(Some) Research Data Management Best Practices

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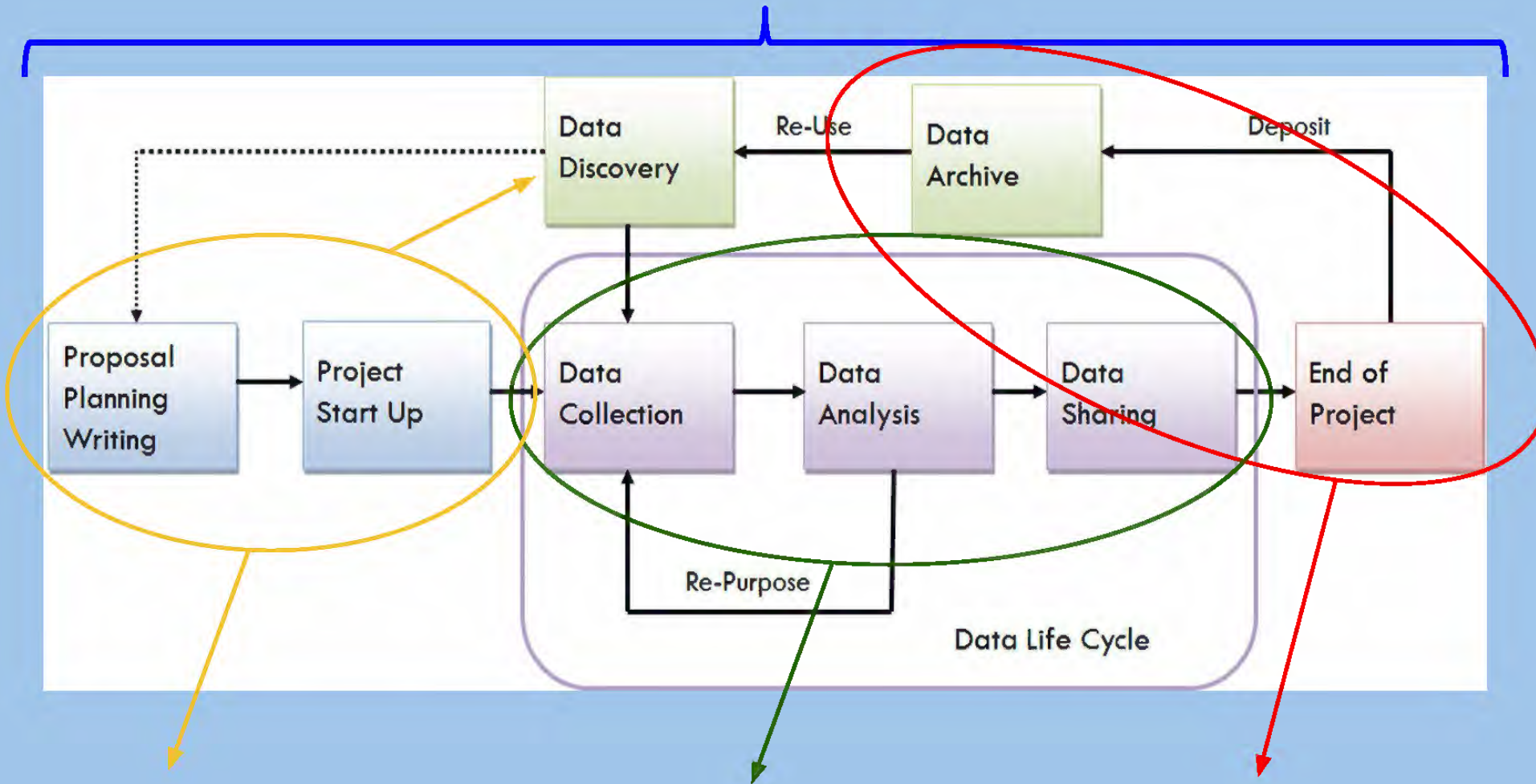
RDM 'Best Practices': A bird's eye view

1. Overarching principles: FAIR; CARE; OCAP



2. Pre-Research:
   - Funder requirements
   - Including RDM into funding applications
   - Data Management Plans
   - Participant consent & Information Letters
   - Ethics applications

3. During Research:
   - Primary data collection
   - Data storage
   - Data transferring
   - Data access
   - Data documentation/metadata
   - File naming conventions

4. Post-Research:
   - Publication requirements
   - Data deposit

Source: "*E-Science and the Life Cycle of Research*", Humphrey, C. (2006)

1. Overarching Principles

FAIR

FAIR is a set of guiding principles focused towards making data **F**indable, **A**ccessible, **I**nteroperable and **R**eusable:

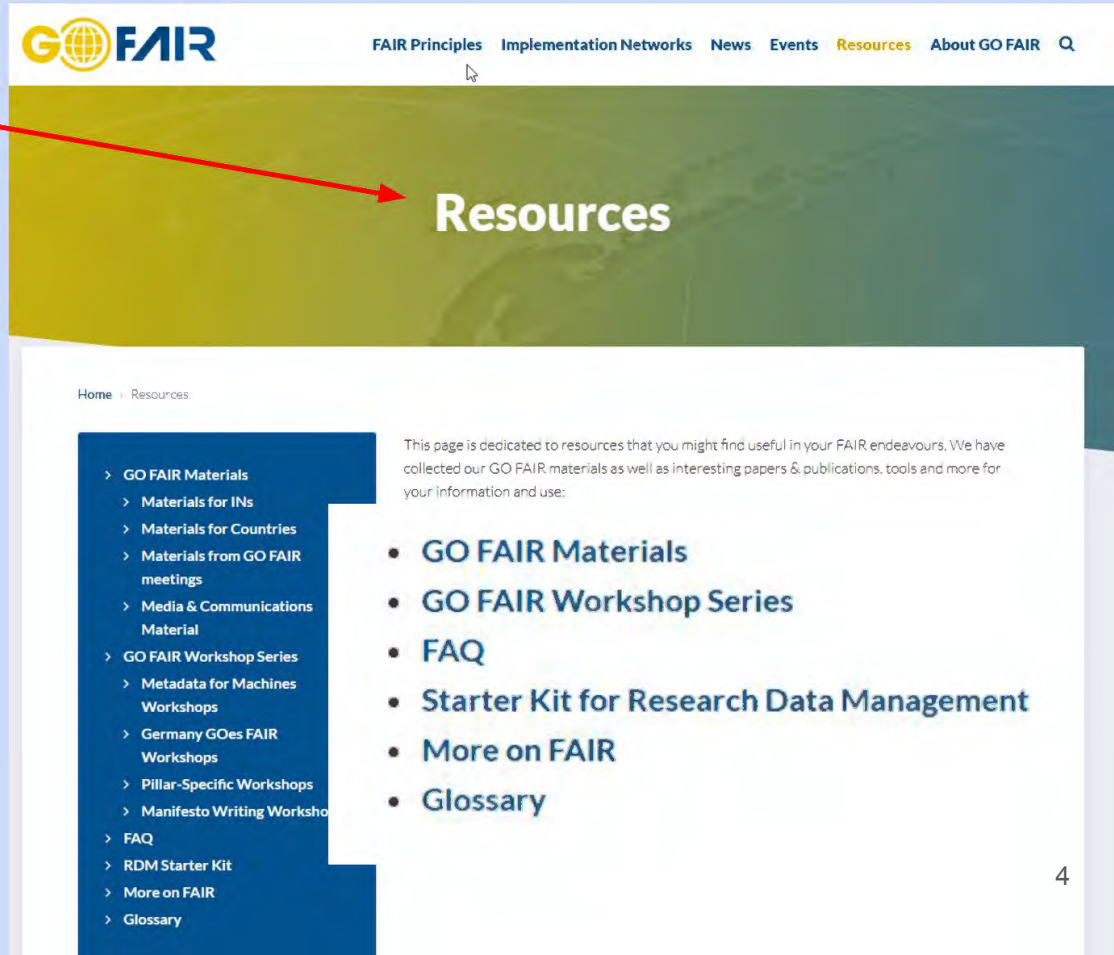
- **Findable** - Data and supplementary materials have sufficiently rich metadata and a unique and persistent identifier.
- **Accessible** - Metadata and data are understandable to humans and machines. Data is deposited in a trusted repository.
- **Interoperable** - Metadata use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- **Reusable** - Data and collections have clear usage licenses and provide accurate information on provenance.

