



# Everything you always wanted to know about Research Data Management\*

**\*but were afraid to ask**

Savvy Researcher Series June 2017

**Richard Higgs**

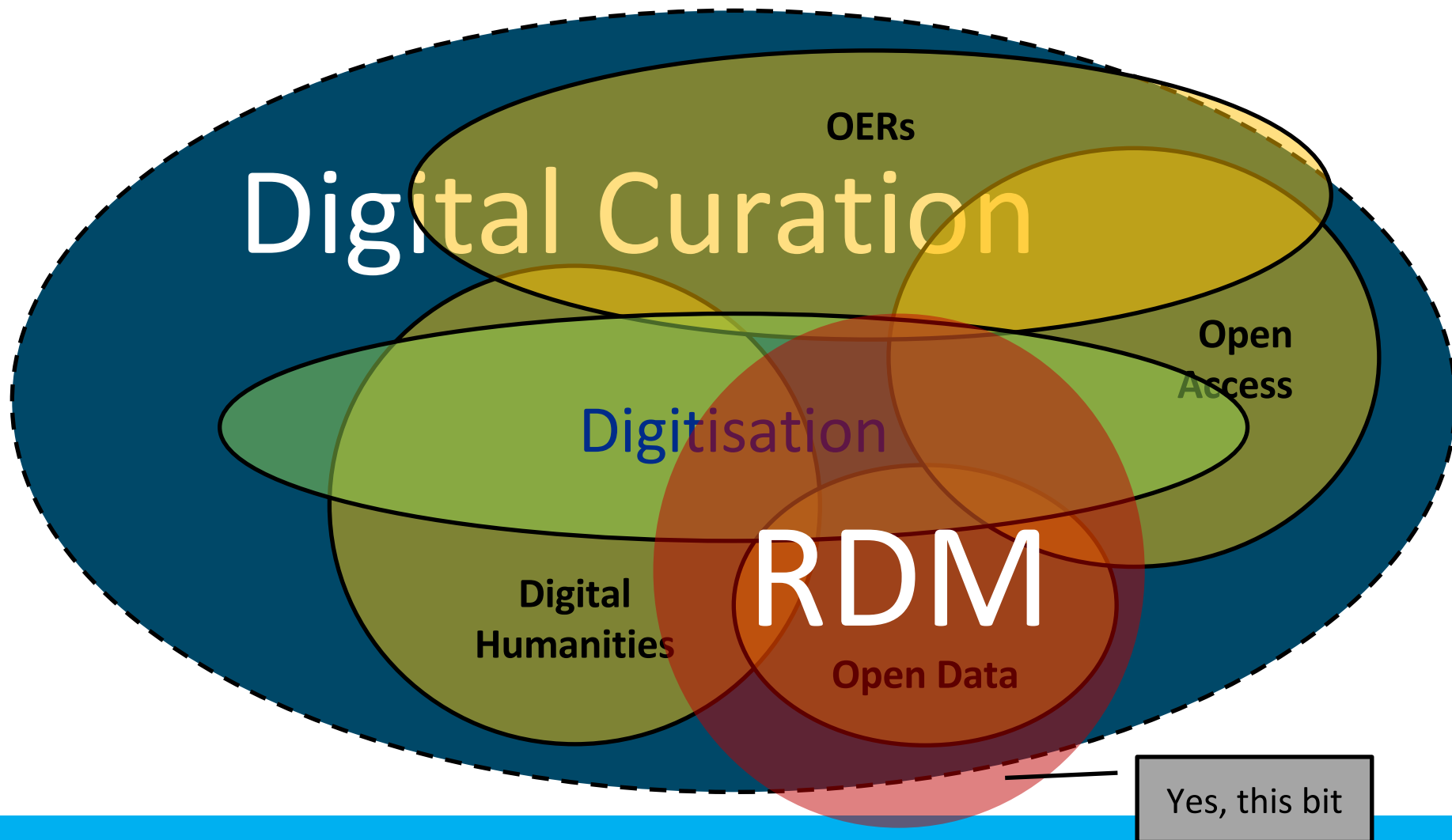


# What is it?

- ...involves maintaining, preserving and adding value to digital research data *throughout its lifecycle*.
- The active management of research data reduces threats to their long-term research value and mitigates the risk of digital obsolescence.

<http://www.dcc.ac.uk/>

# RDM in context



# Why do it?

- Prevent loss of data (hard drives in a professor's cupboard, data collected by Masters students, machine data from experiments)
- Prevent duplication
- Improve data security
- Make good on public funding
- Collaborative research, Big Data
- Common sense
- Open Access
  - Improve peer review
  - Support OA publishing
- Enhance altmetrics
- Technology makes it possible

# What *is* research data, anyway?

- Hard sciences
  - Machine data (e.g. telescopes, oscilloscopes, microscopes, geodata...)
  - Lab notebooks
  - Imaging and visualisation
  - Samples
  - Logs
- Medicine
  - Clinical trials
  - Patient history
- Humanities
  - Texts, field notes, diaries, MS, maps, codices, scores
  - Images, recordings
  - Artefacts
- Commerce
  - Accounting data
  - Economic data
- Other
  - Census / demographics
  - Formulae

