously in different locations. Mutula & Ojedokun, (2008) write that digitization makes libraries to have global reach through international networks such as the Internet. Using web access makes it possible to search the OPACs of many world libraries and to utilize a number of their online resources. Digital archives are ubiquitous, meaning that digital archives are accessible any time from anywhere subject to the availability of enablement.

## Gains of Digitization of Archival Collections in Africa

Developing a digital surrogate of rare and fragile archival materials in Africa prevents the original from damage by handling. Creating digital archives and use reduces wears and tiers in handling of the old or fragile materials and hopefully extending the life of the original (De Stenfino, 2000; Jones, 2001). Instead of using the physical documents, the digitized version are used, thereby reducing the rate of physical consultation and deterioration.

- Digitization increases the scholarly value of source materials. This can be achieved by undertaking collaborative digitalization projects with other institutions in other parts of Africa and the world, by connecting collections electronically, the individual objects in disparate collections and make them to be more useful to scholars.
- The provision of digital archives of Africana materials can overcome gaps in existing collections because digitization provides opportunity for collaborative digitization initiative to allow the re-unification of disparate collections scattered in many archival institutions in Africa (Hughes, 2004). Through collaboration digitized archival collections in other institutions in the world can be accessible in other Archives. This closes the gaps and shortfalls in the collections of other Archives in developing countries thereby replenishing the stocks from other institutions.
- Digitization can raise the profile of modern African institutions and breathe new life into older ones. Digitization of priceless and valuable collections of an institution can bring prestige to the whole institution. It creates visibility not only of the library's (institutions) content, but the scholars work within the university and raises the profile of an institution by showcasing digital collections which can be a useful public relations exercise (McKay, 2003; Ezeani & Ezema, 2009).
- Participating in digitization projects allow for professional development as staff making them to gains new skills, knowledge and expertise while completing the project. Digitization may create an opportunity for investment in the technological infrastructure and technological base among staff. Staff themselves will benefit from access to digital programmes that give them an

opportunity to learn about new technologies. One institution that realizes such benefits is the New York Public Library (NYPL), <http://digital.nypl.org/> which was developed initially to support the New York Public Library Visual Archives, but today it is providing programmatic support for the whole organization. An institution and its staff become assets and may share expertise and lessons learned with other institutions (Smith, 2000; Hughes, 2004).

- Digitization of cultural heritage materials in Africa can have tremendous benefits for administration, education and research. Digital materials can be read in new and creative ways and may be delivered directly to end-users, and retrieved remotely. Since the data is not fixed like printed text, it is easy to reformat, edit, and print. Therefore, the flexibility of the digital content and the ability to provide a large number of users access to unique special collection materials is an added benefit and the most attractive feature of digital conversion projects for archivists in Africa.
- Providing access to digitized collections can help publicize the materials to other departments and peers, in other institutions around the world and demonstrate the importance of the collections (Ingram, 2000). It promotes national initiatives of nations. For example, the USA National Archives and Records Administration (NARA) ([www.archives.gov/](http://www.archives.gov/)) is an archival research center that has developed a comprehensive digital collection of archival materials so that collections can be accessed by means of Archival Research Catalogue, an online catalogue of NARA's nationwide holding. Also, the National Library of Australia, ([www.nla.gov.au/](http://www.nla.gov.au/)), and the National Library of New Zealand, ([www.natlib.org.nz/en/digital/index.html](http://www.natlib.org.nz/en/digital/index.html)), respectively provides information on government policy regarding the information society, and maintains the libraries gateway of their individual countries.
- Digitalization promotes international digital collaborations amongst Africa and other nations in the world. For example, the African Online Digital Library (AODL) ([www.africandl.org/](http://www.africandl.org/)) a digital project funded by the International Development Resource Center and the National Science Foundation (NSF) is an American/African partnerships to develop digital libraries and the technical infrastructure to support them. It is the pioneer of African digital library development that provides multilingual and multimedia collections for scholars in Africa. The project partners includes several important research institutions in Africa such as L'Institut Fondamental d'Afrique Noire, which is the largest repository of Francophone West African Culture and Civilization in Africa. Others are the West African Research Center/Centre de Recherches Ouest Africain (WARC/CROA), and the MATRIX project and Africa Studies Center at Michigan State University. Hughes (2004) reports that the goals of the digital repository is to adopt the emerging best practices of the digital library community and to apply them to the African projects. In addition to this objectives is the production of multilingual, multimedia materials in "a region with limited electronic connectivity" and enable users to easily access digital collections within a global information environment.

