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## **Digitization of Library Resources in University Libraries: A Practical Approach, Challenges and Prospects**

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### **Abstract**

*Digitization is an important aspect for academic libraries especially university libraries in 21st century. It is an essential task in modern day libraries. Digitization (which deals with the conversion of non-digital material to digital form) has opened up new audiences and services for libraries, and it needs to be integrated into the plans and policies of any institution to maximize its effectiveness. Setting up a digital library requires a complex digitization project. Digitization is a complex process with many crucial dependencies between different stages over time. This study reviews the concept of digitization, reasons for digitization, things to be considered before digitization, process of digitization, different stages in digitizing documents, and challenges of digitization of library resources. It concluded that digitization will enable university library to preserve endangered library resources, improve the efficiency of information search mechanisms and enhance access to library resources. Adopting the approach of the issues outlined and the references to more detailed source and past project will contribute to the future success of initiating digitization of library resources.*

### **Introduction**

Recently, universities in developing countries especially in Africa have embarked on integration of digital technology in their operations. This serves as a tool for improvement and development, especially in a situation where attention is drawn to the academic contents and ways of digitizing and preserving them. University libraries are fully involved in this development as they are the heart of the University, being that they house the intellectual contents of the institutions.

A related emergent trend in academic libraries is the implementation of institutional repositories (IRs), digital collections that capture and preserve the intellectual output of university communities (Crow, 2002). A repository established by a particular university or other research institution is known as an institutional repository. It can be intended to collect and preserve in digital form the intellectual output of an institution, which include; PhD dissertations, Masters' theses, preprints (a piece of writing, especially a contribution to an academic journal, that is printed and often distributed in a preliminary form before official publication), post prints, working papers, or technical reports. It can also contain the collection of printed and manuscript documents, public archives, and graphic material, originating from the institution or elsewhere, that the university has converted to digital form for use within the university, and generally available to anyone. It can also contain the administrative output of the institution, as reports,

directories, and local archival documentation. This effort to digitize the intellectual property of the institution as noted by Eke (2011) is what is known as digitization. Digitization of library resources especially in African according to Amollo (2011) has over the years been mostly associated with academic institutions, which are known for producing documentation as a result of research and studies conducted as requirement of academic process.

This trend has led to a transformation of them into digital Libraries. With the availability of several free digital library software packages at the recent time, the creation and sharing of information through digital library collections has become an attractive and feasible proposition for library especially university libraries and information professional around world. Digital libraries depend on digital content. There are information resources which are born digital, having been created by computational technologies and never existing in analogue format, but the majority of holding offered by digital libraries according to (Lee, 2002) were created through the process of digitization, that is, the conversion of an analogue signal or code into a digital signal or code.

Digitization offers many new and exciting opportunities, and indeed it is changing people's way of life in many ways. This work is set out to study the digitization of library resources in university libraries by discussing the concept of digitization, reasons for digitization, things to be considered before digitization, process of digitization, different stages in digitizing documents, and challenges of digitization of library resources.

### **Concept of digitization**

The term digitization has been variously defined by different authors. Digitization according to Obaseki and Momoh (2010) connotes the process of transforming materials from solid manual state into soft visible automatic state. Gbaje (2007) was of the opinion that digitization is a process of converting non digital born documents to digital formats. Fabunmi, Paris, and Fabunmi, (2006) opined that digitization implies conversion of documents and art works into digital images. Feather and Sturges (2003) defined digitization of information materials as the process of converting analogue information to a digital format. On this regards, Witten and David (2003) defined digitization of library resources as the process of converting traditional library resources to digital formats for electronic use and distribution. In this way, the traditional library resources can be stored in computers and be manipulated easily. Amollo (2011) concluded that digitization is a process of converting print-on-paper resources to digital form, usually by scanning. Digitization therefore deals with the conversion of non-digital material to digital form. Some materials in a digital library are born digital, that is to say they were created, and are always used, in digital form. But much digital library content as observed by different authors has to be created by a process of digitization.

