



OPEN UNIVERSITY OF TANZANIA (OUT)

Digital Fluency Course

Module 5: Storage and Access of Digital Resources

This is the fifth in a suite of 5 openly licenced Digital Fluency modules developed at OUT in collaboration with OER Africa to address the needs of academic staff in the 21st century.

Preamble: What do we mean by Digital Fluency? Who should develop this skill, and why?

Our *motivation* for developing this course is to enhance the capacity of academic staff in Higher Education Institutions in sub-Saharan Africa to increase confidence and competence in selecting and using appropriate digital technologies in an informed and manner within their work environment.

The *aim of the course* is to progress beyond the conventional notion of digital or computer literacy – we would like to support you to become ‘fluent’ in the digital workplace. The notion of fluency is often associated with language or numeracy skills development – we now also recognize its importance in preparing to engage in a digital world. The move from literacy to fluency encompasses effective and ethical online communication, good quality resource creation and curation, knowledge co-construction, and an understanding of using these abilities to ‘open up’ education – with all these elements becoming increasingly standard and effortless over time.

The *overall objective* is to develop an ability to comfortably and ethically use digital technologies incorporating a variety of media types, both on- and off-line, to support your teaching and learning, research, and academic administrative duties. We believe that our 5 modules (Digital Fundamentals, Working with OERs, Learning Design and Development for Online Provision, Academic Integrity in a Digital Age, Storage and Access of Digital Resources) shared openly, will support you in your journey towards this goal.

At the start of this Digital Fluency course you may like to reflect on your motivation for engaging with one or more of these 5 modules and ask questions such as:

- What do I hope to achieve personally by engaging with this course and its modules?
- To what extent are digital technologies and OER currently being used at my institution?
- Does my institution have Policies and Strategies in place for Quality Assurance (QA), ICT, eLearning, Intellectual Property (IP) and Open Educational Resources (OER)?

You should revisit these questions as you work through the modules, and perhaps even volunteer to serve as a champion in effecting positive transformation towards embedding and/or informing related Policies, Strategies, and Practices at your institution and beyond.





Course Code: ODF 001

Course Name: Academic Digital Fluency

Module Number: 5

Module Name: Storage and Access of Digital Resources

Module Description

This module will expand your understanding of digital storage and access with regard to a variety of files types and enabling platforms. It will hone your skills in storing and retrieving digital resources using various technologies. This module is intended to address both academic and administrative skills: these skills can be applied in your research, teaching and learning, and administration. With some universities already going ‘paperless’, existing institutional systems for teaching and learning and providing electronic library resources, are being supplemented by content management systems, platforms, and applications for storing and sharing resources between individuals and institutions, on institutional intranets and the internet and web. Some areas related to storage and access, such as Open Education Resources (Module 2) and Data Privacy (Module 4), have already been explored in the Digital Fluency suite of modules. By the end of this module, you will have expanded your knowledge base, and can apply new skills to many aspects of your working life. Note that this module may also be of interest to administrative staff at academic institutions.

Module Learning Objectives



Upon completing this module, learners are expected to have developed skills and knowledge related to:

- understanding concepts such as electronic library and content management systems;
- identifying different types of digital resources and how they can be accessed;
- using virtual-storage technologies in everyday life;
- sharing learning resources with others using ICT facilities; and
- demonstrating the ability to search for and access digital resources from the internet.



Module Topics, Teaching and Learning Media (T&L) and Schedule

| Topic # | Topic Name | T&L Media | Expected Schedule |
|---------|--|---|--|
| 0 | Start-up week: participants verify access to the virtual learning environment (VLE). | VLE; video; discussion forum; file download. | At least 1 hour: access the VLE, introductions, and orientation. |
| 1 | Access to Digital Resources | VLE, video, discussion forum, blog, quiz, internet search engines | At least 6 hours' engagement over a 1 week period. |
| 2 | Nature of Digital Resources | VLE, video, discussion forum, blog, quiz, internet search engines | At least 6 hours' engagement over 1 week period. |
| | Consolidation Break (enables catchup and reflection) | | 1 week |
| 3 | Storage of Digital Resources | VLE, video, discussion forum, blog, quiz, internet search engines | At least 6 hours' engagement over a 1 week period. |
| 4 | Content Management Systems | VLE, video, discussion forum, blog, quiz, internet search engines | At least 6 hours' engagement over a 1 week period. |
| | Wrap up week: participants complete outstanding activities; goodbyes. Digital certificates and open digital badges are awarded. | VLE, discussion forum. | Ensure that all required activities are completed for certification. |

Assessment Plan

Depending on an institution's purpose in offering this module, Module 2 could be assessed using formative and summative forms, as indicated below.

| Formative assessment | Summative assessment |
|------------------------------|---------------------------|
| Level of learner interaction | Portfolio (formative 60%) |
| Self-assessment | Final assignment (40%) |
| Quizzes | |
| Activities as specified | |

Module Evaluation

A module evaluation should be conducted during and after each instance of running the course to effect improvement.





Certification / Accreditation

Completion of 80% of module activities contributes to an award / certificate and/or digital badge.

If this course is offered formally by the [Open University of Tanzania](#) (OUT), completion will result in module credit towards the Digital Fluency course.

Acknowledgements

This work is Module 2 of the Digital Fluency course created by the Institute of Education and Management Technologies ([IEMT](#)) staff and faculty at OUT, in collaboration with [OER Africa](#).

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Licensing



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Every effort has been made to adhere to the licences of OER incorporated in the module. Should there be any queries around individual licensing on module components, please contact the Director of Quality Assurance unit at OUT: dqac@out.ac.tz

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Topic 1: Access to Digital Resources

Introduction

This topic provides you with insight into access to digital resources. You will learn to recognise the different types and formats of digital resources, as well as learn about approaches and techniques you can use to search for and access relevant digital resources from internet sources. Furthermore, this topic introduces the benefits and challenges of using digital resources in our daily operations, and covers issues relating to academic databases.