## Approaches in Digitizing Archival Collection in Africa

The success of digital projects in Africa hinges not on expensive technology, but rather on sound project planning. Technology should not drive digital projects, rather the goals should be determined first, and only then should appropriate technology be selected. There are certain factors that must be considered when digitization projects are to be embarked on in developing countries and these include;

*Planning:* It is the best to ask series of questions before embarking on a digital initiative because the objectives of the digitization must be clearly identified and spell out. Some of these pertinent questions include: Are the archival materials to

be digitized frequently consulted?. A high demand for records may justify a digitization as a means of preventive measure because use of surrogates prevents the originals from unnecessary handling and risks. Can the records/archival materials selected for digitization be safely digitized?; How could archival collections in an institutions repository or digital environment/e-environment be provided in electronic format? What are the strategies or steps for digitization? What are the things to be considered before embarking on digitization of archives? What are the gains? Resources are useless unless they are accessible and for this reason, if an institution is to embark on a digital conversion project, sufficient thought, planning, risk management and correct infrastructure must go into the process or the project will fall short of intended goals. Libraries, archives and museums hold disparate collections accumulated by judicious selection policies over the institutions history in variety of media. Therefore, in developing collection policies, institutions must take into account many factors such as suitability of materials to an institutions mission, the value of the materials in comparison to other materials in the collection, the demand of users or researches for such material, restrictions resulting from the legal status of part of the collections, and accessibility and availability of collections. Similar considerations will inform the selection of collection for digitization because it is not possible to digitize every thing in the collections.

*Setting Goals:* First, the project objectives should be clearly identified as well as obtaining the technology and resources necessary to achieve the project goals; Secondly, the long-term costs of a digitization capacity must be maintained and supported by the institution and its parent organization and other stakeholders in the project. African institutions that wish to embark on preservation of archival information in digital form must also commit to a substantial investment in keeping up with technology. Though, the international standards address physical formats for digital information, this is not the case for software components, and logical formats where a certain level of risk management is unavoidable.

*Develop Digitalization Policies:* Policies for selection of new materials for digitization should be developed, and digitization policies will make it possible to identify collections that add value to these goals. In developing institutional policies on selection of materials for digitization, some of these questions which borders on: whether the materials have sufficient value to ensure interest in digitization; digitization will enhance access or increase use; the rights and permissions for electronic distribution secureable; the goals that will be met by digitization; the institution have sufficient expertise in digitization project management; and organizational and technical infrastructure adequate need some answers.

*Legal/Copyright Issues.* Who owns it? Selection of archival materials for digitization should first be based on a clear understanding of copyright law and rights of ownership (de Stefano, 2000; Tennant, 2000). Does physical ownership mean rights of reproduction? Physical ownership does not mean that an institution owns the rights to reproduce it. One of the most important selection criteria for digitization will be the copyright status of the original materials. Will it be possible to obtain permission to digitize? After digitization, will the institution be able to protect the digital assets by managing the rights to their use? If the institution does not have the rights to digitize, or the means to manage the digital assets, then digital project should not embarked on.

*Selection Criteria:* In developing selection criteria for digitization, the process of selecting specific item to be digitized will employ such standard library selection criteria such as value, significance to the overall collections, user demand and interest, availability and fragility of the original. The UNESCO, IFLA, and ICA Guidelines for Digitization Project (2002) suggest that digitization projects should be *user driven* or based on high demand for access. In order words, unless archivists are trying to encourage consultation of certain documents or restricting the circulation of the originals, it is not advisable to digitize records that are not in demand by patrons; *Opportunity driven*, (i.e. When enablement is available An

inadequate level of human, financial, material, and technological resources may lead to abandonment of the project along the way.); *Preservation driven or the need to protect fragile materials*. This means that a high demand for archival material may justify digitization as a measure to preserve the original as use of surrogates protects the original from unnecessary handling.

*Verifications*: Having selected materials for digitization, the next thing to do is to verify or ascertain whether digital copies of such materials already exist. Duplication of efforts is not necessary. Conventional development policies always try to avoid the purchase of copies whose editions already exist in the collection (Ayris, 1999). However, re-digitization is necessary if the electronic resources created were carried out using older technologies. In addition, if the copyright permission to digitize resources was not in the public domain (i.e. if it was for internal use only) and if the material or the institution concerned wish to embark on a wider area network such as the Internet or world wide web, there is the need to re-digitize the materials. In the past it was thought that when a scholarly production was transferred to an institution the legal rights to reproduce the material are automatically made. Today institutions can no longer count on the fact that legal rights are transferable (Beamsley, 1999). For this reason, institutions must be assured that project objectives are attained within the context of the Copyrights Act

*Metadata*: Metadata simply means information about information that describes digital objects and enables users to find, manage and use digital objects. It represents the total historic record of the digital object and the totality of information about the object. For developing countries good metadata is a key component of developing digital archives that are usable and useful for long term. Good metadata makes it possible to catalogue and effectively present digital information to the public (Jones, 2001). Metadata helps to identify the work, who creates it, migrated or reformatted it, and other descriptive information; it provides unique identifying information about the organization's, files, and databases that have detailed information about the digital contents; describes the technical environment in which the digital files were created, equipment, used, the software, operating systems and other things. Typically, metadata describes how the image was digitized, its format, ownership and copyright information. The justification for digitization and provision of metadata is to enable it in future for without metadata there is no access and when there is no access, it would be difficult for users to learn from the past in terms of their successes and failure. These are the key issues African Archivists should bear in mind whenever they are planning for digitization of their collections.

