

Digitization of Library Materials in Academic Libraries: Issues and Challenges

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Abstract—Digitization as a method of preservation is now a global phenomenon as well as the new trend in managing a library collection especially precious ones among academic libraries. This paper discusses the reasons for digitization and also explains the processes and methodology of digitization. Issues and challenges involved in the process of digitization are also highlighted. Such major deterrents in the project include legal aspect and finances. Other factors are also discussed and the ways forward to the hindrances highlighted. This paper establishes that there are challenges militating against the digitization of academic libraries and concludes with the remarks that although digitization is a challenge still information professionals/librarians must meet with the practical skills and the vision to implement it in a controlled and manageable fashion.

Index Terms—digitization, academic libraries, information, technology.

I. INTRODUCTION

Digital library, Institutional repositories, open archives etc. are the present day buzzwords, which enable users for accessioning digital information and knowledge resources for different purposes. In this regards library has adopted many advance technologies to develop its service quality. The digital materials may be of two types, one that produced in some analog format (e.g. printed books, manuscripts etc) and then converted to digital form. The other one is "born digital" means originally produced in machine readable digital form (e.g. e-books, e-journals, online databases, digital photographs, websites, multimedia etc.).

Digitization of information materials is the process of converting analogue information to a digital format [1]. It is one of the newest methods of managing information resources in the new information age, whereby information technology has assisted in making information accessible to people even in their homes. Traditional library materials in the form of books, papers,

manuscripts, documents, etc. are converted into electronic formats. Images (such as photographs or maps) are converted into digital representations using some type of scanning device (or digitizer) so that they can be displayed and manipulated on a screen.

Digital institutional resources such as theses, manuscripts, special monographs, research papers, or images are of very high value to academic institutions. Cooperation, automation and building of the digital library — all for the enhancement of service delivery in support of teaching and research — are the principal drivers that will shape the collective future of libraries as suppliers of information to the scholarly world [2].

Large-scale digital collections in academic libraries are typically associated with the sciences, but substantial and growing collections of digitized cultural artifacts are enabling new levels of understanding in the humanities. The growing ubiquity and user-friendliness of academic information systems have given rise to the new field of digital humanities, an interdisciplinary endeavor that unites scholars in the humanities with librarians, archivists, and information systems experts to leverage digital tools and techniques in search of new insights in humanities-based research. The majority of the mass digitization efforts that have enabled and catalyzed this new mode of inquiry are taking place in libraries, particularly in academic libraries [3].

II. REASONS FOR DIGITIZATION

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.

The aim of digitizing library materials is for preservation and easy access by any user or researcher. *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 [4].

This entails that the digital library would be open at any time for consultation of materials. Materials uploaded on the website are always there for people to consult, except when erased by the website administrator.

Library materials especially old manuscripts, photo images, theses, and musical recordings etc that are in danger of being lost in the future and which are mostly historical and valuable needs to be preserved for future use. But the main problems for academic libraries are to select which materials to be digitized and how to get these materials digitized. *There were different purposes for digitization. She highlighted the types of materials selected must meet the purpose, selection to enhance access, selection based on content and selection for preservation [5].*

When considering materials for digitization, first criteria will be physical condition of the materials, followed by access, value of content, the demand for the materials, the intellectual property rights, the required infrastructure, cost and sources of funding [6].

One of the advantages of digitization is the ability to search for an item electronically. It is noted that rather than scan through table of contents in a book or newspaper, you can do a quick electronic search and find what you are looking for in seconds. It saves the time of researchers, students and corporations [7]. This implies that a large number of users can access a single material at the same time. This also saves time and it goes in line with Ranganathan's fourth law of library science which states: "save the time of the reader". Digitization also helps to reduce handling and use of fragile documents. Old theses such as theses of the university's first graduates of 1964 which have been steadily used for the past forty-five years have brown brittle. As these invaluable resources have become old, they need less handling and an effective back-up is established.

Academic libraries are digitizing materials because they know the continuing value of library resources for learning, teaching, research, scholarship, documentation, and public accountability. Another reason of digitization is to make access facilities to these resources. The reasons for digitization of library materials are:

- To preserve the age old materials for long use which are important and valuable for future?
- To facilitate new forms of access and use.
- Better and enhanced access to a defined stock of research material
- Creation of a single point of access to documentation from different institutions concerning a special subject
- Support for democratic considerations by making public records more widely accessible

- Better search and retrieval facilities for library types of materials.
- To give the institution opportunities for the development of its technical infrastructure and staff skill capacity.

III. PROCESS OF DIGITIZATION OF LIBRARY RESOURCES

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 [8]:

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:

a) 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. For example: In USA, the planning for digitization in the Central New York brought together all types of libraries, museum, historical societies and archives which took advantage of expertise and content. The Central New York digitization project was supported by a Library Services and Technology grant provided by the New York State Library.