### **Reasons for Digitization of Library Resources**

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, among others according to Pandey and Misra (2014) are some of the forces that prompted digitization of archives and library materials.

Digitization as noted by Tuna, Zogo and Demireli (2013) addresses three main needs of libraries as follows; preserving the documents, making the documents more accessible and reusing the documents.

- **Preserving the documents:** Most libraries are digitizing materials which might be lost in the future, such as old manuscripts, research projects, photo images, analogue maps, non-live musical recordings, government official gazettes and several other historical records. Digitization is useful in preserving precious materials. Making high-quality digital images available electronically will reduce wear and tear of fragile items. However, digital copy should not be seen as a replacement for the original piece, therefore original document should be cared for even after digitization. Preservation remains a secondary benefit of digital projects.
- **Making the documents more accessible:** The search mechanisms for information in the traditional library set up are very slow and inefficient. Libraries in most third world countries are dispersed and uncoordinated. This makes accessing materials in these libraries to necessitate physical contact by users. If these libraries become digitized, such library resources can be assessed online without stress. Online links can be made to existing digital libraries; this will enable users to use materials that are not available in the local library.
- **Reusing the documents.** Digitization improves access to library resources. By digitizing library collections, information will be accessible to all instead of a group of researchers. Digital projects allow users to search for collections rapidly and comprehensively from anywhere at any time. Digitization makes the invisible to be visible. Several users can access the same material the same time without hindrance. It also removes the problem of distance, as users do not have to travel to libraries that possess the hard copies of library materials before they can access and use such materials. A digital library can be made to serve a region.

Pandey and Misra (2014) summarizes the reasons for digitization of library materials to include: preservation of the age old materials for long use which are important and valuable for future; facilitation of new forms of access and use; to provide better and enhanced access to a defined stock of research material; to create a single point of access to documentation from different institutions concerning a special subject; to support for democratic considerations by making public records more widely accessible; to provide better search and retrieval facilities for library types of materials; and to give the institution opportunities for the development of its technical infrastructure and staff skill capacity. Academic libraries are digitizing materials because they know the continuing value of library resources for learning, teaching, research, scholarship, documentation, and public accountability.

Digitization of documents as noted by Alhaji (2009) can take a lot of time, effort and money. As a result, Smith (2001) narrated the following reasons that should be considered before going into digitization.

- **Is it worth digitizing?** Do the documents contain the information that is valuable enough to warrant the costs of digitization? There is no point digitizing the documents that are already out of date, no matter how bulky they, but it is worthy to digitize the old, unique

documents that can be easily damaged so that the people can be allowed to use them without handling the originals.

- **Who is your audience?** If there are only few users, or maybe there are large numbers of potential users, but they do not have computers to access the digital library, they can be served by sending them photocopies. It may be difficult to judge the demand for documents. It is, however; wise to get other people's opinions. Ask the potential users of the documents what they see as their priorities.
- **Do the documents form a collection?** It is important to verify if the documents form a collection. In fact, the documents in a digital library should have something in common like a common subject focus.
- **How easy is it to digitize documents?** Another important factor to take into account is how easy it will be to digitize the documents. Not all the hard copy documents can be easily converted to electronic format. There is the need to check the physical characteristics of the documents to understand how easy it will be to digitize them. If you have a lot of documents that are hard to digitize, you might choose not to include them in the digital library. It is advisable to put them in the image files, rather than in the searchable text document.

### **Process of Digitization of Library Resources**

Fabunmi, Paris and Fabunmi (2006) noted that there are certain factors that must be considered when digitization projects are to be embarked on in developing countries and these include the following stages

