



Managing your research data

Resources, tools, strategies

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Overview

- ♦ A brief Research Data Management primer (10 mins)
- ♦ Data management planning (20 mins)
- ♦ Active data management
 - Data storage & backup (10 mins)
 - In-project data management & collaboration (15 mins)
- ♦ Data archiving & sharing (20 mins)
- ♦ Helpful data management resources (5 mins)

Research data are contents that are used as primary sources to support research, scholarship, artistic activity or research-creation, and that are used as evidence in the research process and commonly accepted in the research community as necessary to validate research findings and results.

Canadian Tri-Agency

Research Data Management is the active organization &

maintenance of data throughout the research cycle to ensure its security, accessibility, usability, and integrity



The research data lifecycle

Courtesy: Leadership Council for Digital Research Infrastructure (LCDRI) Data Management Position Paper, 2017-08-31



Research Data Management

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Courtesy: Leadership Council for Digital Research Infrastructure (LCDRI) Data Management Position Paper, 2017-08-31

Applying RDM best practices will benefit...

Researchers and their collaborators

Research Communities

Funders, governments and the public

- ♦ Improves research efficiency and productivity
- ♦ Provides extra credit for research work
- ♦ Increases research impact
- ♦ May help to meet funding requirements
- ♦ Accelerates discovery
- ♦ Enables validation and verification

♦ Improves return on investment
♦ Increases research transparency
♦ Data as a public good





Tri-Agency Statement of Principles on Digital Data Management http://www.science.gc.ca/default.asp?lang=En&n=83F7624E-1



Tri-Agency Statement of Principles on Digital Data Management: **Expectations**

- Data management planning
- > Constraints and obligations
- Adherence to standards
- Collection and storage

- > Metadata
- Preservation, retention and sharing
- > Timeliness
- Acknowledgement and citation
- Efficient and cost-effective



Tri-Agency Statement of Principles on Digital Data Management http://www.science.gc.ca/default.asp?lang=En&n=83F7624E-1



Tri-Agency Statement of Principles on Digital Data Management: **Responsibilities**

Researchers

- incorporating best practices
- developing DMPs
- adhering to policies and standards

Research Communities

- developing & promoting standards
- fostering excellence
- selecting repositories

Research Institutions

- supporting best practices
- providing access to resources
- creating guidance and policies

Research Funders

- developing policies & guidance
- promoting data management
- providing peer reviewers

Draft Tri-Agency RDM Policy



Tri-Agency draft data management policy¹ — June, 2018

- ♦ Applies to grant recipients and institutions administering tri-agency funds.
- ♦ June-Sep, 2018: consultation period; feedback to inform policy

3 pillars:

- 1. Institutions: Institutional Strategy
- 2. **Researchers**: Data Management Plans
- 3. **Researchers**: Data Deposit

Phased and incremental implementation

Planning for RDM

ConsiderationsDMP Assistant





... it all starts with a (good) plan

A research Data Management Plan (DMP) should:

- Describe how you will manage data through all stages of your research
- Communicate a strategy for creating share-worthy data products

A good DMP will:

- ♦ Be completed at the time of study design
- Ensure compliance with policies / obligations
- ♦ Document and organize research activities
- ♦ Help identify support requirements
- ♦ (Likely) evolve with your study...



Portage DMP Assistant





- Available to all researchers in Canada.
- A guide for best practices in data stewardship.
- Exportable data
 management plans.

https://www.youtube.com/watch?v=zgLaJpJfehQ



https://assistant.portagenetwork.ca/





Activity - Develop a DMP (~15 minutes)

Using the CARL Portage DMP Assistant:

DMP ASSISTANT DATA MANAGEMENT PLANS PLANS DE GESTION DES DONNEÉS

- Navigate to <u>assistant.portagenetwork.ca</u>
- Create an account & login (check email for verification)
 - Or login with user: mcm.rdm.demo@gmail.com | pass: demopass
- Develop a DMP for a current, upcoming or prospective research project
- \diamond Browse through the DMP questions
- Complete the answerable questions in rough form (or internally)
- ♦ Note any confusing, problematic or difficult questions

Navigate to the DMP Assistant:

assistant.portagenetwork.ca

Sign in with your email / password

Click "Create plan"

Set organization to "McMaster University"

Select the "Portage" template



assistant.portagenetwork.ca

Enter relevant personal, organizational and study information

Expand boxes to complete questions for each section

Provide answers in the left-hand box Use right-hand box for guidance/comments





Reflections and Discussion

- What are your reflections on:
- ♦ The overall experience?
- ♦ The interface and its content?