*Key Reading: Wilkinson, M. D. *et al.* The FAIR Guiding Principles for scientific data management and stewardship. *Sci. Data* 3:160018 doi: 10.1038/sdata.2016.18 (2016).

FAIR Principles: Key Resource

go-fair.org (https://www.go-fair.org/fair-principles/)

- Detailed information across the FAIR principles
- Implementation Networks
- News
- Event
- Resources!



1. Overarching Principles

CARE

CARE is a set of guiding principles for Indigenous data governance:

- **C**ollective benefit for inclusive development and innovation, improved governance and citizen engagement, and equitable outcomes
- **A**uthority to control - Recognizing rights and interests, data for governance, and governance of data
- **R**esponsibility for positive relationships, expanding capability and capacity, and Indigenous languages and worldviews
- **E**thics for minimizing harm and maximizing benefit, justice, and future use of data

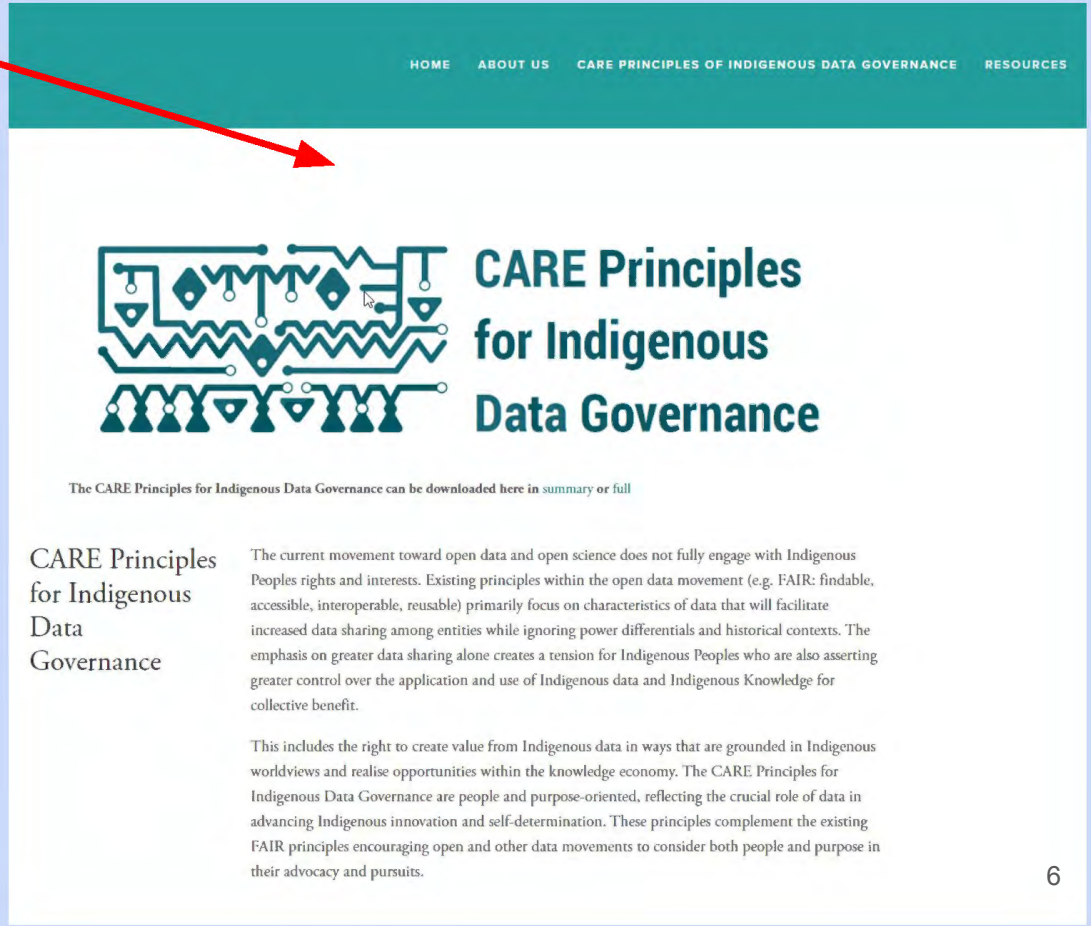
*Key Readings available at:

https://www.gida-global.org/resources

CARE Principles: Key Resource

gida-global.org/care

- Detailed information across the CARE principles
- Foundational readings & publications
- News
- Events
- Resources!



OCAP

The First Nation Principles of OCAP are a set of standards that establish how First Nations data should be collected, protected, used or shared:

- **Ownership:** refers to the relationship of First Nations to their cultural knowledge, data & information - a **community/group collectively owns information** in the same way that an individual owns his/her personal information
- **Control:** affirms that **First Nations communities have rights in seeking control over all aspects of research** - from start to finish - that impact them. This extends to control of resources and review processes and management of information.
- **Access: First Nations must have access to information and data about themselves and their communities** regardless of where it is held, and have the **right to manage and make decisions** regarding access to their collective information.
- **Possession:** Refers to the physical control of data - the **mechanism by which ownership can be asserted and protected.**

"OCAP® is a registered trademark of the First Nations Information Governance Centre (FNIGC)"
www.FNIGC.ca/OCAP

OCAP Principles: Key Resource

First Nations Information Governance Centre
(https://www.FNIGC.ca/)

- Fundamentals of OCAP online training program
- FNIGC data online
- First Nations Data Centre (data by request)
- First Nations surveys (i.e., regional health, early childhood, education, labour, oral health)
- FNIGC online library

2. Pre-Research

RDM Funder requirements

Awareness of funder requirements helps to identify:

- specific supports needed;
- collaborative opportunities;
- RDM supports to leverage.

When involved in funded research projects, know <u>who</u> the funder is and:

1) What general RDM related policies they may have; and

2) If there are any RDM related requirements pertaining to the specific call for funding.