Topic 1 Learning Objectives

| | |
|---|--|
|  | <p>At the end of this topic, the learner should be able to:</p> <ul style="list-style-type: none"> • define digital resources; • identify various types of digital resources; • use digital resources in everyday life; • identify the different types of digital resources and their challenges and benefits; • search for and access relevant digital resources via the internet; and • exploit the potential of ICT technologies to facilitate access to digital resources for teaching and learning. |
|---|--|

1.1 What is a Digital Resource?

A digital resource is any kind of information or resource that can be stored and accessed electronically via various devices such as computers, cell phones, tablets and other hardware. It is not necessary that a resource be online for it to be digital. Even a resource that is not accessible online is digital if it is in a digital format, and is accessed via electronic or digital devices. Even a document that was once a hard copy, becomes a digital resource once it is scanned and made available electronically. There are resources that are digital in their original form, and others that become digital after under passing through a process of digitisation, such as scanning. A digital device is an electronic device that can store, process, and/or display digital information.

1.2. Access to Digital Resources

The advancement of technology has resulted in an increased demand for digital resources by many students, lawyers, academicians, policy makers, engineers, doctors, and many other individuals. Although digital resources may seem advantageous, vulnerabilities in such technology can be present themselves if not properly managed.

“Digital information is a vital resource in our knowledge economy, valuable for research and education, science and the humanities, creative and cultural activities, and public policy. But digital information is inherently fragile and often at risk of loss.

Access to valuable digital materials tomorrow depends upon preservation actions taken



today; and over time, access depends on ongoing and efficient allocation of resources to preservation.” (Smith Rumsey, 2010).

1.3 Nature of digital resources and examples

Digital resources can be presented or stored in different formats and on different platforms, which determine how the resource can be accessed. Digital resources can be in the form of text, images, video, audio, animated images, and so on. There are different software programs that can be used to access particular types of digital resources; thus, a particular program may need to be installed on the device from which you intend to access the digital resource. The nature of digital resources and examples of such are described in detail in Topic Two.

1.3.1 Benefits of access to digital resources

- Digital resources can be easily accessed by many people at the same time, regardless of their geographical location.
- Navigating the contents can be easy if you use the search feature.
- It is easy to share digital resources with different individuals
- Digital resources cannot be destroyed by physical calamities such as fire or floods.
- Updating digital resources is much easier than updating physical resources.
- You don't need a room or physical space to store digital resources.
- A lot of information can be stored in a very small, portable gadget, such as a flash drive.
- Digital resources support editing, publishing, annotation, and the integration of information

1.3.2 Challenges

Although many new technologies come with advantages, they are not always immediately adopted or even accepted. Digital resources are not an exception to this. The following are the challenges you may encounter while accessing digital resources.

- Compatibility issues: Some resources will require software that will enable you to view and access the contents to be installed on. However, in most cases you will be notified about what type of software you will need to access certain digital resources.
- Digital resources can be expensive to access, in term of bandwidth costs, as well as a subscriptions fee for some resources.
- Accessing digital resources requires that the person doing so must be literate when it comes to computers and other digital devices.
- The presence of digital resources has highlighted the need to reduce the digital divide.

1.4 Locating digital resources

Searching for digital resources is one thing, but knowing where to find them is not always so simple. Searching for resources within a device such a computer is easier than conducting a search via the internet.



1.4.1 Finding and accessing digital resources over the internet.

Individuals can face challenges when seeking digital resources from the Internet; in some instances, they can't find adequate or relevant resources simply because they lack the proper knowledge of where and how they can find such digital resources.

Locating digital resources can be a simple task if you know where and how to find them. Some digital resources are free to access but are governed by different licence agreements; one typical example is of a resource that is free to access and redistribute, provided that you acknowledge the source and that you comply with the original source's requirements. Other resources will require you a subscription, the price of which depends on the type of digital resources you wish to access.

Several approaches can be applied to finding digital resources via the internet. The following are well-known methods you can use to find and access digital resources.

1. Search engines: Described in detail in Digital Fluency, Module 1, Topic 1;
2. Open Educational Resources: You can find detailed information about these in Digital Fluency, Module 2, Topic 1;
3. Academic databases; and
4. E-libraries: This will be explained in detail in Topic 4: Content Management Systems.

1.4.2 Locating and accessing digital resources in academic databases

An academic database is a collection of scholarly works or academic articles written by experts in a particular field, commonly compiled for research purposes. They are very useful for academics, researchers, and policymakers.

Searching for relevant articles on an academic data is easier if you use keywords rather than a sentence. As outlined earlier in this topic, some information can be downloaded at no cost; other databases will display abstracts only and you will need to pay for full access.

The following is a collection of links to academic databases through which you can access journals.

Academic Databases and Journals

- African Journals Online (AJOL): <http://www.ajol.info>
- Directory of Open Access Journals (DOAJ): <https://doaj.org/>
- Google Scholar: <http://scholar.google.com>
- Academia.edu
- ResearchGate

Science and Medical Journal Databases:

- SciCentral: <http://www.scicentral.com/>
- PubMed Central: <http://www.ncbi.nlm.nih.gov/pmc/>

Theses & Dissertations:

- Digital Dissertations: <http://www.proquest.com/products-services/dissertations/>
- Theses: <http://www.ndltd.org/>
- Institutional Open Repositories e.g. <http://www.out.ac.tz:8088/>





Activity 1: Locating specific articles in an academic database

| | |
|---|---|
|  | <p>Aim: Finding specific academic articles in an academic database.</p> <p>Motivation: To widen access to digital resources from the internet for knowledge acquisition and research purposes.</p> <p>Task: Find specific academic articles.</p> <p>Duration: 3 hours (180 minutes)</p> <p>Tools: XXX</p> <p>Resources: Selection of Academic Databases</p> <p>What to do:</p> <ul style="list-style-type: none"> • Use at least 3 different academic databases to find an article on the challenges of mobile learning in rural areas in Sub-Saharan Africa. • Record details of the article you find, where you found it, and which database was the most efficient means to locating the article. <p>How:</p> <ul style="list-style-type: none"> • This is an individual activity. • Share your findings in the discussion forum. <p>Feedback/Response: (Peer review)</p> <ul style="list-style-type: none"> • Read and respond constructively to at least one other person's contribution. • Read the other people's responses to your own contribution, and respond to them. <p>Assessment:</p> <ul style="list-style-type: none"> • Completing this activity will count towards your course portfolio. |
|---|---|

1.4.3 Locating and accessing digital resources from MOOC platforms

MOOCs, which stands for Massive Open Online Courses, are online courses open to unlimited participation, at no cost, and usually delivered in an open-access format via the web. Early MOOCs often emphasised features such as connectivism and the open licensing of content, structure, and learning goals, to promote the reuse and remixing of resources. Some later MOOCs use closed licenses for their course materials while maintaining free access for students. Other MOOCs now charge a fee if the learner would like some form of certification of engagement, completion or achievement. These courses or suites of digital resources can be accessed through MOOC software platforms, many of which are managed by universities or educational institutions and organisations. Table 1 lists some providers of MOOCs.