“Unstructured”  
data

Structured data

Object-relational  
data

Metadata

... and LOTS, LOTS more

# Raw or cooked?

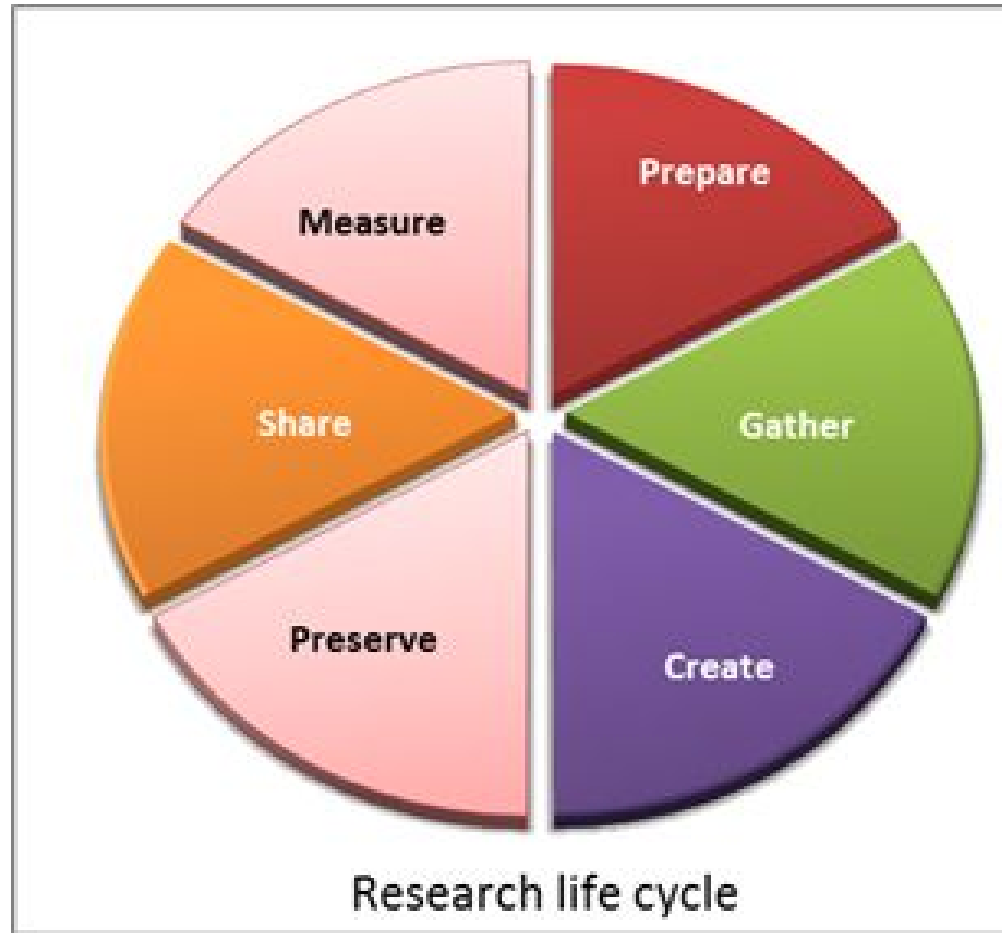


Image: Gérald Anfossi. Source: Wikimedia commons

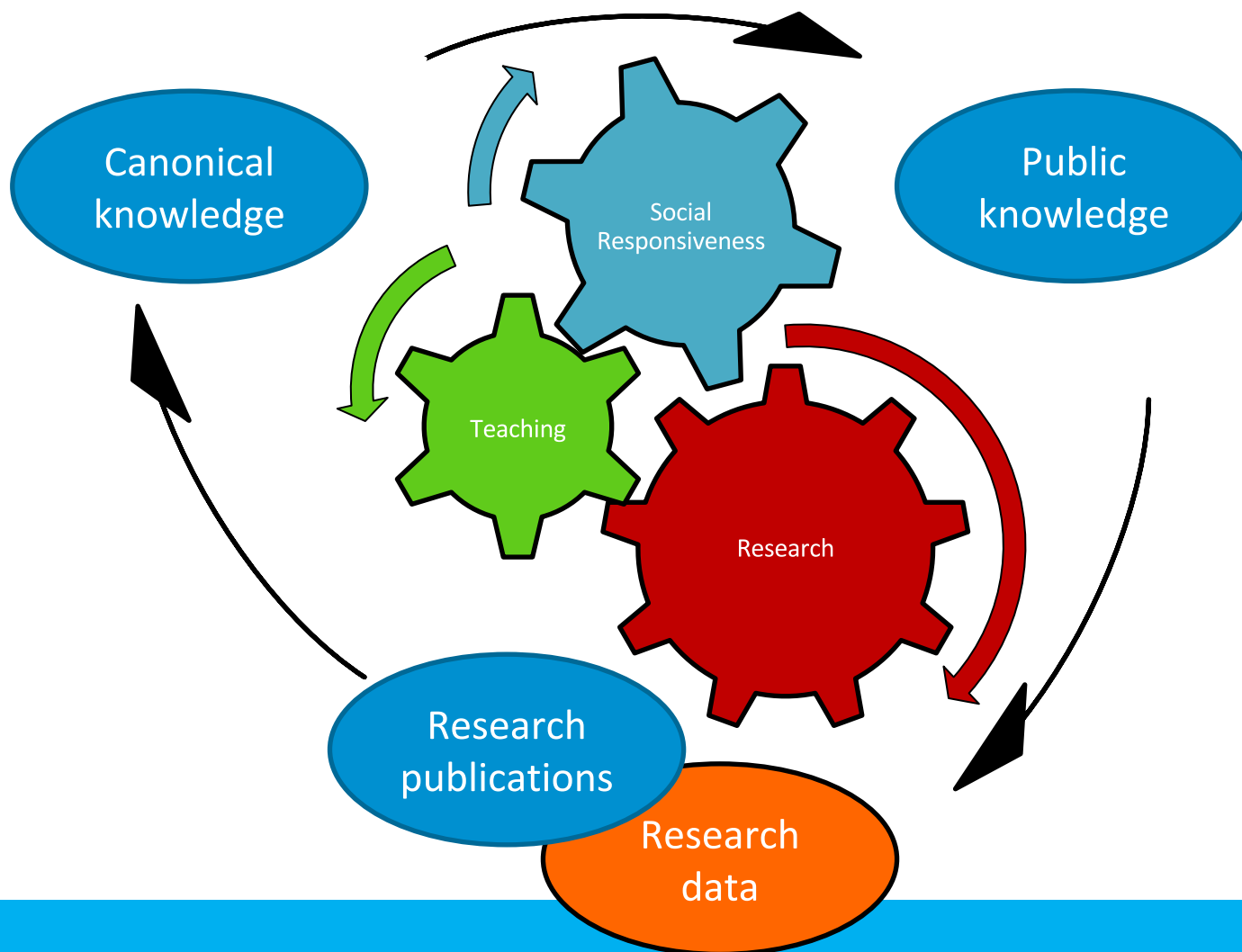


Image: Abbeyvet. Source: Wikimedia commons

# RDM and the Research Lifecycle

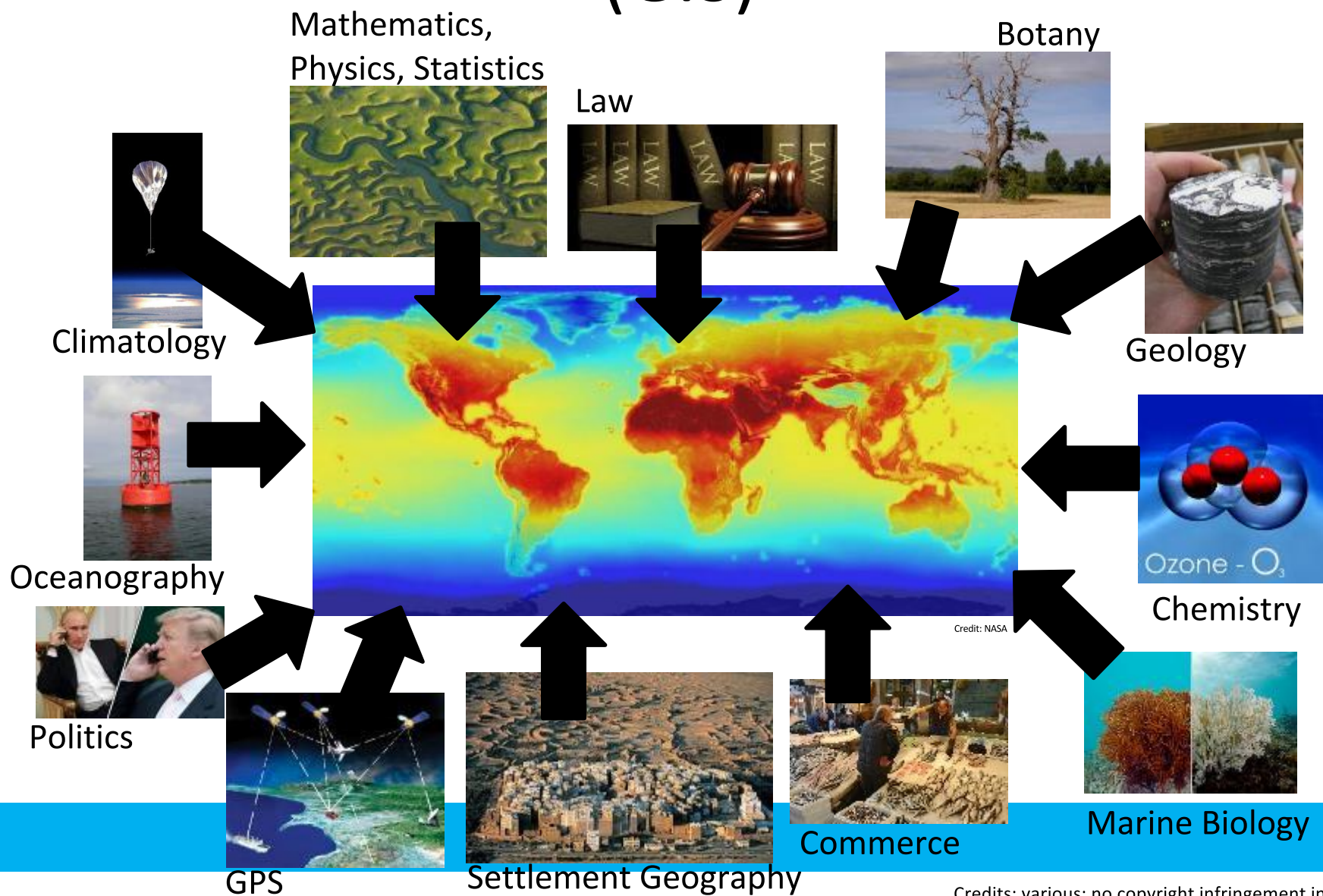


# In the broader academic context

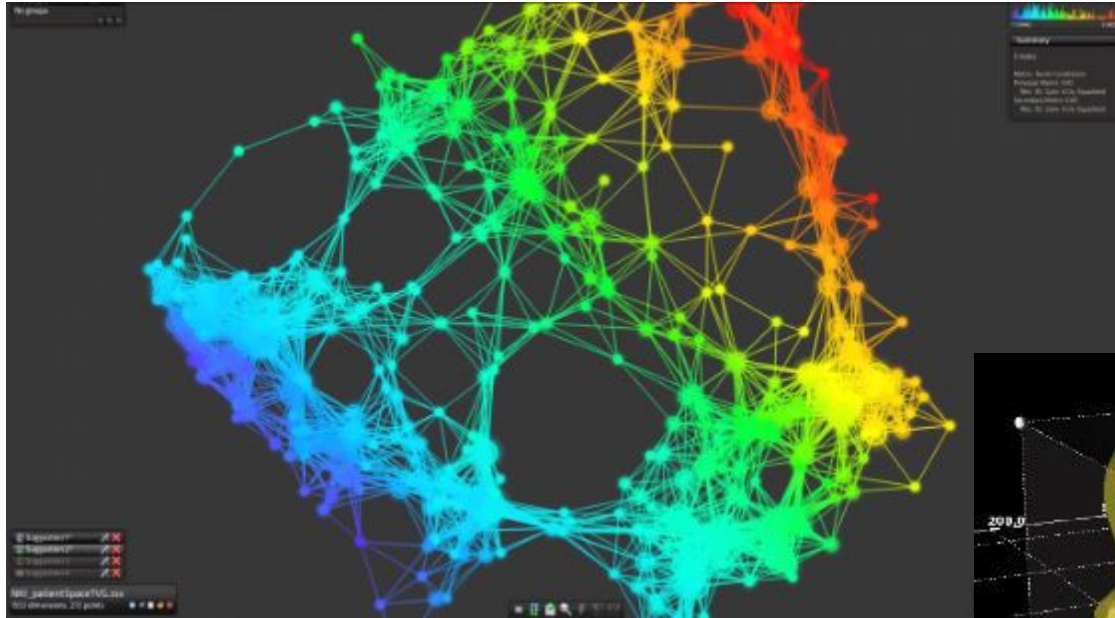