2. Pre-Research

General RDM Funder requirements

Example:
'*Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*' (TCPS-2)

2. Pre-Research

Specific RDM Funder requirements

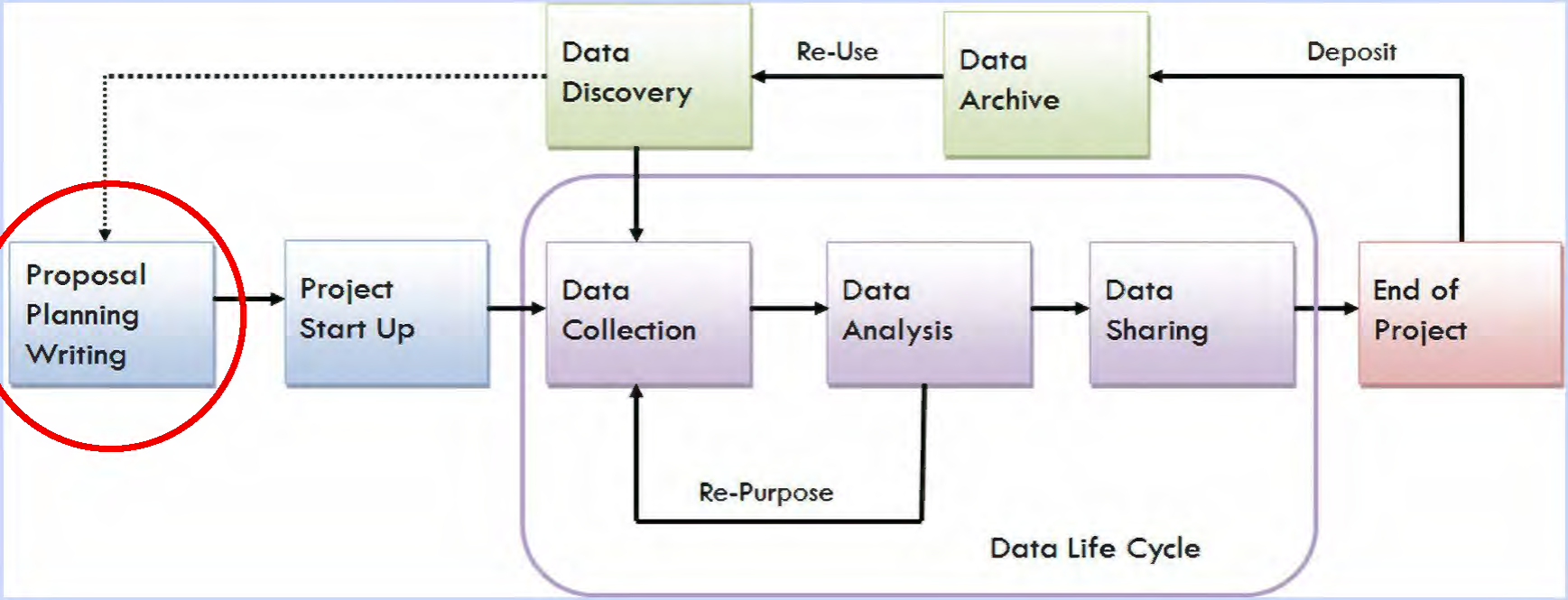
Example: CRAft Digital Research Archive grants

- Research data management plan with a focus on data accessibility and stewardship. ***Please note that the RDM plan is not considered part of the 5-page proposal and should be included as an attachment. We recommend using the Portage DMP Assistant to generate an RDM plan.***

Including RDM into funding applications

Including RDM within funding applications can help to strengthen funding applications by identifying:

- areas where essential RDM support may be needed
- collaborative opportunities *before* the research begins
- specific RDM supports that research projects may leverage



Source: "*E-Science and the Life Cycle of Research*", Humphrey, C. (2006)

2. Pre-Research

Including RDM into funding applications

Example RDM statement:

Research Data Management: The University of Alberta Libraries system will provide research data management training and support for project researchers on a one-on-one and group basis (including HQP), host project research data in Dataverse, UAlberta's data repository, and host project papers and publications, learning objects, digital images, etc. in its open-access Education & Research Archive.[i] Data management will extend beyond the project itself to ensure sustainability of the data for future researchers. We will form a *Research Data Management Committee* (reporting to the *EC*; see *Governance*) and use the *Portage DMP Assistant*[ii], a web-based open source application, to develop a *Research Partnership Data Sharing Agreement* at the beginning of the formal partnership. One of the major outcomes of this project will be well-documented, well-preserved **data sets** which can be used by future researchers and are themselves a form of scholarship.

**Special thanks to Dr. Carla Peck from the Faculty of Education, UofA, for permission to use this text from her recently successful application for SSHRC Partnership funding - "Thinking Historically for Canada's Future"*

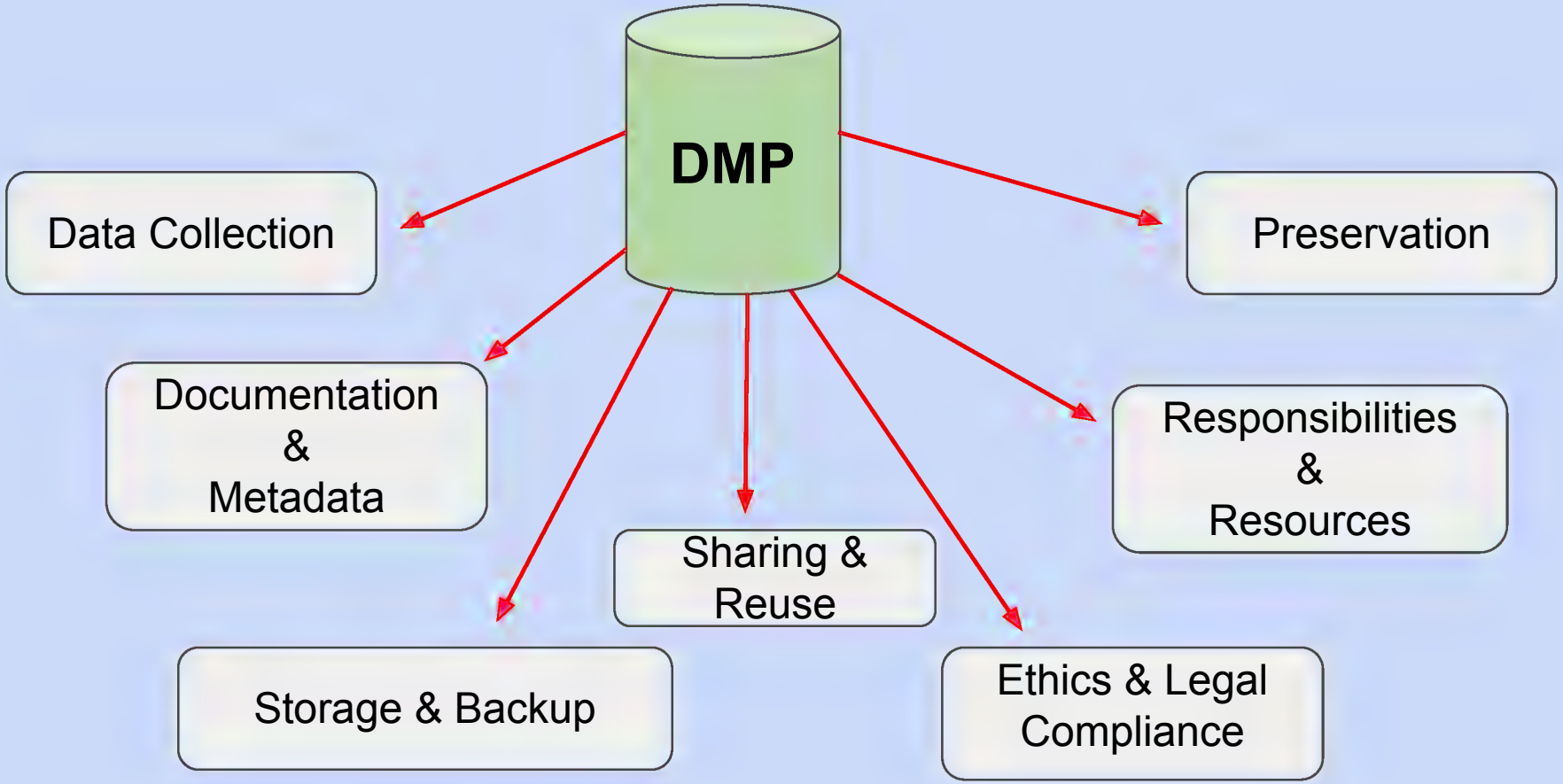
What *is* a data management plan (DMP)?

A DMP:

- Is a formal document which clearly articulates the strategies and tools you will implement to effectively manage your data.
- Speaks to the management of data both ***during*** the active phases of your research and ***after*** the completion of the research project.