**Table 1: Providers of MOOCs / MOOC Platforms**

| Provider | Type | Website |
|-------------|------------|---|
| Africamooc | Non-profit | http://www.aelsnet.net/eportal/ |
| OpenupEd | Non-profit | http://www.openuped.eu/ |
| Coursera | Commercial | https://www.coursera.org/ |
| Udacity | Commercial | https://www.udacity.com/ |
| Futurelearn | Non-profit | https://www.futurelearn.com/ |
| EdX | Non-profit | https://www.edx.org/ |
| Udemy | Commercial | https://www.udemy.com |
| Alison | Non-profit | http://alison.com |

Reflection

Please use the Moodle course blog facility to reflect on your experiences and engagement with this week's topic. (20 minutes)

Summary

| | |
|---|---|
|  | <p>In this topic, we covered digital resources and the different ways to access them. We have gained knowledge about the benefits and challenges of digital resources, and, more importantly, how you can search for relevant materials using the internet. Moreover, we have learnt that some digital resources that are free to access, redistribute, and share for teaching, learning, and research purposes, while others are subject to subscriptions.</p> |
|---|---|

Review Questions

| | |
|---|---|
|  | <ol style="list-style-type: none"> 1. What do you understand by the term “digital resource”? 2. Do you think it is a good idea to share your contents free of charge? Discuss. 3. What are other benefits and challenges of using digital resources not identified in this topic? 4. One of the challenges of access to digital resources is the digital divide. Discuss to what extent this is true, and identify approaches that can be devised to mitigate the digital divide and its effects. 5. State why accessing resources digitally is a strategy worth pursuing. |
|---|---|



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Topic 2: The Nature of Digital Resources

Introduction

This topic will develop your knowledge of existing digital resources and the various standard file formats and media that support them. We will also look at the common application file types that we use during our daily work activities, including audio, image, and video formats, and their file extensions.

Topic 2 Learning Objectives

| | |
|---|---|
|  | <p>At the end of this topic, the learner should be able to:</p> <ul style="list-style-type: none"> • identify different file formats, particularly standard formats; • identify different media players and their associated file formats; and • describe ways of finding and accessing digital media content. |
|---|---|

2.1 Standard File Formats

2.1.1 Full Text

PDF: PDF an abbreviation of Portable Document Format. Each PDF file can contain text, fonts, graphics, and other information, which is saved as an electronic document file. PDF files save documents that are independent of operating systems: both Mac and Windows are supported, as well as smartphones, such as Android cell phones (Jones, 2013a).

doc/docx: The filename extension for the versions of Microsoft Word document files. The current version is the .docx extension, which is used in Microsoft Word 2007 and later versions to save documents. Later versions of Word save documents with the .docx format as a default, but can also open documents with the .doc file extension. A .doc or .docx file can contain text, images, tables, graphs, and charts (Jones, 2013b; Fisher 2016).

xls/xlsx: These are Microsoft Excel file formats. For earlier versions, the .xls extension is used, and for Microsoft Excel 2007 and later versions the .xlsx file format and extension is used. Excel an application that enables users to create spreadsheet documents, which contain features such as calculation formulas and tables (Jones, 2013c).

ppt/pptx: The former is the file extension used by Microsoft PowerPoint prior to 2007. The .pptx file extension is used by Microsoft PowerPoint 2007 and later versions. Microsoft PowerPoint is a presentation application that allows users to create slide shows. A PowerPoint slide show can include text, and embedded audio, images, and video. (Jones, 2013d).



2.1.2 Images, Video, Audio, and other formats

Some common digital media file formats appear in Table 2 (Virginia Tech, 2013). To view or play various media, particular software programmes or players may be required depending on the file format. Some players will come as part of your programmes associated with your operating system (Windows, Android, or iOS). In addition, you will be able to download and use other free-to-use media players supported by your operating system such as those listed on the web sites below:

- [10 Best and Free Media Players for Windows PC](#) (2017 Edi (FOSSBYTES, 2017)
- [The 9 Best Free Media Players for PC and Mac](#) (Digital Trends, 2017)

Please also refer to your Digital Fluency, Module 1 for information on basic file handling, and multimedia editing.

Table 2: Recommended File formats (Virginia Tech, 2013) [CC BY NC SA United States](#)

When deciding what image format to use first weigh its original form to the output. Some formats are better for different data. If you intend that the image will or needs to be printed go for a format that produces a larger file size.

General Rule of Thumb:

- .pdf - good for line drawings with searchable text, e.g. maps.
- .jpg - better for photographs
- .gif - better for images other than photos, e.g. drawings.
- .tiff - for archival images these files are the largest. More info is stored.
- .png - created to replace gif format and is acceptable for photos also.

PDF (.pdf): See above for general information on the PDF format. PDF is best used to store vector-based graphics (i.e. graphics drawn using lines and curves rather than pixels). Vector graphics stored in PDF format will be much smaller, will read more cleanly, and any included text will be searchable. Equations, charts, and diagrams that combine text with vector-graphics are particularly appropriate to store in PDF format.

JPEG (.jpg): The JPEG format is primary used to store photographs. JPEG is a "lossy" format, meaning that some image quality is sacrificed in order to produce much smaller files. Images of higher quality should be stored in TIFF format instead (see below). Non-photographic images such as graphs and charts will be smaller if stored in GIF format instead (see below).

CompuServe GIF (.gif): The GIF format, developed by CompuServe, is best used to store screen-quality images that do not contain many colors. GIF files are typically very small, but cannot reproduce the range of colors necessary to reproduce photographic images (use the JPEG format instead -- see above).