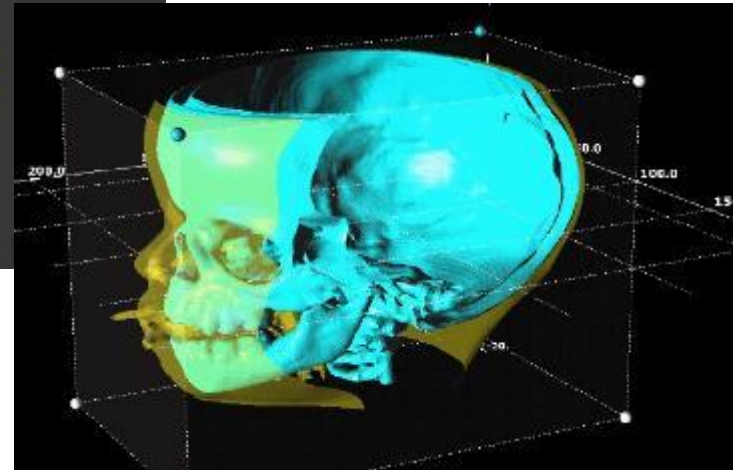
# The power of RDM: Climate Change (GIS)



# Visualisation



Source: wired.com



Source: sciencegl.com

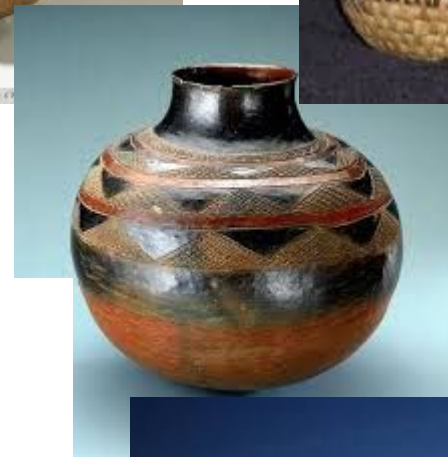
# RDM vs/and Open Data

- Not mutually exclusive or mutually inclusive
- RDM enables Open Data
- Not all managed research data is necessarily open
- Often a subset of a full dataset will be made open
- RDM includes managing embargos, security, anonymisation, usage rights, etc.