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 [9], [10]. 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 [11]. 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.

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. Conventional development policies always try to avoid the purchase o copies whose editions already exist in the collection [12]. 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 [13]. 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 to 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.

IV. METHODOLOGY

The methodology for digitization varies from library to library depending upon the policies and guidelines of the parent institution. The basic steps involved in digitization are setting clear-cut objectives for digitization, selection of materials to be digitized, selection of technology (hardware and software) for digitization and the archiving or preservation of such digital materials.

In the context of materials to be digitized for digital library are divided in four distinct categories, i.e. legacy, transition, new and future. According to him "Legacy resources are largely non-digital resources, including manuscript, print, slides, maps, audio and video recordings. Transition resources, primarily designed for another medium (mostly print), which are being or have been digitized, making transition into the digital world. New digital resources are designed with a particular use in mind employing new Internet and web technologies embodying a great variation and value addition. There is an increasingly wide range of digital resources from formally published electronic journals and electronic books through databases and datasets in various formats, i.e. bibliographic, full-text, image, audio, video, statistical and numeric datasets. Future resources may contain data sets which are not formally specified. The object-oriented world of digital objects, packaging the data resources and the access of processing methods as an entity holds out the best for resources of future [14]. The various steps involved in the process of digitization are as discussed below.

- Setting Objectives / Clarifying Purposes
- Selecting Material
- Choice of Technology
- Preservation

V. LIBRARY DIGITIZATION INITIATIVE: CHALLENGES FACED

The management of digital assets presents new challenges to the academic library community in terms of administering complex hardware and software, but mass digitization has not changed the fundamentals of library services. The ephemeral nature of digital items will require more expense and staff attention in meeting preservation commitments, but the relationship of user needs to item selection and organization remains essential. The complexities involved in supervising intricate information systems optimized to meet specialized user needs requires a strategic approach to management that takes into account the role of digitized collections within the larger context of the library and parent organization [15]. Guiding users to the items most suited to their information needs becomes a very different task as service points become more remote, but the digital environment brings with it increased possibilities to meet the traditional goal of providing personalized services to every user [16].

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 and archivists in developing countries may regret embarking on such project. Not everything 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 librarians in the electronic environment.

A. Legal Aspects

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 [17]. 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. *If libraries do begin to systematically collect digital information on a larger scale, the provision of effective access could be questionable. In fact, copyright could end up preventing libraries from providing open access to the digital information they collect. Questions of copyright must be managed so that digital information can be created and distributed throughout "digital libraries" in a manner that is equitable for both in information producers and information customers. Copyright could become an insurmountable barrier to the development of digital collections* [18].

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. 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" [19].

C. 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. 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.

D. Technophobia

Due to inadequate skills in information technology 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' [20]. Successful application of information handling technologies requires an ability to overcome staff and personal resistance to such innovation.

E. 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 archives and 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.

F. 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.

G. Technological Obsolescence

Digital archives should be transcribed every ten to twenty years to ensure that they will not become technologically obsolete [21]. The continuous changes in computer hardware and software cause technological obsolescence which is a threat to digitization and digital preservation. 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.

H. 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. "Although identical digital copies may be made from digital files, functionality from every software programme cannot be emulated" [22].

I. 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.

J. 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.

K. 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. *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* [23-24].

VI. CONCLUSION

The changes in the information are rapid and unprecedented, and it is necessary for the information professions to change with it. One of the most difficult aspects of digital curatorial management is the blurring of customary boundaries. Academic librarians are the gatekeepers of learning, and should keep in mind their goals of the creation and dissemination of knowledge. Indeed, the motivation of librarians to participate in the mass digitization of cultural artifacts comes not from any new technology but from commitment to service.

Digitization is an important aspect for academic libraries in 21st century. As user demand grows for the digitization of cultural research material, the academic library community will need to pay close and careful

attention to the changing information needs of scholars and students of the humanities.

Users of academic libraries are migrating onto the Web for their information needs, and library services must migrate with them if those needs are to be met. Digital collections should be available through user-friendly search mechanisms that are as powerful and easy to learn as Google. Libraries need not be search engines, but some changes must be made in order for libraries to compete with search engines. User interfaces should be rationalized according to principles of information architecture. Many patrons who have expressed preference for physical items stated that browsing such collections enables better resource discovery. With virtual worlds such as Second Life, there is no reason why patrons should not be able to browse a digital collection in exactly the same manner. Digitized items could be visualized as a bookshelf, and value can be added through search mechanisms that allow the user to rearrange the bookshelf at its will.

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