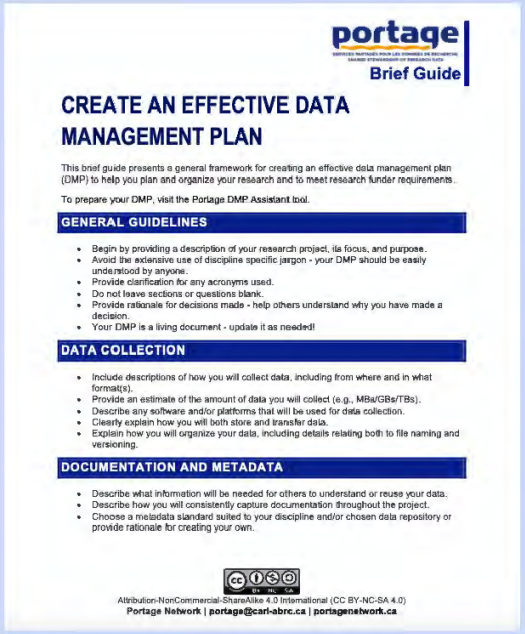
The objective of a DMP is to address issues related to data management prior to starting your research project!

A DMP provides information across key research lifecycle categories:



DMP guidance resources

Creating an effective DMP (English/French)



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Brief Guide

CREATE AN EFFECTIVE DATA MANAGEMENT PLAN

This brief guide presents a general framework for creating an effective data management plan (DMP) to help you plan and organize your research and to meet research funder requirements.

To prepare your DMP, visit the Portage DMP Assistant tool.

GENERAL GUIDELINES

- Begin by providing a description of your research project, its focus, and purpose.
- Avoid the extensive use of discipline specific jargon - your DMP should be easily understood by anyone.
- Provide clarification for any acronyms used.
- Do not leave sections or questions blank.
- Provide rationale for decisions made - help others understand why you have made a decision.
- Your DMP is a living document - update it as needed!

DATA COLLECTION

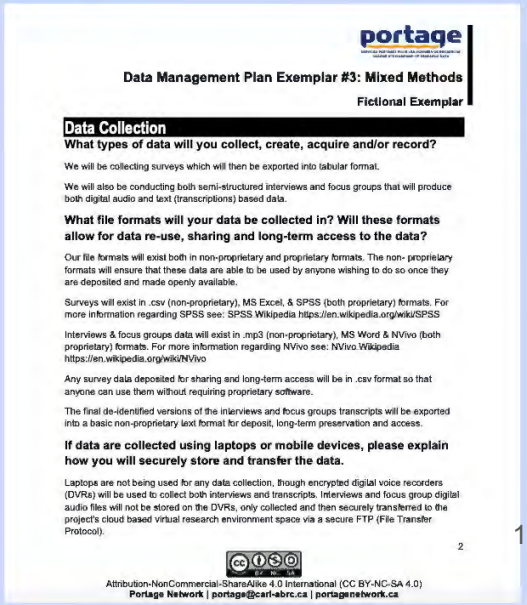
- Include descriptions of how you will collect data, including from where and in what format(s).
- Provide an estimate of the amount of data you will collect (e.g., MBs/GBs/TBs).
- Describe any software and/or platforms that will be used for data collection.
- Clearly explain how you will both store and transfer data.
- Explain how you will organize your data, including details relating both to file naming and versioning.

DOCUMENTATION AND METADATA

- Describe what information will be needed for others to understand or reuse your data.
- Describe how you will consistently capture documentation throughout the project.
- Choose a metadata standard suited to your discipline and/or chosen data repository or provide rationale for creating your own.

Exemplar DMPs:

- **#1: Digital Humanities** (English/French)
- **#2: Digital Humanities and Secondary Data** (English/French)
- **#3: Mixed Methods** (English/French)



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Data Management Plan Exemplar #3: Mixed Methods

Fictional Exemplar

Data Collection

What types of data will you collect, create, acquire and/or record?

We will be collecting surveys which will then be exported into tabular format.

We will also be conducting both semi-structured interviews and focus groups that will produce both digital audio and text (transcriptions) based data.

What file formats will your data be collected in? Will these formats allow for data re-use, sharing and long-term access to the data?

Our file formats will exist both in non-proprietary and proprietary formats. The non- proprietary formats will ensure that these data are able to be used by anyone wishing to do so once they are deposited and made openly available.

Surveys will exist in .csv (non-proprietary), MS Excel, & SPSS (both proprietary) formats. For more information regarding SPSS see: SPSS Wikipedia https://en.wikipedia.org/wiki/SPSS

Interviews & focus groups data will exist in .mp3 (non-proprietary), MS Word & NVivo (both proprietary) formats. For more information regarding NVivo see: NVivo Wikipedia https://en.wikipedia.org/wiki/NVivo

Any survey data deposited for sharing and long-term access will be in .csv format so that anyone can use them without requiring proprietary software.

The final de-identified versions of the interviews and focus groups transcripts will be exported into a basic non-proprietary text format for deposit, long-term preservation and access.

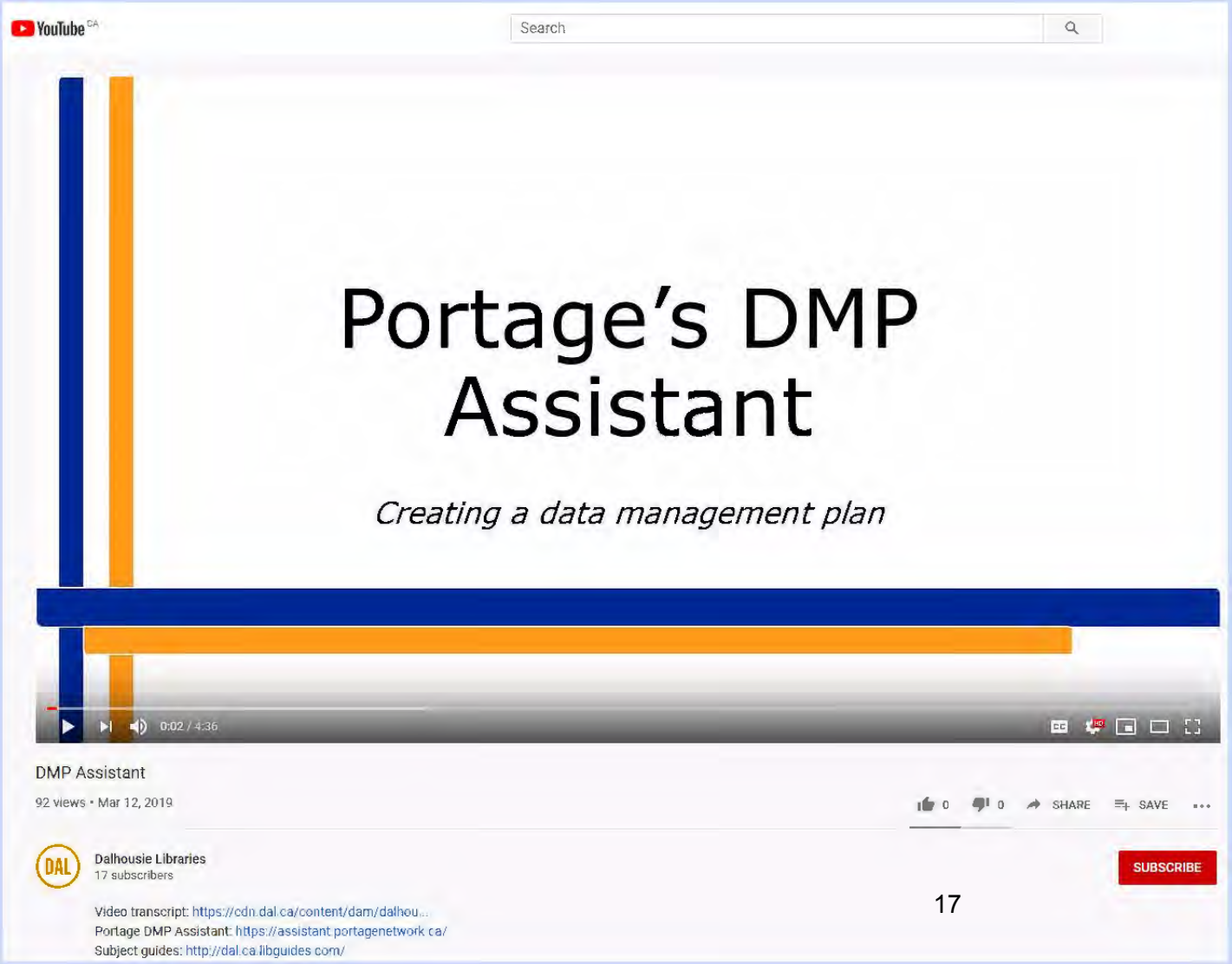
If data are collected using laptops or mobile devices, please explain how you will securely store and transfer the data.