What sections / questions were particularly challenging? Howso?

What kind of support or resources would help you complete this plan?

Planning



What are the stipulations in institutional, funder or publisher data policies to be followed?

What resources do you require to manage your data?

Who is responsible for data management and long-term stewardship?

In-project management

- Storage & backup solutions
- Managing files
- Managing collaboration



Things to consider...

What types of data (and how much) will you collect?

How will you organize, secure, and backup your data?

Are there *ethical* or commercial restrictions?

How will you *describe* your data so that others understand it?

How will you control *access* to your data?

How will you manage data versions?





Quiz time!

Go to menti.com and use the code: 45 20 33

Portage Network's "Good Enough RDM"

https://bit.ly/2zv54Eq

"Good Enough" Research Data Management

(a brief guide for busy people)

This brief guide presents a set of good data management practices that researchers can adopt, regardless of their data management skills and levels of expertise.



portage

de was reproduced by the Portage Training Expert Group with permission from its original creator.



Save your raw data in original format

- 1.1 Don't overwrite your original data with a cleaned version.
- 1.2 Protect your original data by locking them or making them read-only.
- 1.3 Refer to this original data if things go wrong (as they often do).



Backup your data

2.1 Use the 3-2-1 rule: Save three copies of your data, on two different storage mediums, and one copy off site.

2.2 Do not backup or store sensitive data on a commercial cloud (Dropbox, Google Drive, etc.).



copies of your data

2

copies are on-hand (easily accessible)

- 1 "production" (working) copy
- 1 "production backup" copy



copy is in another location ("off-site"), with a **trusted** service provide



"**Production**" copy → Where you work with the data

• PC, laptop, mobile device, etc.

"Production backup" copy → Easily accessible (+ versioning?) backup

- External hard drive with backup software
- MacDrive (seafile): <u>https://macdrive.mcmaster.ca</u>
- MacDrop
- Dropbox, Google Drive, etc.

Considerations for "Archived" Backup

- Security (physical and electronic)
- Automation
- Availability (and time to recover)
- Versioning
- Integrity-checking and error correction
- Data storage (locational) requirements
- Cost



McMaster

Malactor

	RHPCS - Backup Services	RHPCS - Hosted Server Packages	MacDrive	Microsoft OneDrive / Teams	MacDrop
Storage Quota	1 TB; more available for a fee	1 TB; more available for fee	300 GB per account	1 TB per account; up to 5 TB by request	2 GB for free; more available for a fee.
Rates / cost	\$500 / yr + one time set up fee (\$125 / machine) Additional space: \$300 / TB Restore services: \$125 / hour	\$500 - \$4000 / yr Setup fee: \$500 - \$1000 Additional space: \$450 / TB	No cost to users	No cost to users	\$10/month for 100GB
Backups / versioning	Nightly, 14-day rotating cycle; Restore services through RHPCS	Nightly, 14-day rotating cycle; Restore services through RHPCS Nextcloud sync service available.	Ongoing real-time sync 4-month version history Full Library restore through UTS	Ongoing real-time sync Unlimited version history (?)	Ongoing real-time sync Versions are kept indefinitely so long as versions don't exceed 50% of user's quota
Who can use this service?	Any subscribing users or research group	Any subscribing users or research group	McMaster Faculty and Staff Graduate students can obtain zero-quota accounts	All McMaster faculty, staff and students	All FHS users
Server location	A.B. Bourns building	A.B. Bourns building	Replicated clusters in Gilmour Hall and JHE	OneDrive: Canadian servers Teams: Soon in Canadian servers only	Health Science Centre
Other notes			Supports encrypted libraries, file and directory sharing, Desktop client, web interface	Supports file and directory sharing, Desktop client, web interface	
More info	rhpcs.mcmaster.ca/current-rates	rhpcs.mcmaster.ca/current-rates	macdrive.mcmaster.ca/ Documentation: https://goo.gl/AvRGwx	portal.office.com/ Documentation: mcmaster.ca/uts/licensing	https://www.csu.mcmaster.ca /service-catalogue/network-a nd-communications/macdrop

Access the matrix: goo.gl/45iy38



Describe your data

3.1 Machine Friendly: Describe your dataset with a metadata standard for discovery.

3.2 **Human Friendly:** Describe your variables, so your colleagues will understand what you meant. Data without good metadata is useless. Give your variables clear names.



