COURSE GUIDE

LIS 311
MANAGEMENT OF DIGITAL/VIRTUAL LIBRARIES FOR WRITING/RESEARCH

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Printed 2012, 2022

ISBN: 978-978-058-107-7

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INTRODUCTION

Welcome to **LIS 311: Management of Digital/Virtual Libraries for Writing.** This is a two credit (2-CR) unit course which is compulsory for undergraduate students in the department. This Course Guide is a brief content description of the course. The course material will give you the contents of what you are expected to learn. There is a separate Assignment File which contains detailed information on tutor-marked assignments that you are expected to answer after each unit. The course is designed to enable you gain an in-depth knowledge of digital library management.

WHAT YOU WILL LEARN IN THIS COURSE

The course is designed to enable you acquire an in-depth understanding of digital library. It will enable you be familiar with the concept of digital library and how it differs from terms that are synonymous with each other. You will have a broad idea of types of digital library and how the information sources can be generated. In the course, you will be introduced to technical requirements, skills, tools and management policy of digital library. This will enable you access digital information for excellent research and writing which you require for lifelong learning and success in life endeavours. You will also learn about the functions, benefits, means of preservation of rare information materials in digital form and challenges in building and maintaining digital libraries.

COURSE AIM

The aim of this course is to let you have a wide knowledge of digital library management and how effective information retrieval from digital library can enable you have access to required information and materials in different formats. This will empower you to do your research and write-up from any location globally. This is achieved by

- Introducing to you, the concept, meaning and characteristics of digital libraries.
- Helping you to appreciate the functions, benefits of digital libraries and its effect on information seeking and retrieval.
- Creating awareness on features of digital libraries, technical requirements and infrastructure of digital resources and various media in which digital resources can be accessed.
- Specifying some required skills, competencies and policies that can aid in management of digital resources for use.
- Outlining challenges involved in building, managing, safe guarding digital resources for future use.

COURSE OBJECTIVES

The course is divided into modules and units. Each unit has its specific objectives which are designed to help you master the unit. The general objectives are for achieving the aims of the course.

Then, by the end of this course you will be able to:

i. Understand the concept of digital library, digital resources, functions, advantages of digital library for users' and access to information in the current digital age
ii. Build up awareness on the features of digital libraries, digital resource and various media in which digital resources can be accessed and applied for various use.
iii. Discover technical requirements and infrastructure that are required for developing digital libraries for effectiveness and efficiency in accessing digital resources.
iv. Develop the right attitude towards having requisite skills, competencies and knowledge in generating and accessing digital information.
v. Articulate strategies and. policies that can aid in management of digital resources and use.
vi. Identify the challenges involved in building, managing, safe guarding digital resources for future use.
vii. Formulate ways in which the challenges can be resolved for easy generation and management of digital resources,

WORKING THROUGH THE COURSE

To work through the course for your success, carefully read each study unit of this study material and read other materials which may be provided by the National Open University of Nigeria (NOUN) digital library. Base on how the course is structured, each study unit is classified into the following sub-headings: introduction, intended learning outcomes, main content, summary, conclusion, tutor marked assignments, references and further readings.

The introduction, presents a summary of what will be learnt and the topic coverage in the study unit. It is anticipated that, students should read and be conversant with the intended learning outcomes (ILOs) which contains the outline students are expected to complete on each study unit. This will help the students to assess their learning processes at the end of each unit and to know whether they have accomplished the intended objectives of the study unit.

COURSE MATERIALS

Major components of the course are:

- The Course Guide
- Study Units
- Assignments
- References/Further Reading

STUDY UNITS

There are 20 study units in this course that are grouped into 5 modules. The modules and units are presented as follows:

Modules 1 Definition of Concepts

Unit 1 Definition of Concepts
Unit 2 Types and functions of Digital Libraries
Unit 3: Components of Digital Library: Hardware and Software
Unit 4 Advantages of Digital Libraries

Module 2 Characteristics, Resources and Services of Digital Libraries

Unit 1 Characteristics of Digital Libraries
Unit 2 Digital library resources including multimedia applications
Unit 3 Digital Library Services
Unit 4 Characteristics of Digital Libraries users

Modules 3 Skills for Digital Libraries

Unit 1 Skills and Competencies of Digital Libraries
Unit 2 Skills and Competencies of Digital Library Users/Patrons
Unit 3 Technical requirement skills for developing digital libraries
Unit 4 Infrastructure for Developing Digital Libraries

Modules 4 Management of Digital Libraries

Unit 1 Tools for Management of Digital Libraries
Unit 2 Digital Library Management Policy
Unit 3 Information Security Management of digital information Sources
Unit 4 Preservation of Digital Information Sources.

Modules 5 Problems of Digital Library Management

Unit 1 Challenges of Digital Library Management in Nigeria
Unit 2 Copyright and Management of Digital Libraries
Unit 3 Human Resources and Financial Management of Digital Libraries
Unit 4 Information Retrieval and Strategies for Digital Library

ASSIGNMENT FILE

There are more than thirty assignments in this course, comprising one or two assignments per unit. The assignment file contains all the continuous assignment you are to submit to your tutor/facilitator for marking and carries 30% of the scores earmarked for the course. Failure to participate in this assignment may lead to you not having a result at the end of the course, so it is equally important as the examination. The course materials are prepared to assist you in doing the assignments. You are also to read the information materials captured as reference at the end of each unit.

TUTOR-MARKED ASSIGNMENT (TMA)

The Tutor-Marked Assignment (TMA) is a continuous assessment component of your course and it accounts for 30% of the total score. You are required to submit at least six TMAs before you are allowed to sit for the end of course examination. Your facilitator will give you the TMAs, and you are expected to return the same to him/her at the appropriate time.

Your assignment file contains the assignment questions from units in this course. The write-up in each unit, the study units, references and information materials contained in your library will assist you in completing your assignments. You should prove that you have adequate knowledge of the materials read and that you have equally done further research into other references. This will give you a wider viewpoint as well as provide you a profound understanding of the topic.

Make sure that each tutor-marked assignment reaches your facilitator on or before the deadline stated in the presentation schedule and assignment file. In case of any unexpected situations might arise that may hinder you from submitting your assignment before the due date, contact your facilitator before the assignment is due to discuss the possibility of an extension. An extension will not be granted after the due date.

FINAL EXAMINATION AND GRADING

After the completion of this course *LIS 311Management of Digital/Virtual Libraries for Writing,* students will be required to sit for the examination. The duration of the examination will be two-hours. The grade point of the final examination is 70%. Most of the questions that will be given to you are the ones already in your self-assessment of the TMAs. As such, you need to familiarise yourself more with continuous practicing of the questions, reading and understanding of your course/study materials. This will enable you have good grades at the end of the course.

You can form a discussion group with your course mates, practice, and discuss the questions raised and assignments captioned after each unit to prepare for the examination.

PRESENTATION SCHEDULE

Your course materials will spell out the essential dates for completion and submission of your Tutor-Marked Assignments and for attending tutorials. The presentation schedule directs the students on essential dates for the completion of computer-based tests, assignments, participation forum or discussions. Remember that the submission of all your assignments must be timely and appropriate as stated in the course study form.

COURSE MARKING SCHEME

This table presents the layout of course marks

Assessment Marks for three Assignments	30% (Undergraduate)
Final Examination	70% (Undergraduate)
Overall Course Score	100%

COURSE OVERVIEW

1) **Form a Study Schedule** - Design a 'course overview' to guide you through the course. Take note of the period of every unit and the assignment related to it. Keep a diary of significant information, e. g., details of your tutorials, duration of a semester, when you are to submit your assignment, then plan out your own timetable of work for each unit.

2**)** **Follow consistently your study timetable:** Once you have planned out your study timetable, follow it consistently, and stay dedicated. A major cause of failure is not keeping abreast of the work timetable. If you experience any difficulty during your study, notify your tutor/facilitator on time.

3) Read the introduction and objectives of every unit before working through it.

4) **Gather your study materials**. Information about what you need is given at the beginning of each unit. You will always need both the study unit you are working on and information gathered from your library about the unit.

5) **Study analytically** the course information will be constantly posted to you and always visit your Study Centre for up-to- date information.

6) **Do your assignments**: Before the due dates (at least four weeks before the dates), visit your Study Centre for your next required assignment. Be assured that you will learn a lot by doing your assignment to meet the objectives of the course and it will definitely help you to pass your examination. Make sure your assignments are submitted not later than the due dates.

7) **Review study units**: A revision of each study unit objectives will assist you to confirm whether you have achieved them. In case you are not sure whether you have achieved the objectives, review the study materials, or consult your tutor/ facilitator. When you are sure that you have achieved the unit's objectives, you can proceed to the next unit.

8) **Keep to schedule**: Do not wait until your tutor returns the submitted assignment before you proceed to the next unit. Keep to your schedule. When your assignment is returned, take note of your tutor's comments, both on the tutor-marked assignment form and also the written comments on the assignment. Consult your tutor/facilitator if you have any problems or questions.

After completing the last unit, review the course, and get prepared for the final examination. Ensure that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed on the Course Guide).

HOW TO GET THE MOST FROM THIS COURSE

In order to get the best from the course, you need to have basic computer literacy and how to navigate the internet to access the necessary information. It is necessary to have a personal laptop if possible or have a nearby cybercafé where you can always go and access information. This will enhance the study, such that, learning becomes stress-free. The

course materials can also be accessed without geographical boundaries (wherever and anytime).

The students should be able to use the Intended Learning Outcomes (ILOs) to guide them through self-study approach in this course LIS 311. It is expected that, at the close of each unit, students should be able to evaluate themselves to know whether they have inculcated the ILOs, such that, the purpose of that unit course is achieved.

This could be strengthened through a thorough hard work of preparedness of the student based on the notes and jottings taken at the discussion forum and personal study time in each unit course. It is expected of every student to join the online facilitation at the actual time.

Any time a student misses actual time facilitation on the schedule, without wasting time, the student should create time to go over the recorded facilitation session, in order not to lag behind other students. The facilitation session of every study unit will be video recorded, and uploaded on the online platform.

It is expected that, students should work round all self-assessment exercises, such that, they leave nothing behind regarding the course content of this study. Lastly, adhere to all instructions given in the class regarding each unit course.

You can follow this practical strategy for working through the course. In case you run into a problem, do not fail to call your tutor/facilitator or visit the centre nearest to you to iron out the problem, because the facilitators are there to assist you.

FACILITATORS/TUTORS AND TUTORIALS

Facilitation/Tutorial shall be provided to help you out in the course. You will always be notified for the time, dates and locations of these tutorials as well as the names and phone numbers of your facilitators.

Your facilitator will present the theme of the study unit to you for the week and lead you through summary forum discussions on what needs to be covered. He will score and grade all activities when they are needed, support and help you to learn what is needed for the course to be covered. This might include sending personal mails for communication purposes and following up with enquiry on the extent students are coping with their studies. The facilitator will also send videos and audio lectures on WhatsAPP, emails, facebook, linkedIn, among other social media sites to students, apart from the normal upload on online

facilitation platform. Additionally, he will upload your scores into the university recommended platform.

On the other hand you are expected to contact your facilitator in case you have problems or issues that are not clear to you. You can do so based on the following:

- When you do not follow in any part of the study units or the assignments given.
- If you have challenges following the self-assessment exercises.
- If you have issues with an assignment or your tutor‘s comments on an assignment that was given to you.

You are expected to read all recommended reading materials, comments and notes provided by your facilitator explicitly on those relating to assignments. You should also participate in the forums and discussions. This provides the student the opportunity to socialise with others in the programme. It is also advisable for you to have list of questions before the discussion session. This will make students to learn broadly while partaking actively in the deliberations during the forum sessions.

SUMMARY

This course will enable you to be familiar with the concept, the importance, benefits, features and application of digital library in library and Information Science. At the end of the course, you will achieve the objectives if you follow the instructions and do what you are expected to do.

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MODULE 1 DEFINITION OF CONCEPTS

Unit 1 Definition of Concepts
Unit 2 Types of Digital Libraries and Functions
Unit 3 Components of digital libraries: hardware and software
Unit 4 Advantages of Digital Libraries

UNIT 1 DEFINITION OF CONCEPTS

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs)
3.0 Main Content
3.1 Definition of Digital Libraries
3.2 Development of Digital Library
4.0 Summary
5.0 Conclusion,

1.0 INTRODUCTION

Libraries are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community. Traditional libraries are still handling largely printed materials that are expensive and bulky. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed information with more dynamic electronic resources. Therefore, the demand for digital information is on the increase.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, students should be able to:

- Explain the various meanings accorded to Digital Libraries
- Discuss the several digital resources of the digital library.
- Discuss how to build digital collections for the development of digital libraries to support research.

3.0 MAIN CONTENT

3.1 Concept of Digital Library

Digital libraries emerged in 1990's because of the revolution in internet and WWW technologies. The foundation for digital libraries was laid in 1945 when Vannevar Bush envisioned an automated system that would store information, including books, personal records and articles. Bush

developed a system known as 'memex system' that would allow a user to view stored information from different access point (Chapman and Kenny, 1996; Mutula and Ojedokun, 2008). Phrases like "virtual library," "electronic library," "library without walls" and, most recently, "digital library," all have been used interchangeably to describe this broad concept. Before going into meaning of digital library, let us look at the meaning of some of these terms that are synonymous with the term digital library.

Electronic Library is a library which provides primary and secondary information in electronic form through communication networks. The documents are available through electronic means by use of digital technologies that allow for the retrieval, archiving, preservation and dissemination of the documents.

Virtual Library is a library with all its information collection in virtual or digital form. This means that the information resources like abstracts, index, books, catalogue and journals are accessed on through internet. In other words virtual library does not have physical space, rather information can be accessed anywhere. It is sometimes referred as library without a wall, paperless library and networked library.

Looking at the meaning of Electronic and virtual libraries will help us to arrive at the full meaning of DL considering its attributes.

According to the Digital Library Federation (DLF, USA - http://www.dlf.org), "Digital Libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities". To sum up, digital libraries are networked collections of digital texts, documents, images, sounds, data, software, and many more that are the core of today's web and tomorrow's universally accessible digital repositories of all human knowledge. http://old.diglib.org/roles/survey1a.htm.

In another way Riley sees a digital library as a networked collection of digital objects – text, still images, moving images, sound, data – with arrangement, search features, and metadata that allow for discovery and presentation, supporting research and teaching, and with attention paid to architecture, persistence, longevity, and digital preservation. Mutula and Ojedokun (2008) in their view see Digital Library as a collection of electronic information resources, in which all the information resources are accessible through computer. In addition, the functions of

acquisition, storage, preservation, retrieval are carried out using digital technologies.

Having looked at different definitions, one may say that DL is collection of different information resources in electronic form which can only be accessed through computers and contents are stored at a central location for providing access on multiple devices The activities of traditional library are performed in DL with the use of computers and internet and physical documents are converted through digitalization into electronic form. It is also different because electronic information in DL can be stored in CD-ROM and computers that require physical space in many academic libraries. DL has a space and can also be accessed anywhere any time depending on the storage system.

Difference between a digital library and traditional library
A physical library comprises of physical books, magazines, newspapers, monographs, reports, etc. Whereas, digital library are made up of information in electronic format which are e-books, e-magazine, e-newspapers, e-reports, video, audio, rich media, animations, etc.
A physical library has Limited Space and thus is difficult to expand. Whereas, a digital library has limited (limited scalability of underlying IT infrastructure) but large space and thus makes it easier to expand.
A physical library will provide access to objects via Issue and borrow system certainly limited to number of available quantities. Whereas, a digital library will provide access to objects any number of times by any number of users.
A physical is created on a physical space. Whereas, a digital library is created on virtual space viz. data centers, cloud, servers.
A physical library follows rack-based search and indexing. Whereas, a digital library provides Web Interface based search and indexing.
The major demerit of physical library is material degradation, mutilation and loss over time. Whereas, a digital library provides digital preservation and longtime archival of the contents.

Development of Digital Libraries
There are essentially three methods of building digital collections:

Digitization, converting paper and other media in existing collections to digital form. Mutula and Ojedokun,(2008) emphasized that one way of generating content for digital libraries is through digitization. Through this process old materials in paper format are converted online, while others are directly generated as electronic documents such as word processed document, e-mail, image files, information by-product and end-products.

Acquisition of original digital works created by publishers and scholars. This could be electronic books, journals, conference proceedings, pictures datasets, etc.

Access to external materials not held in-house by providing links on library home page to websites, other library collections, or publishers' servers with relevant contentn(Cleveland, 1998; Mishra, 2016). Linde (2006) suggested using free external material by either incorporating the material, such as electronic books and journals, or creating pointers to external websites.

Mishra suggested that for access to external digital collection, DL can obtain access permission to digital collection provided by external sources like institutions, resources of the libraries, electronic journal through on-line access like Elsevier, ACM, etc., which provides their journals on-line through websites. Cleveland further suggested that though third method may not exactly constitute part of a local collection, it is still a method of increasing the materials available to local users. In this respect, we can say that digital libraries can provide access to electronic resources through library home page.

It is important to note that acquiring digital works and doing in-house digitization are expensive, but through collaboration, institutions with common goals can gain greater efficiencies and reduce the overall costs.

4.0 SUMMARY

This unit examined the concept, meaning, histories, development of digital libraries and information resources.

- DL is a collection of information resources in electronic form which can only be accessed through computers. DL is broader than virtual library in the sense that all the activities of traditional library are performed in DL with the use of computers and internet and physical documents are converted through digitalization into electronic form.
- Apparently, for any digital library to be viable, it must eventually have a digital collection with the critical mass to make it truly useful and serviceable. Digital Library Resources is the digitization of all records in the DL collection.
- DL resources involve researchers' works as well as online records including e-book, e- journals, electronic projects, theses and dissertations, e-government publications, e-lecture notes, images, videos educational event, promotional posters, online images, workshops, symposia, or conferences and visiting interviews with researchers

5.0 CONCLUSION

Library collections are not limited to printed documents but also electronic resources. The advent of information technology has led to information explosion. It is important to develop digital library to organise these information in digital format so that they can be accessed by many people. The collection, processing, storage, preservation, retrieval and dissemination of information by digital libraries will promote scientific research and development, facilitate distant-learning environment since information can be accessed anytime anywhere,

6.0 TUTOR MARKED ASSIGNMENT

- Explain the concept of digital library in your own idea
- How is digital library different from other electronic libraries?
- Explain three ways in which resources of digital libraries can be generated.
- Give brief history of digital library.
- In your words explain the difference between digital library and Traditional library

7.0 REFERENCE/ FURTHER READING

Chapman, S. and Kenny, A. (1996). Digital conversion of research library materials: a case for full informational capture. D-lib Magazine October, 1996.
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UNIT 2 TYPES AND FUNCTIONS OF DIGITAL LIBRARY

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2.0 Intended Learning Outcomes (ILOs)
3.0 Main Content
3.1 Types of Digital Library
3.2 Functions of Digital Libraries
4.0 Summary
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6.0 Tutor-marked assignment
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1.0 INTRODUCTION

There is increase of Digital Library of various types as more and more people get connected to high speed internet connections, get involved in distance learning, use online communication, governments, institutions and commercial companies realize the potential in digital deliveries. The basic function of digital library is to generate, manage, preserve and easily made accessible to users in different format.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, students should be able to:

- Discuss types of digital libraries in terms of information resources generation.
- Explain types of digital libraries in terms of organization.
- Identify different functions of digital library.
- Know various digital services that can be offered to the users.

3.0 MAIN CONTENT

3.1 Types of Digital Library

Bush, Sharon and Frank grouped digital library in terms their content as follows:

- Stand-alone Digital Library (SDL)-also self-contained, several collections
- Federated Digital Library (FDL) -also confederated, networked
- Harvested Digital Library (HDL)- also distributed

Stand Alone Digital Library (SDL)

A SDL is a self-contained DL that has all its digital material physically located at the SDL site. Its domain is usually focused and it usually serves its local constituency. A "typical" Digital Library is usually installed on a web server. SDL are Self-contained material which can be born digital, scanned or digitized or purchased or licensed. It can be Single or Several digital collections. Examples are Library of Congress (LC), National Digital Library (NDL) and Internet Public Library (IPL) https://u.cs.biu.ac.il)

Most SDLs represent a single or several local classical libraries whose material were mostly digitized/scanned.

Federated Digital Library (FDL)

Federated Digital Library (FDL) is second generation. A FDL is a collection of several autonomous SDLs that represent heterogeneous repositories connected by a network. It forms a virtual networked library by using network protocols to overcome interoperability problems. A FDL provides its users with a transparent user interface for ease of access to all involved libraries. Representative of second generation DLs include, for example, NCSTRL (Networked Computer Science Technical Reference Library) and OCLC (Online Computer Library Center).
FDL contains many separate digital libraries

- Usually heterogeneous repositories
- Uses search layer "federated search"
- Connected via a network
- Forms a virtual library
- Unified/Transparent user interface

Example: Brown University Digital Repository, Networked Computer Science Technical Reference Library (NCSTRL) and Online Computer Library Center (OCLC)https://u.cs.biu.ac.il)

Harvested Digital Library (HDL)

The third generation of DLs is characterized by Harvested DLs (HDLs). A HDL is a DL that contains only summaries that refer to the distributed data objects. It is usually domain focused, has fine granularity, and provides various metadata structures and advanced library services. HDLs provide a rich environment for applying varied knowledge management techniques. Representative HDLs include, for example, IPL (Internet Public Library) and WWW Virtual. (Uri & Ariel,

2014).
HDL has the following characteristics:

- It harvests digital objects, not full DLs.
- Objects harvested into metadata (using Open Archives Initiative).
- Does not have to contain objects, just metadata/summaries.
- But has regular DL characteristics
- They contain the summaries about the objects, and typically direct you to the home of DL if you want to see/hear digital object

Example: Digital Public Library of America, SourceBank (http://www.sourcebank.com/)https://u.cs.biu.ac.il)

Linde (2006) group Digital Libraries according to institutional base as follows:

- Digital Libraries at scientific societies or organizations
- Digital Libraries at Commercial publishers
- Digital Libraries at National Libraries
- Digital Libraries at Universities
- Digital Libraries at Museums and other cultural heritage organizations

Digital Libraries at scientific societies or organizations
The Institute of Electrical and Electronics Engineers IEEE provides access to almost one third of the world literature in the area of electrical engineering and computer science. Their Digital Library called IEEE Explore provides full-text access to IEEE transactions, journals, magazines and conference proceedings published since 1988. Association for Computing Machinery (ACM) members and registered users can use the Digital Library containing bibliographic information, abstracts, reviews, and the full text for articles published in ACM periodicals (journals, magazines and transactions) and ACM proceedings (http://portal.acm.org/)

There are a number of digital library global initiatives aimed at Africa, for example

The Africa Journals Online (AJOL), an initiative of the International Network for Availability of Scientific Publications (INASP), based in the United Kingdom, offers access, via the internet, to tables of contents and abstracts of African-published journals in agriculture, social sciences, humanities, health, science and technology.

Digital Libraries at Commercial publishers.
These are mostly the same as of Digital Libraries of scientific societies and organizations – bibliographical or full text copies of journal articles, conference proceedings etc. drawn from a single or distributed databases. Major examples of this type are:

Springer Science Publishers (http://www.springerlink.com/).
ScienceDirect which is owned by the giant publisher Elseviers. A collection of science, technology and medicine full text and bibliographic information (http://www.sciencedirect.com/).
ISI- Web of Knowledge: A multidisciplinary databases of bibliographic information (Linde, 2006).

Other examples of digital libraries are:
Bartleby Library – great Books Online (http://www.bartleby.com/) is the pre-eminent Internet publisher of literature, reference and verse.
Library of Congress (http://www.loc.gov/) provides entrance to the catalogue and a number of collections, projects and a large directory of links.
Collaborative Digital Reference Service (CDRS)(http://cweb,loc.gov/rr/digiref) is a DL project involving several institutions, provides professional reference service to researchers through an international, digital network of libraries and related institutions.

Digital Libraries at Universities
In the second half of the 1990s several university libraries started building digital collections making them available publicly. The Electronic Text Center at the University of Virginia is one famous Digital Library offering thousands of SGML-encoded electronic texts and many special collections devoted to famous authors or American historical events (http://etext.lib.virginia.edu/). In Africa many university libraries have their digital libraries which are usually their institutional repository that are made up of their local content which atimes may require to be digitized in other to be in digital form.