TIFF (.tif): The TIFF format is an archival format, meaning that it does not sacrifice image quality in order to reduce file sizes. TIFF images are excellent for storing detailed, high quality images. However, TIFF files tend to be much larger than either JPEG or GIF images, and cannot be opened using most web browsers without installing and



configuring additional viewing software or plugins.

PNG (.png): The PNG format is an open standard developed to replace the Compuserve GIF format. Like GIF files, low-color images stored in PNG format are typically quite small. Unlike the GIF format, the PNG format can also be used to store high-color images, which means it is also suitable for storing photographic content.

General Suggestions: For images that are only intended to be viewed on screen, a resolution of 72 or 75 dpi will result in a small file that can be easily downloaded. A resolution of 600 dpi is recommended for images that are intended to be printed.

MPEG (.mpg): The MPEG format is the oldest and most widely supported format for movies. There are a wide range of viewers available for all platforms. The MPEG format is most commonly used as an output format from UNIX utilities that generate video content.

QuickTime (.mov, qt): The Quicktime format was originally more of a Macintosh-specific format. These days, support for Quicktime movies is good on both the Macintosh and Windows, but not as good on UNIX.

Audio Video Interleaved (.avi): The AVI format is more of a Windows-specific format, and is not as well supported on other platforms.

Suggestions Regarding Video Content: Video is one of the most resource-intensive types of multimedia. Unfortunately, video content that is of even half broadcast quality is often too large to download from home. Consider including lower quality versions of video content in addition to high quality originals.

WAV (.wav): The default standard for Windows sound files, is also supported for most other platforms.

AIFF (.aif): The AIFF format is a Macintosh-specific equivalent of the WAV format. It is not as well supported on all platforms as the WAV format.

MPEG-3 (.mp3): MPEG-3 (or MP3) format eliminates sound data which is not as strongly perceived by the human ear and brain, and as such creates files of reasonable quality that are as much as 10 times smaller than the raw data itself. MP3 files are good for storing long passages of sound content where high quality is not required.

Suggestions Regarding Sound: The quality used to store sound in electronic format reflect the quality of the original recording source. There is very little reason to store low fidelity recordings of speech content in a very high-quality format, as the added file size would not result in any increase in quality. Conversely, high-fidelity recordings should be stored at high-quality.

If you have content that has been created in a proprietary format, it is recommended that you include a copy of the content in both the proprietary format and in a more common format as well. If you have multimedia content that is too large to be downloaded via the web, it is recommended that you include a copy of the content stored at the original quality,





and a copy stored at lower quality (and hence smaller size).

Zip files are also acceptable. A .zip file may contain one or more files or folders. It is an archive file format that supports lossless data compression.

Activity 2: Investigating file formats



Aim: To enhance your understanding of different file formats

Motivation: To become familiar with the programs used to open specific documents and their file extensions, as well as saving those documents.

Task: XXX

Duration 3 hours (180 minutes)

Tools: Discussion forum;

Resources: Snipping tool (Windows), or any other screen-capture tool

What to do:

- a) Find a folder on your own PC/laptop, where there are several files with different file formats.
- b) Take a screen shot (using the screen-capture tool) of the folder with the files sorted by file type.
- c) Write down your explanation of what each of the file types shown represents.
- d) Describe how you would go about viewing a file in a format that is not present on your PC/laptop. For example, you may need to download and install software to access the file, such as Adobe Acrobat for a PDF. What other examples can you think of?
- e) Find out how to convert a PDF file to edit in MS Word, and how to save a MS Word file as a PDF. Record your steps.
- f) Share your record of all of these tasks in a file attached to your forum contribution. Your forum contribution should contain:
 - A description of your challenges in undertaking this activity; and
 - Your screen capture image.

How:

- Find a partner and agree to work with them in the forum.
- You and your partner should confirm access to each other's attached document, and can download and open it on your computing device.

Feedback/response: (peer review)

- Each participant should constructively comment on their partner's contribution.
- Read your partner's response to your own contribution and reflect on the comments.

Assessment:

- Completing this activity will count towards your course portfolio.



2.2 Accessing / discovering digital media content

This section is taken from 'Making your Digital Collections easier to Discover' (Chowcat, Kay, and Stephens, 2017) [CC BY NC ND](#)

Make Google searches work for you

Search engines such as Google, Bing and Yahoo are major discovery tools for all online audiences, including students and researchers. Research repeatedly identifies Google as the main starting point for a wide range of users. Improving the way digital collections and their items are found and displayed by Google is therefore the primary mechanism by which the discoverability of resources can be improved for all audiences.

Strategic Outcomes: Improving how your content is found and displayed by web search engines like Google can contribute to institutional strategies to: enhance reputation, improve efficiency and effectiveness, and offer economy of access.

Using social media to promote your digital collections

Social media allow you to reach a large yet targeted audience with your digital collections. Many social media channels exist ranging from specialist email lists to Twitter and Facebook. Activity to engage audiences through social media is best managed through an organisational social media strategy, usually as part of a wider marketing or communications plan. The [Tate Social Media Communication Strategy 2013-2015](#) and the [2016 update](#) are well-constructed examples of such a strategy. In your social media strategy consider what you want to achieve, what tools you'll use and how you'll measure success.

Strategic Outcomes: Promoting your digital collections through social media can contribute to institutional strategies to: enhance reputation, enrich teaching and learning, enable research, assist widening participation, and offer economy of access.

Use aggregators to boost your collection

In academia, there are a number of major online services that pull together resources relevant to researchers and students in particular sectors. There are lots of different types of aggregators:

- g) Search indexes provided by companies as a part of their discovery products, e.g. [Summon](#) and [Primo Central](#)
- h) Aggregators that are specific to the type or purpose of the materials they pull together, e.g. [ArchivesHub](#) and [Capac](#)
- i) Aggregators that are subject specific, e.g. [VADS](#)

Strategic Outcomes: Using aggregators to enhance your digital collections can contribute to institutional strategies to: enrich teaching and learning, enable research, enhance reputation, and offer economy of access.