- A. Policy Enactment:** A policy is a guiding statement. The top management should enact a policy on the project. Such a policy will serve as a reference point and guide for implementing the project. The policy should contain the goals of the digitization project. Good goal setting is important for any new initiative. To make our materials more accessible on the web is not specific enough. There is a need to be specific, particularly on the categories of users that will access the collection, the type of material they may be interested in, how they will use it, how many people are envisaged to use it, the planned procedure for its advertisement, and the benefit of the material to users and institutions. Contacting current and potential users is an excellent way of having clues to all these issues. One may consider sending out a survey to the project's intended audience in order to learn how they are currently using the material, and how they might use it differently if it was digitized. It may be helpful to contact other institutions that have digitized similar collections and learn from their successes and failures.
- B. Policy Approval:** The policy should be approved by appropriate authorities before project for digitization is implemented. For instance, a university library may need the approval of the university management and other funding agencies before any digitization project can be embarked upon.
- C. Planning, Budgeting and Monitoring:** It is the most essential and desirable to set up a planning committee that will draw the plan and budget for the digitization exercise. Budgets for digitization projects should include the following categories:
  - ✓ Salaries, wages and benefits (likely to be about 50% of the project cost);
  - ✓ Staff training;

- ✓ Equipment and supplies;
- ✓ Services, contracts and legal fees;
- ✓ Overhead and indirect costs (including offices and workspace);
- ✓ Maintenance, licenses, and communications charges;
- ✓ Contingency (setting aside about 10% of the total project budget for unexpected expenses)

The purposes of the digitization project, the source of fund and the amount available for the project should also be taken into consideration. At the regional or national level, effective planning for digitization can bring together all types of libraries, museum, academic/professional societies, historical societies and archives to take advantage of the exercise.

- D. Acquisition of Appropriate Technology:** The plan drawn for the project will determine the appropriate technology to acquire. Technology here refers to all the equipment/hardware and software that are needed.
- E. Administrative Decision on the Procedure to be adopted:** Decision has to be made on the mode of operation, whether to just establish links with existing digital libraries or to digitize in-house or to contract it out. There is a need to establish time limit for the project.
- F. Sensitization, Psychological Preparation and Retraining of Staff:** In most places the staff will like to resist the digitization project. It is a common thing for people to resist change, just for the fear of the unknown. The library staff may fear that the success of the project may affect their jobs adversely. Those who are not computer literate may not be willing to adjust. All these categories of people have their genuine reasons to resist. It is the responsibility of the library management to educate them and allay their fears.
- G. 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 (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.
- H. 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 suggest that digitization projects should be user driven or based on high demand for access (UNESCO, IFLA & ICA, 2002).
- I. 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. 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 (that is, 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. For this reason, institutions must be assured that project objectives are attained within the context of the Copyrights Act.

- J. 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. 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. 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 which should bear in mind whenever they are planning for digitization of their collections.

### **Different Stages in Digitizing Documents**

Cornell University Library (2000) provides six stages in digitizing documents for a digital library: Registering, Scanning, Optical Character Recognition, Proofreading and formatting and producing the Final Version.

- ✓ **Registering:** Before scanning large number of documents, there is the need to first register them and use a filing system to keep their track. If not, you risk misplacing hardcopies, losing files, skipping steps in the process or duplicating work, perhaps without realizing it. There is also the risk of losing electronic versions of files because they have been misnamed or saved in the wrong subdirectory. Moreover, a good filing system is vital, so everyone in the digitizing team knows what he is supposed to do, and he can fill in for another person in case of absence.
- ✓ **Scanning documents:** It is necessary to clean and dust off the documents to be scanned; make sure that all the pages are present and in the right order. If the document is in poor condition, try to find a fresh copy. If it is a sheet fed scanner, cut the document open to get individual sheets to feed through the scanner. If necessary, you can rebind the documents later. If you do not want to damage the documents, you can photocopy each page and feed in the photocopy through the scanner, though this uses a lot of paper and reduces the quality of the scan. To scan a document on a flatbed scanner, place it face down on the scanner platen or put the pages into the sheet feeder. Then, in the software, choose a setting, resolution and colour and scan each page of the document at the settings you have chosen.
- ✓ **Optical Character Recognition (OCR):** Optical Character Recognition (OCR) software converts a scanned image into a text file that a word processor can read. To do this, it must first recognize where the text is on the page. The software breaks the text blocks down into lines or into an individual character. It tries to match the image of each letter

against patterns it recognizes as an “a”, “b”, etc. There is a problem to encounter with languages that use Latin scripts with accented characters. As a solution, you should use the OCR software that is specific for language.