Laptops are not being used for any data collection, though encrypted digital voice recorders (DVRs) will be used to collect both interviews and transcripts. Interviews and focus group digital audio files will not be stored on the DVRs, only collected and then securely transferred to the project's cloud based virtual research environment space via a secure FTP (File Transfer Protocol).

2

Short tutorial video

https://libcasts.library.dal.ca/Portage/DMP_Assistant/



2. Pre-Research

Participant consent & Information letters

Research involving human participants requires informed consent.

Information letters must describe *how data are handled during active phases and beyond*

What can/can't be done will in part be determined by what is said in:

- Participant information letters/consent forms
- Approved ethics applications

NOTE: It can be very difficult, or even impossible, to go back to participants to revise their consent, so getting things right at the start of your research project if important!

2. Pre-Research

Participant consent & Information letters

Outline such things as:

- project background
- purpose of the study
- study procedures
- benefits/risks
- data preservation/destruction
- security/confidentiality
- voluntary participation
- freedom to withdraw

***FUTURE USE OF DATA:**

Participant consent is required in order for data to be used beyond the scope of the immediate project.

Example statement:

*"By participating in this research I hereby give consent for my *de-identified* information to be used for research purposes beyond this immediate project."*

2. Pre-Research

Ethics applications

An ethics application addresses such things as:

Research design/methodology, risks/benefits, security/confidentiality, participant information, informed consent, data sensitivity, data collection, & data storage, retention and disposal.

Most research projects involving human participants require ethics approval.

Multi-institutional/regional projects require multiple ethics approvals.

Your institutional ethics office offers essential supports & services to help guide and support the ethical management of your research data!

2. Pre-Research

Ethics applications

***FUTURE USE OF DATA:**

If there is potential for future use of data outside of the immediate project then this should be clearly stated within the ethics application.

Example statement:

*"There are no plans to destroy these data. Data will be securely stored *enter details of storage methods' *for *i.e., the minimum 5 years*."*

**De-identified* data may be deposited into an institutional repository for discovery and possible repurposing. Any future use of these data outside of the immediate research project will occur only with all ethical and contractual obligations met."*

3. During Research

Data collection: immediate storage

A safe definition of ‘storage’ = 48+ hours

Storing data on mobile devices is not considered best practice.

Any electronic devices used for collecting/storing data should always be encrypted *(i.e., laptops, digital voice recorders, tablets, etc).*

Best Practice:

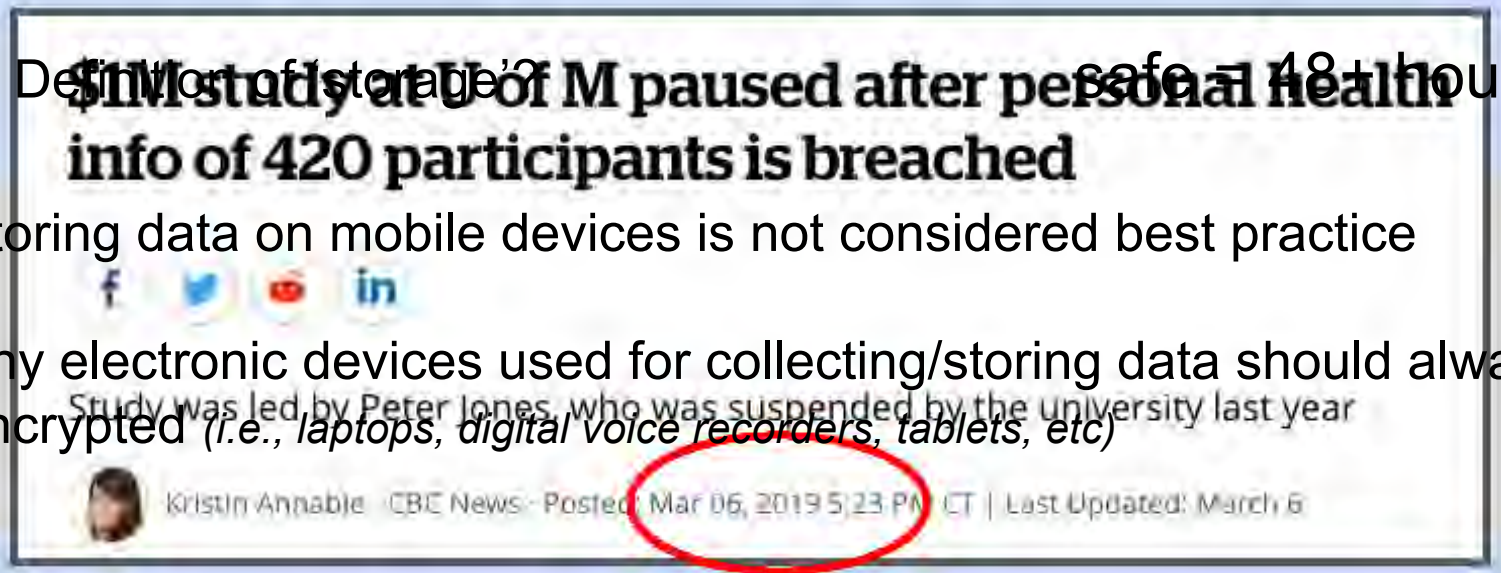
- Clear & succinct data collection policies and protocols *define when and how data are transferred off of data collection devices.*
- Be aware of any data storage policies imposed by institutions, funders, data providers, etc.

3. During Research

Data collection: immediate storage

Definition of storage?

safe = 48+ hours



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Best Practice:

- Clear & succinct data collection policies and protocols that *define <u>when and how</u> data are transferred off of data collection devices*
- Be aware of any data storage policies imposed by institutions, funders, data providers, etc.

3. During Research

Data collection: ‘longer term’ immediate storage

Sometimes it is necessary to store data on electronic devices - i.e., laptops, portable hard drives - for longer periods (collecting data in rural/remote areas).

Beyond security risks, these also introduce risk of data loss and/or corruption.

Best Practice:

If the use of laptops/desktops/hard drives is deemed necessary for longer term data storage, use the 3-2-1 rule:

At least 3 independent copies of your data:
store copies on 2 different types of media; and
keep 1 backup copy offsite.

3. During Research

Data transferring

Transferring of data is a critical stage of the data collection process.

Regardless of whether data are collected from primary or secondary sources, transferring of data is a necessity.