Make your collection available for learning and teaching

Students of all levels look for recommendations from their teachers to help them discover new resources, making teachers and lecturers a key path to sharing content from your digital collection. To support the use of your digital collection in learning and teaching you might wish to develop guidance for teachers on how to use it in a learning context. This might



involve developing self-contained packages based on your digital collection that meet clear teaching needs. For important insights into how and why digital resources are used in teaching see our 2011 report on [open educational resources \(pdf\)](#) and the 2015 report on [The Impact of OER on teaching and learning Practice \(pdf\)](#).

Strategic Outcomes: Making your digital collection available for learning and teaching can contribute to institutional strategies to: enrich learning and teaching, enhance reputation, improve efficiency and effectiveness, and contribute to widening participation activities.

Using popular websites to reach broader audiences

Some of the web's most popular sites offer an opportunity for you to reach large audiences with your content. Services such as Wikipedia, YouTube and Flickr perform well in search engine rankings, and are often used by undergraduate students as well as by researchers looking to find information on topics they are not familiar with. They also often offer additional functionality such as social media integration and APIs which you can take advantage of.

Strategic Outcomes: Ensuring you get the most out of popular web destinations can contribute to institutional strategies to: enhance reputation, improve efficiency and effectiveness, contribute to widening participation activities, and ensure economy of access.

Improve the user experience of your digital collection

User experience refers to the overall experience users have when using a service. User experience is a very wide-ranging concept but it is often associated with aspects of 'usability' in relation to web-based services. To improve the user experience of your digital collection, you need to consider the needs of your users, how they find and navigate your collection, and the tasks they go on to complete as a result.

Strategic Outcomes: Enhancing the user experience of your collection can contribute to institutional strategies to: enrich learning and teaching, enable research, enhance reputation, improve efficiency and effectiveness, assist widening participation, build a scholarly record, and offer economy of access.

Ensuring your digital collections reach academic researchers

Research practice varies widely across disciplines and between individual researchers, however there are some research behaviours which are common among research communities. A common behaviour is citation chaining - following bibliographic references to find further useful resources. There are also new approaches to research - in digital humanities researchers are using software to interact with research materials. Understanding these behaviours could help you make your digital collection more accessible for academic researchers, and embed your digital resources in academic outputs where they can be discovered by new audiences.

Strategic Outcomes: Making your digital collection available for learning and teaching can contribute to institutional strategies to: enable research, enhance reputation, improve efficiency and effectiveness, and build a scholarly record.



Create champions for your digital collections

Many people rely heavily on recommendations from those they respect in order to discover useful resources online. Recommendations might come from teachers, fellow students, fellow researchers, or even family and friends. Engage those who are using your digital collection and ensure they have the ability to promote and otherwise champion your digital collection if they so wish. You will benefit from their efforts to tell their personal network about your collection.

Strategic Outcomes: Creating collection champions can contribute to institutional strategies to: enrich teaching and learning, enable research, and enhance reputation.

Ensure your digital collections integrate with your organisation's systems

Within a single organisation there may be a variety of systems that are used to search for resources. To ensure a digital collection is discoverable by users within an institution it should be indexed within every institutional discovery system. Typically, resources are indexed in discovery systems by the regular transfer of metadata. This might be through the regular import/export of data or through the [Open Archives Initiative Protocol for Metadata Harvesting - OAI-PMH](#). There are two common open source discovery systems used by university libraries - [Blacklight](#) and [VuFind](#). There are also a number of commercial services available, including EBSCO's [Discovery Service](#), Ex Libris' [Primo](#), Proquest's [Summon](#) and OCLC's [Wildcat Local](#).

Strategic Outcomes: Ensuring your digital collection works well with local discovery services can contribute to institutional strategies to: enrich learning and teaching, enable research, improve efficiency and effectiveness, and ensure economy of access.

Reflection

Please use the Moodle course blog facility to reflect on your experiences and engagement with this week's topic. (20 minutes)

Summary



In this topic, we looked at the different file extension format starting, including text, audio, and video. We also covered some of the basic digital-media players that we encounter on a daily basis, and then looked at the different methods by which a user can find digital content.

Review Questions



1. What is a file extension?
2. What is the difference between the doc. and .docx file extensions?
3. Mention two video player that you are familiar with.
4. List two software programs that you can use to open a PDF file.
5. What is the difference between mp3 and mp4?



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Topic 3: Storing of Digital Resources

Introduction

This topic will expand your understanding of and knowledge about the storage of digital resources. We will look at ways in which you can store your digital resources on digital devices and cloud-storage technologies. By the end of this topic, learners will have expanded their knowledge about different types of digital storage devices such as portable hard drives, flash disks, CDs, and so on; and cloud-based technologies such as Dropbox and Google Drive in their working and learning environments.

Topic 3 Learning Objectives

| | |
|---|--|
|  | <p>At the end of this topic, the learner should be able to:</p> <ul style="list-style-type: none"> • show understanding of the concept of digital storage; • identify different types of digital-storage media; • define the concept of cloud storage; • identify different types of cloud storage; • apply different types of cloud technology in daily life; and • identify the advantages and disadvantages of cloud storage. |
|---|--|

3.1 Digital Storage Media

The term digital storage refers to storing data on computers or other hardware devices for the purpose of backup, archiving, or sharing. Digital storage is a means or channel that you can use to store data in a digital form.

3.1.1 Modes of storage

There are three main ways in which media digital content can be stored: online; offline; or nearline. According to Wikipedia (n.d.c), the formal distinction between them is:

- Online storage is immediately available for I/O.
- Nearline storage is not immediately available, but can be made online quickly without human intervention.
- Offline storage is not immediately available, and requires some human intervention to become online.

3.1.2 Types of digital-storage media

The storage media can be physical, where data is stored on physical devices, or virtual, where data is managed, stored, and retrieved remotely, and made available to users over the internet. In both cases, physical or virtual, there are many data-storage options.