Functions of Digital Libraries
The role of a Digital Library is essentially to collect, manage, preserve and make accessible digital objects. **.** Sun and Yuan (2012**)** enumerated **t**he following as function of digital library:

- To provide friendly interface to users.
- To enhance advanced search, access and retrieval of information.
- To support and improve library operations.
- To enable one to perform searches that is not practical manually.
- To preserve unique collection through digitization.

In addition, Eneh (2021) suggested that apart from Digital Library providing User-friendly interface, it enhances resource sharing. That means a library can easily share what it has in terms of information materials with other library when it is in soft form that is in digital form. Digital library may be networked or not. If it is networked, any users can access the resources timely. In such a situation one can say that Internet

is the digital library. Many users can access the resources of the digital libraries simultaneously under the networked environment. Mishra (2016) suggested that digital libraries will provide more equitable access, anywhere, anytime. In networked condition, digital libraries will provide more equitable access for providing the right information to right user at right time. Digital libraries will be cheaper than print libraries as cost is concerned, resources available in digital collection is best than print libraries.

Based on this Trivedi (2010) suggested the functions of Digital Library as follows:

- Access to large amounts of information to users wherever they are and whenever they need it.
- Access to primary information sources.
- Support multimedia content along with text.
- Network accessibility on Intranet and Internet.
- User-friendly interface.
- Hypertext links for navigation.
- Provides Client-server architecture.
- Enables advanced search and retrieval.
- Enhance Integration with other digital libraries.

4.0 CONCLUSION

Digital libraries can be grouped according to type of resources, because one of the major issues in creating digital libraries is the building of digital collections. Apparently the type of digital library to be used will determine who uses the library. As people get connected to high speed internet connections, more people get involved in distance learning, more people get used to online communication, governments, institutions and commercial companies realize the potential in digital deliveries. Developments like these have prepared the ground for a large number of different types of Digital Libraries throughout the world. The functions of digital libraries are many. Libraries and information centres have to overcome any barriers and look ahead for improvement of information services through adoption of digital technology in other to keep pace with what is happening in other parts of the world. Digital libraries provide an effective means to distribute enough information for learning resources to students and other users wherever they are and at any time.

5.0 SUMMARY

Digital libraries can be grouped into:

- Digital Libraries at scientific societies or organizations, Digital Libraries at Commercial publishers, Digital Libraries at National Libraries, Digital Libraries at Universities and Digital Libraries at Museums and other cultural heritage organizations.
- It can also be grouped according to how the resources are built as Stand-alone Digital Library (SDL) -also self-contained, several collections, Federated Digital Library (FDL) -also confederated, networked and Harvested Digital Library (HDL)- also distributed. Telecommunications facilitate the storage, retrieval, use, and exchange of digital resources to different group of people and researchers anytime and anywhere.
- In networked condition, digital libraries will provide more equitable access for providing the right information to the right user at the right time. It is also cheaper and resources available in digital collection are best, as it can be accessed by many users at a time.

6.0 TUTOR-MARKED ASSIGNMENT

1. What are the five ways in which we can categorize digital libraries? Give two example of each.
2. Give 3 ways in which we can categorize digital libraries according to how the resources are generated. Give two characteristics of each.
3. Enumerate the major functions of the digital library.
4. What are the specific functions of digital libraries to the users in terms of ease of access to information?

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UNIT 3 COMPONENTS OF DIGITAL LIBRARIES: HARDWARE AND SOFTWARE

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs)
3.0 Main Content
    3.1 Components of digital libraries: hardware and software.
4.0 Summary
5.0 Conclusions
6.0 Tutor-marked assignment
7.0 Reference/ Further Reading

1.0 INTRODUCTION

The content of a digital library can be classified in two categories. Then first is the one created in a digital format, also known as born-digital. It is a collection of texts, images, etc. that can be stored, retrieved and read over electronic devices. These devices could be computers, mobile, digital readers, etc. The other form is information that has been converted from a physical medium, through digitizing. For these digital information to be managed and accessed they require some hardware and software as listed and discussed below.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, students should be able to:

- Know the different computer hardware and software that are required in a digital library.
- Know the different components of digital libraries.

3.0 MAIN CONTENT

3.1 Computer Hardware and Software

Hardware Requirements for a digital library are: Computer servers, Networks, LAN/WAN, Converters, Scanners, Internet Connectivity, Storage media, Multimedia Interface, UPS, etc Software Requirements are: Liner Operating Systems, Digital Library Software, Greenstone, Fedora D-space, Editing Software, E-print etc (Nahak & Patra 2014).

Server-side Hardware Components
Servers are the heart of a digital library. Servers for digital library implementation need to be computationally powerful, have adequate

main memory (RAM) to handle the expected work, have a large amount of secure disc storage for the database(s) and digital objects and have good communication capabilities. A digital library may need a number of specialized servers for different tasks so as to distribute the workload on to different servers. An example of Server-side Hardware Components is Elsevier's Science Server (Science Server, 1999) which is an effective and powerful information system that provides an integrated access to databases and digital collections hosted on the local Intranet servers as well as other international bibliographic and full-text databases that the Library is authorized to use. In effect, it provides easy and centralized access to multiple information sources including local Intranet resources (local electronic journals and abstracting and indexing services) and remote subscribed Internet services (electronic journals and online databases) through a single interface (eGyankosh, 2017).

Availability of Internet access

Digital libraries are built around Internet and web technologies which are made up of electronic journals. While the Internet serves as the transporter and provides the contents delivery mechanism, the web provides the tools and techniques for content publishing, hosting and accessing. The Internet and associated technologies, made it possible for digital libraries to include multimedia objects such as text, image, audio and video. These Internet and web technologies thus brought in the graphical components in the digital library (eGyankosh, 2017).

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O'Reilly (2018) in his own way divided software tools in digital libraries into two:

- The first is “User generic web content management system” such as WordPress or Drupal, which provides the basic tools for file storage, content management, searches, etc.
- The second is “User specific management system” for digital repositories, like Omeka or DSpace.

On the other hand Kude (2013), in his view stated that components of a digital Library can be broadly categorized as follows:

- **Collection Infrastructure.** This consists of two components: metadata and digital objects. While metadata provides bibliographic or index information for the digital objects; digital objects are the primary documents that users are interested to access. This can appear in three ways: Born Digital resources; Buying Access to External Digital Collections; and Converting of Existing Print Media into Digital Format (Digitization).
- **Digital Resource Organization.** The tools in this category include addressing protocols, Metadata Schemes, metadata assigning to digital objects, assigning Digital Object Identifier

(DOl) to the digital objects, linking of objects with associated metadata for searching and browsing capabilities, as well as building, browsing and searching interfaces.

- **Access Infrastructure.** This includes tools with Search and Browsing Interface which facilitate Simple Search and Advanced Search with Boolean queries, wild cards, phrase searches and field- specific searches.
- **Computer and Network Infrastructure.** It includes hardware and software requirements like Servers, Nodes, Printers, Scanners, Digital Camera, Sound Recorders, (for hardware); while software include System Software, Application Software, OCR Software, File Format converter, Web server, Database software, Antivirus, Networking software, Image enhancing, Compressing software are software requirements in a DL. Also, Digital Library Software like Dspace, Greenstone, Fedora, Academic Research in the Netherlands Online (ARNO), CERN Document Server Software (CDSware).
- **IPR and Digital Rights Management.** Intellectual Property Rights (IPR) and Digital Rights Management Tools. DRM includes technologies and processes that are applied to describe the digital content and to identify the user; to control access, use and distribution; and thereby protect the interests of copyright holders in the online environment.

4.0 CONCLUSION

In digital library there are some basic components that will aid in different stages in forming digital library which are collection, organization and access to the formation. The digital library software should provide web-based access to the content. The software should be accessible on desktop, laptop, mobile, tablets, etc. It would also have advance search features.

5.0 SUMMARY

Hardware Requirements for a digital library are: Computer servers, Networks, LAN/WAN, Converters, Scanners, Internet Connectivity, Storage media, Multimedia Interface, UPS.

Software Requirements are: Liner Operating Systems, Digital Library Software, Greenstone, Fedora D-space, Editing Software, E-print.
Components of a digital Library can be broadly categorized: Collection Infrastructure Digital Resource Organization, Access Infrastructure Computer and Network Infrastructure, Intellectual Property Rights (IPR) and Digital Rights Management Tools.

6.0 TUTOR-MARKED ASSIGNMENT

- What are the components of digital library?
- List the hardware requirements for a digital library.
- List the software requirements for a digital library.

7.0 REFERENCE/FURTHER READING

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UNIT 4 ADVANTAGES OF DIGITAL LIBRARIES

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs)
3.0 Main Content
3.1 General advantages of Digital Libraries
3.2 Benefit of Digital Libraries to the users
4.0 Summary
5.0 Conclusions
6.0 Tutor-marked assignment
7.0 Reference/ Further Reading

1.0 INTRODUCTION

Digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain it. Digital library has certain characteristics, which make them different from traditional library. It has expansive and accurate system of searching with large volumes of text, image and audio-video resources. Digital libraries do not need physical space to build collection and it can be accessed from anywhere, any time. The user can get his/ her information on his own computer screen by using the Internet. However Digital libraries promise new general benefits, especially for e-learning in digital or mobile times, starting with the eradication of the time and space constraints of traditional bricks-and-mortar libraries. The introduction of the DL has raised library transformation to a new level over time. Unlike libraries that occupy buildings accessible only to those who walk through their doors, digital libraries reside on inter-networked data storage and computing systems that can be accessed by people located anywhere.

2.0 INTENDED LEARNING OUTCOMES (ILOS).

By the end of this unit, you should be able to:

Identify the major benefit of digital libraries to the users.
Single out the advantages of digital libraries

3.0 MAIN CONTENT

3.1 Advantages of Digital Libraries

The advantages of digital libraries as a means of rapidly accessing books, archives, and images of various types are now widely recognized

by commercial interests and public bodies alike. Traditional libraries are limited by storage space; digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain it. As such, the cost of maintaining a digital library can be much lower than that of a traditional library. An important advantage to digital conversion is that it is highly increased accessibility to users. They also increase availability to individuals who may not be traditional patrons of a library, due to geographic location or organizational affiliation.

The following are some of the major advantages of digital libraries over traditional libraries, according to Sun and Yuan (2012)

- No physical boundary. The user of a digital library need not to go to the library physically; people from all over the world can gain access to the same information, as long as an Internet connection is available.
- Round the clock availability. People can gain access to the information at any time of the day.
- Multiple access. The same resources can be used at the same time by a number of users.
- Structured approach. Digital libraries provide access to much richer content in a more structured manner, i.e. we can easily move from the catalog to the particular book then to a particular chapter and so on.
- Information retrieval. Digital library has certain features, which make them different from traditional library. It has expansive and accurate system of searching with large volumes of text, image and audio-video resources. The user is able to use any search term (word, phrase, title, name, and subject) to search the entire collection. Digital libraries can provide very user friendly interfaces.
- Preservation and conservation. Another important issue is preservation - keeping digital information available in perpetuity. In the preservation of digital materials, the real issue is technical modernity. Libraries in the pre-digital era had to worry about climate control and the de-acidification of books, but the preservation of digital information will mean constantly coming up with new technical solutions.
- Space. Whereas traditional libraries are limited by storage space, digital libraries have the potential to store much more information, simply because digital information requires very little physical space to contain them. When a library has no space for extension digitization is the only solution.

- Networking. A particular digital library can provide a link to any other resources of other digital libraries very easily; thus a seamlessly integrated resource sharing can be achieved.

The main benefit of digital library is to preserve rare and fragile objects by enhancing their access to multiple users simultaneously. There are several reasons for libraries to go for digitization, but the prime reason for the digitization is for the need of the users, for convenient access to high quality information. Other important considerations for the digital library are quality preservation, multiple referencing, wide area usage, archival storage, and security measure.

DL provides several benefits to users which conventional library may not.

3.2 Benefits of DL to the users

a. Digital library brings information to the user
   Digital information users can access information on-line from wherever they are, provided they have access to internet facilities
   Information retrieval
   The DL user is able to use any sophisticated search term to retrieve information easily and faster with improved facilities for information sharing.
   An incorporated resource sharing can be easily achieved through linking digital library resources of other digital libraries. Research groups can share information among members by notification and file sharing
b. The barriers of time, space, language and culture which hinder access to information have been improved by DL
c. Improved collaboration
   Digital library has improved collaboration by researchers and scholars through the use of digital technology to generate utilize and circulate information (Chowdhury & Chowdhury, 2003; Sun & Yuan, 2012, Akpokurerie & Nina- Okpousung, 2019).

4.0 CONCLUSION

Information technology has changed the world and has become one important tool for retrieving information anywhere anytime. People have realized the importance of digital libraries in terms of knowledge collection, storage, process. Transfer methodologies made possible by digital libraries will not only promote scientific research and development, but also facilitate distant-learning environment through access to required information sources. DLs have the potential to substitute many of the services provided by traditional libraries and more. DLs have the potentials of improving and promoting information related activities.

5.0 SUMMARY

The summary of this unit is as follows:

- The main benefit of digital library is to preserve rare and fragile objects by enhancing their access to multiple users simultaneously.
- Other important considerations for the digital library are quality preservation, multiple referencing, wide area usage, archival storage, and security measure.
- Digital library has expansive and accurate system of searching with large volumes of text, image and audio-video resources.
- The user of a digital library need not go to the library physically to access required information.

6.0 TUTOR-MARKED ASSIGNMENT

1. What are the benefits of digital libraries to distance learning users?
2. In what ways are digital libraries better than traditional libraries with physical space?
3. How are digital libraries beneficial in the use of rare and fragile objects?

7.0 Reference/ Further Reading/Web Resources

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MODULE 2 CHARACTERISTICS OF DIGITAL LIBRARIES

This module will take you through the characteristics of digital libraries and the users, the different digital library resources and services that are available in digital.

Unit 1 Characteristics of digital library
Unit 2 Digital library resources including multimedia applications
Unit 3 Digital library services
Unit 4 Characteristics of digital library to users

UNIT 1 CHARACTERISTICS OF DIGITAL LIBRARY

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs)
3.0 Main content
    3.1 Characteristics of Digital Library
4.0 Conclusion
5.0 Summary
6.0 Tutor marked assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

Retrieval of Information content and services are improving with time. The worldwide network internet has brought forward new facet to libraries of contemporary digital world in which large volumes of text, image and audio-video resources can be access. With this in mind, we will take a quick look at the characteristics of Digital Library..

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, you should be able to explain

The characteristics of digital library.

3.0 MAIN CONTENT

3.1 The characteristics of digital library

The major characteristics of digital library are that the information is in electronic or digital format. Some digital library characteristics are:
Digital library captures information when it is created, makes it available, maintains and preserves it in forms that will be valuable to the

user. Digital information resources such as text to image, audio and video are contents of DL. Digital collections enable users to reclaim, manoeuvre and add content thereby making them depend on the functions and services made available by digital libraries.

DL needs less space. Various types of information resources may exist in different servers around the world. These are made accessible with the use of digital infrastructure and services provided by digital libraries. DL users may put together their own personal collections based on their needs. With the use of digital technologies, librarians and library users should be trained to handle the system capabilities because DL users are located at different places all over the world. Special levels of services have to be considered to meet the needs of the users. Digital information can be viewed and used by different people according to their needs (Chowdhury & Chowdhury, 2003; Borgman, 2007; Sun & Yuan, 2012).

Another characteristic of digital library is that its collections contain permanent documents. The digital environment will enable quick handling and/or ephemeral information. Also digital libraries are based on digital technologies. Therefore it supports communications and collaboration in information-seeking. It compresses data storage and enables publication and storage of digital information (Trivedi 2010). Digitalization of the information resources is the basis of the Digital library. Information in digital form bridges cross-time Information service, opens Information use and standardizes the information transfer. Therefore the digital library embodies cross-district, cross-industry, cross-country cooperation of resource, making the sharing of information resources convenient.

Also Sun and Yuan (2012) emphasized that a digital library is an accumulation of digital computing, storage and communications machinery together with the content and software needed to reproduce, emulate and extend the services provided by conventional libraries system for acquiring, storing, organizing, searching and distributing digital materials for end user access. It is not just a collection of material in electronic form; it includes a browser interface and perhaps a virtual space and society. The digital library is not a single entity and as such is linked to the resources of many such collections.
They summarized some of the features pointed out in the definitions of digital library as follows:

- A library that serve a distinct community or set of communities.
- A corporation of multiple entities.
- Library that integrate learning and access.
- Library that provides fast and well-organized access, with multiple access approaches.

- Libraries with a collection which are large and persist over time, well organized and managed, contain many formats.

4.0 CONCLUSION

With the emergence of new technology and information, DL users would want to work in an online environment that provide the information and services they need and this covers the fifth law of library science.

5.0 SUMMARY

- The digital library embodies resource sharing among institutions. It supports communications and collaboration in information-seeking. It compresses data storage and enables publication and storage of digital information.
- The digitalization of the information resources is the basis of the Digital library. And the other characteristics of DL are based on the digitalization of the information resources.
- Acceptable web search engines are preferred by a good number of digital library users. And in other to make utmost use of DL resources, library users must identify their information requirements and be conversant with the subject domain.

6.0 TUTOR MARKED ASSIGNMENT

What are the characteristics of digital library.

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UNIT 2 DIGITAL LIBRARY RESOURCES INCLUDING MULTIMEDIA APPLICATIONS

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs)
3.0 Main Content
    3.1 Definition of digital library resources
    3.2 Digital library resources
    3.3 Multimedia applications
4.0 Conclusion
5.0 Summary
6.0 Tutor marked assignment
7.0 References/Further reading

1.0 INTRODUCTION

The idea behind building and maintaining libraries in a University or community is to make information resources available. What users of libraries value most from a library is the services been rendered to them either virtual or otherwise. Multimedia is one interesting technology that brings together audio, graphics, animation, video to personal computers and desktop for easy assimilation. Multimedia application has gone beyond the putting together of text, graphics, audio to form digital video but has been used as teaching aid in schools. It also has many usages in the library.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, you would have learnt

- What are digital resources?
- Types of digital resources
- Multimedia application in the library.
- Categories of multimedia.

3.0 MAIN CONTENT

3.1 Definition of Digital Library Resources

Digital libraries are created to solve the underlying problems associated with traditional libraries and offer many new services for efficient use. The services like reference and information services have been integral to traditional services. In view of this, we will refresh our minds on

what digital library is all about before we go into the definition of Digital Library Resources.

Digital / Electronic Library Resources

The term electronic library resources can be defined as information processed and digitally driven using hardware and software that can be accessed by digital electronic users through remote information provider networks or mounted locally by digital library (DL) managers. A digital resource can also be defined as a "resource that requires access to the computer or any electronic product that provides a collection of data, be it text referring to full-text databases, electronic journals, image collections, other multimedia and media-based products" (Dukare, 2020; Kato et al., 2021)

Electronic resources could be in digital libraries for learning and research purposes. These include e-book, e- journals, e-newsletters, e-references, electronic projects, theses and dissertations, e-government publications, e-lecture notes, images, videos images or visual material, others include , portals that provide link or URLs relevant to particular disciplinary topic, online reference resources, audio materials, digital readers or course packs, data archives, digital facsimiles or historical manuscripts and animations (Eneh 2021; Harley 2020)

Digital Resources collections encompass online resources. There are different types of digital online resources to choose from depending on if one is learning or teaching. First, one must consider if the material is an open educational resource (OER). Or it requires the consent of its owner or is under license. Most OERs operate on open licences, often on the Creative Commons (CC), in order to protect the copyright of its authors. Open licences makes resources available for the broad audience. A different type of an online resource will be a MOOC, which is a massive open online course (https://silverplus.erasmus.site/docs/module-5/training-content/5-1-introduction-to-digital-resources/). Other online resources are available in SCOPUS, AGORA.

3.2 Types of Digital Library Resources

There are many digital resources in different format as listed and discussed below.

- Online Databases
- E-Journals
- E-books
- E-Magazines
- E-Newspaper

- (This is a storage media)Multimedia materials
- E-Theses and Dissertations
- (Abeywardena, 2015; Medieval Academy of America 2021).

Digital reference resources

Reference sources are publications of reference books or sources like dictionaries, encyclopaedias of different types and subject areas, year book, calendars, atlases, abstracts and indexes, handbooks, maps etc that are published in online mode or are in digital form and are stored in CD-ROM. It can also be accessed via the website and internet.

Online Databases

Online databases are of various types; complete indexing and abstraction databases, text databases, reference databases and statistical databases. Indexing and abstract databases provide bibliographic information about the journal including summary of articles. Example: SCOPUS, LISA, LIST, etc. There are some databases that are Full text database containing organized collections of information on a particular multidisciplinary topic or theme areas, e.g. ScienceDirect.

E-Journals

Electronic journals are simply serial publications which are made available in digital format. Electronic journals can be accessed via Internet from any web enabled device. Depending on the type of subscription, one or more users can access the resources simultaneously, either directly from an independent web enabled PC or in a local area network through a proxy server (IP addresses based access).

E-Books

"Electronic Book" or E-Book, a term coined by Van Dam of Brown University during the 1960, is very popular today. E-book has been described as a text analogous to a printed book that is in digital form to be displayed on a computer screen. E-books can be read just like a paper book, using dedicated E-book reader such as Gem Star eBook or on a computer screen after downloading it. Thousands of free e-books can be downloaded from the Internet. E-book offers advantages like portability, 24 hours access, text search, annotation, linking, and multimedia and self-publishing possibilities.

Electronic magazine

E-Magazines are a collection of articles and images about diverse topics of general interest and occasions that are in electronic form. Usually these articles are written by writer or scholars and geared towards the appropriate users.

Electronic Newspaper

E-newspapers are a collection of articles about current events usually published daily. In most cases, they replicate exactly the printed version of the newspaper, which occasionally includes additional information (such as interactive graphics or external links). But in some cases there are no parallel print sources like the newspaper "was born digital". Any newspaper available on the Internet can be called newspaper. "It may or may not have a printed copy (Dulcare, 2020).

Electronic Theses and Dissertations

These are University Theses and Dissertations in electronic format. Most of the libraries provide access to online thesis and dissertation produced at universities to its users. A large number of universities have digitized their theses and dissertations collection and have made them available on the Internet for global access. A number of universities have also implemented Electronic Theses and Dissertation programmes, where researchers submit theses in electronic format.

Importance of Digital Resources

- The librarians can serve the users better with digital resources. This is possible as users can access the resources from different desktops.
- Using the right search engine can help searching for information very effective.
- It not time consuming as information resources can be found easily and on time too (Dukare, 2020).

3.3 Multimedia information Resources

Multimedia systems/information resources are when information are stored in different form which may be available in libraries in any of these; CD-ROMs, video discs (VD), laser discs (LD), audio-video cassettes, databases on servers and Digital video.

Multimedia applications can be used in various ways. They are distance learning, desktop video conferencing, workgroup collaboration, instant messaging, and imaging. The multimedia applications in DLs are being accessed by a huge number of different users and researchers at any time, from different locations with the use of internet and wireless networks (Kanellopoulos, 2014).

Multimedia Components

The main Components of the multimedia are:

- Text
- Graphics

- Animation
- Audio
- Video

Text: This include information about an object/ event, notes, captions, subtitles, contents, indexes, dictionaries, and help facilities (Vanankamudi & Padma, 2014). Presenting information in text form is the most frequently used and flexible element of multimedia application. Text in multimedia is capable of putting across detailed information to the user, or it can work as a support for information enclosed in other media items (Ayim, 2018).

Graphics: This is both traditional and computer generated drawings, prints, maps, tables, charts, graphs, spreadsheets (Vanankamudi & Padma, 2014). Graphics and images are capable of getting users to concentrate especially when used in educating. According to Nwangwu and Obi (2014), "graphics or images are digital representation of non-textual information such as drawings, charts, or photographs". Effective communication can be achieved in teaching especially in Library and Information Science, which makes use of graphics and images. It went further to assert that graphics are most useful when there is a need to illustrate something or compare information (Ayim, 2018).

Animation: It is a series of graphics that create an illusion of motion (http://www.ftms.edu.my/images/Document/MMGD0101%20-%20Introduction%20to%20Multimedia/MMGD0101%20chapter%201.pdf).