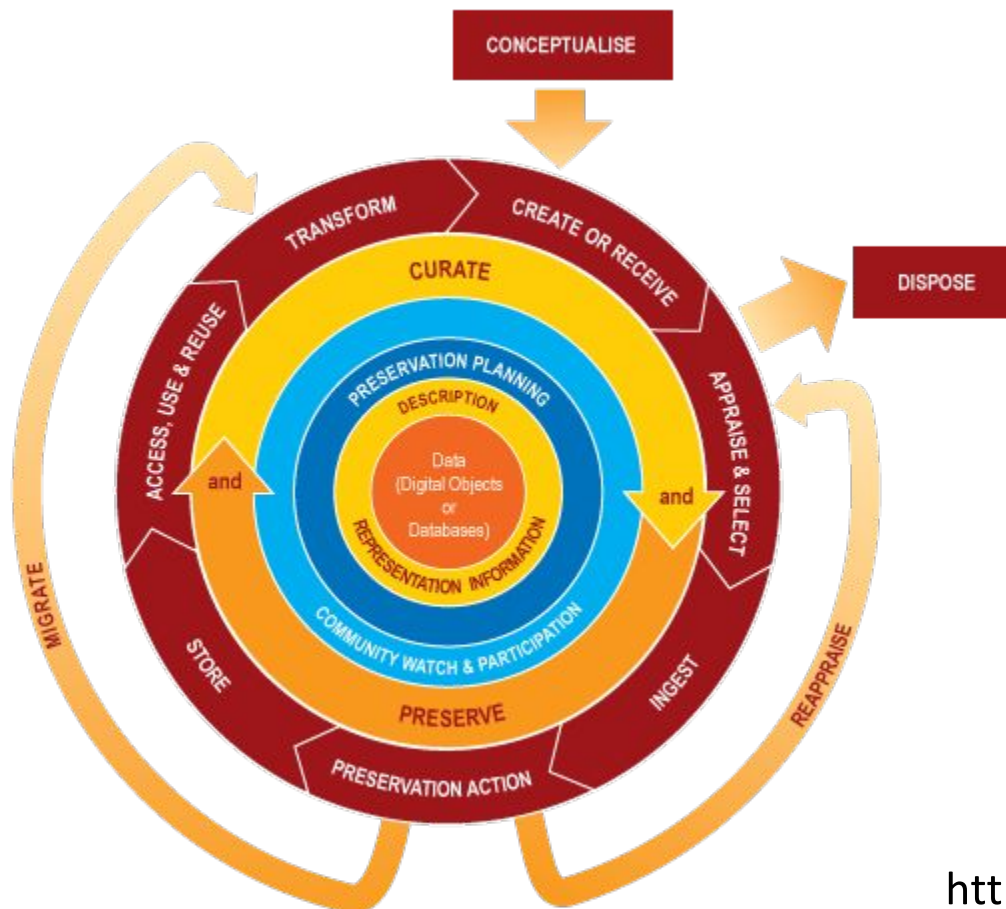
# Repositories

- Institutional
- Domain
- Government
- Proprietary/Open Source
- TDRs and DOIs
- Data citation
- (Portals)





# DCC Curation Lifecycle Model



<http://www.dcc.ac.uk/>

# Caveat: proprietary formats



- Many machine-generated datasets are proprietary, which limits their broader application
- Some MGDs automate some RDM tasks (but not necessarily within standards or policies)
- Some require proprietary repositories as well

# Caveat: personal and other sensitive data

- Integration with research ethics is critical
- Anonymisation and classification of datasets is an important step in RDM
- Intellectual Property: datasets are not deemed to be creative works and are therefore not covered by copyright, although in some jurisdictions (not including ZA), the “sweat of brow” (*sui generis*) right can be asserted
- Open Database License (ODbL): Share Alike license, published by Open Data Commons

# Not invented here syndrome

- Domain repositories can sometimes offer more appropriate services than institutional
- Optimise data for re-use at all levels (from metadata to storage: open standards)
- Territorial issues and resistance





# Digital Humanities & RDM

- Blurring lines



# The Long Tail of data

- Little attention given to the data generated by the majority of scientists (the unglamorous, small stuff)
- The useful lifespan of data far exceeds the funding or infrastructure projected (if at all) for its preservation

# Who pays?

- Funders (provision needs to be made up-front, at proposal stage)
  - NRF
- Institutions (Policy, IT, Libraries...)
- Consortia



# For what?

- Storage (repositories, hardware, infrastructure)
- Metadata activities, advisory
- DOI licenses
- Persistence (backup, migration, emulation)
- Dissemination and publication (portals, websites)
- Rights management, security, usage

# Other considerations

- Policy, ethics
- Process, people: responsibility & accountability
- Technology-dominant mindset
- Information architecture & metadata
- Open standards
- The Cloud hype
- Decolonisation

# Resources

- LISC RDM Occasional Course
  - NQF Level 9
  - 24 credits (Semester 2)
- LISC RDM Short Course
  - On demand, subject to availability
- <http://www.dcc.ac.uk/>

# Research Data Management

## RDM Services at UCT

Savvy Researcher Series

Thursday, 29 June 2017



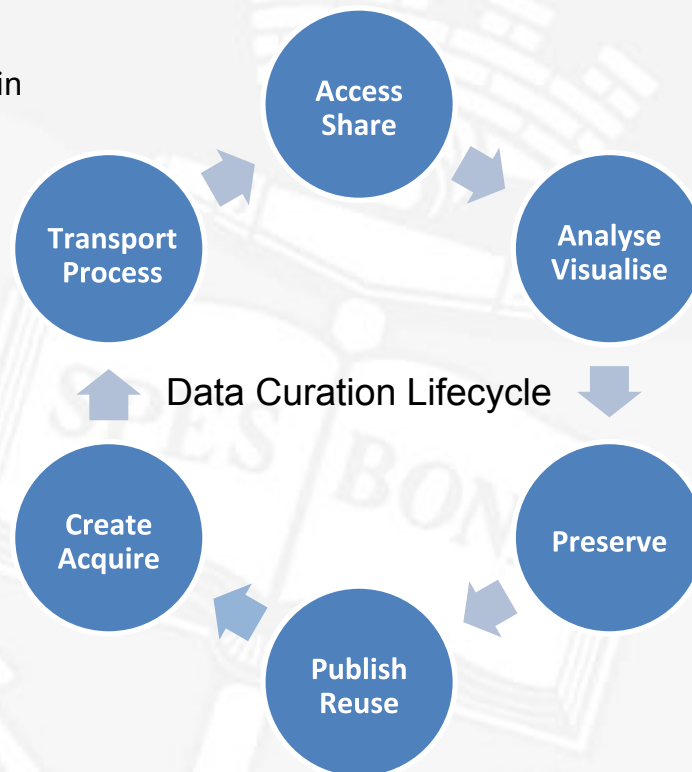
**Erika Mias** — Digital Curation Officer, DLS

**Kayleigh Lino** — Digital Curation Officer, DLS



## Overview: RDM services at UCT

- UCT RDM Policy
- Demonstration of tools and services available to support researchers in depositing, preserving and sharing their data:
  - [UCT DMPonline](#)
  - [UCT OSF](#)
  - [UCT Zenodo Community](#)
  - [Implementation of IDR](#)
- Tips for managing & working with data



# RDM services at DLS



DIGITAL LIBRARY  
SERVICES



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HOME RESEARCH DATA MANAGEMENT DIGITISATION DIGITAL SCHOLARSHIP STAFF CONTACT US NEWS HOW TO...