Physical digital-storage media: This involves saving or storing your data using physical devices, such as your personal computer or laptop's internal hard drives, servers, floppy disks, flash disks, external hard drives, DVDs, CDs, tablets, and cell phones. Common types are:





- **Magnetic media:** The term “magnetic media” is used to describe any storage media on which information is recorded and retrieved in the form of a magnetic signal. Examples of magnetic media are magnetic hard disks, floppy disks, and magnetic tape (cassettes or cartridges).
- **Optical media:** Optical media describes a range of storage device on which the stored information is read optically by a laser. There are three main types of optical disc:
 - ROM discs contain information that cannot be changed or added to by the user. CD-ROM and DVD-ROM are the most common types of ROM disk.
 - WORM (write once, read many) discs are also known as read-write optical discs. The most common forms of WORM disc are CD-R and DVD-R (recordable). Users can record information on them, but it cannot be deleted or changed.
 - Rewritable optical discs, also known as EO (erasable optical) disks, allow the user to record information on a disc, erase it, and replace it with new data. The most common forms are CD-RW and DVD-RW.
- **Solid state media:** Solid state storage refers to devices that store data in “flash memory”, rather than on rotating disks or optical media. Examples include USB flash drives, Compact Flash (CF) cards, Secure Digital cards (SD), xD-Picture cards, and Memory Stick cards.

3.1.3 Virtual (cloud) storage

Cloud storage refers to the online storage of data in a physical location unknown to the user, such as on multiple virtual servers, generally hosted by third party. It is a service whereby data is remotely managed and backed up over the network, provided there is an internet connection. It allows a user to store and manage their files and access them regardless of their location. The data is available all the time and can be accessed via the internet using hardware devices such as desktop computers, laptops, smartphones, and tablets (Cloud storage, 2013). Using this technology, you can save and store your files using applications such as Dropbox and Google Drive. You can store your photos on Flickr, Facebook, Instagram, Tagged, or Picasa at no cost. Some of these services are limited to a certain amount of data storage, with additional charges for extra services (Cloud storage, 2013). Another issue with storing digital resources using services such as these is to check who owns the rights to the resources once they are uploaded. For example, did you know that when you upload an image or other content to Facebook, the terms state:

“2.1 For content that is covered by intellectual property rights, like photos and videos (IP content), you specifically give us the following permission, subject to your privacy and application settings: you grant us a non-exclusive, transferable, sub-licensable, royalty-free, worldwide license to use any IP content that you post on or in connection with Facebook (IP License). This IP License ends when you delete your IP content or your account unless your content has been shared with others, and they have not deleted it.” Facebook (2015) [Statement of Rights and Responsibilities](#).

When it comes to business, cloud storage has reduced the time and cost that a company might incur during the storage process. The cost of purchasing servers and backup devices, and the operational cost of maintaining those devices can be removed. Many providers of cloud-





storage services, such as Google, provide unlimited scalability and innovative functionality, and offer standard security features and data-analysis tools. Other services offered by cloud-service providers include backup and recovery provisions, the hosting of large data repositories, and the maintenance of servers. (Google Inc, 2012)

Types of cloud storage include:

- **Public cloud storage:** This is offered on a commercial basis by a service provider to anyone, given that they possess an internet connection. The cloud resources are stored to the cloud server of the service provider (Jacob, 2013; Transparency Market Research, 2013).
- **Private cloud storage:** This occurs when cloud storage services are exclusively owned by an organisation. It provides faster backup and recovery of data because it is normally carried out within the organisation's LAN, rather than WAN, which provides high bandwidth for data transfer (Transparency Market Research, 2013).
- **Hybrid cloud storage:** This is a combination of both public and private cloud storage. Some data can be stored in a private cloud and a copy of it can be stored in the public cloud. This system allows the movement of data between the two different storage types (Jacob, 2013).

Examples of useful popular cloud storage applications include:

- **Dropbox** is a cloud-based service that allows you to upload and share files easily, regardless of the location. It is an application that allows sharing of files and collaboration between persons sharing the folders and files. It also gives a user the ability to edit, create, and delete files from their account (Dropbox, n.d.). You can use Dropbox by either installing the Dropbox desktop client application, or using the web-based interface directly. The Dropbox application is supported by different operating systems, including Windows, Mac, and Linux. The [Dropbox Tour](#) provides further guidance. Watch a video on '[How DropBox Works](#)' (Cox, 2015). The benefits of using Dropbox include: 
 - You can move files or folders by simply dragging them and dropping them into Dropbox, where they will automatically synchronised to your account;
 - Dropbox tracks changes you made, and restoring files is possible. For example, you can “un-delete” files and restore the previous state of files;
 - Dropbox is also accessible on mobile and tablets, such as iPads, iPhones, Android phones and tablets, and BlackBerry.
 - Dropbox offers 2GB of charge, which can be upgraded to 500GB (Dropbox, n.d.).
 - You can share folders by simply right- clicking the file or folder on the desktop, and choosing “sharing” (Cloud Storage, 2013).
 - By using the public folder that is located in you Dropbox folders, you easily share folders to Dropbox and non-Dropbox users by sending links to your files.
 - Dropbox allows automatic synchronisation of files. Changes within your Dropbox will be automatically updated across your other devices that have Dropbox installed.



- **Google Drive** is a file storage and synchronisation service provided by Google, which enables cloud storage, file sharing and collaborative editing. Google Drive allows you to store, share, and access different files online, and can be synchronised with your hard drive. The stored files can be accessed through the computers and mobile devices, such as smartphones and tablets (Google Blog, 2012). View the video ‘Intro to Google Drive’ (Cox, 2016) 
- With Google Drive, you can upload, organise, and view files; and work with images and videos at any time with a device that has internet connectivity. Google Drive automatically syncs files, folders, and Google Docs directly to your Google Drive folder once it has been installed on your Mac/PC and the computer is connected to the internet.
- Google Drive allows you to share files, folders, and allows collaboration with your colleagues. It also provides visibility options and access levels: you can control who sees and edit your files.
- Google Drive gives you 15GB of free storage space to store your files, emails, and photos, with an option to buy more storage space for a fee (Google Blog, 2012).
- Google Drive also allows users to create new documents, spreadsheets, and presentations that they can share and collaborate on with others in real time (Google Blog, 2012).

Advantages of cloud storage (Cloud Storage, 2013)

- It gives you easy access to data via both computers and mobile devices;
- Files can be accessed anywhere and at any time;
- It provides backups of data;
- It provides secure storage of your backup data;
- It provides cost savings; offering backup of data at a reasonable price; and
- For some applications, it allows the ability to access data offline (Jacob, 2013).