It is mainly video generated by computer (Vanankamudi & Padma, 2014). Animation resources include a motionless image or object moving continuously on projected presentation. Nwangwu and Obi (2014) defines animation as imitation of motion produced by continuously playing motionless image frames with diverse gestures. They also pointed out that animation is generally used to represent objects impossible to portray. Animation awakens the imagination of the users and makes them to understand an episode for themselves (Ayim, 2018). According to Yadav and Shrivastava (2015), animations consist of interactive effects, which allow users to engage with the animation action using their mouse and keyboard. The most common desktop application for producing animations on the Web is Adobe Flash.

Audio: Audio resources are essential in a multimedia presentation. Audio could be voice recitation of a text. It could be music, speech or any other sound (Nwangwu & Obi, 2014; Uzuegbu, Mbadiwe & Anunobi, 2013). Audio formats include MP3, WMA, Wave, MIDI and

Real Audio. A compressed format of audio is generally used within website to minimize on download times (Yadav & Shrivastava, 2015).

Video: These are photographic images that are played back at speeds of 15 to 30 frames a second and they make available the appearance of full motion (http://www.ftms.edu.my/images/Document/MMGD0101%20-%20Introduction%20to%20Multimedia/MMGD0101%20chapter%201.pdf).
Video resources are efficient tools in which realistic and theoretical concept could be illustrated. According to Madu and Nwangwu (2014), instructional video is an incorporation of text, audio, motionless and motion pictures for presentation of information.).

Source: http://www.soporteoptico.com/catalog/images/multimedia.png

Multimedia application for Instruction /training
Librarians now make use of multimedia as a tool to train their staff in the new library technologies/applications and also train users on the use of library resources (Rarnaiah, 1998). Multimedia has made education more interesting in that it integrates audio-visual experience directly with text. The main advantage of using multimedia for training is its interactivity which makes it possible for users to explore related topics and concepts (Sapathy & Sinha, 2002). For this reason, it is used by a number of schools, colleges, and universities for trainings and education purposes.

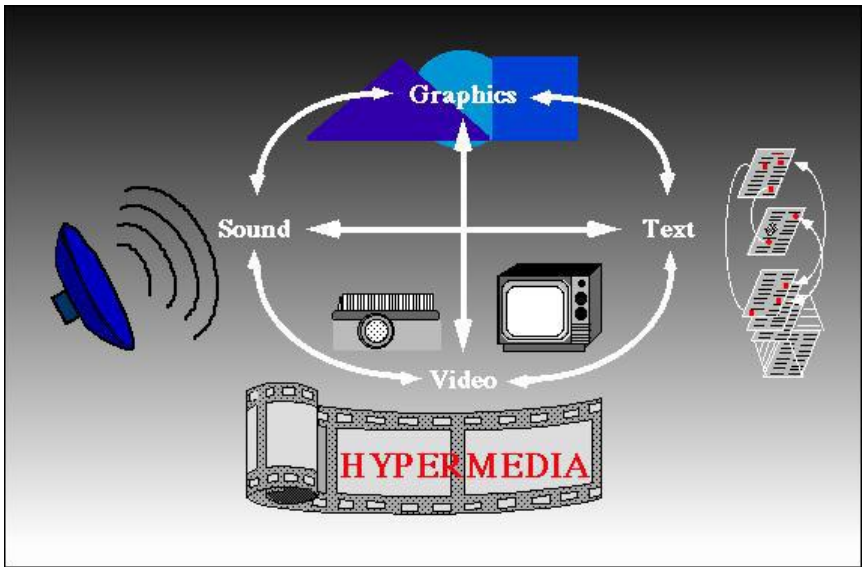
"University of Tennessee, Knoxville libraries have made a hypermedia-based computer-based training (CBT) package for their new staff. They made use of pictures, animation, sound and graphics and implemented them on Mac platform for the training. The training programme covers library services, online catalogue, orientation to the libraries, circulation policy, access to journals literature, preservation of library materials,

introduction to reference work, use of e-mail, technical services, integrated online systems for libraries, and acquisition and processing library material's" (Rarnaiah, 1998).
A few multimedia-based CAI packages designed using HyperCard for library staff training/instruction are:

lnformation Access- a library research skills tutorial for university students.

Hypercard-based AACR2- a self-teaching CAI package for preparing catalogue cards.

Hypercard-based University of Hawaii OPAC tutorial (Rarnaiah, 1998).



Source:(http://www.ftms.edu.my/images/Document/MMGD0101%20-%20Introduction%20to%20Multimedia/MMGD0101%20chapter%201.pdf).

Although multimedia is an everyday use application, we looked at its use in the library.

4.0 CONCLUSION

In order to get most of the information from the use of digital resources users must be digitally literate. There are different types of digital online resources to choose from depending on if one is learning or teaching or conducting research. Digital resources are; Online reference resources, Digital Archives, Online or digitised documents, online Databases, E-Journals etc.

5.0 SUMMARY

- Digital Resources can be defined as information resources that have been conceived and produced digitally or by converting analog materials to a digital format. The aim of a digital library is to improve the efficient development of digital resources collection and also to collect, store and organise information and knowledge in digital form. Digital libraries are created to solve the underlying problems associated with traditional libraries and offer many new services for efficient use.
- Multimedia is an integrated computer-driven communication system which creates stores, transmits, and receives textual, graphic and auditory networks of information. The multimedia applications in DLs are being accessed by a huge number of different users and researchers at any time, from different locations with the use of internet and wireless networks.

- The main Components of the multimedia are: Text, Graphics, Animation, Audio, Video. These multimedia components records, processes, stores and delivers all types of information in binary code the same way as a computer does. Its main advantage of a digital format is the flexibility in combining, transmitting, manipulating and customizing the elements of the multimedia according to the needs of the user.

6.0 TUTOR MARKED ASSIGNMENT

1. In your own words, define digital library resources
2. Explain the different types of digital library resources and how they are used.
3. Discuss the application of multimedia in the library.
4. What are the components of multimedia

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UNIT 3 DIGITAL LIBRARY SERVICES

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes (ILOs
3.0 Main Content
    3.1 Definition of digital library services
    3.2 Digital library services
4.0 Conclusion
5.0 Summary
6.0 Tutor marked assignment
7.0 References/Further reading

1.0 INTRODUCTION

The idea behind building and maintaining libraries in a University or community is to make information resources available. What users of libraries value most from a library is the services been rendered to them either virtual or otherwise. These information services can be "online bibliographic instruction, distance learning services, e-databases, instant messaging services, inter library loan and document services, ready references, virtual classrooms, virtual references", and so on. These easy-to-use digital library system and services can at times enable users to access information on their own.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, you would have learnt;

- What are digital library services?
- Types of digital library services
- Explanation of the digital library services

3.0 MAIN CONTENT

3.1 Digital Library Services

Digital library service is defined as "services that are delivered digitally through computer networks. It maintains all, or a substantial part of its collection in computer accessible form as an alternative, supplements, or complements to the conventional printed form. It then means that when digital resources are generated, it has to be made available to users through library services. Electronic/Digital information services can be provided through CD-ROM facilities, electronic transmission of documents; maintaining of on-line subscriptions and purchase; access to

online periodicals, including free online journals; e-mail and electronic alerts from publishers of journals and handing of websites and databases.

Digital libraries offer technology base information resources and services to enable learners to access relevant knowledge anywhere anytime. With the introduction of digital library concept, institutional repositories, e-journals, e-book and e-journal databases, wiki's, blogs etc., the word dissemination of information resources is replaced with services. These information ranges from online bibliographic instructions, computerized library catalogs, digital library, distance learning services, e-databases, instant messaging services, inter library loan and document services, ready references, virtual references and so on. Eneh (2021) was of the opinion that with the features of digital libraries which are associated with creating, searching, retrieving and using information resources in divers' fields. The libraries are then positioned to offer digital services to users wherever they are.

3.2 Digital library services

Digital library services include:

- Web based library services
- OPAC
- Document delivery services to electronic document delivery service
- Current Awareness services
- Selective Dissemination of Information
- Search Engine Services
- Audio-visual Service

(Singh, 2011 as cited in Idiegbeyan-ose, Nduka, Adekunjo & Okoedion, 2015).

These digital library services are explained below:

Web-Based Services

Many types of library materials such as journals, books, patents, newspapers, standards, photographs, pictures, motion pictures or music Services are now available in electronic or digital format. From user's point of view, digital resources hold many advantages such as time and place convenience, timeliness, ability to search directly on text (as against the catalogue records), ability to link to further reading material, and ability to disseminate and share information. From the library's point of view digital format offers convenience of storage and maintenance, cost advantage, ability to target global users, etc. However, digital resources also pose human, social and technological

problems. Problems of Internet access, poor infrastructure and lack of sufficient skills to use the digital resources.

Online Public Access Catalogue (OPAC)

Libraries create online public access catalogues (OPAC) to enable users know the available collections. An OPAC is used in the library to search the catalogue database in order to check the availability of a particular work on a particular subject and where it can be found. With the digital library systems access to OPAC can be done from anywhere through the use of the internet. Internet enabled OPAC is called Web OPAC. Web OPAC can be searched using any common browser, such as Microsoft Internet Explorer or Netscape Navigator (Khan, 2013).

Digital reference Services

Khan (2013) defined digital reference as Internet-based question and answer services that connect users with individuals who possess specialized subject or skill expertise. Digital reference services refer to a network of expertise, intermediation and resources put at the disposal of a user seeking answers in an online/networked environment. Asynchronous tools such as e-mail, subject gateways, FAQs, and electronic libraries and interactive tools like chat rooms, virtual reference desk, and ask-me have replaced the conventional means. Ask-a-Librarian allows the user to click on ask-a-librarian link to send a formatted enquiry to the reference librarian. Digital Reference Service (DRS) is one of the essential service that is been provided by many libraries. DRS can be provided through diverse formats like email and web forms, Ask A librarian services, online chat reference, video conferencing, digital robots, and collaborative digital reference are the services offered through DRS (Roopa & Krishnamurthy, 2014).

Current Awareness Service (CAS)

This is a service that helps to draw the attention of the library users to the resources of the library especial the current resources that can be of interest to them and assist them in their learning, research and teaching. In the digital format it can be displayed as news highlights or updates on a database, website and social media platforms (WhatsApp, text messages, e-mail facebook) (Eneh, 2021).

Selective Dissemination of Information (SDI)

This service is based on the information interest and demand of the users or group of users or researchers. The information required by the identified users may be current or not. It is current when library staff has been working with the group, so that any information that is required is sent to them electronically or alert is sent to them. It may not be a current material, when a user requires information in a particular field of

research; both current and not up-to-date information can be package for the user.

Search Engine Services

The useful search engine services can be as follows. www.askjeeves.co.uk: It is useful for complex questions and is a good choice for searchers who lack Boolean or other searching skills. The Electronic Library helps the researchers by providing various online reference sources. www.help.com: that claims to offer real time search assistance any time in 24 hours. www.about.com: It is a service that shows a number of pre-defined categories related to a search topic given by the user.

4.0 CONCLUSION

The aim of a digital library is to improve the efficient development of digital resources collection and also to collect, store and organise information and knowledge in digital form. Digital libraries are created to solve the underlying problems associated with traditional libraries and offer many new services for efficient use. The services like reference and information services have been integral to traditional services. Digital libraries can be categorized in two forms. One concentrates on operations which have to do with access, collection and retrieval of digital content. The second line focuses on service aspects of digital libraries. A digital library service is defined as "services that are delivered digitally through computer networks.

5.0 SUMMARY

- The information services available in digital libraries ranges from online bibliographic instructions, computerized library catalogs, distance learning services, e-databases, instant messaging services, inter library loan and document services, ready references, virtual references.

- In other to get the most from the library services, it will be best to combine digital library services with library service using digital resources. Digital library services include: Web based library services, OPAC, document delivery services to electronic document delivery service, current Awareness services, selective dissemination of Information, DLS using repository, Search Engine Services, Audio-visual Service and Electronic Document Services.

6.0 TUTOR MARKED ASSIGNMENT

1. Differentiate between the traditional library service and the digital library service.
2. Write short notes on five digital library services.

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UNIT 4 CHARACTERISTICS OF DIGITAL LIBRARY USERS

CONTENTS

1.0 Introduction
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1.0 INTRODUCTION

Digital Libraries should take into consideration the specific needs of users when installing user-profiling technologies that enable digital library users to configure a networked information environment. The users of digital libraries should also have some distinctive characteristics like being able to identify their information needs and use different searching strategies to gain information.

2.0 INTENDED LEARNING OUTCOMES (ILOS

By the end of this unit, you would have learnt;

- The characteristics of digital library users.
- Challenges Faced by Digital Library Users

3.0 MAIN CONTENT

3.1 Characteristics of Digital Library to users

The digital library user is no different than the normal library user with skills on manipulating the system to get whatever information resource they need. It is basically an individual who makes use of information in any way to complete a task or to satisfy an information need. A user according to Reddy, Krishnamurthy, and Asundi (2018) is one who makes use of things, an individual, or someone unknown. The user as a personality is at large, while his behaviour is unknown till he interacts with the system [digital library]. However, only the urge to get answers or solution to information needs and queries draws the user to make use of the digital library.

Today, the advancement of technologies and the complexities in modern users' needs have modified and influenced the ways user queries appear. The average user can no longer be merely satisfied with the traditional library. His/her information needs span well wide outside his library, university, state, country, or even continent. However, the universal and unsatisfactory nature of the users' needs promoted the relevance of digital libraries. The fact that information resources in the United States can be easily and comfortably accessed from Nigeria is something to cheer for; while different libraries coming together in consortia to solve their unending user needs is priceless.

Users can be identified as individuals, groups by communities. The individual characteristics can be of age, experience in research, job background and seniority and so on. Many psychological characteristics and effectiveness of available services and characteristics of user environment are the key behaviours. (Reddy et al.,2018)

Digital library users often tend to classify their wants/ interests into fragmented shopping lists, whereas their true needs may only be identified from a greater understanding of the user as a person. Hence for digital librarians to understand their search needs perfectly, the emphasis should be placed on their basic needs as persons rather than merely on the 'enquiry'. Furthermore, the users' environment is important and can affect his/ her use of digital libraries. If the user do not have friends and peers that are ICT-oriented, or do not have friends that believe in settling most of their information needs through the digital libraries; then the user is not convinced on how the digital library could be a solution. Also user orientations go a long way into instilling trust in the digital library process within the user.

Long ago, Devadason and Lingam [1996] distinguished between four types of users:

Potential user- the one who needs information which might (or might not) be provided by specific services of the information facility.
Expected user- the one who is known to have the intention of using certain information services.
Actual User- the one who has actually used an information service regardless of whether any advantage was derived from it or not.
Beneficiary user- the one who derives measurable advantage from information services.

Digital Librarians should take into consideration the specific needs of users when installing user-profiling technologies to ensure that digital library users have easy access to available information. In other to make utmost use of DL resources, library users are supposed to identify their

information requirement, which means the person should be able to use different search strategies in other to gain the required information.
It is easier for Digital library users to explore the Digital Library resources if they are conversant with the subject domain. Digital library users desire uninterrupted presentation of collections and services, notwithstanding where, whom, or in what form they are organized. Digital Library users face some difficulties in assessing services they are not familiar with.

3.2 Challenges Faced by Digital Library Users.

Some of the difficulties experienced by digital library readers are as follows**:**

User unfriendliness:
User unfriendliness varies widely. Although many online journals contain excellent information, the user unfriendliness of some results in the non-use of the journal. The user (reader or researcher) is required to scroll linearly through the article which may create boredom, eyestrain, or discomfort reading the screen. In addition, the reader who wants to access a back issue may find the task daunting considering the number of steps required and simplicity of following commands that are highly variable among journals. User friendliness is also limited by lack of consistency and availability of current and accurate information for subscribing to and retrieving e-Journals (Al-Shboul, 2016). Complexity of different types of information resources, interfaces, or search systems may affect usability. That is the effectiveness, efficiency, and satisfaction with which users can achieve tasks in the particular environment of a product. High usability means that the system is easy to learn and remember; efficient; visually pleasing and fun to use; and, quick to recover from error.

Technical Difficulties:
Lack of knowledge of basic information skills and ICT skills may be a problem in the use of digital library. The reader must possess some basic computing and networking skills in order to take advantage of e-Journals. Basic computer skills are needed, in addition to the ability to navigate the World Wide Web. Obviously someone who lacks competence of the e-resource use and computer experience will need help to use e-Journals and other digital resources

Time Commitments
Online access is time consuming: The time spent searching for, accessing, and reading e-Journals must be considered. Time commitments for novice of computer and network users will be considerable at the beginning. Experienced computer and network users

may also spend excessive amounts of time when accessing e-Journals. Although the ability to link to other sources can be quite beneficial, it is not unusual to spend far more time on the computer accessing interesting links.

Lack of Accessibility:
User demographics suggest that there is not equal access to online journals. Findings from several reviewed literature suggest that online journals are less accessible to those outside the United States, especially females, low income families, and older adults (who did not grow up with computers and must learn computer skills from scratch). Those literature reviews report that those countries accessing journals are those with high connectivity and that there is a low user base in many countries outside of the United States. Low use may also relate to the non-use of English as a second language.

Lack of awareness of available resources
Lack of knowledge of available resources will lead to users not having access to required information. This may lead to waste of time of time and at the end not getting the digital resources required.

Lack of knowledge on information technology
This may hinders efficient use. The appropriate search engine has to be determined (even if it is already part of the software, its capabilities should be assessed to ensure they are adequate. Whether searches can be performed in an incremental manner (i.e., building on previous ones) to ensure they are adequate.

Network Constraints:
Users with computer expertise may also find the experience of accessing online information frustrating. Network constraints and telecommunication problems abound. Digital resources that include graphics often are very slow to access. The lack of technical standardization sometimes results in the inability of the user (reader or researcher) to access sites.

Inadequate and limited infrastructure
Limit infrastructure is one of the factors that may affect the use of digital library, that is available of computer, strong network, access to internet and databases;

4.0 CONCLUSION

In other for library users to access electronic resources, there is need for them to possess information literacy skills and computer use competence. The computer use competence has to do with the

knowledge of how to use the computer. Information literacy embraces the Information Skills, ICT Skills, and Library Skills along with the Problem- solving and Cognitive skills thatwill enable student learners to function effectively. The library users should be educated in the use of multiple levels of searches including simple and advanced options. And the different types of searches available in the library. There also challenges that come with the use of electronic resources some them are; lack of accessibility, lack of awareness of available resources, lack of knowledge on information technology, network constraints and inadequate and limited infrastructure.

5.0 SUMMARY

- At the end of this unit you would have learnt the different characteristics of digital library users.They, therefore, need to possess a high level of skills in Web and database searching, and information evaluation.

- Some of the difficulties experienced by digital library readers are as follows**:** user unfriendliness, technical difficulties, time commitments, lack of accessibility, lack of awareness of available resources, lack of knowledge on information technology, network constraints and inadequate and limited infrastructure.

6.0 TUTOR MARKED ASSIGNMENT

1. List five characteristics of digital library users.
2. Discuss six challenges faced by digital library users.

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MODULE 3 SKILLS FOR DIGITAL LIBRARIES

This module will take you through skills and competencies of digital libraries and the users, technical requirement skills for developing digital libraries and infrastructure for developing digital libraries.

Unit 1 Skills and competencies for managing Digital Libraries
Unit 2 Skills Requirements for Digital Library User
Unit 3 Technical requirement skills for developing digital libraries
Unit 4 Infrastructure for developing digital libraries.

UNIT 1 SKILLS AND COMPETENCIES OF DIGITAL LIBRARIES CONTENTS

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  3.2 Digital literacy skills required by digital librarians
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1.0 INTRODUCTION

Information professionals in Library Information Sciences are encouraged to obtain digital literacy skills in order to function well as modern libraries are becoming multifaceted to work in. Libraries all over the world have been faced with the evolving technological advancement, and digitization of information. For academic libraries to meet up with recent trends of digital library, it is pertinent that they develop certain skills that will help disseminating information to users at the right time in the right format.

2.0 INTENDED LEARNING OUTCOMES

In this unit, you should be able to learn;

- The meaning of digital literacy, competence and skills
- The different skills required by digital librarians
- The competencies of digital librarian
- The different categories of digital competences in digital library

3.0 MAIN CONTENT

3.1 Definition of some concepts

Digital literacy is the capacity of a Librarian to employ digital technology, communication tools or networks in other to trace, assess, apply and generate information. Digital literacy is been able to comprehend and make use of information in various formats from different sources once it is presented through computers. For these reasons, librarians are employed to upgrade their skills in other to function well. There is a great need for digital competencies among librarians working in university libraries for developing and managing digital libraries, and for staying relevant in the twenty first century information environment.(Baro, Obaro & Aduba, 2019).

Digital competence is a set of knowledge, skills, attitudes and abilities that are required when using ICT and digital library that are needed to manage library information; collaborating; creating and sharing content; and build knowledge effectively for work and learning.(Ferrari 2012).

According to Merriam-webster dictionary, skill is the ability to use one's knowledge effectively and readily in execution or performance (https://www.merriam-webster.com).

However Khan and Bhatti (2017) defined digital skills "as the capability to use digital information systems including computer hardware and software to apply appropriate security measures and protect digital information".

3.2 Digital literacy skills required by digital librarians

Digital librarians should possess skills in using digital library software, assigning metadata to digital content and selecting an appropriate indexing language. It is essential for them to possess digital competencies in using different storage devices to save digital content and to ensure sustainability. Also they should have knowledge of use of scanners, imaging skills, assigning OCR records, digitization processes and management of digital collections. The Knowledge of intellectual property rights is also important to decide which document should be scanned or not, knowledge about the creation and management of digital libraries, experience with metadata creation and Preservation of information. University libraries have a good opportunity to start digitizing their scholarly publications, rare materials and theses because there are few copyright issues in digitizing these types of materials Khan and Bhatti (2017).

For librarians to carry out their assignment appropriately they require to have **I T skills**, mainly in three areas of information technology, i.e. hardware, software and web applications. As electronic resources too have become part of library resources, the management of electronic resources becomes the responsibility of the librarian. Knowledge in three areas of information technology is indispensable for a library professional because he/she has to make use of all the possibilities of information technology in order to provide the users with the best services (Usuman and Gopakumar, 2018).

Online information search skills

Macaulay (2006) observes that one important skill required of a librarian is Internet knowledge. Before a librarian can guide library clientele on how to search the Internet for information, he must have deep knowledge about how to carry it out successful. This knowledge must include knowledge of online databases how to identify the right information when found, navigate the web; how to download files (Partridge and Hallam, 2004; Bohyun, 2011).

Hardware Knowledge

It is important that librarians have fare idea on how computer systems are joined together to work; especially the components within computer systems ranging from motherboard to other parts such as RAM and power packs. Nwachukwu (2004) stated that a digital librarian needs to be equipped with knowledge about Central Processing Unit (CPU), which implies– understanding where USB/Firewire port is; understanding of mouse, keyboard and monitor; knowledge on barcode scanner plug; knowledge of mp3 players and iPods; knowledge on printers and how to troubleshoot printing problems; knowledge of thumb drives/flash drives; Knowledge of projectors; Knowledge on web applications Software.

Content management system (CMS)

Content management system (CMS) is a web based application intended to create, edit, publish, organize and maintain digital contents. Knowledge in content management system, which can be used to manage digital content or web content in an easy way, is indispensable for library professionals in modern digital era. CMS acts as a Graphical User Interface (GUI) by communicating with database through URL and making information in the intended form. Millions of digital information is coming out day by day. CMS has become one of the favorite applications of libraries as it helps in the preservation, storage and retrieval of ever growing digital resources in a web environment without the complexity of programming.

Library management system

Library management system is the planning system of a library, which includes all materials, resources and activities of the library. This involves knowing about Commercial/ Open Source Software packages that are available to automate all the activities of a library. It is very important to select appropriate software, which suit the structure and nature of the library. (Usuman and Gopakumar, 2018).

3.4 Categories of digital competencies.

There are three main categories of digital competencies for developing and managing digital libraries. They are:

1) Digital competencies for developing digital libraries;
2) Digital competencies for managing digital libraries; and
3) Digital competencies to protect digital contents.

Digital competencies for developing a digital library include

1. Knowledge of digitization,
2. Assigning metadata,
3. Ability to develop a database of digital contents,
4. Knowledge of digital storage devices and
5. Preservation of digital content.

Digital competencies for managing digital libraries encompasses

1. The ability to manage digital library infrastructure,
2. Define policies and standards for digitization,
3. Cost planning
4. Manage staff
5. Train library users
6. Knowledge of digital library evaluation and
7. Digital skills to backup digital contents.