DMPonline | UCT Zenodo Community | Digital Collections

Quick Links ▼

Home > Research Data Management

Why manage data?  
What do I need to do?  
RDM policy  
Funder guidelines  
RDM planning  
Data storage  
Sharing my data  
Useful RDM links

Revision state: *Published*  
Most recent revision: Yes  
Actions: *Unpublish this revision*

**Research Data Management**

[edit](#)



Our RDM services assist researchers with organising, managing, curating and sharing their research data, to facilitate its preservation and access for present and future use. Together with [UCT eResearch](#) and [ICTS](#), we give you access to the datasets and tools that you need to enhance and complete your research.

**Why manage data?**

<http://www.digitalservices.lib.uct.ac.za/dls/rdm>



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# Fun quiz!



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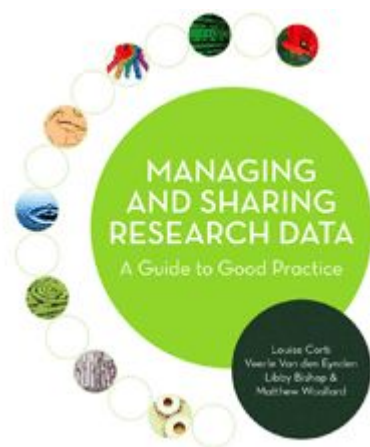
29 June 2017



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## Questions

1. Organising my file-names and folder structures *consistently* is (choose all possible answers):
  - (a) a waste of time
  - (b) not necessary until I finish my project
  - (c) good practice for my research project
  - (d) important for sharing and future use of data



## Questions (cont.)

2. Systematic and logical file-naming (choose all possible answers):

- (a) makes it easier to keep track of the data files
- (b) provides useful cues to the content and status of a file
- (c) can help in classifying files
- (d) is not necessary as I am the only person using the data



## Questions (cont.)

3. Digital information can be easily copied, changed or deleted. How can you ensure that your data are *authentic* (choose all possible answers):
- (a) keep master files of the data
  - (b) regulate write access to master files
  - (c) assign responsibility for master files
  - (d) record changes to master files



# UCT RDM Policy

# RDM Policy

<http://www.digitalservices.lib.uct.ac.za/dls/rdm-policy>

- Aligned with related institutional policies (IP, Open Access)
- Publicly funded research data are a public good, which should be made openly available with as few restrictions as possible in a timely and responsible manner
- Published research results should include information on how to access the supporting data
- To ensure that the research process is not damaged by premature release of data, associated policies, guidelines and practices ensure that legal, ethical and commercial constraints are considered at all stages in the research process
- It is appropriate to use public funds to support the management and sharing of publicly-funded research data.



## UNIVERSITY OF CAPE TOWN RESEARCH DATA MANAGEMENT POLICY

**Policy name:** University of Cape Town Research Data Management Policy

**Responsible Executive:** DVC (Research & Internationalisation)

**Responsible Office:** Research Office

**Issued:** 2016

**Version:** Draft Policy Document Version 4

**Document URL:**

### A. POLICY STATEMENT

#### 1. Introduction

The drivers and principles for managing research data at the University of Cape Town (hereafter referred to as "the University"), are defined in response to the increasing number of policies published by funders of research to ensure the validation of research results; to provide research opportunities in data reuse, and to enable actionable and socially-beneficial science to address global research challenges. In addition, recent emphasis on the principle of Open Access by default to data resulting from publically-funded research requires consideration of the necessary limits on openness, particularly relating to personal information and commercial considerations to assist researchers to comply with legal requirements, and emerging terms of funding and scholarly publishing.

# Data Planning: UCT DMPonline



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## What is a DMP?

- “...a formal document that describes the data produced in the course of a research project. [It also] outlines the data management strategies that will be implemented both during the active phase of the research project and after the project ends.”  
- Sarah Jones ([DCC](#))



## Why create DMPs?

- Mandatory funder requirement
    - +/- 10% weighting in many funding applications
  - Mandatory Institutional requirement
    - Your data can't be stored or published if you don't have ethical clearance or funding for storage, curation and preservation.
  - Part of good research practice: your research data needs management throughout the research lifecycle.
  - Well-managed data allows for:
    - verification or refinement of published research results,
    - reduces the potential for scientific fraud,
    - promotes new research through the use of existing data,
    - provides resources for training new researchers and discourages unintentional redundancy in research
- ... By planning for data management, these benefits are more likely to be realised.

# DMPonline

[dmp.lib.uct.ac.za](http://dmp.lib.uct.ac.za)

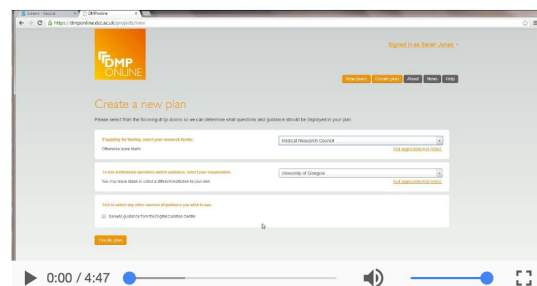


[Home](#) [About](#) [Roadmap](#) [Help](#)

Welcome.

DMPonline has been developed by the Digital Curation Centre to help you write data management plans.

Screenshot on how to use DMPonline



## Sign in

Email address \*

Password \*

[Forgot your password?](#)

☐ Remember me

[Sign in](#)

## Sign up

New to DMPonline? Sign up today.

[Contact us](#) | [Terms of use](#) | [DMPonline previous version](#)

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## Why have a UCT instance of DMPonline?

- Data is stored and managed locally
- Loading of customised templates with unique institutional-specific guidance
- Administrative access for departmental data managers

DMPonline demonstration follow at:

[dmp.lib.uct.ac.za](http://dmp.lib.uct.ac.za)

Watch the video for more info on the [admin interface](#) functionality  
To set up the account contact [Erika Mias](#).

## Basic DMP questions:

1. What data will you collect or create?
2. How will the data be collected or created?
3. What documentation and metadata will accompany the data?
4. How will you manage any ethical issues?
5. How will you manage copyright and Intellectual Property Rights (IPR) issues?
6. How will the data be stored and backed up during the research?
7. How will you manage access and security?
8. Which data should be retained, shared, and/or preserved?
9. What is the long-term preservation plan for the dataset?
10. How will you share the data?
11. Are any restrictions on data sharing required?
12. Who will be responsible for data management?
13. *What resources will you require to deliver your plan?*

New on DMPonline: National Institutes of Health (NIH) funder template



My plan (National Institutes of Health (NIH) template for data sharing)

Plan details	NIH data sharing plan	Share	Export
1 Project name (1 question, 0 answered)			
2 Lead Principal Investigator(s)/Grant Holder (1 question, 0 answered)			
3 What data will be shared? (1 question, 0 answered)			
4 Who will have access to the data? (1 question, 0 answered)			
5 How will researchers locate and access the data? (1 question, 0 answered)			
6 When will the data be made available? (1 question, 0 answered)			
7 Will a data sharing agreement be required? (1 question, 0 answered)			
8 What data transformations/preservation actions will be necessary? (1 question, 0 answered)			
9 What additional information will be submitted alongside the data? (1 question, 0 answered)			
10 Data Storage (5 questions, 0 answered)			
11 Budget (1 question, 0 answered)			