Disadvantages of cloud storage (Cloud Storage, 2013)

- There are extra charges for a large amount of data and bandwidth usage;
- The free usage offers limited space, for example, Google Drive is limited to 15GB;
- Files cannot be accessed when there is no internet connection.

3.1.4 Choice of digital storage media

Any storage medium is dependent upon specific combinations of hardware and software for access. The accessibility of information stored on such media is highly vulnerable in a rapidly evolving technological environment, even over relatively short timescales.

No digital storage medium can be considered “long term” or permanent, and there will always be a need to periodically refreshing storage media. Careful selection of media can maximise the periods between refreshment and simplify the refreshment process, in addition to ensuring that data is as secure as possible.

Criteria to be considered by data administrators / creators when selecting removable storage media include: Availability and speed; Longevity; Capacity; Viability; Obsolescence; Cost; and Susceptibility. (National Archives, 2008)



3.1.5 What you need to do

Actively manage your important digital content. Always consider the following steps:

- Have at least two separate copies of your content on separate media — more copies are better;
- Use different kinds of media (DVDs, CDs, portable hard drives, thumb drives, or cloud storage); use reputable vendors and products;
- Store media copies in different locations that are as physically far apart as practical;
- Label media, such as important documents, properly, and keep it secure locations; and
- Create new archival media copies at least every five years to avoid data loss.

Activity 3: File Sharing practice



Aim: To enhance your understanding of online file-sharing technology and practices.

Motivation: To learn how to share large files in different formats with your colleagues, either individually, or in groups working on a common project.

Task: Share a file online.

Duration: 3 hours (180 minutes)

Tools: Discussion forum;

Resources: Flickr OR SlideShare; Google Drive or Dropbox.

Who: Please undertake this activity in pairs.

What to do:

- If you have not already signed up to EITHER [Google Drive](#) OR [Dropbox](#), you need to do so now. (Individually)
- Develop a coherent document outlining the step-by-step process to start using the photo sharing site [Flickr](#) OR the slide sharing host platform [SlideShare](#).
- Now choose a partner to work with for this activity.
- Upload your document to your Google Drive OR DropBox account. Share the document with your partner (you will need their email address).
- You and your partner should confirm that you have access to each other's documents.
- Describe your challenges in undertaking this activity within a post to the discussion forum, including the link to your document to share with the group.

Feedback/response: (peer review)

- Constructively comment on at least other person's contribution;
- Read the other peoples' responses to your own contribution and reflect on the comments.
- By the end of the discussion, you should have a clear idea of how to use a file sharing application, and where you can host certain types of resources.

Assessment:

- Completing this activity will count towards your course portfolio.



3.2 Security and data privacy challenges of cloud storage

There is a concern about data security and protection offered by cloud-storage providers, largely relating to the issues of data integrity and access control. Some users may not fully trust cloud servers, for fear that their stored data could be corrupted or removed by a third party, or could be accessed by unauthorised users. Since cloud storage is a web-based technology, it also faces the challenges of security breaches and privacy infringements that are associated with the use of internet connectivity in storing or transferring data (TrendMicro, 2012).

Cloud storage services have been subject to different online attacks. These include cybercrimes, spam, malicious attacks, and DDOS (denial of service), all of which can interfere with data security and the privacy users.

Dropbox was hacked and spam emails were sent to its users in 2012. It was found that one of the Dropbox employee's accounts was hacked, and user email addresses were obtained, with spam then being sent to these email address (Brodkin, 2012).

3.3 Digital Storage media care and handling

View the video (7m40s) "[Why Digital Preservation is Important for You](#)" (Library of Congress, 2010). The following guidance on [Media Durability](#) is provided by Library of Congress (n.d.) for personal archiving. In addition, some useful information is provided on how to preserve digital materials of a particular type.

How Long Will Digital Storage Media Last?

All digital storage media have a short life. This is why digital preservation requires active management, including regular migration of content from older storage devices to newer devices. The life of storage media is cut short by at least three factors:

1. Media durability: Computer storage media devices vary in how long they last. The quality and construction of individual media items differ widely. The following estimates for media life are approximate; a specific item can easily last longer--or fail much sooner.
2. Media usage, storage and handling:
3. Media obsolescence. People have a direct impact on the longevity of storage media:
 - The more often media are handled and used, the greater the chance they will fail;
 - careful handling can extend media life, rough handling has the opposite effect.
 - Stable and moderate temperature and humidity, along with protection from harmful elements (such as sun and salt) helps keep media alive.
 - Good-quality readers and other hardware media connections are beneficial; poor connections can kill media quickly.
 - Media that are not labeled or safely stored can be lost or accidentally thrown away.
 - Fires, floods and other disasters are very bad for media!



Reflection

Please use the Moodle course blog facility to reflect on your experiences and engagement with this week's topic. (20 minutes)

Summary



In this topic, we have explored the concept of cloud storage and its types. We also were introduced to Dropbox and Google Drive, and looked at the security and privacy challenges of cloud storage. Despite the risks that may arise, cloud storage has been beneficial to both individuals and organisation, in terms of offering a reliable and convenient service offered. Cloud storage can reduce organisational costs, provide a data-recovery option, and offer easy accessibility.

Review Questions



1. What do you understand by the term “digital storage”?
2. Explain ways in which cloud storage systems can be used.
3. What do you understand by the term “file synchronisation”?
4. List examples of cloud storage systems that you are familiar with, and state their advantages and disadvantages.

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Topic 4: Content Management Systems

Introduction

In Topic 4 we will discuss electronic libraries and their applications. You will also learn about Content Management Systems and their applications in everyday academic, professional, and working life. The topic will address the benefits, as well as challenges, associated with electronic library applications from the user's point of view, and some guidance on using an electronic library is also provided.

Topic 4 Learning Objectives

| | |
|--|---|
| | <p>At the end of this topic, the learner should be able to:</p> <ul style="list-style-type: none"> • explain the concept of electronic libraries; • search for relevant information or resources using an electronic library; • identify and explain the concept of Content Management Systems; and • identify the benefits and challenges of using Content Management Systems. |
|--|---|

4.1 Electronic Libraries within Academic

4.1.1 What is an electronic library?

An electronic library is a repository of digital information or resources that is used for storing resources for learning and research purposes on the intranet, internet, or a networked environment via specialised software. The information stored is searchable and retrievable, and can be in different forms, such as text, images, audio, and video. Other terms for an electronic library are digital library, digital repository, and virtual library.