Some Risks:

Data transfers may occur:

- from field (real world settings)
- from data providers
- between researchers
- between researchers & stakeholders

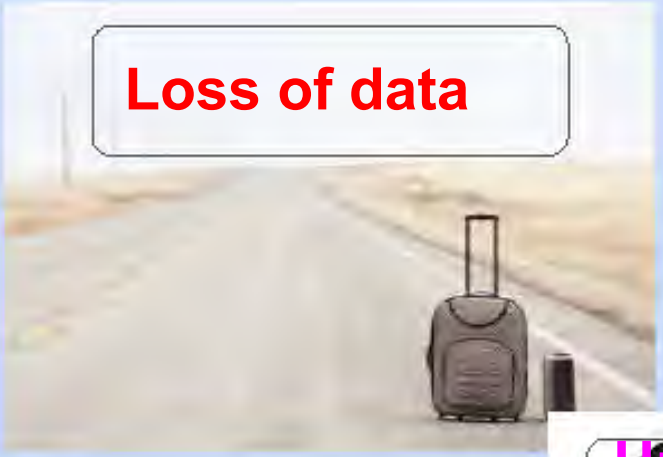
3. During Research

Data transferring

Transferring of data is a critical stage of the data collection process.

Regardless of whether data are collected from primary or secondary sources, transferring of data is a necessity.

Some Risks:



3. During Research

Data transferring: Risks

Definite don’ts: e-mail, unencrypted devices

Typical do’s: Secure FTP; Securely supported MS Sharepoint; secure extranets

Best practice:

- Identify data transfer methods that you will use before the research begins.
- Talk to your local IT support to identify secure methods available.

Data storage: Cloud services

What is ‘Cloud Storage’?

- Physical storage typically spans multiple servers (sometimes in different locations).
- Data are easily available and remotely accessible→ typically 24/7.
- Best practice → built in physical, technical, & administrative safeguards.

3. During Research: **Cloud Services**

Do you know where your cloud is?

‘Clouds’ are clusters of servers → servers need to live somewhere.

Find out:

- Where servers are physically located before using a cloud service → local, provincial, Canada?

- What security policies and procedures are in place→ disaster recovery, back-ups, etc.

compute canada → Research Portal

- Rapid Access Service
  → Freely available cloud space for Canadian researchers
- Resource allocation competitions
  → for greater needs
- **High performance computing**
- **Big data transfers** → i.e., TBs of data
- **Portals for specialized software & tools**
- **Data storage & back-up**

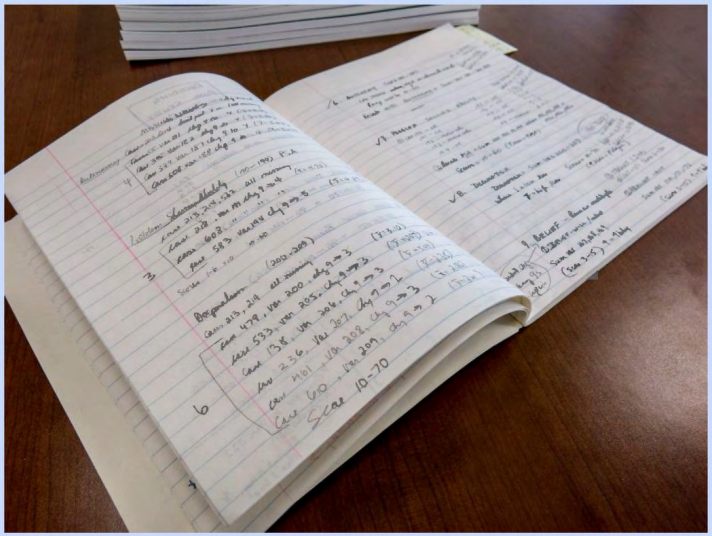
3. During Research: **Data documentation & metadata**

‘Metadata’ essentially refers to ‘data about your data’.

Descriptive information that describes your data, as well as to help others (and machines) to locate it and make it readable and useable.

Some key examples of metadata documentation can include:

- Data codebooks/dictionaries
- Data management and processing protocols
- Readme files
- Analytic plans
- Code



3. During Research: **File naming**

Having clear and standardized file naming helps to support:

- **Organization**
- **Quality assurance**
- **File versioning**
- **Collaborative use**
- **Data analysis**
- **Dissemination**
- **Preservation & archiving**
- **Staff/Student training**

Elements of file names can include:

- Project name/acronym
- File version
- Data type
- Participant codes/ pseudonyms
- Geographic location
- Context information
- Date information
- Interviewer codes/ initials

Working with data: File versioning

File versioning is an important component of research - it supports such things as participant confidentiality, organization, work efficiency, quality control, analysis, ...

As data are processed (cleaned), new 'versions' are created - from raw data, to the versions which will be used for analysis, and beyond.

Qualitative research example:

'Raw' audio data = the original digital audio recording

'Raw' transcript data = the original and unaltered transcript (text)

'Master' transcript data = the processed transcript → e.g., further de-identified, interviewer comments, typos fixed, etc.

'Analytic' transcript = working copy used for analysis/importing into analytic software