Process your data

4.1 Make each column a variable.

4.2 Make each row an observation.

4.3 Store units (e.g. kg or cm) as metadata (in their own column).

4.4 Document each step processing your data in a README file.

Open Science Framework

https://osf.io/

- ♦ Free, open source web application
- Connects and supports the research workflow
- Integrates with existing services
 (e.g. Google Drive, Dropbox, etc.)
- ♦ Supports collaborative workflows
- Facilitates data publishing to selected data repositories

GETTING STARTED WITH THE OPEN SCIENCE FRAMEWORK (OSF)

Workshop demo: https://osf.io/muq5f



https://youtu.be/2TV21gOzfhw





Archiving and Sharing

- FAIR principles
- Data repositories
- Scholars Portal Dataverse





Archive and preserve your data

5.1 Submit final data files to a repository assigning a persistent identifier (e.g. handles or DOIs).

5.2 Provide good metadata for your study so others could find it (use your discipline's metadata standard, e.g. Darwin Core, DDI, etc.).



Things to consider...

How will your data products be stored in the long-term?

- ♦ How to ensure that it remains *integral* and *secure*?
- ♦ Who will assume long-term *responsibility* for your data?

How will others access your data products?

- What data (if any) can/should be shared? Who should have access?
- How will you manage legal, commercial & ethical constraints?

How to maximize credit for sharing your data?

- In which repository should you deposit your data?
- How to ensure that your data is **FAIR** (findable, accessible, interoperable and reusable)?

The FAIR Guiding Principles





Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Bouwman, J. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Scientific data, 3. *doi:10.1038/sdata.2016.18*



Domain vs. General Repositories

Domain-specific Repositories: Archives of digital and/or digitized information related to an area of research. They can be broad in scope, such as ICPSR at University of Michigan, or more tightly focused, such as Milkulski Archive at Space Telescope (MAST) at the Space Telescope Science Institute.

General Repositories: The archives of digital and/or digitized information is not related to an area of research and hence it is general in nature. Scholars Portal Dataverse is an example of general repository.



re3data.org

Registry of research data repositories





Scholars Portal Dataverse



- A data repository for researchers at Ontario's universities -- free and open for all researchers in Canada
- An online platform to share, preserve, cite, explore and analyze research data.
- Allows researchers to control how they share their data.
- Supports data DOI registration through Datacite Canada.

https://www.youtube.com/watch?v=UDFGqRY61fQ

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http://dataverse.scholarsportal.info



Dataverses, Datasets, Files







Create your own (demo) Dataverse

 Scholars Portal Demo Dataverse site: <u>https://demodv.scholarsportal.info</u>



Sign-up & Institutional Affiliation

Scholars Portal Dataverse	Search all dataverses	Fr (Beta)	
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Institutional Dataverse



Container for your Datasets and/or Dataverses*

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You can have as many Dataverses within your Institution Dataverse as you like!



Customize your Dataverse

- Customizable features:
 - Branding/logo
 - Featured Dataverses
 - Facets
 - Contact





Linking Datasets and Dataverses



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Self-service Deposit Model

 Anyone with an account can publish to Dataverse

 SP Terms of Use covers removal of data if necessary

Scholars Portal Dataverse Account Terms of Use

Acceptance of Terms

The following terms and conditions govern all use of the Scholars Portal Dataverse website (the Stel) and the services available on or at the Stel (taken together, the Service). The Service is operated by the Ontario Council of University Libraries (OCUL). The Service is offered subject to acceptance without modification of all of the terms and conditions contained herein (the Terms of Use) and all other operating nules, policies and procedures that may be published from time to time on this Ste by OCUL.

The Service is available only to individuals who are at least 13 years old or possess legal parental or guardian consent. If you do not so qualify, do not attempt to use the Service. OCUL may refuse to offer the Service to any person or entity at any time and may change its eligibility criteria, at any time, in its sole discretion. Modification of Terms of Use

OCUL reserves the right, at its sole discretion, to modify or replace any of the Terms of Use at any time. It is your responsibility to check the Terms of Use periodically for changes. Your continued use of the Service following the posting of any changes to the Terms of Use constitutes acceptance of those changes.

More

Rules and Conduct

As a condition of use, you promise not to use the Service for any purpose that is prohibited by the Terms of Use. For purposes of the Terms of Use, "Content" includes, without limitation, any information, data, text, software, scripts, graphics, and interactive features generated, provided, or otherwise made accessible by OCUL, or its partners on or through the Service.