## Challenges of Digitization of Archives in Africa

Despite every thing that digitization can accomplish, there are some good reasons librarians and archivists in developing countries may regret embarking on such project. Not every thing in the collection is worthy of digitizing because the idea of an entire archives or library being digitized is a long way process. Successful digital project are the result of careful planning and evaluation of collections and the digitization of only those items that will provide the greatest benefits to the users. Below are some of impediments to digitization project for African archivists in the electronic environment.

- Constantly changing software and hardware:- This creates greater pressure on archival institutions because preservation of digital archival collections centers on the interim mechanism for storing the digital information, migrating to new form and providing long-term access. One of the greatest issues facing the longevity of digital collections is not only the storage media deterioration, but the problem of rapidly changing storage devices. Unlike analogue information which places emphasis on the preservation of physical artifacts, it is the informational contents of the digitized material

that is preserved. It will therefore take a conscious effort of archivists to make sure that the digital information is preserved since “continuously change software and hardware creates headache for staff working on digital longevity” (Besser, 1999).

- Funding:- Digital projects are expensive. Digitization of archival/library automation requires enormous funding due to frequent hardware and software upgrades, and increasing cost of subscription to electronic databases (Jain, 2002; Mutula, 2003). Apart from inadequate fund to train archivists in Africa, training of archivists in digitization and preservation of electronic format creates a herculean problem. A well funded digitization project assures new and improved services and sustainability of the project.
- Computer Phobia: Due to inadequate skills in information technology in Africa, many traditional librarians and archivists are conservatives and have phobia for computers. Because of generation gaps between the new and old professionals, computers are perceived as a threat to their status as experts. Thus, they find it difficult to cope or measure up with the requirements of the electronic/digital age, and are at the same time 'too reluctant to jettison the old practices for new one' (Ayoku & Ojedokun, 2008). Successful application of information handling technologies requires an ability to overcome staff and personal resistance to such innovation.
- Technical Expertise: Inadequate technical expertise is prevalent in many African countries. There is shortage of personnel/human capital. Few librarians with computer science qualifications (computer engineers) work in archives and libraries, hence the consequent frequent break down of ICT facilities and disruption of services in digitized libraries and archives. In many African countries, human resources with appropriate skills, competences and attitude are not readily available to initiate, implement and sustain digitization project, and most African states are still lagging behind in technological and telecommunications infrastructure. Added to these is the fact that as Ngulube (2004) in Constable (2008) argues, African trainers (archivists) lack expertise and are ill-equipped to train others in electronic preservation and digitization as was obtainable in America and other European countries.
- Inadequate Technology Infrastructures: Frequent power outage constitute serious bottleneck to digitization in Africa. This has the effects in damaging digital equipment and where there is generating set the cost of running them is prohibitive. Added to this is the harsh environment of Sub-Saharan Africa which is not always friendly with technology equipment. “Most countries in Africa” Zulu (1994) reports, “do not have adequate and reliable supply of electricity which consequently makes it impossible to maintain a conducive and sustainable technological environment suitable for digitization project in the continent”. Again, telecommunications infrastructures in most African countries are either lacking or poorly developed, and few African states have modern digital and packet switching telecommunications facilities needed for data transmission.
- Technological Obsolescence: The continuous changes in computer hardware and software cause technological obsolescence which is a threat to digitization and digital preservation in Africa. It causes the loss of the means to access to information in digital form. Technological obsolescence is caused by continuous upgrade of operating system, programming language application and storage media. Alegbeleye (2009) suggested that digital archives should be transcribed every ten to twenty years to ensure that they will not become technologically obsolete.
- Refreshing: This is a way of periodically moving files from one physical medium to another in order to avoid the obsolescence or degradation of the storage medium. Refreshing enables digital files to be transferred periodically to new physical storage media in order to refresh the materials and keep it from physical decay and obsolescence of the medium, or the materials will be inaccessible. Loss of format is a troubling issue because as information is transferred from programme to programme, information is

lost when analogue material is digitized, and information may also be lost as digital resources are refreshed or migrated to modern computing environments. As Besser (1999) remarks “although identical digital copies may be made from digital files, functionality from every software programme cannot be emulated”.