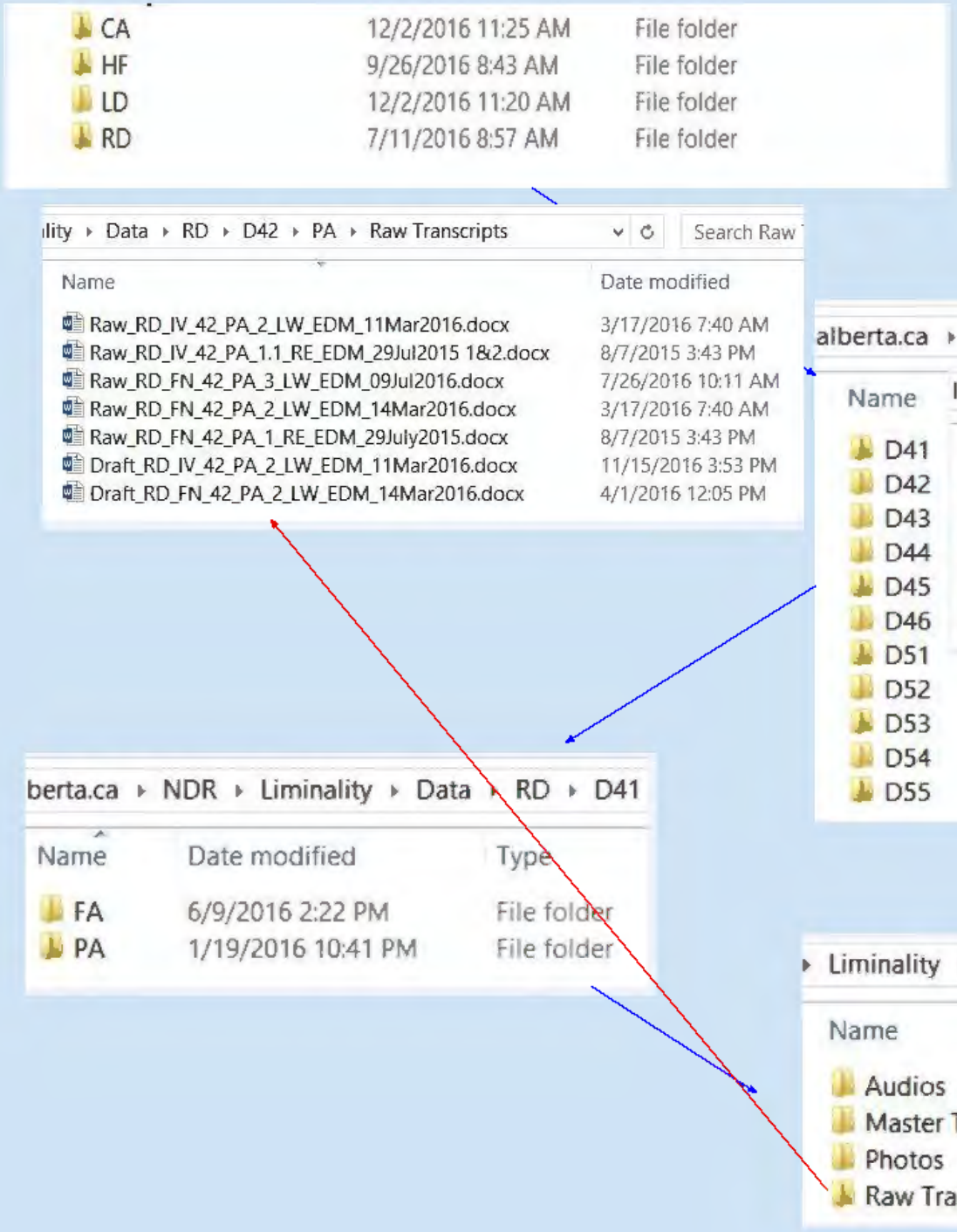
Transcript File Naming Convention Table

File Version *NOTE: This is only applicable for the interviews (IN) and Transcripts (IVT)	Illness	Data Type	Dyad Number (Numerically as they enter the study; two digits)	Dyad	Interview / FN/ Photo TYPE *NOTE: Interviews with multiple parts (Part 1, 2, etc) use decimals (i.e., 1.1, 1.2)	Interviewer (first and last initial)	Location (first three letters of city)	Day	Month	Year
Raw	HF=Heart Failure	IV = Audio Interview	01-20=HF	PA=Patient	1= 1st in-person interview / 1st photo	Joanna=JC	EDM=Edmonton	Two digits	First three letters	Use four Digits
Master	LD = COPD/Lung Disease	IVT = Interview Transcribed	21-40=LD	FA=Family	2=2nd in-person interview / second photo	LW=Lacie	VIC = Victoria			
Draft (use when cleaning transcript)	RD=End Stage Renal Disease	FN=Field Notes	41-60=RD		3=Phone interview / third photo	LD= Lindsay				
	CA = Advanced Cancer	PH=Photo	61-80=CA		OTH#= Other (e.g. field note during intake call)	LC=Lynn				
						MA=Marcy				
						RE=Rebecca				

EXAMPLE 2: **MASTER_LD_IVT_39_PA_01_MA_VIC_15DEC2015**								
Master Transcript	COPD	Interview	Dyad 01	Participant	First Interview	Marcy	Victoria	December 15, 2015

EXAMPLE 1: **Raw_CA_FN_01_FA_OTH1_LD_VIC_15Apr2016**								
Raw Transcript	Advanced Cancer	Field note	Dyad 01	Family Member	Field note made at a time not specific to an interview (e.g. dropping off the camera)	Lindsay	Victoria	April 15, 2016

Antonio, M. G., Schick-Makaroff, K., Doiron, J. M., Sheilds, L., White, L., & Molzahn, A. (2019). Qualitative data management and analysis within a data repository. *Western Journal of Nursing Research*, 1939459198817O6. doi:10.1177/0193945919881706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HF 9/26/2016 8:43 AM File folder
LD 12/2/2016 11:20 AM File folder
RD 7/11/2016 8:57 AM File folder
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Search Raw
Name
Date modified
Raw_RD_IV_42_PA_2_LW_EDM_11Mar2016.docx 3/17/2016 7:40 AM
Raw_RD_IV_42_PA_1.1_RE_EDM_29Jul2015 1&2.docx 8/7/2015 3:43 PM
Raw_RD_FN_42_PA_3_LW_EDM_09Jul2016.docx 7/26/2016 10:11 AM
Raw_RD_FN_42_PA_2_LW_EDM_14Mar2016.docx 3/17/2016 7:40 AM
Raw_RD_FN_42_PA_1_RE_EDM_29July2015.docx 8/7/2015 3:43 PM
Draft_RD_IV_42_PA_2_LW_EDM_11Mar2016.docx 11/15/2016 3:53 PM
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PA 1/19/2016 10:41 PM File folder
Liminality ▸ Data ▸ RD ▸ D41 ▸ PA
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Date modified
Type
Audios 12/8/2016 2:11 PM File folder
Master Transcripts 12/8/2016 2:16 PM File folder
Photos 1/21/2016 8:06 AM File folder
Raw Transcripts 12/8/2016 2:06 PM File folder

4. Post-Research: **Publication requirements**

- Increasingly, journals are requiring research data to be made openly accessible.
- Talk to researchers early about journals to which they may be interested in submitting their articles.
- Find out what the journals' data policies are.
- Most journals requiring data to be made openly available will have exceptions for data with legal and/or ethical considerations.
- Refusal to share data are grounds for rejection.

EXAMPLE: PLOS ONE

PLOS One is a peer-reviewed open access scientific journal published by the Public Library of Science (**PLOS**) since 2006. The journal covers primary research from any discipline within science and medicine.

4. Post-Research: **Data deposit**

What *is* a 'research data repository'?

A research data repository is a technology-based platform that allows for research data to be:

- Deposited & described
- Stored & archived
- Shared & published
- Discovered & reused

There are different types of repositories including:

- Proprietary (paid for services)
- Open source (free to use)
- Discipline specific

RESOURCE! → Re3data.org is an online registry of data repositories, which can be searched according to subject, content type and country. Find a list of Canadian research data repositories.

Dataverse Features

Digital Object Identifier (DOI) assigned

Persistent identifier assigned when upload data

Automatically registered with DataCite https://www.datacite.org/

User controlled data access

From fully open to restricted access

Many types of data

Tabular (CSV, SPSS, R, etc)
Documentation (pdf, doc, text)
Geospatial data
Multimedia (audio-visual)

Built in data citations

Madueke, Ijeoma Sylvia, 2018, "NIGERIAN LITERATURE IN FRENCH TRANSLATION (NILIFT)",
https://doi.org/10.7939/DVN/CHNOHA

Usage metrics

File Versioning

Retain previous versions and metadata

Customized Terms of Use

Including a customizable guestbook

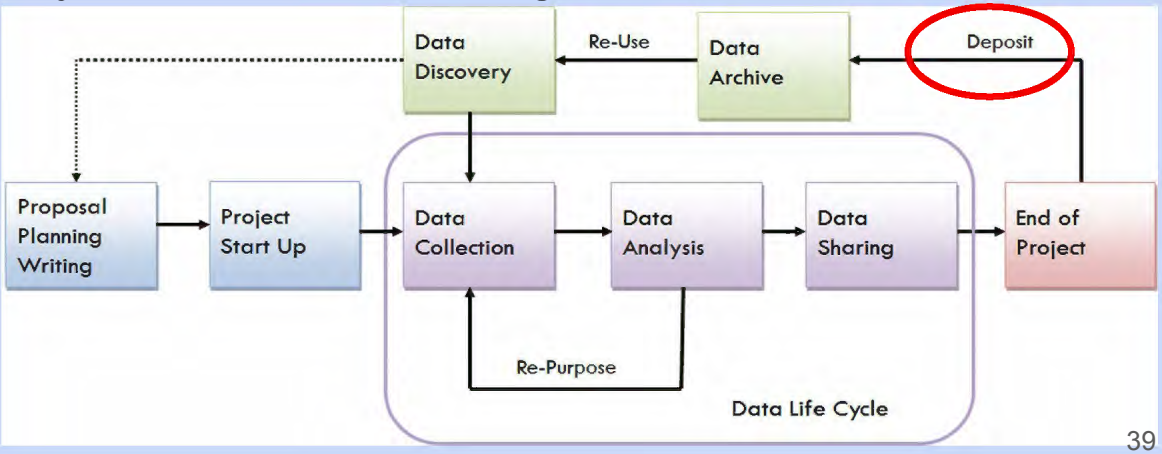
Create Terms of Use for data

Portage Training Materials in development

High level as well as in-depth web based training modules

Why should I consider depositing my data?