- ✓ **Proofreading:** This is the act of making corrections to the document text and layout. This is done in two ways:
  - a) Comparing the scanned text on the screen with the hardcopy and entering the corrections directly into the computer. The word processor’s spellchecker will help in spelling errors quickly.
  - b) Printing out the scanned text and comparing it with the original copy. Mark any corrections on the printout, and then enter them into the computer. This is a slower method, but may be the best option if there are not enough computers for each proofreader.
- ✓ **Reformatting:** The Optical Character Recognition (OCR) software may produce a document that consists of straight text, no columns, no headers and footers. There is the need to reinsert these by hand or correct where they appear on the page. There may also need to change the typeface, heading styles and so on, to make the document more attractive and readable. Alternatively, you may be able to adjust the settings of your OCR program to preserve the layout of the page.
- ✓ **Final Version:** For many documents, there is a need to add some information to the text so that readers can identify it easily. As for a book you must make sure that the book title, the author or the editor, the publisher and the publication date are all included. As for chapter in a book, you should include the title and the author of that chapter and the original page numbers in the printed version of the book. As for the journal articles you should include the journal title, the date, the volume and the issue number, the article title and the authors and the page numbers in the original printed journal. In other words there is the need to add Metadata to describe each document.
- ✓ **Technology Infrastructure and Personnel:** Several resources are required for the creation of digital library collections, their maintenance and provision of services. The two major resources needed are technology infrastructure and personnel.
- ✓ **Infrastructure:** Access to a digital library collection can be provided online or offline. The Online access today typically means that the client uses a web browser on a desktop computer or laptop and access the collection by connecting to the digital library website over the Internet. The Online access requires a connection to the Internet or to an internal network (Intranet). In Offline access, the digital library is not accessible over a network. One way of providing an Offline access to a digital library collection is to receive and respond to the user queries over e-mail. Another way is to distribute the digital library collection on a CD-ROM. A digital library project would typically require the following equipment: Server computer, Desktop computers, Digitization equipment, Network connectivity and other equipment.

Another aspect is the software to be used in digital library. The Digital library software works with the web server in providing various digital library functionalities including creation, organization, maintenance, indexing, search and retrieval. In choosing the software, some features should be taken into consideration. These include: Support for different document types, Support for customized metadata, Collection administration,



Support for standards like Dublin core metadata standard, Search and retrieval and Multi-lingual support.

Several free digital library software packages are now available which could facilitate the easy creation and sharing of information through digital library collections. Examples of open source free digital library software include: Greenstone Digital Library software by New Zealand Digital Library; Academic Research in the Netherlands Online (ARND); Tilburg University, The Netherlands; CDSware; CERN Document server software, Geneva, Switzerland; D-space; MIT Libraries, Cambridge, MA USA. etc.

- ✓ **Personnel:** Personnel are most important digital library's resource, not only during its initial creation and set up, but also for its operation, maintenance and provision of services.

Since the access to the digital library is easy, compared to a physical library, more users are likely to access it. If the digital library does not meet the expectations of the users in terms of currency and quality of content, they will lose confidence, and it is likely for them not to visit the digital library again. It is therefore important to assign the personnel with the right skills and attitude to handle the various tasks associated with the digital library project. Broadly speaking, the personnel will be required for the following tasks:

- a. Project management.
- b. Selection and preparation of source material.
- c. Digitization and conversion.
- d. Cataloguing and metadata assignment.
- e. Quality assessment.
- f. System administration and maintenance of digital library server and website.
- g. System analysis/programming for digital library application/interface development.
- h. Promotion and provisions of services.

Moreover, the rapid changes in the digital library technologies require constant re training and repositioning of staff for an effective practice in technological application.