According to Wikipedia (2014):

An electronic library (also referred to as digital library or digital repository) is a focused collection of digital objects that can include text, visual material, audio material, video material, stored as electronic media formats (as opposed to print, micro form, or other media), along with means for organising, storing, and retrieving the files and media contained in the library collection. Digital libraries can vary immensely in size and scope, and can be maintained by individuals, organisations, or affiliated with established physical library buildings or institutions, or with academic institutions. The electronic content may be stored locally, or accessed remotely via computer networks. An electronic library is a type of information-retrieval system.

The electronic library differs from traditional paper-based library in that within an electronic library all resources are stored and retrieved in a digital form; nowadays, most academic libraries are at hybrids of paper and electronic storage.

4.1.2 Benefits and constraints of Digital Libraries

The advantages of digital libraries as a means of easily and rapidly accessing books, archives, and images are now widely recognised by commercial interests and public bodies alike.





Obvious pros include 24/7 and multiple person access, with the cons being that internet connectivity is required for access. Advantages and limitations of a digital library (Trivedi, 2010) are listed in Table 3.

Table 3: Advantages and Limitation of a Digital Library (Trivedi, 2010)

| Advantages | Limitations |
|--|---|
| Nearly unlimited storage space at a much lower cost; Re-allocate funds from some staff, collection maintenance, and additional books; No physical boundary; Round the clock availability; Multiple access; Enhanced information retrieval; Preservation for some print material; Added value; and Universal accessibility. | Lack of screening or validation; Lack of preservation of a fixed copy (for the record and for duplicating scientific research); Lack of preservation of “best in class”; Difficulty in knowing and locating everything that is available, and differentiating valuable from useless information.; Job loss for traditional publishers and librarians; and Costs are spread and many become hidden. |

4.1.3 Locating and accessing digital resources using an electronic library

Searching for digital resources within electronic library can be easy, due to searching within a library catalogue (database) such as the [Online Public Access Catalogue](#) (OPAC). General tips for searching include:

- Avoid being too general when searching for resources from the library; instead, narrow down your search by using keywords, such as name of author, name of publisher, name of the subject, or a combination of more than one keywords.
- Ask the librarian if you encounter any difficulties.

4.2 General Content Management Systems

According to TechTarget (n.d.), a content management system (CMS) is “a software application or set of related programs that are used to create and manage digital content. CMSes are typically used for [enterprise content management](#) (ECM) and [web content management](#) (WCM). An ECM facilitates collaboration in the workplace by integrating document management, digital asset management and records retention functionalities, and providing end users with role-based access to the organization's digital assets. A WCM facilitates collaborative authoring for websites. ECM software often includes a WCM publishing functionality, but ECM webpages typically remain behind the organization's firewall.”



4.2.1 Examples of Web Content Management Systems

There are many examples of Content Management Systems; some of them are open source, and some proprietary. Some well-known Web Content Management Systems are:

- [WordPress](#) is a free-to-use and popular Content Management System you can use to create a website or blog. It is Open Source.
- [Joomla!](#) is a popular open source system (OSS) allowing the building of web sites and online applications.
- [Drupal](#) is the third-most used CMS and originated before WordPress and Joomla. Drupal is an open-source content management platform powering millions of websites and applications.
- [ExpressionEngine](#) is in the top five most-used Content Management Systems. It is a commercial CMS made by EllisLab.
- [Alfresco](#) has open source and proprietary versions of the same product.

Activity 4: Exploring Content Management Systems (CMS)



Aim: To enable you to identify and work in different Contents Management Systems.

Motivation: To help you manage and retrieve digital resources from Content Management Systems.

Task: Engage with selected CMSs.

Duration: 2 hours

Tools: Discussion forum;

Resources: Websites to be explored -

- [e/merge Africa](#)
- [Easychair](#)
- [Multi-Device Learning Study](#)
- [OER Africa](#)
- Your own institutional website

Questions:

- Which CMS was used to build each site (if the information is provided).
- What is the purpose of the site?
- Are you able to engage in any way with the site? e.g. via comments, up/downloading of files, engaging in discussion forums or other activities. Describe which activities (if any) apply to which site.

What to do:

- Browse through each of the suggested web sites and answer the questions above.
- Record your responses in a suitably structured table.
- Paste the table into your discussion form contribution.

Feedback/response: (peer review)

- Read and respond to at least 1 other person's contribution.
- Read and respond to at least 1 other person's comment on your own contribution.

Assessment:

- Completing this activity will count towards your course portfolio.





4.2.2 Benefits of Using Content Management Systems

The following are the benefits most Content Management System will offer:

- There are many good OSS Content Management Systems available, which keeps costs low.
- Ease of use. Uploading and updating information is quite easy; once installed, you don't need to be a technical or programming expert to use a CMS. At the Open University of Tanzania, for example, uploading and updating information relating to faculties on the university's website is normally done by individuals representing each faculty, most of them non-technical people.
- Easy to customise: Almost all Content Management Systems offer flexibility to suit the user's needs and wants.
- Can be integrated with other systems, such as Learning Management System. For example, the Moodle Learning Management system of the Open University of Tanzania has been installed with the Alfresco plugin, which allows users to access resources stored in Alfresco while logged in Moodle.
- Secure, in that it requires login credentials to upload, update, and manage resources in the Content Management System.

A consideration of using a CMS is that it requires expertise in maintaining and updating the system.

Reflection

Please use the Moodle course blog facility to reflect on your experiences and engagement with this week's topic. (20 minutes)

Summary



In this topic, we have learned about electronic libraries and Content Management Systems (CMS). We have also identified the benefits and challenges associated with electronic libraries. Searching and accessing information from digital libraries has been discussed. Furthermore, the benefits and challenges of using Content Management Systems has also been explored in this topic.

Review Questions



1. Define the following terms: Electronic Library; Content Management System
2. Discuss the pros and cons of traditional paper libraries vs digital libraries?

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