- Helps you to meet both funding and journal requirements.
- Increases the impact and visibility of your research .
- Digital Object Identifier (DOI) = your data are discoverable and citable.
- Your data are made available, as appropriate, to others → supporting science.
- Obtain metrics on *how* your data are being used.

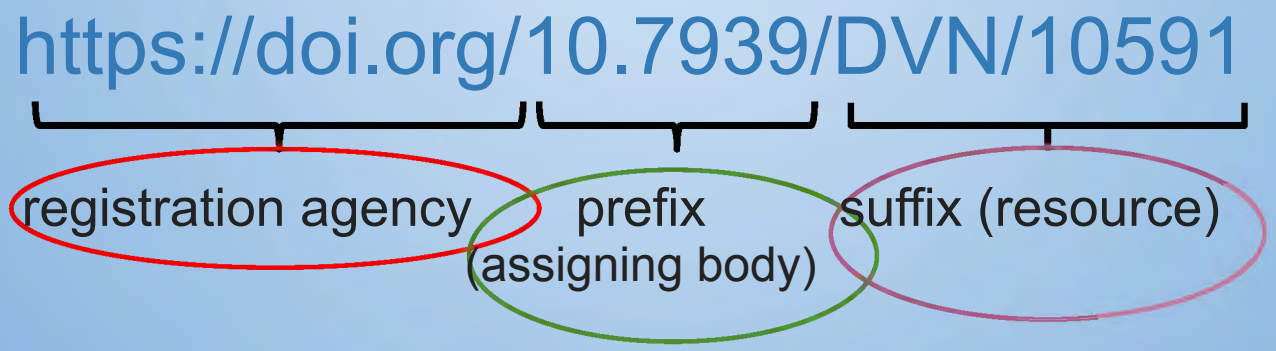


4. Post research: **DOI**

What is a Digital Object Identifier?

A **digital object identifier** (DOI) is a unique persistent identifier assigned by a registration agency to identify digital content and provide a persistent link to its location.

Anatomy of a DOI:



What does a DOI do?

DOIs help data producers take control of the management of their research in that they:

- Support the discovery & appropriate sharing of data;
- Support data producers in receiving credit for their data through data citations;
- Make research data easier to access, reuse and verify; and
- Help to meet funder requirements → data deposit and assignment of DOIs are becoming increasingly expected, or even required, in academia.

DOIs - supporting data usage metrics

Without DOIs our understanding of data usage and impact is extremely limited:

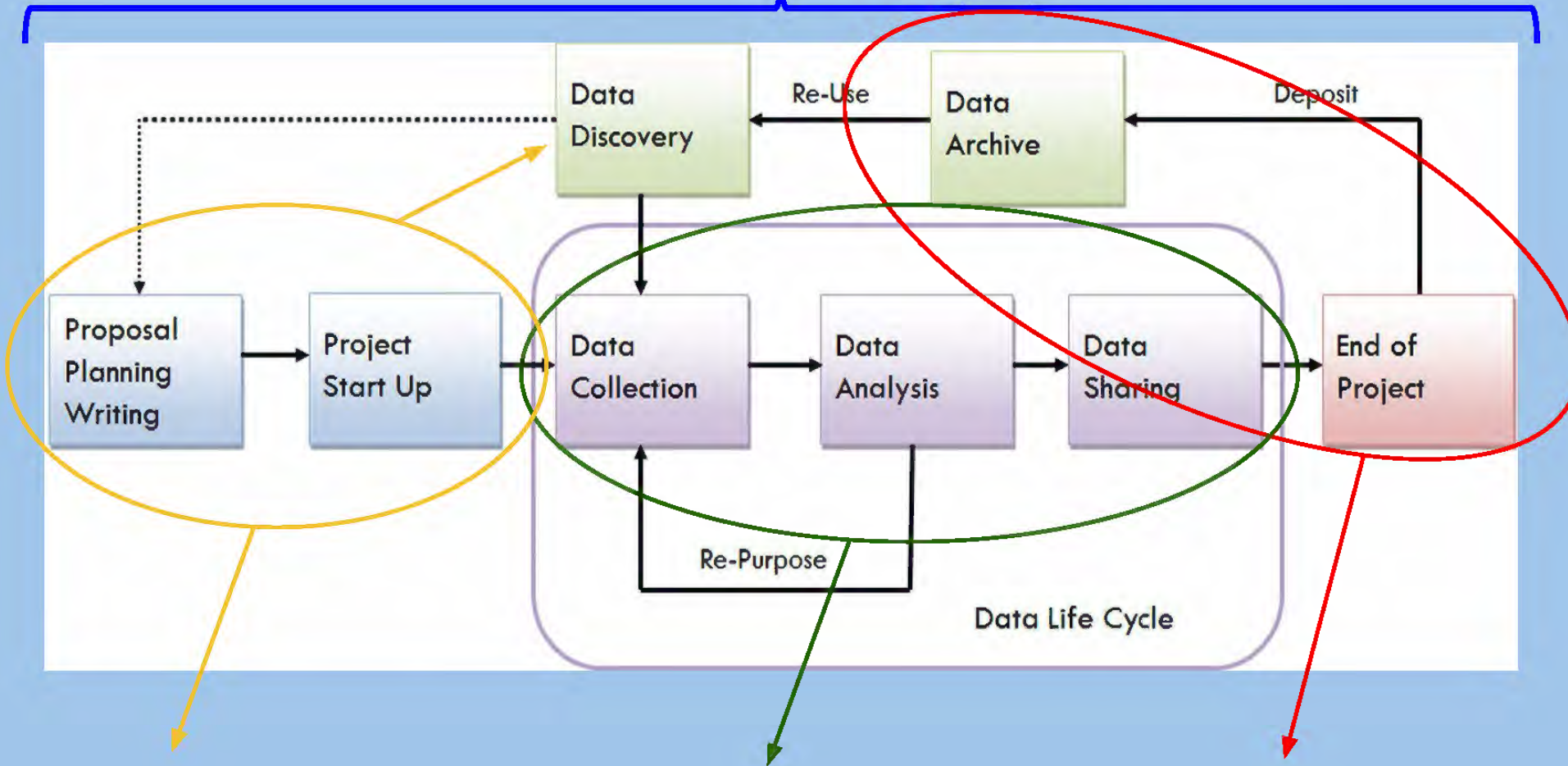
- # of downloads → does not tell us how data are used
- Possible citations, but not easily tracked

A DOI supports data usage metrics by providing:

- Persistent identifier to the data
- Ready-made citation which includes the DOI
- Bi-directional discovery → data to outputs and back to data
- Ability to 'scrape' the web using the DOI

RDM 'Best Practices': A bird's eye view

1. Overarching principles: FAIR; CARE; OCAP



2. Pre-Research:
   - Funder requirements
   - Including RDM into funding applications
   - Data Management Plans
   - Participant consent & Information Letters
   - Ethics applications

3. During Research:
   - Primary data collection
   - Data storage
   - Data transferring
   - Data access
   - Data documentation/metadata
   - File naming conventions

4. Post-Research:
   - Publication requirements
   - Data deposit

portage
SERVICES PARTAGÉS POUR LES DONNÉES DE RECHERCHE
SHARED STEWARDSHIP OF RESEARCH DATA

Questions & Discussion

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