Digital competencies to protect digital contents include

1. Knowledge to apply security software firewalls,
2. Filtering routers
3. Encryption and decryption measures on data,
4. Knowledge of data security by keeping a backup of digital contents in case of a disaster, knowledge to protect access to the digital content by providing passwords
5. Knowledge of security measures and
6. Knowledge to design administrative back-end control systems for a digital library.

4.0 CONCLUSION

The use of IT has turn out to be extremely essential for librarians to possess digital skills and competencies for managing digital libraries. Digital librarians must be able to carry out various tasks in the digital library.
Digital competencies for digital librarians are divided into three main categories:

1) Digital competencies for developing digital libraries;
2) Managing digital libraries; and
3) Digital competencies to protect digital contents.

5.0 SUMMARY

- Digital literacy is the ability of a librarian to employ digital technology, communication tools or networks in other to trace, assess, apply and generate information. Digital skill is defined as the capability to use digital information systems including computer hardware and software to apply appropriate security measures and protect digital information. Digital literacy skills required by digital librarians are: assigning metadata to digital content and selecting an appropriate indexing language, using different storage devices to save digital content and to ensure sustainability. IT skills are required mainly in three areas of information technology i.e. hardware, software and web applications. They should have knowledge of: Internet, Hardware, Content management system (CMS) and Library management system. In other for library professionals to work well there is need for them to possess disciplinary knowledge, Generic skills and Personal skills.

- Digital competence is the set of knowledge, skills, attitudes and abilities that are required when using ICT and digital library that are needed to manage library information; collaborating; creating and sharing content; and build knowledge effectlively for work and learning. There are three main categories of digital competencies for developing, managing digital libraries and to protect digital contents.

6.0 TUTOR MARKED ASSIGNMENT

Write short note on

1. Digital skills required by digital librarians
2. Digital competencies required by digital librarians
3. Digital literacy skills possessed by digital librarians

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UNIT 2 SKILLS AND COMPETENCIES REQUIRED BY DIGITAL LIBRARY USERS

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcome
3.0 Main content
3.1.1 Skills and competencies required by Digital Library users
4.0 Conclusion
5.0 Summary
6.0 Tutor marked Assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

Library users can carry out their research by accessing whatever information they need from digital library online. However for them to achieve their aim they are required to have some basic digital literacy.

2.0 INTENDED LEARNING OUTCOME

In this unit you will learn the;

Skills and competencies required by digital library users.

3.0 MAIN CONTENT

3.1 Skills and competencies required by digital library users

Library users require computer and digital skills to access electronic resources. Computer competency is knowledge and ability to use computers and related technology effectively for maximum use of electronic resources (Odunewu & Aluko-Arowolo, 2018).

The following skills are needed for effective use of electronic resources

Information literacy skills
Information literacy skills can be gained through user education and IT skills to the user learning community as stated by ACRL information Literacy. Boylston (2015) cited in Nwachukwu and Obetta, (2021) was of opinion that information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, the use of information in creating new knowledge. This implies that distance learners should be

given adequate information literacy skills in order to be able to locate, evaluate and use information effectively

Digital literacy skills
Digital literacy is been able to comprehend and make use of information in various formats from different sources once it is presented through computers. For users to be able to do this they must be conversant with entering into required file or database, know how to search, download and print out required information.

Be able to refine search during search operations.

Searching is a critical component of any digital library. It is one of the primary ways through which users will find specific holdings. There should be multiple levels of searches including simple and advanced options. The different types of searches available in the library have to be part of user education. The appropriate search engine has been determined (even if it is already part of the software) if its capabilities should be assessed to ensure they are adequate for the users. The user should be able to determine whether searches can be performed in an incremental manner (i.e., building on previous search results).

These skills can be further broken down as Ojetokun and Okafor (2015) found out that users should have skills on how to formulate word processing task as follows:

Fundamental knowledge of computer
Word processing is also a key skill requirement in libraries. It is particularly helpful in the production of useful library management reports. Reports require a variety of skills that majority of the users should have. For emphasis, the skills include data entry, basic word processing, page formatting and use of the toolbar. The highest form of word processing skill, however, is being able to navigate the various toolbars that are part of the word processing program. These include the Tools menu (which has spell check, word count and other functions), as well as the various options for saving your document

Knowledge on how to save documents
knowing how to install files, import and export data, maintain backup files and make copies of files; creating new folders; knowing how to email files; understanding how to download files from email or from websites; understanding Windows concepts, including how to explore folders and files, and how to create or remove shortcuts from the desktop and/or the start menu; and understanding database design concepts and Knowledge of how to save documents in different forms and how to print documents.

How to formulate search query

Library users should be able to evaluate resources retrieved from internet and other online resources. Experience in the use of SQL (structured query language) to define, manipulate and access a database is very important. So also is a thorough understanding of tools and utilities to maintain a database, including functions such as image copy, upload, reload and reorganization; detailed knowledge of performance thresholds and indicators in a database; and of application development requirements of a database, such as levels of security.

Internet Search Skills

Be able to use search features of different search engines. Many of the library users lacked knowledge of search engines and directories, other than Google and Yahoo, respectively. Although many library users know how to formulate a search query and how to refine the search during search operations, they do not know how to evaluate and catalogue e-resources. Training users to search the Web is simply an extension of the bibliographic instruction sessions by librarians. It is, therefore, important that they are sufficiently equipped for this service. Users are also expected to have skill information retrieval; users should evaluate what they retrieve and assume greater responsibility for learning and research outcomes. They, therefore, need to possess a high level of skills in Web and database searching, and information evaluation.

4.0 CONCLUSION

In other for library users to access electronic resources, there is need for them to possess information literacy skills and computer use competence. The computer competence has to do with the knowledge of how to use the computer. Information Literacy embraces the Information Skills, ICT Skills, and Library Skills along with the Problem- solving and Cognitive skills that will enable student learners to function effectively. The library users should be educated in the use of multiple levels of searches including simple and advanced options. And the different types of searches available in the library.

5.0 SUMMARY

Computer competence refers to the knowledge and ability to use computers and related technology effectively for maximum use of electronic resources. Searching is a critical component of any digital library. It is one of the primary ways through which users will find specific holdings. The skills required for effective search operations can be further broken down into; Library users should be able to evaluate

resources retrieved from internet and other online resources experience in the use of SQL (structured query language) to define, manipulate and access a database is very important. Users are also expected to have skill information retrieval; users should evaluate what they retrieve and assume greater responsibility for learning and research outcomes. They, therefore, need to possess a high level of skills in Web and database searching, and information evaluation.

6.0 TUTOR MARKED ASSIGNMENT

1. Discuss the skills need for effective use of electronic resources.
2. What do you mean by computer competence?

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UNIT 3 TECHNICAL SKILLS FOR DEVELOPING DIGITAL LIBRARY

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes
3.0 Main content
3.1 Technical skills for developing digital library
4.0 Conclusion
5.0 Summary
6.0 Tutor marked Assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

With the advent of new technology in digital library, technical skills are needed to develop the digital library. In other words, the digital librarians should develop the necessary IT skills for information services.

2.0 INTENDED LEARNING OUTCOMES

In this unit, you will learn the:

- Technical skills needed in developing the digital library.
- Why digitization is crucial in digital library process.

3.0 MAIN CONTENT

3.1 Technical skills for developing digital library

Technical skills are required more in computer-related activities than in traditional archival functions of appraisal and selection. No single person will be an expertise in all areas but within a repository, all areas require attention.
In other to develop digital library, the librarians should be conversant with the following:

- Knowledge of classification and assigning metadata
- Digitization processes
- Digital preservation and storage
- Archiving digital documents
- Management of digital collection
- Knowledge of multimedia technology
- Designing user interfaces

- Developing digital content
- Web markup languages
- Database development and management systems (Choi & Rasmussen, 2006;Sreenivasulu, 2000; Pearce & Davis, 2006 as cited in Khan & Bhatti, 2017)

These are explained below.

Classification and Metadata

Metadata is the information taken from an article (such as date, author name, publisher, type of document, abstract, ISBN number) which is then entered as a unique field in the library database. It is used for sorting, indexing, and other database functions not openly detectable. Classification and metadata are key elements of a system designed to support records management and archives. This greatly improves the quality of DL. Records that are accurately classified in groups can be treated as aggregates. Records with right metadata can be managed and retrieved much more efficiently, and can be migrated and checked for integrity without difficulty.

Digitization Process

Digitization comprises the processes of making collection of materials online. This involves the acquisition of the right materials based on the policy of the library, scanning and transcribing the materials, creating mark up and index to create metadata. It also involves employing subject specialist to handle the process. The digitization also involves process of ensuring quality images, upholding the web to preserve and maintain the archival media and online collection. By digitizing materials, information can be made accessible and available for various uses (Abdulsalami, Nwachukwu, & Salami,2015).

Digital Preservation and Storage

This is a procedure that allows digital data be preserved in digital form in order to ensure the usability, durability and intellectual integrity of the information it contains even when the technology used for the preservation is out of date. Therefore librarians should be conversant with the various software used for digital preservation for example; Alchemy(R) Information Management research Inc. http://www.imrgold.com

And CONTENT dm, DiMeMA, Inc.http://contentdm.com/ (Nahak & Patra, 2014). Knowledge of computer forensics may be a particularly valuable skill for digital preservation. Choosing the right storage place to store digital records is also closely tied to preservation. Selection of format requires that skill be informed by the creative application of knowledge. Digital records might be stored in its original format to

guarantee the ability of authenticity, as well as in a plain-text rendering to support full-text indexing and as a last-resort preservation version.

Archiving Digital Documents

Digital materials require ongoing active intervention to remain accessible. Computer crashes, changes in software and hardware, and the large volume of digital content that are generated on a daily basis can contribute to the loss of important memories if digital records are not kept accessible over time (https://guides.lib.umich.edu/c.php?g=992751). The main concern of digital libraries is preservation and archiving of digital contents, in whatever form they were acquired be it through subscription, purchased in digital media or converted in-house. Moreover, the academic community looks upon libraries to preserve materials that were ever accessible to them on internet at least in an offline digital format, such as stored on-line (or on CD-ROM, diskettes or other physical carriers) or to the products of analog to digital conversional long-terms access in intended. These records must be preserved to retain its integrity and is authentic and usable (Nahak & Pathra, 2014).

Management of Digital Collection

The digital collections may include text, images, audio, and video. Maintaining digital collections involves preserving fragile originals by limiting handling; improve access by making the information available on the Web, or both. There are several digital collections management systems designed specifically for libraries by vendors of integrated library systems. They include; Endeavor's ENCompass for Digital Collections (www.endinfosys.com), ExLibris' DigiTool (www.exlibris-usa.com), Innovative's MetaSource (www.iii.com), OCLC's ContentDM (www.oclc.org/contentdm) SirsiDynix's Hyperion Digital Media Archive and Horizon Digital Library (www.sirsidynix.com) , and VTLS' VITAL (www.vtls.com) (Boss, 2006).

Knowledge of Multimedia Technology

Multimedia applications can be used in various ways. They are distance learning, desktop video conferencing, workgroup collaboration, instant messaging and imaging. The multimedia applications in DLs are being accessed by a huge number of different users and researchers at any time, from different locations with the use of internet and wireless networks (Kanellopoulos, 2014). A lot of libraries in developed countries have various multimedia projects such as archiving different forms of information, multimedia databases, multimedia catalogues, walk-through programmes, Instructional packages, electronic books, and digital libraries. The multimedia products mostly used by libraries are reference and educational resources including electronic books, databases, self-training software etc (Rarnaiah, 1998). Therefore the

digital librarian should be able to be familiar with the use of the various multimedia applications.

Designing of User Interface

The interface design defines the real appearance on the computer screen, for instance the choice of frames, icons, colours, and visual clues to help the user. It also includes decisions about how the different functions are presented to the user. Many interface designers want the user to see materials exactly as they were designed. They want to control graphical quality, typography, and window size, location of information within a window and everything that is important in good design. Therefore, good designs must be effective in a range of computing environments. The best designers have an ability of building interfaces that are suitable to use and attractive on a range of computers, but some designers find it complex in making the transition from traditional media, where they control everything, to digital libraries and the web. A common mistake is over-elaboration, so that an interface is almost unusable without a fast network and a high-performance computer (Arms, 2000).

Management of Digital Content

Digital content managers collect, organize, and evaluate digital assets regardless of their types, formats or methods of delivery. They manage the life cycle of digital content from creation to curation, build applications (such as Websites, databases, information retrieval systems) and develop services (such as digital libraries and digital curation) that respond to institutional and individual user needs.

Web Markup Languages

The technology industry seems to be moving toward a single standard, Extensible Markup Language (XML). XML typically stores textual information as tagged character data whenever possible, although non-textual data, such as images or sound, are stored as tagged binary data. Library professionals have to be fluent in basic XML, as well as related standards, such as Extensible Schema Description (XSD), and Extensible Stylesheet Language Transforms (XSLT), etc. Digital Librarians also need to have knowledge of other markup languages, such as Hypertext Markup Language (HTML), now largely a subset of XML, and Standard Generalized Markup Language (SGML).

Database Management

Databases contain “information that is accessed and updated through software (a database management system) that has been organized, structured, and stored so that it can be manipulated and extracted for various purposes.” The data may be stored in a number of related tables or in a sequential string, using tags, delimiters, and an internal directory to identify fields. Other database technologies (for example, ISAM,

XML, object-oriented systems) store the information differently. This means that information professionals must be familiar with the general concept of a database and also understand the internal structure of the data.

4.0 CONCLUSION

Technical skills are needed to develop the digital library which involves computer-related activities and no single person will be an expertise in all areas but within a repository, all areas require attention.

5.0 SUMMARY

At the end of this unit you have learnt the technical skills needed to develop a digital library. These skills are needed by librarians in order to develop a functional digital library and make access to information easier for their users. For the Librarian to manage the digital library well he needs to have Knowledge of classification and assigning metadata, Digitization processes, Digital preservation and storage, Archiving digital documents, Management of digital collection, Knowledge of multimedia technology, Designing user interfaces, Developing digital content, Web markup languages and Database development and management systems

6.0 TUTOR MARKED ASSIGNMENT

1. List and discuss seven technical skills required in developing a digital library.
2. Explain in your own words why digitalization is an essential process in digital library

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UNIT 4 INFRASTRUCTURES FOR DEVELOPING DIGITAL LIBRARIES

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3.0 Main content
  3.1 Infrastructure needed in development of digital library
  3.2 Major tasks to be considered when developing a digital library
  3.3 Steps in developing a digital library
  3.4 Digital infrastructures used for managing content
4.0 Conclusion
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6.0 Tutor marked Assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

The development of a digital library requires careful planning for acquiring the necessary digital library infrastructure and to design an effective digital information system in other to generate digital content.

2.0 INTENDED LEARNING OUTCOMES

In this unit you will learn;

- The infrastructures in developing digital libraries
- The task involved in the developing of digital library
- Steps in developing digital library
- Infrastructures needed in managing of content

3.0 MAIN CONTENT

3.1 Infrastructure needed in developing of digital library

The infrastructures required in developing of digital library are:

- Database development,
- Interactive technical services,
- Hardware and wiring,
- Use of preservation technology,
- Computer hardware and software,
- Server technology,
- Availability of internet access,

Obsolescence of technology (Tebbetts, 1999; Jeevan, 2004; Khan & Bhatti, 2017).

Database Management Software

The database management software provides structured storage and retrieval facilities to the contents of a digital library. Digital libraries use a variety of database management system which are relational and extended relational database management systems (DBMS) and object-oriented database systems. Relational DBMS are most often used for the storage of metadata and indices with attributes that contain pointers to files in a file system. The relational DBMS software listed below can be accessed by using SQL (Structured Query Language): Oracle, Infonnix, Sybase, SQL Server, http://www.oracle.corn/, http://www.informix.com/, http://www.sybase.com/, http://www.microsoft.com/(eGyankosh, 2017).

Preservation Technology

Microfilming is the best technology for preservation of documents with confirmed longevity. The life expectancy of microfilm is in the 500+ year range. Microfilm master, if stored accurately, is quite simply the most secure reformatting method available (eGyankosh, 2017).Other digital preservation technologies are; Replication, Emulation, Refreshing, Metadata Attachment, Trustworthy digital Objects, Normalization, Bit stream Copying, Technology Preservation, Digital Archeology, Analog Backups, Encapsulation etc (Kude, 2013).

3.2 Major tasks to be considered when developing a digital library

1) Online public-access catalogues
2) Managing digital content
3) Planning long-term preservation
4) Material to be digitized or collected,
5) Formatting and imaging standards (Tebbetts, 1999; Jeevan, 2004; Khan &Bhatti, 2017).

These are explained below.

1) Online Public Access Catalogue (OPAC)

Online Public Access Catalogues (OPACs) have long provided author, title, and limited subject access to local holdings (and more recently to union holdings across to multiple libraries). In physical libraries, the card catalogues or OPAC is physically distinct from the items on shelves (Nazim, 2009). Libraries create OPAC to enable users know the available collections. An OPAC is used in the library to search the catalogue database in order to check the availability of a particular work on a particular subject

and where it can be found. With the digital library systems access to OPAC can be done from anywhere through the use of the internet. Internet enabled OPAC is called Web OPAC (Khan, 2013)

2) Managing Digital Library Content

Contents in a digital library are organized and managed for the purpose of immediate access to the library user. Content management includes the following:

- Selection and acquisition;
- Indexing;
- Storage;
- Retrieval;
- Maintenance and
- Copy rights management.

- Selection and Acquisition

Selection of content by libraries is done based on collection development policy been used. There are two key challenges in content selection. The first is the cost of acquisition, which takes into account Intellectual property rights, the cost of digitization and maintenance. The secondly, is the quality of the content before acquiring it. Issues of authorities as well as authenticity should be considered here. After selection has been resolved, content must be acquired. For objects, which are in digital form, the file transfer through networks or mass storage is simple using specified file formats. In case of already available resources that are in prints, digitization must be done (Nazim, 2009).

- Indexing

  Indexing is required for digital content to be easily accessible to the users in a selective way like OPAC for printed content. What to be indexed (author, keywords, phrase, etc), how the content and index files are linked, what sort of access points are provided, etc should be discussed. Most digital libraries offer access to primary content using a variety of access tools. An active area of research is user interfaces for digital collections. Access interfaces depend on the content organization and storage and serve as the bridge between internal (technical services) and user services (Nazim, 2009).

- Storage

  Depending on the type of content in the digital library and the approach adopted for delivering it, higher speed storage may be needed to ensure adequate performance (e.g., for streaming music); text-only content may not require a speed as high, but will

still require failover and automatic error correction. HathiTrust, is an example of a centralized, aggregated collection, that uses the Isilon clustered storage system, which is highly scalable with the addition of new nodes to the storage cluster (Henry, 2012).

- Retrieval
  Digital library software use database management system, sophisticated search engines and user-friendly search interfaces to facilitate search and browsing of resources available in a digital library. Once the required images have been identified their associated document image can quickly be retrieved from the image storage device (Kude, 2013).
- Maintenance
  Maintaining systems and preserving content are important and costly activities. Some storage systems have short life span. Optical storage offers longer life spans. Digital librarians should be prepared to copy digital holdings periodically and especially for the unavoidable obsolescence's of different media types and playback devices. Just as the computational system change, digital content may also change as well. Several versions of a digital document may surface especially given the ease with which electronic documents may have changed. Maintaining the most important document requires that versions be well managed, which includes updating and deleting the links to those objects (Nazim, 2009).

- Copyright and security issues
  There are several issues that concerns copyright law's applicability in digital library, this include e-reserves, registration, delivery, and equal use of information. The role of academic libraries is to offer access to information to their constituents any-where and at any time. A legal framework to address copyright issues and protect the rights of content creators and owners should be put into consideration by digital library creators and their materials, to preserve copyright issues in the production and management of digital libraries. Technical protection measures such as e-watermarking, digital signatures, authentication, etc could be used to protect digital resources (Kato, Kisangiri & Kaijage, 2021). Security protects unauthorized access as well as ensures the veracity and authority of digital information objects. The misuse that can be put to digital content is far more serious and voluminous than for printed content (Nazim, 2009).

3) Long term Preservation

In the preservation of digital materials, the real issue is technical obsolescence. Technical obsolescence in the digital age is like the

deterioration of paper in the paper age. Which means that preservation of digital information will mean constantly coming up with new technical solutions.

There are three types of "preservation" to be considered in the use of digital materials:

a. **Preservation of the storage medium**.

Tapes, hard drives, and floppy discs have a very short life span when considered in terms of obsolescence. The data on them can be refreshed, keeping the bits valid; this can only be possible if the media storage is still modern. The media used to store digital materials become obsolete from two to five years before they are replaced by better technology. Over the long period, hardware and software for reading older media materials will not be available. Therefore, libraries will keep on changing storage medium.

b. **Preservation of access to content.**

This form of preservation involves preserving access to the content of documents, regardless of their format. When a file format becomes obsolete data migration is done. This means translating data from one format to the other preserving the ability of users to retrieve and display the information content. The problem with this data migration is that it is costly. There are as yet no standards for data migration and distortion or information loss is inevitably introduced every time data is migrated from format to format.

c. **The preservation of fixed-media materials through digital technology.**

This involves the use of digital technology as a replacement for current preservation media, such as microforms (Cleveland, 1998).

4) Materials to be digitized or collected

Digitization is the conversion of analogue media, such as books, journal articles, microforms, photos and paintings into electronic form through scanning, sampling, or re-keying. An obvious obstacle to digitization is that it is very expensive (Cleveland, 1998). Large-scale digitization projects are aimed at conserving and preserving old, fragile and deteriorating documents of high scholarly value and also providing increased access and search possibilities that is possible once the documents are available in the form the computer can process (eGyankosh, 2017).

Criteria for selecting materials to be digitized are:

- potential for long-term use
- intellectual or cultural value
- if there will be greater access especially for rare materials and

- if there is copyright restrictions or licensing that will permit conversion (Cleveland, 1998).

5) Formatting and imaging standard

File format is defined as arrangement for discrete sets of data that allow a computer and software to interpret the data. Different file formats are used to store different media types like text, images, graphics, pictures, musical works, computer programs, databases, models and designs, video programs and compound works combining many types of information Source (eGyankosh, 2017).

3.3 Steps in developing of digital library

The main steps in developing of digital library are as follows:

1. Ideology, manuscript creation, literature search
2. Creation
3. Acquisition
4. Cataloguing and indexing
5. Preservation
6. Access / dissemination

Ideology, Data Collection, Manuscript Creation, Literature Search

When the idea of developing a digital library is conceived, the first thing to do is to identify and select what to digitize and what not to. Policies and programmes of the library, the users' expected needs, should influence this decision (Jeevan, 2004). Research should also be carried out to find out problems faced by other libraries that have embarked on it and suggestions and information about the new development of DL (https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf)

Creation

In other to build a digital library, creating digital content and collections is the first step to be considered. Open source software like D-space; Green stone etc are used for creation of digital library. Digital creation is the act of converting print information in a digitized format (https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf)

Acquisition

The acquisition of digital library products is divided into different categories, i.e. print and non-print version, utility for present and future. Many commercial agencies have emerged for providing commercial electronic resources through providing IP address with user name and password (https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf)
.

Cataloguing and Indexing

Documents acquired in digital format are assigned identification number and also catalogued. Indexing is essential for the digitized contents to search and access contents in a selective manner (Jeevan, 2004).This help the digital library to manage the electronic resources smoothly and for easy accessibility. Identification provides a unique key for finding the digital document and linking the document to other related documents. Cataloguing helps in organization and access to the documents (https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf)

Preservation

This is the aspect of archival management that preserves the digital content of a digital library. Preservation of digital content is mostly based on time frame and also depends upon the hardware and software. The issue that must be kept in mind while dealing with computer hardware, software and peripherals are if the software can be updated and have backward compatibility of 2 to 3 versions. For journal articles image files, PDF or HTML are used. For purely electronic documents, PDF is most prevalent format (https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf)

Access

The information stored in a digital library server i.e., document or e-information can be accessed through search or retrieving software. The software involved in digital library helps to retrieve the metadata after analyzing the contents stored in the server. Appropriate Boolean logic needs to be used to narrow the search from a larger set https://www.pcenagpur.edu.in/img_akki/abt_inst/pdf/digitallibrary.pdf). The best alternative for electronic access is via the Web by converting the electronic full text available in the pre-production stage into html format. Figures or tables may be changed to formats like GIF/JPG or JPEG. Also electronic provision of full text can be handled more appropriately in Portable Document Format (PDF) using Adobe Acrobat software (Jeevan, 2004).