# Depositing & Sharing Data



# Why Share Data?

[Rewards of sharing](#) research data

- **Secure funding** by:
  - meeting the requirements of your current or potential funding agency
- **Get published in journals** that require access to research data as part of the review process
- Make your research more **trustworthy**
  - reviewers and other researchers can access and validate your data
- Get recognition and **increase citations** by:
  - sharing your data and making it reusable
- Enable **growth in research output** by:
  - reducing the time and cost of future research

## What is a repository?



# Repository

Repositories preserve, manage, and provide access to many types of digital materials in a variety of formats. Materials in online repositories are curated to enable search, discovery, and reuse. There must be sufficient control for the digital material to be authentic, reliable, accessible and usable on a continuing basis.

source: <http://dictionary.casrai.org/Repository>

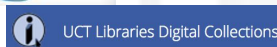
- Different types of repositories:

- Institutional repositories

- OpenUCT



- UCT Digital Collections



- UCT IDR... pending...

- Discipline-specific repositories

- Have their own guidelines for depositing and sharing data.

- Many offer training and/or manuals to assist you with data preparation and deposit

- Ocean Biogeographic Information System ([OBIS](#))



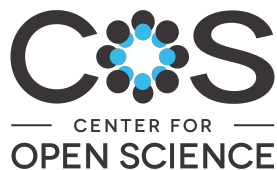
OCEAN BIOGEOGRAPHIC  
INFORMATION SYSTEM

- National Institutes of Health ([NIH](#))



## Depositing & sharing research data

- Development of institutional communities for managing, collaborating, and sharing research data within internationally recognised online platforms:
  - UCT Zenodo Community
  - UCT OSF (under construction)
- Implementation of **Institutional Data Repository (IDR)** at UCT:
  - [Recommendation](#) submitted
  - Pilot implementation underway
- Further guidelines for [depositing](#) & [sharing](#) your research data...
  - <http://www.digitalservices.lib.uct.ac.za/dls/data-sharing-guidelines>

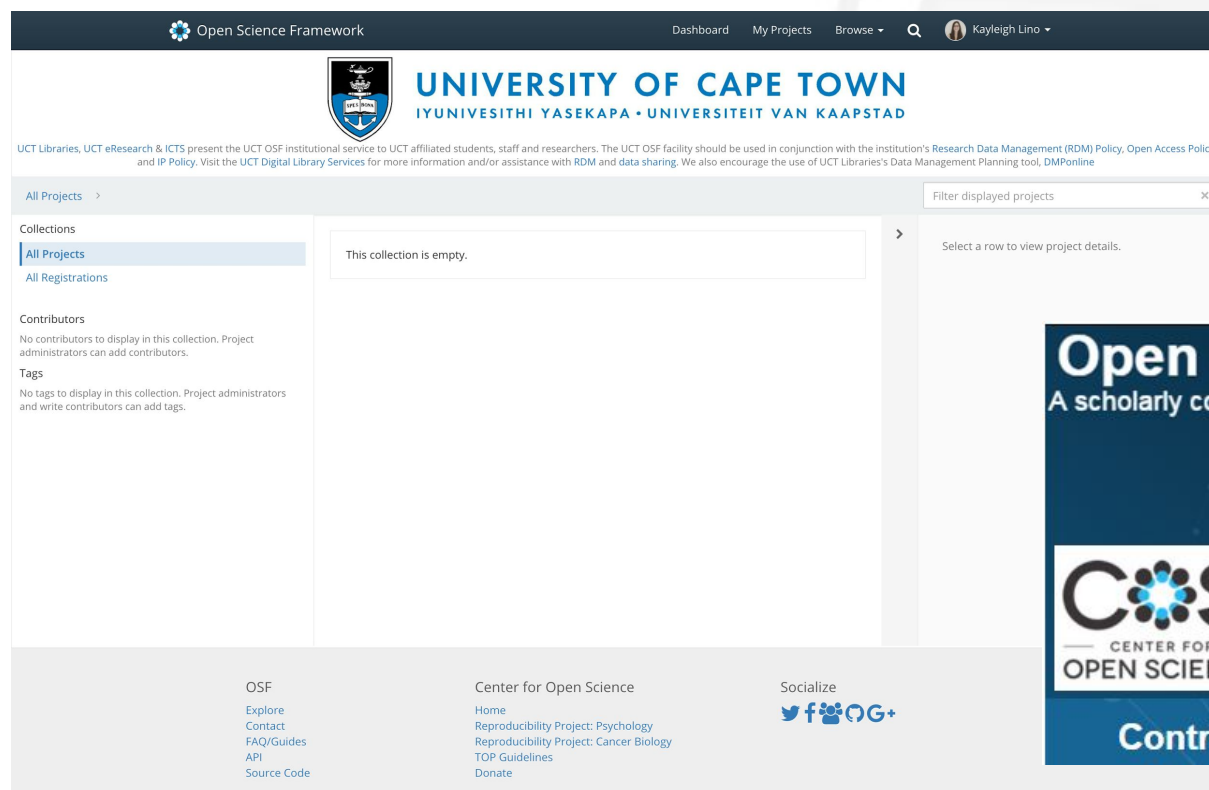




# UCT (Open Science Framework) OSF


[osf.uct.ac.za](https://osf.uct.ac.za)

**Open Science Framework (OSF) for institutions** offers a free online service concerned with 'filling the gaps' between research data management tools and services to enable reproducible science.



Open Science Framework

Dashboard My Projects Browse 🔍 Kayleigh Lino

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UCT Libraries, UCT eResearch & ICTS present the UCT OSF institutional service to UCT affiliated students, staff and researchers. The UCT OSF facility should be used in conjunction with the institution's Research Data Management (RDM) Policy, Open Access Policy and IP Policy. Visit the UCT Digital Library Services for more information and/or assistance with RDM and data sharing. We also encourage the use of UCT Libraries's Data Management Planning tool, DMPonline

All Projects > Filter displayed projects

**Collections**

All Projects  
All Registrations

This collection is empty.

**Contributors**

No contributors to display in this collection. Project administrators can add contributors.

**Tags**

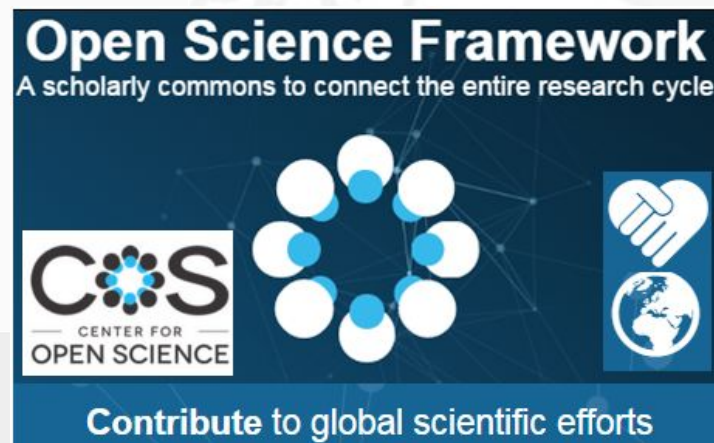
No tags to display in this collection. Project administrators can add tags.