- Emulation: The objective of emulation is for older data-sets to run on contemporary computers. Emulation may be similar to migration, but focuses on the applications software rather than on the files containing the data. It seeks to develop new tools that will create conditions under which the original data were created. This can be done by mimicking early operating systems and software applications. For African archivists, digitization of archival collections does not necessarily end in conversion of analogue contents to digital formats, it hinges on continuous sustainability and accessibility of the digitized materials in electronic environment.
- Continuous Migration: The purpose of migration is to keep on preserving the intellectual contents of digital objects and retain or maintain the ability of users to keep on using them in the face of constant changing technology. Migration is the process of periodically moving files from one encoded environment/ format to another and updating the information to one that is consistent with more recent computer environment. Examples include moving information from Word Perfect to Microsoft Word95, then to Microsoft Word97, migrating data-sets from Dbase to MYSql or word processed files from Window 2000 to 2007, and so on. Migration is seen as a means of overcoming technological obsolescence by transferring digital resources from one hardware/ software generation to the next. Few African countries and institutions have the required funds to maintain problems that arise as a result of migration.
- Lack of Legislation/Policy: Wamukoya & Mutula (2005) observe that legislators in Africa are neither aware of, nor conversant with the requirements of digital preservation and for that reason, they either ignore or inadequately cover digital preservation issues. The Internet links is also a challenge to digitization because of copyright legislation. The copyrights of software needed to access digital files, and the right to copy for preservation has not been adequately articulated in most national legislation, and if permission for digitization cannot be obtained, digitization of such materials should not proceed.
- Deterioration of Digital Media: Deterioration of digital media is responsible for the disappearance of, or inaccessibility of digital information in the long run. This is because media deteriorates or decays within few years after digitization. Another challenge is that digital media get lost during disaster or virus attacks, and in Africa there may be absence of or inadequate organizational plans to manage e-records. These in addition to the harsh environmental conditions of the Sub-Saharan Africa which accelerates degradation of electronic equipment demands for re-digitization. Hazen, Horrell, & Merrill-Oldham (1998), in Hughes (2004) writing on the rationale for re-digitization advocated that the reason why re-digitization is inevitable is the likelihood that electronic resources created in previous years using older technologies may not be accessible or compatible with the new technologies.

## Conclusion

Information is an intangible but invaluable resources for institutions, organizations and individuals, and they will benefit from using it more efficiently if they are properly organized and permanently preserved. The goal of digitization initiatives for Africa is to develop interoperable and sustainable resources which can be regarded as institutional assets. One important aspect of digitization initiative for Africa is a plan to ensure a long-term preservation and continued access to the digitized materials. Therefore, if valid archival records in Africa are not properly kept and managed by African archivists, not only will the archival resources be lost

to future generations, but the institutions also face a number of risks associated with failure to produce evidence of their past. If access to archival information is not to be restricted to scholars in African environment, if archivists in Africa are to escape from the negative biases associated with traditional archival services, and if the archival profession in this 21st century are not to be shortchanged, they must set priorities concerning how archives and records in their repositories can best be preserved and utilized to benefit the institutions and the users in this electronic age.

## Recommendations

Technology is usually ahead of the law, and the Internet creates added pressures for new legislation to be made in order to protect digital materials. There are many proactive measures institutions should apply to protect their digital collections.

One of them is listing full copyright information with the images on the websites. Controlled access to the collections may be provided when digital images are marked correctly with ownership.

Technical feasibility and a long-term commitment to infrastructure must be evaluated before embarking on a digital conversion projects. System analysts must understand the changing software and hardware and make collaboration and migration a crucial element of digitization projects.

The stakeholders and key-players (librarians, archivists, administrators, systems analysts, programmers, scholars and end-users) must work together to make the intellectual control of digitized collection very important in their institutions. Powerful technology allows electronic materials to be easily manipulated and end-users must be educated on the importance of authenticating the object. For this reason, every effort must be made to educate end-users about the inherent problems associated with digital medium due to the fact that hardware, software and network infrastructures change rapidly to the extent that it is often difficult to anticipate or forecast how the data of today will be viewed and accessed tomorrow.

Metadata should be the first line of defence to protect digital information and contents. By providing detailed metadata, institutions may minimize the risks of digital resources becoming inaccessible in the future. In metadata, important technical information such as scanning specifications, operating systems, software versions, and decompression schemes, must be captured. In addition to institutional administrative data, it is important to maintain the digital integrity of the files.

The best way for Africa to ensure longevity and long-term access to their digital data is to use standard formats and open system, such as open archives information systems (OAIS), and to have a permanent and sustainable strategy for the project. To be able to do this, a long-term costs of digitization of archival resources should be maintained and supported by the host institution; the institution should make a commitment to the long-term maintenance of digital data. Therefore, institutions which commit to preserving information in digital formats must also commit to a substantial investment in keeping pace with technology because the way information is appearing and accessed has fundamentally changed making the society and modern archivists to be what Anunobi and Nwabueze (2010) described as "being digitally charged".

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