2.4 Digital infrastructures used for managing content

1) Storage and Content Delivery
2) Metadata Approaches and Harvesting
3) Search and Discovery
4) Services and Applications
5) System Sustainability (Henry, 2012).

1. **Storage and Content Delivery**
   In order to handle bulky amounts of digital information a robust server and storage system that is well built and functions properly is needed. Establishing a reliable digital library requires storage hardware, server allocations, databases and distribution approaches, along with bandwidth considerations (Henry, 2012).

- **Storage**
  To guarantee high accessibility of the content and proper discharge of information that is sufficient to meet users' needs, Disc speed, failover capabilities, and automatic error correction functionality found in clustered storage solutions should be provided (Henry, 2012).
- **Servers**
  Servers are critical in providing a reliable platform for the digital library. Server hardware for large and mass digitization projects differ extensively. A number of services have been configured to distribute activity load over multiple servers for systems that have robust architectures to accommodate high performance under varying usage loads. Different servers are used and load balancers are required to handle activity so that there will not be server crash during peak usage periods (Henry, 2012).
- **Databases and Repository Platforms**
  Decisions about managing the content and metadata often depend on the types of data to be stored and the search approach to be used. Repository platforms such as DSpace and CONTENTdm are used by most digital library collections and organizations that do not have a large staff of programmers to support functional system development (Henry, 2012).
- **Content Distribution and Format Assumptions**
  In order to ensure that content is available when needed, the digital library is mirrored in multiple locations. This is done in case there is system breakdown at one location, the mirrored site can provide continued access to the resources and services. Mirroring across multiple geographic locations can facilitate better, more reliable delivery of the resources than does a single site. Examples of large archives that have mirror sites include the Internet Archive, with the production site in San Francisco and the mirror site at Bibliotheca Alexandrina in Egypt and HathiTrust, with the production site at the University of Michigan and the mirror site at Indiana University's Indianapolis campus.
  Backup and restore services are also critical for the recovery of content in the event of a catastrophic failure. Such services are among the simplest but most fundamental for any repository (Henry, 2012).

2. Management of Metadata with Content

Metadata can be either loosely or tightly coupled with its corresponding digital content objects. Platforms such as DSpace support this type of architecture for metadata. Advocates for tighter coupling of metadata with the content object note that metadata are essential components of the digital resource and should always accompany it as it moves. There should be no risk associated with losing the metadata because of their separation from the resource they describe. It is also critical for the digital preservation of the resource to have the metadata bundled with the object. Large digital libraries are starting to employ both approaches: structured metadata, such as DC, loosely coupled with the content; and a descriptive metadata file, such as METS, included with the digital objects
(Henry, 2012).

- **Harvesting and Content Ingestion**

Harvesting metadata is a way to gather descriptive information about items in distributed collections for a federated digital library. Having the metadata centralized can enable common support for functions such as discovery services, timelines, tag clouds, or geospatial visualization that can be used with all the federated collections, even though the content remains distributed. Approaches to the harvest of metadata differ, but many rely on content providers to make their data available to the large digital library in a known format. Metadata can be harvested from collections using a DC metadata format by means of a DC harvester such as Open Archives Initiative - Protocol for Metadata Harvesting (OAI-PMH). The IMLS DCC/Opening History beta sprint for the Digital Public Library of America (DPLA) demonstrates the effectiveness of this approach (Henry, 2012).

3. **Search and Discovery**

For text, large repositories most often use the Lucene search engine, an open source information retrieval platform. SOLR is a scalable search engine that uses the Lucene library, and many digital repositories implement it to support full-text search, hit highlighting, faceted search, dynamic clustering, database integration, and rich document (e.g., Word, PDF) handling. The discovery technologies to be included in a digital library platform depends on the types of discovery services that digital libraries will provide, the varying content formats, and overall performance considerations (Henry, 2012).

4. **Services and Applications**

A true service-oriented architecture (SOA) approach supports scalability and the addition, subtraction, or substitution of technologies over time. HathiTrust and NSDL are two large

digital libraries that have embraced this approach in their system development efforts. Defining the functional components of the digital library in terms of services allows changes to be made in isolated or semi-isolated parts of the code with little impact on the other software components. It is easier to integrate new capabilities and improved technologies into the system if designers follow SOA principles while developing the system. Once defined and developed, services can be reused or modified, supporting flexibility and a modular architecture. In addition to an overall SOA architecture, large digital libraries often provide value-added applications and services. Example of the value-added application and services are:

a) NSDL provides a WordPressMultiUser blog, a MediaWiki, and Shibboleth user authentication.
b) HathiTrust facilitates access to its content through a page-turner application and offers a Collection Builder interface.
c) Europeana provides map and timeline views of its resources.
d) NINES applications and services include

- Juxta, a bibliographic collation system
- IVANHOE, a multiplayer game of literary interpretation
- Collex, a tool for collecting and annotating digital objects and for publishing interlinked online exhibits that includes support for folksonomic tagging
- XML-to-RDF style sheets for TEI-encoded documents.

e) Streaming services for audio and video can be included if the digital libraries support large audio and video files.
f) JPEG2000 viewers can enhance image viewing for digital libraries with image collections.
g) CAD-CAM architecture drawings can also be added.

These are just a few of the applications and services being provided by a handful of large digital libraries (Henry, 2012).

5. **System Sustainability**

Although the infrastructure of the digital library is important for providing a robust management system for digital content, it is equally important that the system continue to operate reliably into the future. Having sustainability in mind at the early stage of the development process can facilitate in building a thriving digital library that users can trust. A federated collection or to manage the content centrally should be decided to keep the system functioning especially where there is shortage of staff. Sustainable systems must be easily maintained, and they need to scale easily to meet growing traffic and content. Overall sustainability can be a problem for federated systems because the content is beyond the control of the library that people rely on for discovery and enhanced services. Sustainability can be a key factor in users' trust of the system (Henry, 2012).

Mutula and Ojedokun (2008) agreed that the development of digital libraries also require infrastructure like PCs/Servers, web authoring language browsers, different applications programmes, internet connectivity, content information architecture, mode of websites and associated hyperlinks, various standard to cater for whole range of format of graphic, web pages, audio, still and moving images.

4.0 CONCLUSION

In this unit we discussed the necessary infrastructure requirements for developing digital libraries. We also looked at various tasks that are required when starting any digital library development project. We also looked at the infrastructure for managing content in a digital library. Digital librarians must develop adequate digital skills for the development and management of digital libraries. They should be grounded in using any digital library software, scanning processes, know server technology, understand database development and management.

5.0 SUMMARY

In this unit we discussed;

- The infrastructures in developing digital libraries: which are Database development, preservation technology, Computer hardware and software,
  Server technology, availability of internet access which are very important in making a digital library functional.
- Under the task involved in the developing of digital library we discussed; Online public-access catalogues (OPAC), Managing digital content (which involves selection and acquisition, Indexing, Storage, Retrieval, Maintenance and Copy rights management), Planning long-term preservation, Material to be digitized or collected, Formatting and imaging standards,
- Steps in developing digital library here were discussed. The main steps in developing of digital library are as follows: Ideology, manuscript creation, literature search, Creation, Acquisition, Cataloguing and indexing, Preservation and Access / dissemination.Finally, we discussed the infrastructures needed in managing of content which are; Storage and Content Delivery, Metadata Approaches and Harvesting, Search and Discovery, Services and Applications and System Sustainability.

6.0 TUTOR MARKED ASSESSMENT

1. Discuss the infrastructures needed in developing digital libraries.
2. Enumerate steps involve in developing digital library.
3. What are Infrastructures needed in managing of content?

4. List six ways of managing digital library content and discuss each.
5. How is Metadata harvested?
6. Write examples of repository platforms.
7. Why do you catalogue digital documents

7.0 REFERENCES/FURTHER READING

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MODULES 4 MANAGEMENT OF DIGITAL LIBRARIES

Unit 1 Tools for Management of Digital Libraries
Unit 2 Digital Library Management Policy
Unit 3 Information Security Management of digital information Sources
Unit 4 Preservation of Digital Information Sources

UNIT 1 TOOLS FOR MANAGEMENT OF DIGITAL LIBRARIES

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes
3.0 Main content
  3.1 Concept of Digital Library Management Tools
  3.2 History of Digital Library Management Tools
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4.0 Conclusion
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1.0 INTRODUCTION

The emergence of digital libraries has been very much applauded as it has to a large extent helped managed the booming excess of information resources especially in libraries and information centres. It has over the past 15 years made a wealth of scholarly materials available online resulting in new business models for information delivery Henry (2012), as well as a cultural shift in the way information is being distributed. To ensure effective control and use of these digital resources, there is need to place emphasis on its management.

Digital libraries which involve the processes of co-operation, co-ordination and collaboration between and amongst libraries for the purpose of sharing information (Eze, 2013) can be very weak, or dysfunctional if there are no tools for its management and sustainability. A lot of white-elephant projects as seen in libraries concerning information resource procurement, organization and management; have obviously died off because there were no proper plans as well as tools to effectively sustain the tempo of its functionality.

Since the aim of digital library is to enhance mode of access to information, effective management of digital libraries is achievable through digital library tools. As a result, digital library tools (intellectual, technological, structural, etc) complete the information management of digital libraries and helps in reshaping its service. We speak about electronic references, full text data access, web resources that are the integral part of the University education. As a student researcher or librarian, effective knowledge and comprehension of tools for managing digital libraries is important and extremely necessary if a library must remain relevant to the demands of this century.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the meanings accorded to digital library management tools
- Discuss a brief history of digital libraries and its management
- Delineate the objectives of digital library management tools
- Discuss the tools of digital library management as seen in libraries today

3.0 MAIN CONTENT

3.1 Concept of Digital Library Management Tools

As opinions of the meaning of digital libraries vary, in the same way digital library management strains from it with practical descriptions of devices that aid digital library management operations. A digital library is seen as a type of information retrieval system (Candela, et al, 2011). From the main concepts of digital libraries, where it appears as a library in which collections are stored in digital formats (as opposed to print, microform, or other media) and accessible via computers (Eze, 2013); digital library management tools may just be regarded as tools that would accomplish the management of the basic functions of digital libraries.

These tools can extend a library's ability to create, modify, and manipulate digital libraries and its operations to suit the objectives of the host library. Digital library management tools can include intellectual competencies and expertise; content creators and modifiers; technological components like the software and hardware; communication and dissemination tools like the website, repositories, social media, news, etc; infrastructures for holding digital texts, images, audio, video, digital documents, computers and of course, the internet.

The activities and contents to be managed by these tools may be stored locally, or accessed remotely via computer connected networks. Hence, the tools can be applied in digital libraries to enhance the accessibility, usability, and retrieval of the information accessed; as well as the automation and manipulation of the metadata.

In a more technical sense, digital library management tools according to Sreenivasulu (2000) are tools used to work on the following aspect of digital library: text analysis; database creation; database distribution; design of interfaces; design of retrieval languages document structuring; language-related industry (e.g. translation, terminology, software); network-related activities (e.g. Internet, intranet, extranet, LAN, WANs); optical-based information products (CD-ROMs, CDI, DVD); telecommunications; virtual reality; communication formats; competitive intelligence; data mining; knowledge mining; technology watch.

3.2 Tools of digital Library Management

The importance of digital library management has led to the development of proper tools to improve its effectiveness and efficiency. Tennant (2004) opined that technical skills as follows:

- like being knowledgeable with the typical manipulations required editing an image and saving it in different formats aided by proficiencies in Adobe Photoshop;
- skills in Optical character recognition on scanned works using specialized software, such as Abbyy FineReader or Omnipage Pro. Knowledge of Markup languages whether HTML or web pages or XML for more complex documents, for marking up anything from a document to a database record.
- Tools on Cataloguing and metadata are equally important as digital resources need their bibliographic details taken down and metadata captured; they should be aware of pertinent standards like MARC, AACR2, and the Dublin Core.
- Indexing and database tools are needed also for creating database of digitized resources and knowledge of tools for indexing.
- Graphic design skills and tools are also needed like writing the functional specifications and work with other professionals to achieve the desired goal.
- Knowledge of programming and programming language is needed especially with general-purpose languages like Perl can perform a variety of tasks quickly and easily. Web technology tools are very much important too if the digital library collections and services must be disseminated to the right people at the right time. A digital librarian is expected to be well-versed in web technology, which may involve HTML and CGI programming.

- Project management tools and skills help digital library managers to communicate effectively with a diverse range of people, often both inside and outside the library; as well as helping to keep the project within expected time and budget, and keeping track on the envisioned goals.

4.0 CONCLUSION

The unit has re-emphasized the importance of digital library management tools. The student having gone through the expositions must have learnt the meaning and concept of digital library tools and how it came about. Also they should be able to enlighten people on the features of digital libraries and the objectives of digital library tools.

5.0 SUMMARY

Digital libraries aim at enhancing mode of access to information through effective management with digital library tools. Hence, these management tools which can be intellectual or technological is an important phenomenon to consider in digital library management. This unit dealt with tools for managing digital library, without which the aim of digital library will not be achieved. It highlighted some features of digital library tools for collection infrastructure, digital resource organization, access infrastructure and computer and Network Infrastructure.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain the meanings of digital library management tools
2. Outline the objectives of digital library management tools
3. Discuss the tools of digital library management as seen in libraries today

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UNIT 2 DIGITAL LIBRARY MANAGEMENT POLICY

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1.0 INTRODUCTION

As much as management of digital libraries is important, it is extremely necessary to study the policies that would act as a driver and support for the operations involved in the digital library management process. Every successful organization has an official/ unofficial; verbal/ written; implied guide/ mere statements guiding its affairs, placing limits and direction in which managerial decisions and actions are expected to take place.

The importance of creating rules, norms, and guides to ensure the accomplishment of the main goals of the digital library can never be overemphasized. Digital library management policies determine the life quality and span of digital libraries and help maintain sanity and appreciable value to the entire operation involved. It initiates a blueprint or framework for all digital library service delivery. Hence, it is necessary to know what digital library management policy is all about, as well as its content, instances, types and objectives; for its improved knowledge and application in the management of digital libraries.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the meaning of digital library management policy
- Discuss the content of digital library management policy
- Explain the objectives of digital library management policy

- Discuss the Typologies of digital library management policies today

3.0 MAIN CONTENT

3.1 Understand the Meaning of Digital Library Management Policy

Policy is described as a deliberate system of guidelines that guide decisions in order to achieve rational outcomes. It is a statement of intent and is implemented as a procedure or protocol. Policies are generally adopted by authorities within an established organization. They are general statements that guide in decision-making, and are needed for continuous decision making which applies to repetitive situations. Policy decisions are normally taken by the Executives and Boards. According to Walter (1997) policies are deliberate choices or decisions that guide actions and influence outcomes. It can be seen in almost all ramifications of human existence. For instance, foreign policy guides a country's relationship with the outside world; economic policy attempts to guide the complex exchange of goods and currency in a society. In the same manner, organizations have policies which guide issues related to personnel decisions and interactions with the media. Libraries typically have internal policies which guide collection development and service priorities. Library policies are choices made by library decision-makers which are expected to facilitate, rather than restrict, access to information and to advance the library's ability to serve its clients. Ubogu (2013) said that policy represents sets of conditions, rules, terms and regulations governing every aspect of the digital library service and management. These include acceptable user behaviour, digital rights management, privacy and confidentiality, charges to users, and collection formation.

Hence Digital Library Management Policies are verbal, written or implicit guide or statements which sets up general limits and direction in which managerial actions on digital libraries will take place. They are patterns of rules, norms, and guides; developed by top digital library managements to see that the main goals of the library are achieved. Digital library management policies are important because they are fundamental to defining the values of the library, as well as help the library executives translate those values into service priorities. These management policies establish a standard for rendering digital library services that can be understood by users of the digital library. Policies ensure fairness and equity for all digital library staff and the policies created provide a framework for service delivery. Ubogu (2013) further stated that digital library policies include acceptable user behaviour,

digital rights management, privacy and confidentiality, charges to users, and collecting of formation.

3.2 Content of a Digital Library Management Policy

Digital library management policies (DLM) are typically developed through official written physical or electronic documents. This often appears with the endorsement of the library executives to legitimize and enforce the policy. Some major components of digital library management policy are:

- Purpose Statement: this showcases the digital library's reason for issuing the policy and the desired effect or outcome.
- A Digital Library Applicability and Scope Statement: this describes who the policy affects (users, librarians/ personnel, digital library operations), and which actions are expected to be influenced by the policy. Applicability and scope helps to focus the policy on only the desired targets, and avoid unintended consequences.
- An effective date: this is the date which specifies when the DLM policy takes off
- A Responsibilities Section: this section indicates which parties in the digital library are responsible for carrying out each of the policy statements.
- Policy statements: this shows the specific regulations, requirements, or modifications to digital library that the policy is creating.
- *Background*: some policy statements may contain reasons, history, ethical background statements, and/or intent that led to the creation of the policy, as a sort of motivation.

On other hand Koulouris, Kapidakis and Makedon (2005) divided digital library management policy into six categories.

- The first category refers to the **way users may get the object** (full-fledged version, evaluation copy, and object with activation key) or as post card ware (products that are actually free and their creator wants only to keep track of their use).
- The second component refers to the **duration of the object** (can be unlimited, for a period, for a number of uses).
- The third component refers to the **action on the end of this period** (nothing, less functionality, messages to the user, no functionality and payment for the full version).
- The fourth component refers to the **license that the software may use for its installation**.
- The fifth component is the **license for redistribution** (none, for private use only, for commercial use too).

- The sixth component refers to the **continuous payment** that is needed for the upgrade and/or update of some objects (zero, or subscription, or free for period of time).

Furthermore, the Standing Committee of the IFLA Acquisition and Collection Development Section March (2001) outlined some contents of digital library management policy:

- **Introduction** (mission statement of the digital library, the purpose of this policy and the audience to whom it is addressed, brief statements community or user group(s), description of the types of programs the library collection serves, the size of the collection, and budget information.
- **General Statements** (current focus, resource types, languages, formats, special sources of funding, maintenance of the collection, and size of the collections).
- **Narrative Statements** (scope of coverage should be described, subject description with library's classification scheme and subject descriptors, library unit or selector responsible for the collection(s), interdisciplinary and consortia relationships, and policies for acquiring access to information).
- **Subject Profiles** (collection assessment arranged by subject, classification scheme, or combination of either.
- **Collection Evaluation Methods** (The techniques and processes used to gather data for collection assessment; Collection-centred techniques examine the content in order to determine the size, age, scope and depth of the collection in comparison to an external standard. Client-centered techniques describe how the collection is used and indicate the effectiveness of the collection relative to use.
- **English language material predominates** (The overall focus is on collecting material in the vernacular of the area).

Examples of Digital Library Management Policy

There are several examples of digital library management policy, but all depends particularly on the mission and vision, as well as goals of the digital library.

The University Library of the Radboud University has developed DLM policy for digital library resources, data files, (consultation) software and digital media (like educational streaming services).

The user has to adhere to the following terms and conditions of use:		
1.	Use of the digital library resources, data files, (consultation) software and media is allowed only within the academic context of research, education and study.	
2.	Commercial use of the digital resources is prohibited.	
3.	The user is not permitted to use the digital resources for an	

	organisation or company outside the RU to which he is associated.	
Furthermore, there are a number of other terms and conditions of use attached to the use of digital library resources, data files, (consultation) software and digital media:		
4	The use of library resources, data files, (consultation) software and digital media is submitted to standard copyright rules.	
5	Printing and downloading individual journal articles and parts of book chapters is only permitted for personal use.	
6	It is prohibited to systematically download, distribute, print or store substantial parts of licensed materials.	
7	Publishing licensed materials through Internet or electronic networks is not permitted.	
	Violations detected by the University Library, or violations of which publishers have informed the library, will be reported to the Computer Emergency Response Team (CERT) of the Radboud University. Access to the digital library from home via the proxy server is automatically closed for 24 hours in case of excessive downloading.	
	The violator of the license conditions faces possible legal or financial consequences.	
	Most licenses are for access to the content no exchange of personal data occurs with the supplier. However it should be pointed out that personal data can possibly be incorporated by suppliers (for instance after activating a personal account). This is not covered via the license and it is the responsibility of the student/staff member themselves.	

Source: **https://www.ru.nl/library/library/about-library/library-regulations/conditions-digital-library/**

On the other hand The York Digital Library Policy has the follow sub-headings:

Metadata Policy (Access to some or all of the metadata is controlled); Digital Library Code and Documentation; Resource Policy; Content Policy; Submission Policy; Rights Policy and Preservation Policy. For details use this web address.

https://www.york.ac.uk/library/collections/yorkdigitallibraryyodl/yorkdigitallibrarypolicy/

3.3 Objectives of Digital Library Management Policy

There are so many purposes and reasons why digital library management policies are created. Hence to qualify being a policy, the statement must emanate from the executive; contain familiar statements; save time by serving as precedents; they must aid in coordination; they must aim at providing stability in the organization; they must be fair in providing a weapon for decision taking without fear or favour; they must serve as guides to thinking and action and thereby facilitate quick and

accurate decisions. Furthermore, they must provide a more refined and flexible approach to recurring problems; they must be able to translate objectives into a workable forms. Policies are expected to speed up decision-making by providing a blanket framework, summarizing past experiences too. They ensure that the planned operations are not deviated unnecessarily while helping to achieve coordination.

According to Ubogu (2013) stipulates that the objectives of a well written digital library policy could be as follows:

- it must be Intentional (it must be created according to an explicit policy);
- Clear (it must be described in manner to allow one to determine the authenticity, integrity, interpretation, scope, format, restrictions on access, ownership of the item);
- Curated (it must be actively managed during its lifecycle);
- Accessible (avoiding unnecessary impediments to use, and accessible to persons with disabilities);
- Respectful (the policy must be conscious of the intellectual property rights of all partners).
- Furthermore, the policy must be Useful (it supplies data that allows standardized measures of usefulness to be recorded).
- Other objectives are being interoperable with other systems, local and international;
- integrated into the user's teaching and research workflows;
- sustainable over time, with the appropriate digital preservation commitment, knowledge, and infrastructure in place.

3.4 Discuss the Typologies digital library management policies today

There are various typologies of digital library management. The American political scientist Lowi (1972) proposed three types of policy namely: distributive, regulatory and constituent.

- **Distributive policies** extend electronic information resources to members of the digital library, as well as distributing the costs of the information infrastructure and resources to the members of the organization.
- **Regulatory policies** limit the discretion of individuals and agencies, or otherwise compel certain types of behaviour. These policies are generally thought to be best applied when good behaviour can be easily defined and bad behaviour can be easily regulated and punished through fines or sanctions.
- **Constituent policies** create executive power entities, or deal with laws.

Policies may further be categorised according to their imposition, for example

- **Originated policies** are formulated by top level management of the digital library, with reference to the objectives of the organization and their achievement; to guide the actions of their subordinates**.**
- **Implied policies** are those evolved by them when a series of decisions are made by managers over a period of time. They normally appear in an unwritten form.
- **Appealed policies** are formulated at the higher managerial level in response to appeals made by lower managerial levels.
- **Externally imposed policies** are those policies which are influenced by the policies of the Government and other public agencies, trade unions, trade associations.

4.0 CONCLUSION

In this unit you must have learnt meaning of having a policy and why a digital library should have its policy. The content of library policy was discussed with specific example on what should constitute the content. Types of policy were discussed and also policies can be categorised according to their impositions. It also specifies the objectives of a well written digital library policy.

5.0 SUMMARY

This unit dealt with formulating library policies which expected to speed up decision-making by providing a blanket framework to ensure that the planned operations are not deviated unnecessarily while helping to achieve that harmonisation. The importance of creating rules, norms, and guides; to ensure the accomplishment of the main goals of the digital library and that the life quality and span of digital libraries are maintained.

It highlighted some types of digital policies.