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**Open Science Framework**  
A scholarly commons to connect the entire research cycle

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☐ Embargoed Access

☐ Restricted Access

☐ Closed Access

Required. Open access uploads have considerably higher visibility on Zenodo.

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**Communities**

Start typing a community name...

University of Cape Town (UCT)

Funding recommended >

Related/alternate identifiers recommended v

Specify identifiers of related publications and datasets. Supported identifiers include: DOI, Handle, ARK, PURL, ISSN, ISBN, PubMed ID, PubMed Central ID, ADS Bibliographic Code, arXiv, Life Science Identifiers (LSID), EAN-13, ISTC, URNs and URLs.

**Related identifiers**

e.g. 10.1234/foobar.567890

+ Add another related identifier

Contributors

References

Journal

Conference

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☐ references this upload  
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☐ is new version of this upload  
☐ has this upload as part  
☐ is part of this upload  
☐ is compiled/create by this upload  
☐ compiled/created this upload  
☐ is identical to this upload

## Sharing data on Zenodo

- Flexible licensing
  - Open Access: [CC](#)
  - Embargoed: OA upon future date
  - Restricted: access upon request
  - Closed: not accessible
- Communities
  - Add data to numerous communities
  - [Affiliate your data with UCT](#)
- Link data to your dissertations or other research publications informed by the data
- Get recognition!
  - DOI enables increased citations
  - Altmetrics (SM shares)

[zenodo.org/communities/university-of-cape-town](https://zenodo.org/communities/university-of-cape-town)

# Thank You!

## Questions?

[Visit the LISC website](#)  
[Visit the DLS website](#)

### Contact us:

Richard Higgs: [richard.higgs@uct.ac.za](mailto:richard.higgs@uct.ac.za)  
Erika Mias: [erika.mias@uct.ac.za](mailto:erika.mias@uct.ac.za)  
Kayleigh Lino: [kayleigh.lino@uct.ac.za](mailto:kayleigh.lino@uct.ac.za)

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# Best practices for working with your data

## File management

- File management practices help you **identify, locate and use** your data effectively
- Good file management helps others to understand, collaborate and/or reuse your data effectively
- Well managed files are:
  - distinguishable
  - easy to locate and browse
  - easy to collaborate with
  - easy to work with (open formats)



Image Credit: [Cliparts](#)

## File formats

- **Plain text (or open) formats are your friend**
  - Why?
  - Types of open file formats?
- File formats **encode information about a file** that enable it to be **recognised** by a computer program or application
- File formats are indicated in the filename by an **extension** that follows a full-stop
  - jpg, docx, pdf
- **Proprietary** vs **Open** file formats
  - Proprietary file formats can only be opened by the software used to create the file
  - Open file formats are openly available and can be recognised by a number of applications
  - Best to **use open formats wherever possible**, or **convert to open formats** and save alongside proprietary files.

## File formats

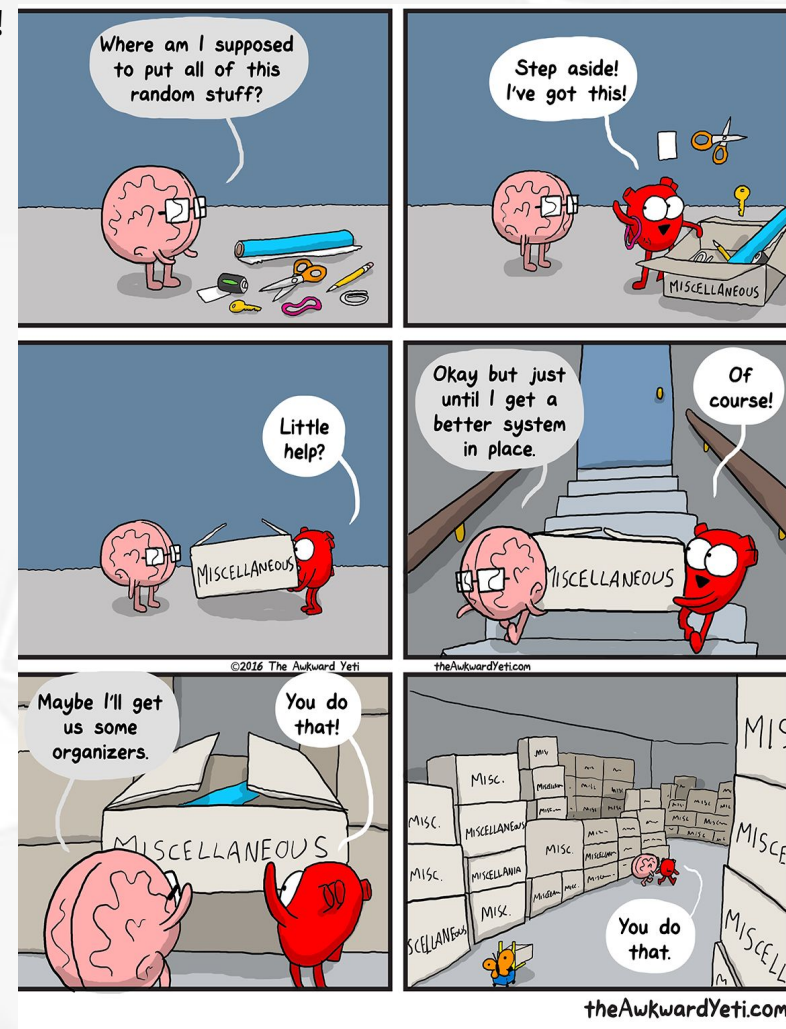
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# File naming

Naming files sensible things is good for you and your computer!

- **Three** criteria to assist with naming files:
  - Organisation
  - Context
  - Consistency
- **Elements** to consider when naming files:
  - version numbers
  - creation / publication date
  - creator's name / group name
  - content description
  - project number
- Always consider **scalability** when naming files
  - e.g. 001 vs 01
- **Don't**
  - punctuation, or capital letters
  - use special characters or spaces
- **Do**
  - replace full-stops with underscores
  - replace spaces with dashes
  - keep to YYYY-MM-DD date format
  - keep file names relevant and as short as possible



<http://theawkwardyeti.com/comic/misc/>



# File versioning

Always **record changes** to your data files, even if it seems unnecessary!