### **Challenges of Digitization of Library resources**

Digitization of library resources poses a great deal of challenge to the major stakeholders, that is, the library management, employees and library users. Despite everything that digitization can accomplish, there are some good reasons librarians in developing countries may regret embarking on such project. Not everything in the collection is worthy of digitizing because the idea of an entire library being digitized is a long way process. Below as listed by Pandey and Misra (2014) and others are some of the impediments to digitization of library resources.

#### **A. Legal Aspects/ Issues of Copyright**

This is related to intellectual property rights. A major challenge for digital libraries is complying with copyright, intellectual property rights and related issues like plagiarism (Wawick, Terras, Galina, Huntington & Pappa, 2008). Digital libraries are hampered by copyright law because, unlike with traditional printed works, the laws of digital copyright are still being formed. The republication of material on the web by libraries may require permission from rights holders, and there is a conflict of interest between libraries and the publishers who may wish to create online

versions of their acquired content for commercial purposes. This is an aspect where librarians and researchers need to take precaution. There is an increasing unease among members of the library community that copyright changes will adversely affect the ability of libraries to provide digital collections and services. Intellectual property is the fifth challenge stated by Library of Congress as one of the challenges to building an effective digital library. It stated that a key element for digital libraries is appropriate recognition and protection of legal rights such as copyright, publicity, privacy, matter of obscenity, defamation intellectual property as well as less legalistic but serious concerns associated with the ethics of sharing or providing access to fold or ethnographic materials.

### **B. Cost/Funding**

Digital projects are expensive. Digitization of library automation requires enormous funding due to frequent hardware and software upgrades, and increasing cost of subscription to electronic databases. Apart from inadequate fund to train Librarians in Africa, training of Librarians 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. Edmund (2010) opined that Cost of digitisation and any potential print delivery raises several questions. How should scanning be funded, by donor or by the requester? Should profit be made? Raise the costs too high and choice of work becomes prohibitive. Setting them too low could affect the quality of digital and print outputs.

### **C. Technophobia**

Due to inadequate skills in information technology many traditional librarians 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, 2008). Successful application of information handling technologies requires an ability to overcome staff and personal resistance to such innovation.

### **D. Technical Expertise**

Inadequate technical expertise is prevalent in many developing countries. There is shortage of personnel/human capital. Few librarians with computer science qualifications (computer engineers) work in libraries, hence the consequent frequent break down of ICT facilities and disruption of services in digitized libraries and archives. In many developing 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.

### **E. 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.

### **F. Refreshing**

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.

### **G. 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.

### **H. 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, and then to Microsoft Word97, migrating data sets from Dbase to MySQL or word processed files from Window 2000 to 2008, 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.

### **I. Bandwidth**

Developing countries may have limited bandwidth available. This is a problem according to (Eke, 2011) that is being experienced in UNN. Poor connectivity has always affected the rate at which files are uploaded. In a study carried out by Warraich and Tahira (2009), it was found that HEC (Higher Education commission) provides shared bandwidth via Pakistan Telecommunication Limited (PTCL). It was noted that poor connectivity has been a big challenge for accessing and downloading information especially large files.

### **J. Difficulty in digitizing some materials**

Most academic staff supplies their biodata and scholarly publications in a CD. At times, the CD-ROM drives of the computers used for the scanning are faulty. Some cases have occurred where the drives could not open, nor read the CDs provided. As a result, a section was created for dumping of such CDs and they were tagged "problem documents".

## **Conclusion**

Digitization is an important aspect for academic libraries in 21st century. In other words, it is an essential task in modern day libraries. Setting up a digital library requires a complex digitization project. Digitization has opened up new audiences and services for libraries, and it needs to be integrated into the plans and policies of any institution to maximize its effectiveness. It is essential for the library management to provide policy guidelines and articulate plans for the exercise. Digitization is a complex process with many crucial dependencies between different stages over time. Utilizing a holistic life cycle approach for digitization initiatives will help develop sustainable and successful project. Digitization will enable university library to preserve endangered library resources, improve the efficiency of information search mechanisms and enhance access to library resources. This study reviews the concept of digitization, reasons for

digitization, things to be considered before digitization, process of digitization, different stages in digitizing documents, and challenges of digitization of library resources.

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