6.0 TUTOR MARKED ASSIGNMENT

1. What do you understand by the meaning of digital library management policy
2. Discuss the basic content of digital library management policy
3. Explain the objectives of digital library management policy
4. Discuss the Typologies of digital library management policies today

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UNIT 3 INFORMATION SECURITY MANAGEMENT OF DIGITAL INFORMATION SOURCES

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- 3.2 Infrastructure for Information Security Management of Digital Information Sources
- 3.3 Objectives and Principles of Information Security Management of Digital Information Sources
- 3.4 Benefits of Information Security Management of Digital Information Sources

4.0 Conclusion
5.0 Summary
6.0 Tutor marked Assignment
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1.0 INTRODUCTION

There has been an increase globally of digital libraries as well as their resources, facilitated by technological advances. Unfortunately we hear reports of security breaches and information/ identify theft in the online environment threatening to undermine library clients' trust in digital services generally, including digital libraries (Kuzma, 2010). These issues appear in forms of natural disasters, computer/server malfunction, cyber-attacks, and physical theft. The field of information security has in recent years become more relevant and important in the survival of libraries in the digital age. The purpose of this unit is to introduce information security management of digital information sources by throwing light on the meaning of Information Security Management of Digital Information Sources, its history, Infrastructure required, objectives/ principles, and of cause the benefits of Information Security Management of Digital Information Sources.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the meaning of Information Security Management of Digital Information Sources
- Infrastructure for Information Security Management of Digital Information Sources
- Objectives and Principles of Information Security Management of Digital Information Sources
- Benefits of Information Security Management of Digital Information Sources

3.0 MAIN CONTENT

3.1 Understand the meaning of Information Security Management of Digital Information Sources.

Library organizations today create, assemble, and store massive amounts of information for their clients including information resources, subscribed databases, digitized rare resources, usage data, personal information, and more. The increase in organizations' data collection over the past decade, along with the increasing threat of hacks, cyber-attacks and data breaches, has led to significant development of Information Security Management.

Information security which is sometimes referred to as *infosec*, is a set of practices intended to keep data secure from unauthorized access or alterations, both when the data is being stored and when it is being transmitted from one machine or physical location to another (Fruhlinger, 2020). According to Wright and Teravainen (2021), information security is the practice, policies and principles to protect digital data and other kinds of information. Generally, an organization like the digital library applies information security to guard digital information resources as part of its overall cyber security initiative.

In the perspective of its management, Raza (2019) defined information security as a framework of policies and controls that manage security and risks systematically and across the entire library enterprise. An example is the ISO 27001 which is a set of specifications detailing how to create, manage, and implement ISMS policies and controls. Protectable information can appear in the forms of electronic, physical, and idea or knowledge. Information security's primary focus is the balanced protection of the confidentiality, integrity, and availability of data while maintaining a focus on efficient policy implementation, all without hampering the library organization's productivity (Keyser,

2018). Hence, information security management describes the set of policies and procedural controls adopted and implemented by digital libraries to secure their informational assets against threats and vulnerabilities. When these set of InfoSec policies are documented, they are often called Information Security Management System.

3.3 Infrastructure for Information Security Management of Digital Information Sources

Infrastructure for information security management of digital information sources involves fundamental security measures as categorised by Fruhlinger (2020). They are: Technical measures-which include the hardware and software that protects data and other components; Organizational measures- which include the creation of an internal unit dedicated to information security and assigning duties; Human measures which include providing awareness training for users on proper infosec practice; and Physical measures which connotes controlling access to the office locations like datacentres.

In a detailed discussion, Anday, Francese, Huurdeman, Yilmaz, Zengenene (2012) listed infrastructure for information security management as:

Library computers/ hardware as an infrastructure for information security, and opined that they are physically vulnerable to theft, damage and destruction, and vulnerable to attacks by a host of malware agents like hackers, viruses, worms, and Trojan horses. **Hardware security** is the security of equipment like computers, printers, monitors etc. which libraries find indispensable in their daily functions especially as seen in the digital era.

Network security. Part of the core competencies of libraries today is the availability of security, efficiency and cost effectiveness of access to Network. Network equipment like hubs, routers switches and cabling are necessary and fundamental infrastructure for information security. Networks can be through LAN cables or wireless. Wireless networks help students to interact with the digital library systems on the net (Khalil, 2004).

The **operating system** is the fundamental system on which application programmes run also needs to be security insured. The system is expected to be secured by aborting needless functions, restricting access and tracking changes and processes.

Database security is very critical as it hosts the main brain of metadata, and other administrative information. Database security can be

maintained discretely by having tracking features that can track when the database was accessed by whom and what changes took place. For instance; it must be possible to trace who added an article to the collection and when. In addition, data transmission should also be secured using protocols such as Secure Socket Later (SSL) or Secure Shell (SSH).

Web application is another important infrastructure for critical information security. These vulnerabilities appear in three main types: Cross scripting (allows the injection of programming code by malicious third parties into web pages); Denial of Service (prevents access to network resources) and SQL (commands are injected into data-plane input in order to affect the execution of predefined SQL statements injection). Causes of these types of vulnerabilities can affect updating and upgrading of the application or software.

Bhaskar and Kapoor (2014) discussed eight steps for establishing proper infrastructure for information security management of digital information sources. They are:

Categorize- In this step, information systems and internal information should be categorized based on impact;

Select- select an initial set of security controls for the information system and apply tailoring guidance as appropriate;

Supplement- Supplement the initial set of security controls with risk assessments, including the security requirements, threat information, and cost/benefit analyses;

Documenting- set of security controls and the supplements should be documented;

Implement- the identified security controls should be implemented in the organization's information systems;

Assess- this involves accessing the security control to determine whether the controls are implemented correctly, operating as intended, and if they are producing the desired outcome with respect to meeting the security requirements for the system.

Authorize- authorizing the information systems after determining the risk to organizational operations, organizational assets, or individuals resulting from their operation;

Monitor- monitor and assess selected security controls in the information system on a continuous basis.

3.4 Objectives and Principles of Information Security Management of Digital Information Sources

Objectives of information security are centred on the triad of Confidentiality, Integrity and Availability. InfoSec controls are put in place to ensure the confidentiality, integrity and availability of protected information.

Confidentiality: This is principle means of ensuring that only authorized persons can have access or modify the data. According to Fruhlinger (2020), data is confidential when only those people who are authorized to access it can do so. Hence, to ensure confidentiality, digital libraries should be able to identify whoever is trying to access their data and block attempts by those without authorization. In this case, passwords, encryption, authentication, and defence against penetration attacks are all techniques designed to ensure confidentiality.

Integrity: Integrity is the principle that information is consistent, accurate and trustworthy. In IT security, data integrity means maintaining and assuring the accuracy and completeness of data over its entire lifecycle (Boritz, 2005); which means that data cannot be modified in an unauthorized or undetected manner. According to Fruhlinger (2020), integrity means maintaining data in its correct state and preventing it from being improperly modified, either by accident or maliciously. Many of the techniques that ensure confidentiality will also protect data integrity. In a broader concept, integrity is an information security principle that involves human/social, process, and commercial integrity, as well as data integrity. Hence it deals on information security for data credibility, consistency, truthfulness, completeness, accuracy, timeliness, and assurance.

Availability: Information security management deals with data availability by implementing processes and procedures that ensure important information is available to authorized users when needed. Availability is the principle that information is easily accessible by those with proper authorization and will remain so in case of failure to minimize interruptions to users. This entails that for library information system to serve its purpose, the information must remain available whenever needed, computing systems must remain functional, as well as communication channels (Fruhlinger, 2020). However, these three basic principles do not exist in isolation, but they inform and affect one another. Therefore, any ideal information security system will involve a balance of all three factors

3.5 Benefits of Information Security Management of Digital Information Sources

Every organization including digital libraries needs protection against cyber-attacks and security threats. The services of a trustworthy information security provider will militate against digital risks and keep systems running without collapse or disruption. According to Raza (2019), so many benefits ensue from having a functional information security system. It helps libraries to:

Plan (identifies problems and collects useful information to evaluate security risk; defines the policies and processes to address its root causes; develops methods to establish continuous improvement in its capabilities).

Do (implements the devised security policies and procedures with respect to ISO standards and available resources in the library).

Check (it monitors the effectiveness of ISMS policies and controls by evaluating tangible outcomes and behavioural aspects).

Act (it focuses on continuous improvement by documenting results, sharing knowledge, and using feedback loops).

Anday, Francese, Huurdeman, Yilmaz, Zengenene (2012) stated that since digital libraries will also inevitably become the target of malicious attack by people seeking unauthorized information, and by terrorists seeking to disrupt the global information infrastructure and the physical infrastructures built upon it, it is both timely and essential to adopt and invest in information security to save our digital libraries. A secured system with corrupted data is useless; in the same way, the data storage within a frail infrastructure is weak and exposed to danger; hence system security and data protection go hand in hand. Information security management are important because enormous amounts of digital information will get lost if not implemented.

4.0 CONCLUSION

In this unit you must have learnt the meaning of Information Security Management of Digital Information Sources in all aspect. You have to be conversant with the History of Information Security Management of Digital Information Sources. You also have to know the Infrastructures needed for Information Security Management of Digital Information Sources. You should be able to enumerate the objectives, benefit and principles of Information Security Management of Digital Information Sources.

5.0 SUMMARY

In this unit information security management of digital information sources was introduced. The meaning of Information Security Management of Digital Information Sources was dealt with to create awareness to future librarians on areas in which this can occur in digital libraries. Brief history, Infrastructure required, objectives/ principles, and of course the benefits of Information Security Management of Digital Information Sources were also treated in the section.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain the meaning of Information Security Management of Digital Information Sources in all aspect.
2. What are the Infrastructure needed for Information Security Management of Digital Information Sources
3. Enumerate the objectives and principles of Information Security Management of Digital Information Sources
4. Discuss the benefits of Information Security Management of Digital Information Sources

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UNIT 4 PRESERVATION OF DIGITAL INFORMATION

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    3.2 Strategies for Preservation of Digital Information.
    3.3 Best Practices for Preservation of Digital Information.
    3.4 Importance of Preservation of Digital Information
    3.5 Challenges of Preservation of Digital Information
4.0 Conclusion
5.0 Summary
6.0 Tutor marked Assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

The digital information which is of high importance can be lost, if not properly preserved. Digital resources can be texts, images, databases, programs, applications, desktop files, email, movies, music, web domains, as well as social media. Hence there is no digital object or system that is not provisionally within scope for digital preservation. Therefore there is need for continuity of digital heritage materials for as long as they are needed through digital preservation.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the Concept of Preservation of Digital Information
- Know the Strategies for Preservation of Digital Information
- Ascertain the Best Practices for Preservation of Digital Information
- Understand the Importance of Preservation of Digital Information
- Understand the Challenges of Preservation of Digital Information

3.0 MAIN CONTENT

3.1 Concept of Preservation of Digital Information

Digital preservation as defined by UNESCO (2021) consists of the processes aimed at ensuring the continued accessibility of digital materials. They are all those processes aimed at ensuring the continuity of digital heritage materials for as long as they are needed. To New World Encyclopedia (nd), digital preservation of information is a set of

processes and activities that sustain and maintain information stored in digital formats to ensure continued access to the information; it includes the preservation of materials resulting from Digital Reformatting, data migration, emulation, replication, refreshing, and metadata attachment.
From Xie and Matusiak (2016) in their viewpoint, digital preservation represents an evolving area of digital library research. It focuses on the policies, technologies, and strategies to ensure that digital library objects and collections are available and usable now and in the future. All resources in the digital format are fragile and susceptible to information loss. Therefore, multiple risks stem from the unstable nature of digital formats, degradation of storage media, and technological obsolescence. The preservation of digital information is widely considered to require more constant, proactive, and ongoing attention than preservation of other media (McLeod, Wheatley, and Ayris, 2006). Indeed, while we still focus on, and can still read our written heritage from thousands of years ago, digital information created merely a decade ago is in serious danger of being lost. The preservation of valuable information is an important obligation that libraries must bear for the sake of future generations.

Digital preservation is a complex, technical, social, economic, and organizational issue because it stems from the fact that it is interwoven into the process of creating, using, and maintaining a wide array of digital materials and collections (Xie & Matusiak, 2016). The sustainability of digital content depends on the careful management of preservation risks, organizational policies, institutional commitment, and technical infrastructure (Corrado & Moulaison, in Xie & Matusiak, 2016). Bodleian Libraries (2021) described it as the formal activity of ensuring access to digital information for as long as necessary. It requires polices, planning, resource allocation (funds, time, people) and appropriate technologies and actions to ensure accessibility, accurate rendering and authenticity of digital objects.

Digital preservation involves not only an active and continuous management of digital content but also monitoring of the evolving technological environment and preservation methods. The field of digital preservation is still evolving especially in developing countries, but little or no significant progress are being made in building technological infrastructure and in developing policies, recommendations, and standards for it to thrive successfully.

3.2 Strategies for Preservation of Digital Information

Digital preservation strategies according to Mathew Igberaese, and Sambo (2014) include: Controlling the material sufficiently to achieve long term preservation; Ensuring that the material remains

understandable to the expected users; Making the preserved material available to the designated community of users as appropriate; Advocating good practice in the creation of digital resources; Negotiating for and accepting appropriate digital materials from producers; Ensuring that the material is protected against all likely threats, and making it accessible. While Gbaje (2012) opined that Online Computer Library Centre developed a four-point strategy in 2006 for the long-term preservation of digital objects. Inclusive are: Determining the appropriate metadata needed for each object type and how it is associated with the objects; Providing access to its contents; Assessing the risks for loss of content posed by technology variables; Evaluating the digital content objects to determine what type and degree of format conversion or other preservation actions should be applied.

UNESCO (2021) listed strategies involved in preservation of digital information resources. The strategies include:

- Working with producers (creators and distributors) to apply standards that will prolong the effective life of the available means of access to the resources;
- Recognising that it is not practical to try to preserve everything and highlighting the need for selection;
- Placing the material in a safe place;
- Controlling material, using structured metadata to facilitate access and preservation; Protecting the integrity and identity of data;
- Choosing appropriate means of providing access in the face of technological change, and managing preservation programmes to timely and proactively achieve their goals.

Igberaese, and Sambo, (2014) stated that digital preservation can take place by copying, refreshing, or migration, transferring from less stable magnetic and optical media by printing on paper or microfilm, and preservation in simple digital formats in order to minimize the requirements for sophisticated retrieval software. They further listed preservation strategies that can be adopted by libraries and information centres for digital information as thus:

Technology Preservation is ensuring ongoing access to digital objects by keeping the old technology used to create and access the digital information in their original form and environment;

Technology Emulation is creating new software that mimics the operations of older software and hardware in order to reproduce its performance.

Metadata Management: is for tracking lineage of digital objects, and for future location and access;

Printing/Output to Paper is printing of digital materials and preserving the paper copy. **Digital Archaeology** denotes procedure to rescue content from damaged media or from obsolete or damaged hardware and software environments, that is, the recovery of digital materials at risk.

Migration: (covers a wide range of activities to intermittently copy, convert, and transfer original information from one generation of technology to subsequent ones.

In 2006, the Online Computer Library Center developed a 4-point strategy for the long-term preservation of digital objects that consisted of: Assessing the risks for loss of content posed by technology variables; Evaluating the digital content objects to determine what type and degree of conversion of format to be applied; Determining the appropriate metadata needed and its connection with objects; as well as providing access to the content (Online Computer Library Center, 2006).

Further strategies libraries can use to actively combat the loss of digital information according to Online Computer Library Center (2006), are:
Refreshing i.e. the transfer of the same data between two different types of the same storage medium so there are no alteration of data;

Migration is the transferring of data to newer system environments or new format; **Replication** means duplicating copies of data on one or more systems because data existing on a single copy in only one location is highly vulnerable to software or hardware failure, intentional or accidental alteration, and environmental catastrophes like fire, flooding, etc.

Emulation is replicating the functionality of an obsolete system. This is a popular strategy for retaining the functionality of applications, operating systems, or hardware platforms.

Metadata attachment is data on a digital file that includes information on creation, access rights, restrictions, preservation history, and rights management attached to digital files so as not to be affected by file format obsolescence.

Trustworthy digital objects are digital objects that can speak to their own authenticity. Enable digital objects can be used to maintain a record of their change history so future users can know with certainty that the contents of the object are authentic (Gladney, 2004).

3.3 Best Practices for Preservation of Digital Information

Despite the fact that preservation strategies vary among materials and between institutions, adhering to nationally and internationally recognized standards and practices is an important part of digital preservation activities.

Best practices in digital preservation continue to evolve particularly on activities on the information content before or at the point of upload into the institutional repository; as well as on the process of digitization itself. The Library of Congress has been maintaining a repository of shared tools since no one library can afford to develop all needed tools for accessing digital information resources. This role is today called the Community Owned Digital Preservation Tool Registry and covers tools as seen below:

Audio Preservation

There are various best practices and guidelines for audio preservation.

- Guidelines on the Production and Preservation of Digital Audio Objects IASA-TC 04 (2009) (International Association of Sound and Audiovisual Archives, 2009) which sets out the international standards for optimal audio signal extraction from a variety of audio source materials from analogue to digital conversion and for audio preservation.
- Capturing Analog Sound for Digital Preservation: Report of a Roundtable Discussion of Best Practices for Transferring Analog Discs and Tapes (2006) (Council on Library; Information Resources, 2006) defined procedures for reformatting sound from analogue to digital and provided recommendations for best practices for digital preservation.
- Digital Audio Best Practices (2006) (Digital Audio Working Group Collaborative Digitization Program, 2006) which covers best practices and provides guidance both on digitizing existing analogue content and on creating new digital audio resources.
- Sound Directions: Best Practices for Audio Preservation (2007) published by the Sound Directions Project, (Casey & Gordon, 2007) which describes the audio preservation workflows and recommended best practices and has been used as the basis for other projects and initiatives.
- Documents developed by the International Association of Sound and Audiovisual Archives (IASA), the European Broadcasting Union (EBU), the Library of Congress, and the Digital Library Federation (DLF).

Moving Image Preservation

Moving Images denotes analog film and video and their born-digital forms: digital video, digital motion picture materials, and digital cinema. The complexity of digital video as well as the varying needs and capabilities of an archival institution are reasons why no single best practice fits all. The following resources offer information on analog to digital reformatting and preserving born-digital audio-visual content.

- The Library of Congress tracks the sustainability of digital formats, including moving images (LOC, 2019)
- The Digital Dilemma 2: Perspectives from Independent Filmmakers, Documentarians and Non-profit Audiovisual Archives (2012) (Digital Dilemma, 2012). The section on non-profit archives reviews common practices on digital reformatting, metadata, and storage. There are four case studies.
- Federal Agencies Digitization Guidelines Initiative (FADGI). Started in 2007, this is a collaborative effort by federal agencies to define common guidelines, methods, and practices for digitizing historical content on still image and audio visual
- The Association of Moving Image Archivists (AMIA) equally sponsors conferences, symposia, and events on all aspects of moving image preservation, including digital. Video Preservation for the Millennia (2012), published in the AMIA Tech Review, details the various strategies and ideas behind the current state of video preservation (Tadic, 2012).

Email Preservation

Email poses exceptional challenges for preservation because their clients vary widely, hence no common structure for email messages. They can carry viruses or have spam content; unfortunately there is no formal standard for the long-term preservation of email messages.

Preserving emails may vary according to the purpose for which it is being preserved. For businesses and government purposes, email preservation may be driven by the need to meet retention and supervision requirements for regulatory compliance and to allow for legal discovery. Research libraries and archives preserve mails as born-digital or hybrid archival collections for cultural and historical record (Prom, 2011).

Personal Archiving

Consumers, clients, and artists personally engage in other activities to help care for their collections at home.

- "Resource Center: Caring For Your Treasures" developed by American Institute for Conservation of Historic and Artistic Works (2013) details simple strategies for artists and consumers to care for and preserve their work themselves.

- The Library of Congress also hosts a list for the self-preserver which includes direction toward programs and guidelines from other institutions that will help the user preserve social media, email, and formatting general guidelines (such as caring for CDs). Among the programs listed include: HTTrack: software tool that help users download a World Wide Web site from the Internet to a local directory, building recursively all directories, getting HTML, images, and other files from the server to their computer.

Lakshminarasimhappa and Veena (2014) opined that in as much as it is impossible to define all the requirements applicable for all digital preservation needs, because of its dependence on type, size, amount of data, and goals of each organization regarding the recycle of data; there are still common requirements that can be helpful:

- Digital Preservation requires that a copy (or preservation) of any preserved digital object unknown, but may be as long as decades or even centuries for reliability purpose to avoid any data losses.
- A future client should be able to decide if the accessed information is sufficiently trustworthy. The provenance of digital objects should be required, especially its creator or entity responsible; same as assurance of the integrity and originality of the digital objects.
- Digital Preservation requires that future consumers are able to obtain the preserved information as its creators intended, dealing with obsolescence threats.
- Dynamic collection and environments for digital preservation require technical skills to face the technology evolution allowing the addition of new components through incremental updates.

3.4 Understand the Importance of Preservation of Digital Information

The importance of preserving digital information in libraries can never be over emphasized. As discussed by Conway (1994);

- **Resource Allocation:** The main essence of preservation management is resource allocation. The originality of rare digital resources needs to be protected and multiplied if possible, so that more people can have access to them. People, money and materials must be acquired, organized and put to work to prevent deterioration or renew the usability of selected groups of materials.

- **Multipurpose Use:** Things are preserved so that they can be used for all kinds of purposes, scholarly and otherwise. The creator or

originator may not be able to dictate what his or her digital creation will be used for, as users' needs are indeterminable.

- **Protect Originals:** The most common application of digital technologies in an archive or library is to create digital copies of sufficient quality that they can be used for ready reference. Hence, preservation goals are met because the original documents can be protected by limiting access to them.

- **Represent Originals:** A digital system could be built that represents the information content of the original sources in such detail that the system can be used to fulfil most, if not all, of the research and learning potential of the original documents.

- **Transcend Originals:** Digital imaging promises to generate a product that can be used for purposes that are impossible to achieve with the original sources. This category includes imaging that uses special lighting to draw out details obscured by aging, use, and environmental damage.

Ultimately, the purpose of the digital image product is driven by the uses to which it will be put, while preservation of original source documents should be determined by the preservation needs of the original sources.

More knowledge on the importance of preserving digital information can be seen from the video below by Digital Preservation Coalition (2021) at
https://www.youtube.com/watch?v=qEmmeFFafUs&index=43&list=PLEA69BE43AA9F7E68

3.5 Understand the Challenges of Preservation of Digital Information

The uniqueness of digital forms makes it easy to create content and keep it up-to-date, but at the same time it raises many difficulties in the preservation of this content. Margaret Hedstrom points out that "digital preservation raises challenges of a fundamentally different nature which are added to the problems of preserving traditional format materials (Hedstrom, 1997).

Physical Deterioration: According to Hedstrom, the media on which digital contents stand are more vulnerable to deterioration and catastrophic loss. Though deterioration is less evidence as most digital works are electronic, it happens over decades especially on the storage device. The recording media for digital data deteriorate at a much more

rapid pace, and once the deterioration starts, in most cases there is already data loss.

Digital Obsolescence: this is another challenge when it comes to long-term access. Digital technology is developing extremely fast, and one retrieval and playback technology can become obsolete in a matter of years. When faster, more capable and cheaper storage and processing devices are developed, the older version gets replaced almost immediately. Hence the software and hardware are abandoned and no longer in production, with records likely to get damaged simply because they are not in use anymore.

Difficulty in Maintaining Authenticity: In many cases of emergent technological advances there are substantial difficulties in maintaining the authenticity and integrity of objects over time. Digital tools these days enable digital editing on the resource content, hence verifying the authenticity of the work is a challenge as they can be manipulated and tampered with.

Software Adaption and Copyright Issues: For the preservation of software as digital content, a specific challenge is the typically non-availability of the source code as the commercial software which is being preserved is normally distributed in compiled binary form; hence it is difficult to adapt or emulated. Also copyrights attached to the preserved work affects how it is supposed to be used

Economic Challenges: The economic challenges of digital preservation are also enormous. Preservation programs for digital information require significant upfront investment to create, along with on-going costs for data ingest, data management, data storage, and staffing. And these are not very easy to come by.

4.0 CONCLUSION

In this unit you have learnt meaning Concept of Preservation of Digital Information. You have to be conversant with Strategies for Preservation of Digital Information. You also have to know the Best Practices for Preservation of Digital Information. You should be able to enumerate the Importance of Preservation of Digital Information and the Challenges of Preservation of Digital Information.