By way of example, and not as a limitation, you shall not (or permit others to) either (a) take any action or (b) upload, download, post, submit or otherwise distribute or facilitate distribution of any content using any communications service or other service available on or through the Service, that:

- · infringes any patient, trademark, trade secret, copyright, right of publicity or other right of any other person or entity;
- Is unlawful, threatening, abuske, harassing, defamatory, libelous, deceptive, traudulent, invasive of another's privacy, tortious, obscene, oflensive, or protane;
- constitutes unauthorized or unsolicited advertising, junk or bulk e-mail ("spamming");
- contains software viruses or any other computer codes, files, or programs that are designed or intended to disrupt, damage, limit or interfere with the proper function of any software, hardware, or twiccommunications equipment or to damage or obtain unauthorized access to any system, data or other information of Scholars Portal or any third party

http://guides.scholarsportal.info/dataverse



Storage Size Limits

- Currently SP Dataverse supports
 - 2 GB file size upload
 - Will be increased to 10 GB in the near future
 - Unzipping, tabular ingest, processing intense



Dataset Management / File Versioning





Dataset Management / File Versioning





Dataset and File Permissions

- User/groups and roles
 - Assign permissions for collaborators, curators, file downloaders (access)
 - Granular file-level permissions
 - IP Group based permissions

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Licensing

- Default to CC0 (Open Data)
- OR
- Custom "Data Usage Agreement"



Sample Data Usage Agreement

(Note: This is a sample DUA for datasets that have de-identified human subject data)

This is an agreement ("Agreement") between you the downloader ("Downloader") and the owner of the materials ("User") governing the use of the materials ("Materials") to be downloaded.

I. Acceptance of this Agreement

By downloading or otherwise accessing the Materials, Downloader represents his/her acceptance of the terms of this Agreement.

II. Modification of this Agreement

Users may modify the terms of this Agreement at any time. However, any modifications to this Agreement will only be effective for downloads subsequent to such modification. No modifications will supersede any previous terms that were in effect at the time of the Downloader's download



Guestbooks

- Who is downloading my data?
 - User fills out guestbook form
 - Owner downloads Guestbook report in Excel format
 - Can be used to mediate access / approval of access to data





Metadata Standards

- DataCite, Dublin Core, DDI (Citation)
- DDI (Social Science)
- Virtual Observatory VOResource (Astronomy)
- ISA-Tab (Life Science)

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Metadata Templates

- Setup templates available at the Dataverse level to reduce need to copy information
- Can be set to default template, or can be copied

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Data Citation and Journal Cross-referencing

- Get a DOI / data citation before publishing data
 - DataCite Canada DOI minting and indexing
 - Cite data in a paper, access for review process

• ORCID ID field (coming soon... ORCID sign-in)

• Reference a publication that uses data





Widgets support for Research Promotion

cholars Portal Dataverse	Fr (Beca) GARY KING BID & C.V. WRITINGS RESEARCH AREAS SOFTWARE DATAVERSE RESEARCH GROUP TEACHING COM
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Jagaia Liffe, Kolitopter, Morkenon, Steve, Moreau-Vintaen, Lindsay, McDonald, Andrew, 2017, Analysis of Strainbursts in the Sudbury Region and Numerical Modeling of Destress Blacking", Jos:10.5863/SFI4RFHBJ, Scholars Portal Dataverse, V1, UNF % ML0096(doVasehebbCc.)Q== @ Learn about Data	disate + Restants & Dataverses (0) 1 to 10 of 59 Results II Soci-
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Data Analysis and Visualization

• Data Explorer (cross tabulations)

a	X B Results	Download •	Chart View	Table View		
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H 194401				and a second second	ON	14.0
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Data Analysis and Visualization

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Preservation – Archivematica Integration

• Free and open-source digital preservation system designed to maintain standards-based, long-term access to collection of digital objects

• Currently work is underway to support Archivematica integration with Dataverse

Helpful data management resources





Helpful resources

- CIHR's RDM Learning Module (beta)
- Portage's <u>"Good Enough" Research Data Management Guide</u>
- UBC Library DataGuide
- MANTRA Research Data Management Training
- Scholars Portal Dataverse <u>User Guide</u>





Thank You.

For more information:



portage

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

library.mcmaster.ca/services/rdm rdmgmt@mcmaster.ca

McMaster Library's RDM webpage and primary contact portagenetwork.ca/

CARL Portage Network page: Access to RDM information and DMP Assistant