- **Don't** use the word "**final**" - instead, **number or date versions**
- Avoid using labels - eg. 'draft', 'test', 'final', 'rev', 'corrected', etc
- Indicate major version changes with:
  - YYYY-MM-DD\_Title\_Author\_V1
  - YYYY-MM-DD\_Title\_Author\_V2
- Indicate minor version changes with:
  - YYYY-MM-DD\_Title\_Author\_V1-1
  - YYYY-MM-DD\_Title\_Author\_V1-2



credit: PHD Comics

"Final".doc <http://phdcomics.com/comics.php?f=1531>

## File formats continued...

- File format **obsolescence**
  - Changes in technology
  - Updates of software
- **Migration** vs **Normalisation**
  - both involve **converting files from one format to another** (typically preservation-friendly, open formats)
  - **Migration** refers to the conversion of files when the **file format is at risk of obsolescence**
  - **Normalisation** is the practice of converting file formats **upon acquisition or creation** for long-term preservation
  - Always practice [normalisation](#) to ensure preservation of your data and avoid emergency migration!

### Resources:

- [DPC - File formats and standards](#)
- [Stanford University - Best Practice for file formats](#)
- [Archivematica - Format Policy Registry](#)
- [DCC - Open source software and open standards](#)
- [Open Data Handbook - File formats](#)

## Data transformation

- Involves **changing the actual data** (not file format)
  - sensitive/personal/private data
    - de-identification, anonymisation
  - converting qualitative data into quantitative data
  - visualising quantitative data
    - numerical data to bar graphs/pie charts
- Data transformation enables further analysis of the data collected
- Data transformation also enables sharing and analysis of data that might not otherwise be ethical to share

### Resources:

- [DataFirst](#)

# Metadata

## Definitions...

*"A set of [data](#) that describes and gives information about other [data](#)" ([Oxford Dictionaries](#)).*

*"Metadata is structured information that describes, explains, locates, or otherwise makes it easier to **retrieve**, **use**, or **manage** an information resource. Metadata is often called **data about data** or information about information" ([NISO, 2004](#)).*

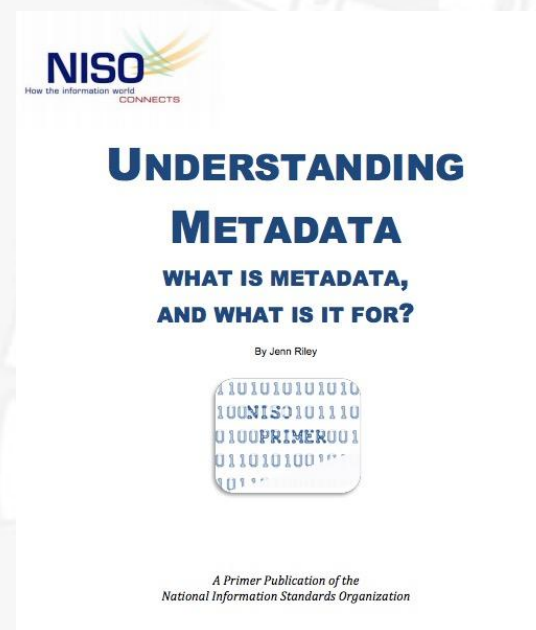
Metadata is 'Information about data' that helps us to **find**, **access**, **understand** and **use** (or **reuse**) data

## Three types:

- Descriptive
- Administrative
- Structural

## Resources:

- [DCC list of disciplinary metadata](#)
- [UCT metadata entry guidelines](#)



[NISO, 2017](#)

## Documentation

### Readme Files

- Increasing requirement of data repositories and funders to submit a readme file when depositing in a data repository.
- Advantage of creating well structured Readme files:
  - [Helps the reader to identify, evaluate, use and engage with your project.](#)

An example of data deposited in a repository with readme files [here](#).

For programmers see also Daniel Beck's excellent [Readme checklist and presentation](#)

### Codebooks and Laboratory Notebooks

- Raw data such as these also need to be managed effectively and preserved where possible- NB for reproducibility. (Researcher interview: [Shaun Bevan](#))

**Document your data while you're creating it so that it is easy to understand and use later on...**



The screenshot shows a web browser displaying a Cornell University Readme template. The header includes the Cornell logo and the filename 'AUTHOR\_DATASET\_ReadmeTemplate.txt' with a 'Download' button. The main content area contains a pre-filled template for a dataset's README file. It starts with a line: 'This DATASETNAMEreadme.txt file was generated on [YYYYMMDD] by [Name]'. Below this is a section titled 'GENERAL INFORMATION' with a dashed border. Inside this section are five numbered items: 1. Title of Dataset, 2. Author Information, 3. Date of data collection (single date, range, approximate date) <suggested format YYYYMMDD>, 4. Geographic location of data collection (where was data collected?):, and 5. Information about funding sources that supported the collection of the data:. Below the 'GENERAL INFORMATION' section is another section titled 'SHARING/ACCESS INFORMATION' with a dashed border. It contains two numbered items: 1. Licenses/restrictions placed on the data: and 2. Links to publications that cite or use the data:.

Credit: [Cornell University](#)  
Filename: [AUTHOR\\_DATASET\\_ReadmeTemplate.txt](#)

## Storing and backing up your data

- **Storage**

- From the outset, think about how much storage you require
- Think about who needs to access your data and how that affects your storage location
- Include costs of storage in your DMP and funding applications
- Network drives highly recommended for storing and accessing master copies
  - [UCT eResearch data storage services](#)

- **Backup**

- Find out about your network provider's backup services
- Set up your own backup workflow...
  - daily / weekly / monthly
  - 2 - 3 copies, different locations
  - Incremental vs. Full
  - Cloud vs. Local

- **Security**

- Who needs access? How will you control access?
- Sensitive data and encryption

*researcher interview on file management and security: [Natalia Calanzani](#)*

## Other Resources

- **Research Data Management Tutorials**
  - [Mantra](#)
  - [Leeds University](#)
  - [Research Data Management and Sharing](#) (Coursera)
- **DMPonline tutorials**
  - [EUDAT presentation on writing a DMP](#)
- **Metadata schemas and disciplinary metadata**
  - [Overview of metadata types](#)
  - [Disciplinary metadata](#)
  - [Metadata standards](#)
- **Open Research**
  - [SPARC](#)
  - [Why Open Research](#)
- **Researcher Interviews**
  - [Odum Institute](#) interviews researchers on why RDM is important.

*(On a less serious note : [“A Data Sharing and Management Snafu in 3 Parts”](#))*

## Extra work!?

- RDM makes it easier to understand, preserve and work with your data
- RDM assists you with planning your research project in order to satisfy funder requirements.
- RDM [increases the likelihood of reproducing your results and validating your research](#) and eases the transition into a research project for new members or collaborators.
- [Data transformation](#) can lead to unforeseen uses in other research disciplines: new use cases = more citations and greater reach / recognition of your work



Source: [Cliparts](#)



## FAQs

- Do I have to keep my data and where?
- Isn't just backing up my files to an external hard drive enough?
- What will it cost to store my data?
- Who can advise me on meeting the requirements of my grant funder's data policy?
- What research data services are we currently offering at UCT?
- What are my responsibilities as a researcher to manage my data?
- What is the best and safest way to share data with my research collaborators during the research project?
- We have more than one funder for a collaborative research project, what are the implications of this in terms of policies around data storage and copyright?
- Does UCT have a data repository?
- Can you track how many times my data are downloaded?
- Can I get credit for publishing my data?