5.0 SUMMARY

In this unit information security management of digital information sources was introduced. The meaning of Information Security Management of Digital Information Sources was dealt with to create

awareness to will be librarians on areas in which this can occur in digital libraries. Brief history of Infrastructure required, objectives/ principles, and of course the benefits of Information Security Management of Digital Information Sources were also treated in the section.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain the Concept of Preservation of Digital Information.
2. What are the Strategies for Preservation of Digital Information.
3. What are the Best Practices for Preservation of Digital Information.
4. Discuss the Importance of Preservation of Digital Information.
5. Enumerate the Challenges of Preservation of Digital Information.

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MODULES 5 PROBLEMS OF DIGITAL LIBRARY MANAGEMENT

Unit 1 Challenges of Digital Library Management in Nigeria
Unit 2 Copyright and Management of Digital Libraries
Unit 3 Human Resources and Financial Management of Digital Libraries
Unit 4 Information Retrieval and Strategies for Digital Library

UNIT 1 CHALLENGES OF DIGITAL LIBRARY MANAGEMENT IN NIGERIA

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcome (ILO)
3.0 Main content
  3.1 Technological challenges
  3.2 Administrative challenges
  3.3 Skill challenges
4.0 Conclusion
5.0 Summary
6.0 Tutor marked assignment
7.0 References/ Further Reading

1.0 INTRODUCTION

New tools of information technology have absolutely changed the role and responsibilities of librarians. This has resulted to a lot of challenges delaying the progress of digital library development in Nigeria. The variety and complexity of digital library initiatives implies the existence of a wide range of challenges and barriers to its implementation and management.

2.0 INTENDED LEARNING OUTCOME (ILO)

By the end of this unit, you should be able to explain:

- The technological challenges
- Administrative Challenges
- Skill challenges in digital library management

3.0 MAIN CONTENT

3.1 Technological Challenges

ICT Infrastructure

The key challenge for the digital library development in Africa remains lack of infrastructure such as hardware, software, and standard bandwidth Technological obsolescence of hardware and soft, may pose problems of access to information in digital form. Building and sustaining a digital library requires the proper technological infrastructure. This infrastructure includes telecommunication, servers, application platforms and software applications. For the development of a digital library, telecommunication infrastructure is a major factor that is needed for Information and Communication Technology (ICT) (Gbaje, 2007).

The lack of a national fiber network backbone infrastructure is a major issue in a successful implementation of the digital Library. VSATs technology is required for Bandwidth and connectivity for higher education institutions and for Internet service. This technology is expensive which reduces the number of higher education institutions that can benefit from use of digital Library. High internet connectivity remains a strong reason for poor effectiveness when it comes to the proper efficiency of the digital library. There is a challenge of strong signal and connectivity to access online information and other service delivery. Slow connectivity can be time consuming (Igboechesi, 2019).

Also is the issue of the unavailability of material resources like sufficient computers, high grade and durable servers, availability of conducive work environment, other computer output accessories like scanners, printers, uninterrupted power supply (UPS) etc. Another major constraint to digital libraries development in Nigeria is the absence of steady power supply. A web/proxy server needs to be up and running 24/7 and this is almost impossible with the erratic power supply (Gbaje, 2007).

3.2 Administrative Challenges

Bureaucracy

The innovation of digital library in some institutions is as a result of its relevance and a pressing need that should be resolved. But the interference of some individuals always results in non-implementation of the idea (Igboechesi, 2019). General lack of political goodwill also hinders the functioning of Digital library (Ongus, Kemparaju, Nyamboga, & Veerabasavaiah, 2007).

Meritocracy and Mediocrity
The use of staff that lack the expertise and basic skills needed to develop the digital library to head sections of the library are a great challenge to the development of digital library in Nigeria (Igboechesi, 2019). Untrained library staff, reluctant management, uninformed users are challenges also facing digital library management (Ongus et al. 2007).

Instability in IT Policy
Unstable nature of the National Information Technology Policy is a major obstacle to the success of digital libraries in Nigeria. The National Information Technology Development Agency (NITDA) has the responsibility of implementing the National Information Technology Policy, but much has not been achieved regarding the IT policy. This has an adverse effect to all digital library initiatives in Nigeria (Sadiku, 2015).

Lack of Qualified Personnel and Training
The unavailability of human capacities that have technical skills for installation, maintenance, designing and implementation of ICT infrastructure is a problem for digital library development (Sadiku, 2015). Also, lack of provision for staff training and development, limited and tighter budget hinders digital library management (Ongus et al., 2018).

Right Technologies
The inability of stakeholders to critically assess which kind of technology is appropriate for the intended use. Many foreign manufacturers flood the African market with all sorts of digital product, using incentives to persuade government officials and managers of business as well as academic organizations to adopt their software and hardware. Many of these managers do not know that each IT products or brands exist for a given purpose (Sadiku, 2015).

Copyright: Most university library in Nigeria has the copyright of local content and that is the one they can easily digitalize. They do not own the copyright of the material of most of the core books they hold. So libraries will never be able to freely digitize and provide access to the copyrighted material in their collection. They have to develop a mechanism for managing copyright (Kiran & Najuru, 2004).

Preservation: Another important thing crucial in managing a digital library in Nigeria is the issue of preservation. In the preservation of digital material, the real issue is technical obsolescence. Preservation of the storage medium, tapes, hard drives; floppy discs, even CD-ROM have a short life span when considered in terms of obsolescence. These

may lead to loss of crucial information they contain (Kiran & Najuru, 2004).

Building digital collections is one of the most important issues in creating a digital library. One of the major issues is the degree to which libraries will digitize existing material and acquire original digital works is a big task for some libraries (kiran & Naguru 2004 and Mishra, 2016).

3.3 Skills Challenges

Digital librarians in Nigerian Universities cannot with assurance handle digital libraries, online reference, IRs and other digital library services without adequate ICT skills (Ojedokun& Okafor, 2015).

Web Application skills
The developing, installing and configuring web applications in a network environment requires an understanding of how the chosen network operating system works at different levels. Unfortunately, Nigeria has an acute shortage of digital/systems librarians and experienced web technology staff in libraries to install and manage technology networks.Web technology skills is needed to maintain web servers that host locally digitized materials and other digital resources hosted remotely as well as maintaining proxy access to restricted resources(Gbaje, 2007).

Also according to Ojedokun and Okafor (2015), some librarians lack database management skills and are not proficient in Web design or familiar with Web design applications. Such skills include the ability to use data effectively to improve programs; knowing how to use database software to find records, sort, print and other functions developing clear channels of communication; knowing how to install files, import and export data, maintain backup files and make copies of files; creating new folders; knowing how to email files and so on.

Digital Divide
This is one of the major challenges militating against the steady development of digital libraries in Nigeria. Computer literacy is required for people to be able to take advantage of digital library applications. The digital divide refers to the gap between those who can effectively benefit from information and communication technologies (ICTs) and those who cannot.

Digital divide can be categorized into two;

i. Technical digital divide refers to availability of the infrastructure, the hardware and the software of ICTs, and

ii. Social digital divide refers to the skills required to manipulate technical resources. Unfortunately, Nigeria as a developing country is deficient in these aspects. (Sadiku, 2015).

Expertise Challenge

Most librarians lack expertise in the aspect of digitization and technology that are required in the digital library (Igboechesi, 2019). They also lack motivation, technological know-how, inability of library staff to revolutionize and apprehension of technology (Oyedokun, Oyewumi, Akanbi & Laaro, 2018).

Library information science professionals were observed to lack competency in ICT skills and inadequate web search skills as a result of underutilization of information resource in Nigeria (Aschroft & Watts, 2005; Adomi & Anie, 2006; Ademodi & Adepoju, 2009; Adebayo & Adekunjo, 2013). Some library professionals lacked knowledge of search engines and directories, other than Google and Yahoo. And they have no idea how to evaluate and catalogue e-resources (Ojedokun& Okafor, 2015).

4.0 CONCLUSION

The emergence of digital libraries and the new technologies have changed the roles and responsibilities of librarians which have resulted to a lot of challenges. These challenges are categorized into technological, administrative and skill challenges. Resolving these challenges will help in ease of managing the digital library in Nigeria

5.0 SUMMARY

Building and sustaining a digital library requires the proper technological infrastructure. This infrastructure includes telecommunication, servers, application platforms and software applications. VSATs technology is required for Bandwidth and connectivity for higher education institutions and for Internet service. Also required are steady power supply, high grade and durable servers and availability of work environment that is conducive.

Another problem is the unavailability of human capacities that have technical skills for installation, maintenance, designing and implementation of ICT infrastructure. Also, the inability of stakeholders to critically assess which kind of technology is appropriate for the intended use is a huge challenge in managing digital libraries. Most Nigerian Universities do not own the copyright of the material of most of the core books they hold.

Web technology skills is needed to maintain web servers that host locally digitized materials and other digital resources hosted remotely as well as maintaining proxy access to restricted resources. Some librarians lack database management skills and are not proficient in Web design or familiar with Web design applications. Digital divide is one of the major challenges militating against the steady development of digital libraries in Nigeria. Computer literacy is required for people to be able to take advantage of digital library applications.

6.0 TUTOR MARKED ASSESSMENT

1. Explain five technological challenges in the management of digital library in Nigeria?
2. Discuss five important administrative challenges in the management of digital library in Nigeria?
3. Enumerate ICT skills require for a digital librarian to function well.

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UNIT 2 COPYRIGHT AND MANAGEMENT OF DIGITAL LIBRARIES

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1.0 INTRODUCTION

A copyright is a law that allows the creator of a document, musical composition, book, artistic works etc, the advantage to choose what individuals can do with it. Copyright conceptualization is to protect the producers or authors of works written on a fixed, tangible layout. Copyrightable works include; Original literary works, musical works, dramatic works, and so on. The purpose of the copyright system is to encourage talented persons to produce creative works and provide incentives for the dissemination of those works. With the advent of digital technology many issues accompanied it with regards to the use of copyright materials. Although copyright owners lobbied for stringent measures, it also had issues regarding content access. Finally, librarians have a role to play in safeguarding the copyrighted materials and educating the library users on how to make use of copyright materials in other not to violate the law**.**

2.0 INTENDED LEARNING OUTCOME (ILO)

By the end of this unit, you should be able to explain;

- Concept and meaning of Copyright
  Works that are protected by copyright law
- International Copyright Laws
- Nigeria Copyright Law
- Issue of Copyright and the Digital Environment
- Measures taken to protect Copyright in the Digital Environment
- The role of Librarian in protecting Copyright

3.0 MAIN CONTENT

3.1 Concept and definition of Copyright

Concept of Copyright

The concept behind copyright is that creators of literary works (authors, composers, artists) as well as those concerned with the circulation and transfer of knowledge such as publishers, broadcasters, producers of phonograms and films have rights of ownership in their works, and further, that those rights should be legally protected in order to prevent unlawful reproduction of their works (Sahoo & Rao, 2003). The concept of copyright originated from the fact that creators of intellectual property deserve to benefit from their efforts in an economic way. Copyright emanated from intellectual property right, which also includes patents, trade mark and industrial design laws (Afegbua, 2017). If the early law of copyright was predominantly concerned with piracy caused by printing press, modern copyright law is predominantly concerned with the ease with which copyright works can be replicated in the digital medium (Sahoo & Rao, 2003).

Definition of Copyright

According to World Intellectual Property Organization (WIPO), copyright is defined as a legal term describing rights given to creators for their literary and artistic works (https://www.wipo.int/about-ip/en/). Copyright can also be defined as the rights of owners of works of a literary, drama, music, art or cinematography to protect their expressions (Clarke 1999 cited by Moahi, 2008).

A copyright is a law that allows the creator of a document, musical composition, book, artistic works etc, the advantage to choose what individuals can do with it . This means that such created work can only be used if the owner of such work gives the permission (Fabunmi, 2007). Copyright can also be defined as a legal framework that gives the creator of a work of art or literature, or a work that relates information or ideas, the authority on how the work is used and for what purpose, this is to encourage inventiveness and innovation among authors by making certain that other writers do not duplicate others' works without permission (Fishman,2008 cited in Nneji, 2018).

3.2 Works that are protected by copyright law and the copyright laws Works that are protected by copyright law

Copyright conceptualization is to protect the producers or authors of works written on a fixed, tangible layout (Moahi, 2008). Copyrightable works include the following categories:

1. Original literary works (novels, stories, poetical works, plays, broadcasting scripts, textbooks, treatises, articles, reports, addresses, law reports, computer programs etc
2. Musical works, including any accompanying works composed for musical accomplishment
3. Dramatic works, including any accompanying music
4. Pantomimes and choreographic works
5. Pictorial, graphic, and sculptural works (paintings, drawings, engravings, maps, photographs, diagram etc)
6. Motion pictures and other audiovisual works
7. Sound recordings
8. Architectural works (Onoyeyan & Awe, 2018**;** Sahoo & Rao, 2003).

The purpose of the copyright system is to

(i) encourage talented persons to produce creative works, and

(ii) provide incentives for the dissemination of those works (Sahoo & Rao, 2003).

International Copyright Laws

- The Berne Convention (1886) for the protection of literary and artistic works. It assists the nationals of its member states with international protection for author's works such as novels, poems and plays, songs and musicals, paintings, sculpture and architectural works (Sinha & Bhardwaj, 2010)
- The Universal Copyright Convention (UCC) (1952). Each contracting state undertakes to provide for the adequate, effective protection of the rights of authors and other copyright proprietors in literary, scientific and artistic works including writings, musical, dramatic and cinematographic works, paintings, engravings and sculpture (Sinha & Bhardwaj, 2010).
- The Rome Convention (1961) for the protection of performers, producers of phonograms and Broadcasting Organisations (Sinha & Bhardwaj, 2010).
- The Geneva Convention (1971) for the Protection of Producers of phonograms against unauthorised duplication of their phonograms (Sinha & Bhardwaj, 2010).
- Trade Related Aspects of Intellectual Property Agreements (TRIPS) was under World Trade Organisation (1995). TRIPS on the whole joined intellectual property right with trade partnership and State who wants to benefit from it must be a member of WTO. TRIP protected computer software and databases (Moahi, 2008).

World Intellectual Property Organization (WIPO) Treaty

This was established to carry out the administrative work of Berne Convention. Two treaties of WIPO extended copyright to digital materials:

- WIPO copyright treaty and
- The Convention for the Protection of Producers of Phonograms (Moahi, 2008).

Nigeria Copyright Law

Nigeria Copyright law was governed by the English Copyright Act 1911 which was made applicable to Nigeria by virtue of an order-in-council under Section 25 of the Act of 1911 of Great Britain. Nigeria applied the 1911 Act until 1970, when it was replaced with the Copyright Act of 1970. Also in 1988 another Act enacted. In 1992 vide the Copyright Amendment Decree No. 98 of 1992, the Act was amended. The primary legislation now is the Nigerian Copyright Act Cap. C.28, Laws of the Federation of Nigeria 2004, initially passed in 1988, amended in 1992 and 1999 and recoded in 2004 (UNESCO World Anti-Piracy Observatory 2009 as cited in Onoyeyan & Awe, 2018). Nigeria is also signatory to a number of international conventions. Nigeria ratified the Berne Convention in September 14, 1993 and became a member of the Universal Copyright Convention on February 14, 1962. In October 29, 1993, Nigeria also signed the Rome Convention, and ratified the WIPO Copyright Treaty and WIPO Performers and Phonograms Treaty in 1996 (Onoyeyan & Awe, 2018).

3.3 Issue of Copyright and the Digital Environment

The content and information are been accessed and used has been changed since the invention of the digital environment. Information is progressively created in digital form. Digital information can be replicated at a low cost, at a speed of light and altered in a way that it will not be noticed. To keep track of and control usage of digital materials is very difficult. This is as a result of the way digital information is disseminated around the world through the use of e-mail, websites and other social media. The use of storage media by library users to download, store, display and print digital materials makes it easy for them to alter and send them to others without the knowledge of the copyright owner and the library (Eddy-Ugorji, 2020).

Availability of information in a digital form is unappealing for both authors and distributors. There is now a conflict between users who enjoy the culture of sharing any information that appeals them and owners of the works who advocate a culture of copyright and privation of information (Story et al, 2006 as cited in Moahi, 2008). As the use of digital technology is becoming widespread, it is necessary that the

copyright law in Nigeria be upgraded in other not to pose a barrier to access information for education purposes. The issue of digital technology in the way it transforms and the manner of production, dissemination and storage of data can simply be duplicated. As such copyrighted materials in digital form can easily be duplicated (Chuma-Okoro, 2018).

The issue of copyright can limit access to digital resources that are placed under protection and consent to access the resources cannot be easily acquired. These barriers may tend to affect the numerous activities of users such as copying, reproducing the work in formats that are suitable for the potential users, and sharing or using the work to create new materials (Chuma-Okoro, 2018). The major issue in electronic publishing is that copyright law does not cover complexities of computer-based and networking systems giving rise to uncertainties. Authors of works and their agents have engaged in lobbying for rigorous ways of checkmating access to digital information and other copyrighted materials (Moahi, 2008).

Measures taken to protect Copyright in the Digital Environment

The Digital Millennium Copyright Act

The Digital Millennium Copyright Act (DMCA) was passed in 1998. The main purpose of the DMCA was to stop widespread piracy of digital works. Its aim also is to offers exception from liability for online service providers under certain circumstances, which is helpful to educational institutions who generally qualify as online service providers. There is also an anti-circumvention provision of technological protection systems.

The issue with DMCA is that it

- limits access to copyrighted works,
- Undermined the fair use rights and the right to first sale.

As it is the DMCA is far more damaging than useful to the general public and users of copyright protected works. In reality, it compels individuals and institutions into negotiating contracts for the use of materials and dictates the rights of each party to the contract (Ferullo & Soules, 2012).

Digital Rights Management (DRM).

The DRM is a system made for the safeguard of digital works. It is designed to protect the unauthorized replication and illicit sharing of copyrighted digital products. The purpose of DRM technology is to check access to, track and restrict uses of digital works. These controls are usually inserted in the work when it is distributed to the consumer (Latha, 2015).

Steps in the use of DRM

- Watermarks and identifiers are used to identify the content uniquely. This identification can also be used for downstream tracing of the content to ensure an authorized use of the content.
- To ensure that only consumers with appropriate keys like log in codes, IP addresses can access the content and that the content is unchanged throughout the process.
- It is encrypted, and the authorized user can decrypt the content of the work.
- It contains rules on how to access the resources (Latha, 2015).

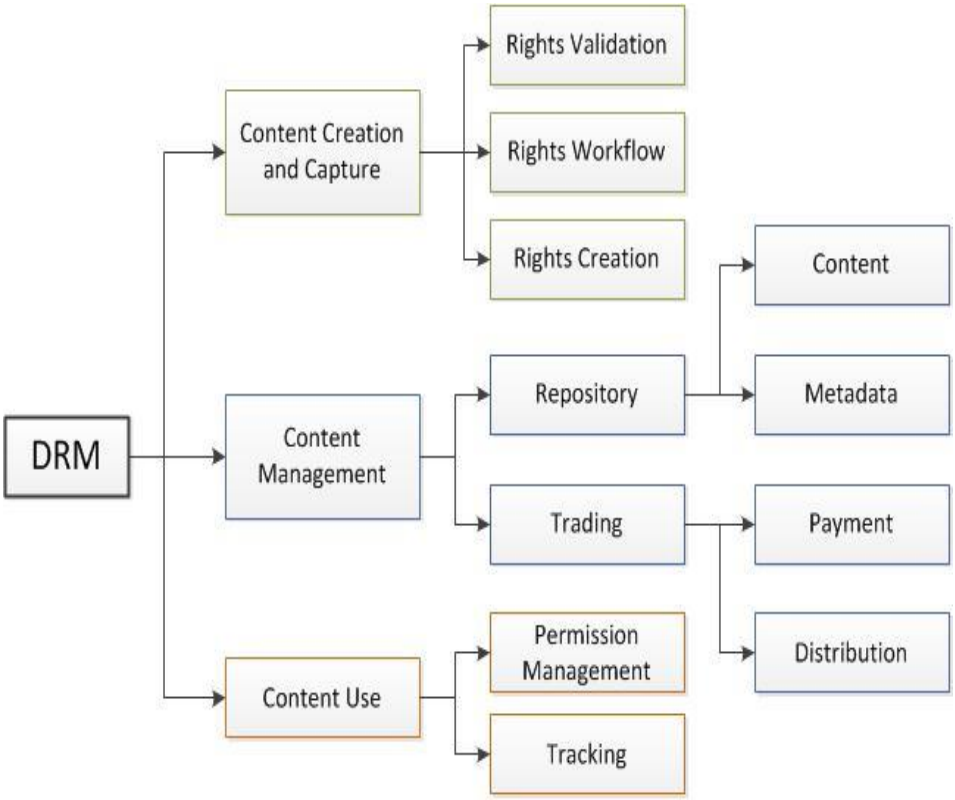
DRM changes the fundamental relationship between the creators, publishers, and users, to the detriment of creators, users, and the institutions that serve them. If DRM is not cautiously implemented it can lead to several issues which are:

- Eliminating the "First sale" doctrine.
- Enforcing a "Pay-per-use" model of information dissemination
- Enforcing time limits or other limitations of use that prevent preservation and archiving
- Eliminating "fair use" and other exceptions in Copyright Law that underpin education, criticism, and scholarship (Latha, 2015).

The benefits of DRM are;

- Secure E-book distribution
- Content authenticity
- Transaction Non-repudiation
- Market Participant Identification
- Protection of digital content (Latha, 2015)

This was illustrated below by Xiao.



Source: Xiao,(2011).

Licensing of Content

Publishers and copyright owners now make use of contract law by imposing the signing of agreements as a preamble to gaining consent to use copyrighted works. This is done to safeguard their earnings. For example, in order for a University Library to have access to a database, they have to sign a user agreement that indicates the rights and requirement of the user. They dictate who may use, access and the duration of use of such information. The issue with licensing is that it affects fair use, first sale and public lending rights (Moahi, 2008).

3.4 The role of Librarian in protecting Copyright

Libraries are creatures of the historical and statutory balance in copyright law. Libraries lend materials based on the First Sale doctrine. Libraries are often the only entities that provide access to the vast majority of copyrighted works that lose market vitality long before the expiration of the copyrights, and are often the only entities that preserve public domain materials (Fabunmi, 2007).

- The main role of librarians is to make available library collections to students and faculty in support of teaching, learning, research and scholarship (Onoyeyan & Awe, 2018).
- Cochran (1997) also reiterates that librarians have the professional duties concerning copyright materials, to both serve the client's needs using copyright-protected resources to provide

the information requested, and to respect the intellectual property rights in the protected works that are used each day (Cochran, 1997 as cited in Onoyeyan & Awe, 2018).

- The vast majority of copyrighted works in library collections were purchased or acquired through license agreements. Hence, there is the need for library staff and users to know about copyright, their limitations and benefits, when making use of any of the materials on the library shelves, either in open or closed access in order to safeguard anti-piracy legislation (Fabunmi, 2007).
- There is a need for all the librarians in Nigeria to have copyright education and the nation's Copyright (Amendment) Decree of 1999, in order to familiarize themselves with the basic principles and concept of copyright laws in Nigeria. This will enable them to render their services without violating copyright laws. With adequate education in copyright, librarians will be able to know the risk involved in copying from copyright-protected material and operate within the laws (Fabunmi, 2007).
- They will be able to make use of the 'fair use' principle which means that one can copy a very small amount of a work thereby catering for the interests of the owner of the work and that of the user (Fabunmi, 2007).
- Copyright warnings should be displayed by librarians in conspicuous locations in the libraries so as to pass the message across to the users (Fabunmi, 2007).
- They must provide the right guidance to their library users on how to make use of the library stock without infringing on the copyright of the authors of such works (Fabunmi, 2007).
- The librarians can provide the following assistance to library users in order to properly enforce the copyright laws in the library. Research projects in the library should be made available to researchers for consultation only. Photocopying the entire work should not be allowed, and if there is the need to photocopy, the principle of fair use should be strictly adhered to. Also, the librarians should ensure that precise citation is done by any researcher for any piece of information collected from a given source in the Library (Fabunmi, 2007).

4.0 CONCLUSION

Copyright issue is very essential as the libraries and librarians are creating their digital content for use. It is essential to create the awareness among our uses and among ourselves so that we will not infringe into copyright laws. Issues on copyright and the digital environment were raised and also measures taken to protect copyright in

the digital environment. The role of Librarian in protecting Copyright was also highlighted.

5.0 SUMMARY

At the end of this unit, you have learnt;
The concept behind copyright is that creators of literary works (authors, composers, artists) as well as those concerned with the circulation and transfer of knowledge such as publishers, broadcasters, producers of phonograms and films have rights of ownership in their works, and further, that those rights should be legally protected in order to prevent unlawful reproduction of their works. Copyrightable works include; Original literary works, Musical works, Dramatic works, Pantomimes and choreographic works, Pictorial, graphic, and sculptural works, Motion pictures and other audio visual works, Sound recordings and Architectural works.

There are copyright laws that protect the works of authors. Nigeria Copyright law was governed by the English Copyright Act 1911 which was made applicable to Nigeria by virtue of an order-in-council under Section 25 of the Act of 1911 of Great Britain. Nigeria applied the 1911 Act until 1970, when it was replaced with the Copyright Act of 1970. The primary legislation now is the Nigerian Copyright Act Cap. C.28, Laws of the Federation of Nigeria 2004. The issue of copyright can limit access to digital resources that are placed under protection and consent to access the resources cannot be easily acquired. The major issue in electronic publishing is that copyright law does not cover complexities of computer-based and networking systems giving rise to uncertainties.
There are several measures taken to protect Copyright in the Digital Environment. The Digital Millennium Copyright Act (DMCA) was passed in 1998. The main purpose of the DMCA was to stop widespread piracy of digital works. Digital Rights Management (DRM) is a system made for the safeguard of digital works. Librarians have a role to play in protection of copyright in the digital library. They need to familiarize themselves with the basic principles and concept of copyright laws in Nigeria. This will enable them to render their services without violating copyright laws.

6.0 TUTOR MARKED ASSESSMENT

1. What are the roles of librarians in protecting copyright laws in the University Library?
2. State the copyright laws
3. What are the issues of copyright and the digital environment?
4. What is Digital Library Management and explain the steps involve in the use of DLM.

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UNIT 3 HUMAN RESOURCE AND FINANCIAL MANAGEMENT OF LIBRARIES

CONTENTS

1.0 Introduction
2.0 Intended Learning Outcomes
3.0 Main content
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  3.2 Practical Applications of Human Resource and Financial Management in Libraries
  3.3 Scope of Human Resource and Financial Management in Libraries
  3.4 Importance of Human Resource and Financial Management in Libraries
  3.5 Problems of Human Resource and Financial Management in Libraries
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1.0 INTRODUCTION

Human resource and financial management are strong backbones of digital libraries and are gaining more importance in recent times. Particularly, human resource which are seen as available talents and energies of people who are available to an organization as potential contributors to the creation and realization of the organization's mission, vision, strategy, and goals (Jackson & Schuler, 2000 in Jain, 2005). Finance also helps in implementing the projects as strategized by the management. Hence this study discusses the concepts of human resources and finance management, their practical implications, scope, importance and problems.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the Concept of Human and Financial Resource Management in Libraries
- Understand the Practical Applications of Human Resource and Financial Management in Libraries
- Know the Scope of Human Resource and Financial Management in Libraries

- Know the Importance of Human Resource and Financial Management in Libraries
- Understand the Problems of Human Resource and Financial Management in Libraries

3.0 MAIN CONTENT

3.1 Concept of Human Resource and Financial Management in Libraries

Human resource management (HRM), according to Boxall, Purcell, and Wright (2008) is the management of work and people towards desired ends. It is seen as a fundamental activity in any organization in which human beings are employed. The strategic human resource management involves thinking ahead and planning ways on how an establishment can meet the needs of its employees and that of the organization. Since a library is a growing organism, a proper management involves improving the facilities available and taking users' needs into account. It is a way the library can help its staff to gain competitive advantage over others. Among its responsibilities are enhancing employee benefits, recruitment, training and development, reward management, performance appraisal, pay and wages, and industrial relations. Its overall purpose is to ensure that the library organization achieves success by managing the human capital of the library through implemented policies and processes.

Financial management can be said to be the function in an organization which is concerned with profit making, management of expenditures, cash and credits, so that the organization may have the means to carry out its objectives as satisfactorily as possible. As defined by Juneja (2015), financial management means planning, organizing, directing and controlling financial activities such as procurement and utilization of funds, of an enterprise. Financial management involves studies on financial problems in individual firms, seeking sources of low-cost funds and seeking profitable business activities. The function also includes the effective and efficient daily management of funds, including capital sourcing and raising, and its accompanying policies.

3.2 Practical Applications of Human Resource and Financial Management in Libraries

There are various practical applications of human resource management in libraries basically dependent on the aims and objectives of the library, its structure, and the quality of personnel at hand. Luisa Arenas Franco & Díaz (1995) in what can be adopted as practical applications of

human resources and financial management on digital libraries listed the following strategic components:

- **Human resources:** This implies having both professional librarians and non-professional staff members who are achievement-oriented, innovative, competent, informed and satisfied with their work in professional and financial terms, as well as interacting effectively in the library.
- **Users:** This implies that to satisfy the demands and information needs of technologically advanced users, there has to be organized training for the staff, as well as orientation for users according to the human and material resources available.
- **Management:** This aspect helps the library become innovative, rapid in response, efficient, integrated, co-ordinated and austere, respecting the autonomy of its members, and having a participative management system. These should be adopted especially by top staff members of the library.
- **Strategic Planning:** This aspect of human resource management makes a library a centre of excellence by making them open to exchange and co-operation with similar institutions. It also helps them in boosting their teaching and research prowess; improve service delivery, mastery handling of queries, and stimulating love for learning and research.
- **Financial Resources Management:** This aspect aims at maximizing the cost-benefit analysis of procurement of information resources and services, as well as optimizing internal and external financing that will ensure the sustenance of development and its maintenance. Proficient human resources are expected to oversee this area, to minimize spending and maximize output.

A library that is ready to remain relevant must channel determined focus on its finance sources and funding, as well as determine how the resources is been allocated to each deserving section/ operation of the library. A cost-benefit analysis should be conducted, as well as placement of priorities, i.e. determining which financial need should be embarked on first before others. That is, money is an “essential element for purchasing materials, paying staff salaries, and the other necessary expenses in the library” (Celik, 2000). Most documentation seen on funding of libraries always looks negative, as they keep complaining of scarcity of funds as a consistent problem to the progress of libraries. Unfortunately, the quantity of finance invested in libraries is equivalent to the type and nature of services given to users, which is often not satisfactory.

Scope of Human Resource and Financial Management in Libraries

The scope of human resources in libraries varies but is likely to include certain basic functions of: developing, implementing, coordinating, and monitoring all human resource programs and processes for academic librarians, professional, and classified staff, and hourly assistants (Defa, 2008). Specific the scope of human resources could include the following:

Recruitment: This duty includes coordinating the recruitment, selection, and appointment of professional staff and academic librarians, as well as the recruitment of classified staff, students, and hourly assistants. This area ensures there is no shortage of staff of any category, and makes adjustments in cases of resignations, retirements, and redeployments.

Employment/Compensation: This aspect of HRM monitors library's salary budgets in conjunction with the library financial/ administrative manager. The duties involve overseeing annual salaries and hourly wages for fairness and equity. Also grieved staff on the basis of compensation can equally be attended to.

Position Administration: This area of HRM handles and oversees the position-classification and job-analysis process; they equally coordinate the performance management process of the staff, including evaluations and appraisals for librarians and staff. They help determine proper placements for staff and interpreting positions from the appraisal laws of the institution.

Determination of Tenure and Retention Process: This aspect helps the library management determine the duration of a given appointment in the library and the criteria to re-appoint or retain well-performing staff too. They ensure that affirmative action, equal opportunity, other federal and state regulations, and university and library policies are also followed.

Training/Staff Development: This area ensures that the right staff gets the right training to perform well in any assigned position. They develop and oversee comprehensive library employee orientation and training programs, including needs assessment, curriculum design, and evaluation. They also handle basic matters in-house, take broader library issues directly to the campus HR/ Personnel department, and represent the leadership of the library in addressing any related issues.
As stated by Strutner (2020) financial management spans through four categories:

Planning: This is the process where there is a projection of how much money the digital library will need in order to maintain positive cash flow, allocate funds to grow or add new products or services and cope with unexpected events, and shares that information with other colleagues. It readies the library ahead of time in cases of unforeseen financial eventualities. They can be in forms of capital expenses, indirect, and operational expenses.

Budgeting: This involves allocating the library's available funds to meet costs, such as mortgages or rents for the building, salaries, raw materials, and employee T&E; and other obligations. Also setting aside for emergencies and funding new potential opportunities.

Managing and Assessing Risk: This aspects looks into preparing for eventualities like, assessing and providing compensating controls for a variety of risks, including: Market risk, Credit risk, and Liquidity risks. Operational risk: is a catch-all category, and new to some finance teams. It may include, for example, the risk of a cyber-attack or disaster recovery and business continuity plans.

Procedures: This involves setting procedures regarding how the finance team will process and distribute financial data, like invoices, payments and reports, with security and accuracy. These written procedures also outline who is responsible for making financial decisions at the library and who signs-off those decisions.

3.4 Importance of Human Resource and Financial Management in Libraries

Human resource management has been an important area of operation in digital libraries in modern times.

HRM has helped digital libraries extend their services beyond the physical library walls of a building, by strategically managing human resources through electronic means, and by providing assistance to librarians and information users in navigating and analysing tremendous amounts of information.

HRM also helps to improve the employee retention rate by helping to improve the rate of skill acquisition of its members so as to reduce the burden of finding and training new employees in digital libraries. They do this by equipping the staff with skills to achieve the digital library's goals in an improved and attractive way.

Hence, HRM improves current performances through training of staff and provides suitable and qualified personnel to meet the present and

future needs of the ever advancing users. This will further enhance the quality of the digital libraries services.

For a digital library, financial management helps in balancing between expenditure and revenue of the organization; shows a comprehensive and detailed financial summation of both revenue and expenditure; ensures accountability of fiscal operations and a consistent time financial plans at regular intervals of the library's year.

It determines the services that can be funded by the library and the resources devoted to each digital library program. It further ensures that available funds are effectively utilized to realize the library's objectives.

3.5 Problems of Human Resource and Financial Management in Digital Libraries

As great as human resource management appears in digital libraries, it still comes with its own challenges and problems.

- Complexities of the HR challenges for digital library administrators are unique to the host institution. The size and structure, as well as the functionalities in the digital library determine the kind of challenges they are prone to getting.
- It can be on activities and the services rendered, like digital libraries that offer digitization may have challenges on scarcity of skilled staff that can handle the machineries; digital libraries that also host institutional repositories can have internet and server issues, copyright challenges, electricity issues, staff relocations and redeployments etc. Digital libraries that run selective dissemination of information, online referencing, and social media operations can have lack of skilled staff with good public relations attribute as a challenge.
- Lack of trainings to support the tasks awarded. Further issues may vary in laws regarding employment, benefits, compensation, discipline, and termination for staff of digital libraries.
- The demands of digital library employees are important challenges of human resource management, some employees may want or need what the organization cannot reasonably supply.
- Sustaining high levels of services when facing financial pressures of social, economic, educational and technological developments including the growth of social networking, virtual learning and research environments often look difficult as they all need proper financial commitment and accountability.
- Lack of knowledge of the sources of fund for library, allocations due and financial rights especially on the part of librarians also limit their access to funds that could transform the services rendered in digital libraries.

- Librarians do not equally cultivate the culture of budgeting. No matter how small the resources allotted, a plan must be made and/or implemented.
- Other problems include partial or improper allocation of funds; misplacement of funding priorities; mismanagement and misappropriation of funds; problems with monitoring financed flows and projects.

4.0 CONCLUSION

In this unit the concept of human and financial resource management in Libraries were introduced. The Practical Applications of human resource and financial management in libraries was dealt with and also the Scope of human resource and financial management in libraries. The Importance of human resource and financial management in libraries and the problems of human resource and financial management in libraries were highlighted.

5.0 SUMMARY

Human resource management (HRM) is the management of work and people towards desired ends. It is seen as a fundamental activity in any organization in which human beings are employed. On the other hand financial management means planning, organizing, directing and controlling financial activities such as procurement and utilization of funds, of an enterprise. Financial management is also an area a digital library cannot survive without. To be able to measure the profit earning of a digital library, proper financial management is important.

6.0 TUTOR MARKED ASSIGNMENT

- Explain the Concept of Human and Financial Resource Management in Libraries
- What are the Practical Applications of Human Resource and Financial Management in libraries?
- Discuss the Scope of Human Resource and Financial Management in Libraries.
- Enumerate the Importance of Human Resource and Financial Management in Libraries.
- What are the Problems of Human Resource and Financial Management in Libraries

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UNIT 4 INFORMATION RETRIEVAL AND STRATEGIES FOR DIGITAL LIBRARY MANAGEMENT

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2.0 Intended Learning Outcome (ILO)
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1.0 INTRODUCTION

Digital libraries contain lots of voluminous interesting information resources. That needs expert skills to be able to manage, manipulate and professionally sieve out the most needed information relevant to the information need required. Hence, there is need to discuss these information retrieval strategies to help researchers and information users in the quest for literatures, as well as lessen the laborious tasks involved in searching the web.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, students should be able to:

- Understand the Concept of Information Retrieval in Digital Libraries
- Know the Methods and Tools for Information Retrieval in Digital Libraries
- Understand the Challenges of Information Retrieval in Digital Libraries
- Know the Approaches to Information Retrieval in Digital Libraries
- Understand the Skills Needed for Information Retrieval in Digital Libraries

3.0 MAIN CONTENT

3.1 Concept of Information Retrieval in Digital Libraries

Information retrieval is a much-talked-about phenomenon especially as it concerns digital libraries. From general definitions, the idea of information retrieval (IR) is concerned with the indexing and retrieval of knowledge-based information. Even though it means retrieval of any type of information, the field originally focuses on retrieval of text-based documents, reflecting the type of information that was initially available at the inception of computers. However, with the transformation in multimedia contents like images and videos, the concept of Information Retrieval has broadened significantly. Information Retrieval is a term used to describe the organization, location and retrieval of encoded information in computer systems (Chimah, Unagha, & Nwokocha, 2010).

The main aim of using the information retrieval system is to access its content, which most times appear as digital libraries. The major intellectual processes of IR are indexing and retrieval. Hersh (2003) argued that indexing, which appears either in manual or automated forms; assign standardized terms and attributes to documents, often following a specific protocol. Manual indexing is done with controlled vocabularies (humans using sets of acceptable terms and relationships) while automated indexing involves computers making the indexing assignments. Kumbhar and Priolkar (2015) emphasized that retrieval systems are necessary for users to obtain the information they need from the digital libraries. Retrieving of information depends on the type of media, or storage device, used to store information; the storage capacity; the speed of accessing and transferring information to and from the media; and how the media interacts with the computer (Unagha,2010). Information retrieval is an important exercise that helps researchers and users to retrieve only relevant resources needed.

3.2 Methods and Tools of Information Retrieval in Digital Libraries

There are various methods and tools of information retrieval in digital libraries depending on how knowledgeable the users are. Wan and Liu (2008) discussed three methods of retrieving information in a digital library as follows:

Free Browsing. By this means, a user browses through a collection and looks for desired information.

Text-Based Retrieval. Through this method, textual information is indexed so that a user can search the digital library by using keywords or controlled terms.

Content-Based Retrieval enables a user to search multimedia information in terms of the actual content of image, audio, or video.
Some content features can include colour, texture, size, shape, motion, and pitch. There have been arguments that text-based retrieval techniques are good enough to locate desired multimedia information especially with properly assigned metadata or tags. However, words are not sufficient to describe what is sometimes in a human's mind, and other abstract representations. An effective and reliable information retrieval tool is one that helps in prompt dissemination of information, prudent in information filtering, timely and economic extraction of the right information, as well as checking for the currency of such resource.
Onwuchekwa (2011) opined that an information retrieval system (tools) serves as a bridge between the world of creators or generation of information and the users of that information. He further categorized information retrieval systems into two:-

- **In-house information retrieval systems** which are set up by a specific digital library or information centre to serve mainly the users within. An example is the Online Public Access Catalogue (OPAC) which provides facilities for library users, does catalogue searches, as well as checks the availability of the resource.

- **Online information retrieval** systems are those that have been designed to provide access to remote databases to a variety of resources, like access to established online databases.

Information retrieval tools have developed into widely used services and have become essential tools for finding information resources. They are also crucial for retrieving information for educational purposes. These tools are often called literature search tools as they are locational and are very useful for answering research queries (Ibrahim, 2020). Before now Aina (2004) classified information retrieval tools into library catalogues, indexes, abstracts, and bibliographies. However, in digital libraries, most resources are in electronic format. Hence, tools used for online information retrieval include links to connected databases, the OPAC, online indexes, abstracts and bibliographies.

3.3 Challenges of Information Retrieval in Digital Libraries

Despite the usefulness of this information retrieval there are a lot of challenges involved. Findings have revealed that these factors to Fordjour, Badu and Adjei 2010).include:

- **Lack of information search and retrieval skills**: Most challenges faced in information retrieval always revolve around lack of search and retrieval skills. If a user cannot manipulate computer technologies or find his/ her way around skill adoption in searching, the user will not be satisfied with whatever search results the system brings up. The Boolean search skill is equally necessary and applicable in this case, as well as other ICT skills.
- **Lack of subscriptions to important databases**: Most digital libraries find it difficult and tough subscribing to important databases that would have been far more useful to the users because of financial constraints. Even the indigenous knowledge and institutional repository are not functional in most cases. Hence, users are limited to what they can download.
- **Technological and Infrastructural Issues**: retrieval of information from digital libraries requires that the technologies involved, as well as the infrastructures should be constantly functional to be able to serve the IT-savvy users on round the clock basis.
- **Low level of user education and information literacy training:** Most libraries neglect the place of user orientation and information literacy training to help their users to be able to search independently without the help of librarians, and still get satisfied with the resources he or she got. Knowledge of electronic resources, databases, and repository contents, etc. Furthermore, understanding and knowing how to approach the search topics and queries are also very important in boosting users information retrieval skill.
- **Students' subject backgrounds:** Having knowledge of student's/ user background information like field of specialization is also important, especially when a librarian or information specialist wants to help the user in the search. Some search keywords can be dependent on the subject of application, i.e., can be found in different disciplines; hence, searching in the line of the users discipline improves on the relevancy of the search results.

Based on this Ajiboye, Oyedipe and Alawiye (2013) lamented that most library-based retrieval tools for accessing these resources were only occasionally used. This implies that the libraries' resources were under-utilized. Echem and Udo-Anyanwu (2018) later concluded that the effective use of these tools were hampered by some varying factors like;

lack of information search and retrieval skills; poor user education and information literacy training, and students' subject backgrounds. Other challenges exists that handicaps information retrieval in digital libraries. Challenges like lack of awareness and low literacy levels on how to retrieve information. On the other hand, not knowing the methods and tools for information retrieval will also cripple the rate of use of any digital library. Furthermore, being unskilled, IT-wise is a major challenge to the retrieval of information in digital libraries.

3.4 Approaches to Information Retrieval in Digital Libraries

There are two broad approaches to information retrieval, as discussed by Hersh (2003);

Exact-match searching: This form of searching allows users precise control over the items retrieved and gives the user all resources that exactly matches the criteria specified in the search statement(s). Since the Boolean operators AND, OR, and NOT are usually required to create a manageable set of documents, this type of searching is often called Boolean searching.

In modern times, exact-match searching is most likely associated with retrieval from bibliographic databases for example searching with PubMed: The first step in the exact-match type of retrieval is to select terms to build sets. Other attributes, such as the author name, publication type, or gene identifier may also make up the set selection. Once the search attributes and terms have been resolved, they are combined with the Boolean operators. The Boolean AND operator is used to narrow a retrieval set to contain only relevant documents about two or more concepts. The Boolean OR operator is usually used when there is more than one way to express a concept, particularly synonymous words; and when there is need to have more search results. The Boolean NOT operator is used for exclusion and is a subtraction operator for words that must not appear in the search result. Some systems expanded search terms by using the wildcard character, which adds all words to the search that begin with the letters up until the wild-card character. This approach is also called truncation.

The development of partial-match searching is usually attributed to Salton (Salton, 1991). Partial-Match Searching recognizes the inexact nature of both indexing and retrieval, and instead attempts to return the user content ranked by how close it comes to the user's query. Although it does not exclude the use of non-term attributes of documents, and for that matter does not even exclude the use of Boolean operators, it is mostly commonly used with query of a small number of words, also known as a natural language query. Documents are typically ranked by

their closeness of fitting to the query. That is, search outputs having more query terms will likely be ranked higher, since those with more query terms will in general be more likely to be relevant to the user. This process is also called relevance ranking or lexical-statistical retrieval.

Steps in Information Retrieval in Digital Libraries

Various steps are involved in retrieving information from digital libraries. Chimah, Unagha, and Nwokocha, (2010) discussed the steps listed by Unagha (2010) are as follows:

- **Clarifying and Negotiating the Information Need and Search Objective**: This stage involves clarifying the request and ascertaining the exact need of the user or requestor. The user narrates with the aim of ensuring retrieval of most relevant items (high recall); retrieval of only relevant items (high precision); and retrieval of some relevant items (brief search).
- **Identifying retrieval databases:** This step ensures that there is no waste of time and labour or duplication of efforts. There are various databases specifically proficient in searching and bringing up information on distinguished areas or field of specialization. Hence, in this stage, the searcher identifies which online database is useful for first consultation, second, and so on; which should be exhaustive during search.
- **Formulating Basic Search Logic (planning search strategies)**: In this step, the searcher analyses the search topic into parts called facets or concept groups. Identify main independent concepts and the dependent concepts. As well as plans his approach to search, and how to combine concepts of the topic.
- **Compiling search terms:** This stage demands choosing indexing terms from database thesaurus or selecting terms for text search of the title, author, or abstract. Most users use keywords from the title for broad searches, and read through the abstract for other needed terms that did not appear on the title. Users are equally advised to use thesaurus and alphabetic word lists online.
- **Making choices:** This has to do with deciding which result best matches the search intentions of the user. It involves limiting and printing output of only relevant works. Selecting strategies and results that best satisfies the search objectives expressed by the requestor.
- **Conceptualizing the search as input to the retrieval system:** This involves arranging and rearranging the search terms; for example, truncation, and word proximity. Prioritizing from the most important to less important concept groups and deciding on sequence input to access these concept groups efficiently.
- **Evaluating preliminary results:** This step re-assesses search results step by step considering alternative search strategies to

meet search objective. Checking for missing areas research gaps not covered by the search.

- **Evaluating final results:** This step determines the level of satisfaction of the user or requestor.

Skills Needed for Information Retrieval in Digital Libraries

Various skills are required to selectively retrieve accurate and sufficient information online instead of all the information that may not be relevant for the users' research. Ibrahim (2020) opined that having skills in information retrieval reduces the time wasted in seeking information in digital libraries. It requires a combination of skills which include informational retrieval skill, operational retrieval and strategic retrieval skills to make the process of retrieving information a simple task. Nieuwenhuyen (2015) also highlighted skills that can help users "navigate, select, evaluate and re-use information" as effective information retrieval skills. Other skills like the ability to handle the different retrieval tools that abounds. Unfortunately, there is low effective use of this information retrieving tools in developing countries mainly caused by lack of information search and retrieval skills, low level of user education and information training, and students' subject backgrounds (Fordjour, 2010).

Ekenna & Iyabo (2013) in recommending skills stated that digital library users should be able to perform literature searches, organise and communicate the information retrieved, satisfactorily in their research work. They highlighted that the operational retrieval skill which is the ability to exhibit some level of competence in the use of computers and the network connections are very crucial for information retrieval. Furthermore, strategic retrieval skill assists in improvement of search skills as well as search speed and use of Boolean search skills.

4.0 CONCLUSION

This unit dealt with the Concept of Information Retrieval in Digital Libraries. It looked at methods and tools for Information Retrieval in Digital Libraries and Approaches to Information Retrieval in Digital Libraries. It also highlighted issues on Skills required for Information Retrieval in Digital Libraries and challenges that hinders Information Retrieval in Digital Libraries.

5.0 SUMMARY

As Digital libraries are crucial in today's educational system so information retrieval is crucial for student in the world of information, since they cannot fully learn and do research without having adequate

knowledge in retrieval systems. Hence the knowledge of skills and approaches to information retrieval are very important.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain in your words the Concept of Information Retrieval in Digital Libraries.
2. Enumerate the Methods and Tools for Information Retrieval in Digital Libraries.
3. What are the Challenges of Information Retrieval in Digital Libraries?
4. Discuss the Approaches to Information Retrieval in Digital Libraries

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