Research Data Management: File Organization

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Katherine McNeill
&
Helen Bailey

MITLibraries

Research Data Management Services

- Workshops
- Web guide: http://libraries.mit.edu/data-management
- Individual assistance/consultations
  - includes assistance with creating data management plans
- Contact: data-management@mit.edu

What you will learn

- Why file organization of your research data is important
- Specific techniques for organizing your research data, including developing plans for:
  - File structures - *where to put data so you won't lose it* (including tips on embedding metadata)
  - File naming - *what to call data so you know what it is*
  - A bit on version control - *keeping track of data*
- Will also include opportunities for:
  - Small group discussion
  - Exercise for organizing your own data
- Focuses on research data, but applies to other types of files as well

Small group discussion with your neighbor: 3 minutes

- What kind of data do you work with?
- What organizational challenges have you faced?
- What tools or techniques work for you?

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Why Research Data File Organization is Important

Why file organization is important

- You think you'll remember things, but over time…
- Multitude of formats and version of data and documentation
- Investment of time at the beginning in an efficient system can save time in the long run
- Good file management practices/naming protocols enable sharing with collaborators

Can you understand/use these data files? Would anyone 5 years from now?

- Experimentdata.txt
- Laurensdata.dat
- Data:currentversion.dta
- Todaysimage.tif

- SrvMthdDraft.doc
- SrvMthdFinal.doc
- SrvMthdLastOne.doc
- SrvMthdRealVersion.doc

Video: one researcher’s experience

- Dave Anderson, National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center
- http://www.youtube.com/watch?v=Z_ysxiAGKC8

Key principles

- Organization is a means to efficient research, not an end in itself
- Some extra work when you collect material may prevent a lot of future hassle; think of what information you need to document now so that your files make sense to you (and others) in the future
- There’s no single right way to do it
- Establish and document a system that works for you
- Strike the balance between doing too much and too little: be realistic
- The 5 Cs: be Clear, Concise, Consistent, Correct, and Conformant

Techniques: File Structures – *where to put data so you won’t lose it*

Methods of organising electronic material

- Hierarchical
  - Items organised in folders and sub-folders
- Tag-based
  - Each item assigned one or more tags
- Remember: you *can* do a hybrid combination of hierarchical and tag-based

Hierarchical systems: benefits

- Familiar and widely used
- Good at representing the structure of information
  - Constructing the hierarchy can itself be a helpful exercise
- Similar items are stored together
- Sub-folders can function as task lists
- Great for location-based finding

Hierarchical systems: drawbacks

- Surprisingly hard work to set up and maintain – ‘a heavyweight cognitive activity’
- Can be hard to get the right balance between breadth and depth
- Items can only go in one place
- Time consuming to reorganise if the hierarchy becomes out of date

Tag-based systems: benefits

- Items can go in more than one category
  - Moreover, multiple *types* of category can be used
- Many people find tagging quicker and easier than hierarchical filing
- When collaborating, can be easier to combine than hierarchical systems

Tag-based systems: drawbacks

- Not how operating systems store files
- If material isn't tagged properly when first acquired, it can be hard to find later
- There's a risk of inconsistent tagging
- And of similarly named categories getting mixed
- Less good at representing the structure of information

Tips for managing a hierarchical system

- In Windows, Windows Explorer is a good tool
- If possible, avoid overlapping categories
  - Find other ways of linking items
- Don't let your folders get too big – or your structure get too deep
  - Create separate folders for older (no longer active) material

Creating a tag-based system

- Possible tools include:
- Bibliographic software
  - EndNote, Zotero, Mendeley...
- Image management programs
  - Flickr, Picasa...
- Google tools
- See our guide to Tagging and Finding Your Files: http://libguides.mit.edu/metadataTools/

Small group discussion with your neighbor: 3 minutes

- What sort of structure(s) do you currently use?
- What do you see as the key advantages and disadvantages of the different types of system?
- Are there specific tasks one sort of system seems particularly suitable for? How does this apply to your research project(s)?

Tip 1: Embedding metadata

- If feasible, try to enter basic information about the data file within its contents (e.g., author, date created/modified, project, grant, version)
  - May be able to <comment> information in a file
  - May help to identify files using your system's full-text searching capabilities
- Embed metadata in header
- May also be able to assign this information as tags (external to your files); see our guide to Tagging and Finding Your Files: http://libguides.mit.edu/metadataTools/
  - Caveat: some programs strip tags during file transfer or transformation, so don't rely solely upon these

Tip 2: adding searchable keywords to files in Windows

- Open up the Windows folder view and highlight (don’t click to open) your file of interest
- In the pane at the bottom of the folder window, you’ll see metadata about your file
- Click the property that you want to change/add (you’ll see the box for tags all the way on the right), type the new property, and then click Save.
- To add >1 tag, separate each with a semicolon.
- Terms entered here will be found by the Windows search function

Tip 3: Adding tags on a Mac

- When you save a file, from the document menu, or in Finder
- Spotlight Comments (and use Spotlight to search)
- http://support.apple.com/kb/HT5839
- http://www.maclife.com/article/howtos/mavericks_howto_organizing_files_and_folders_tags
- http://computers.tutsplus.com/tutorials/how-to-tag-files-and-create-spotlight-comments-on-a-mac--mac-46431

Tip 4: Shortcuts in Windows

- Shortcuts allow you to open a file from multiple places
- Functions to place a file in >1 category
- Use for frequently accessed items
- Use to create project folders

Tip 4: Shortcuts on a Mac

- On OS X you can create "symbolic links" using the terminal and the 'ln -s' command
- Use Automator (http://support.apple.com/kb/ht2488), alone or in conjunction with AppleScript (http://www.macosxautomation.com/applescript/)

- Now, back to the idea of a hierarchical folder structure…

Create a file structure system: why?

- Organization - important for future access and retrieval
- Simplifies your workflow in managing files
- Data files are easier to locate and browse
- Eases data sharing: clear organization is intuitive to team members and colleagues
- Data files are distinguishable from each other within and across folders
- Document your system and use it consistently!

Good practices for organizing data files

- First: define the types of data and file formats for the research
- Be Clear, Concise, Consistent, Correct, and Conformant
- Choose a meaningful directory hierarchy/naming convention
- Includes important contextual information
- Could organize folders by primary, secondary, tertiary subject or collection method
- Document your system and use it consistently - choose a naming convention and ensure that the rules are followed systematically by always including the same information in the same order

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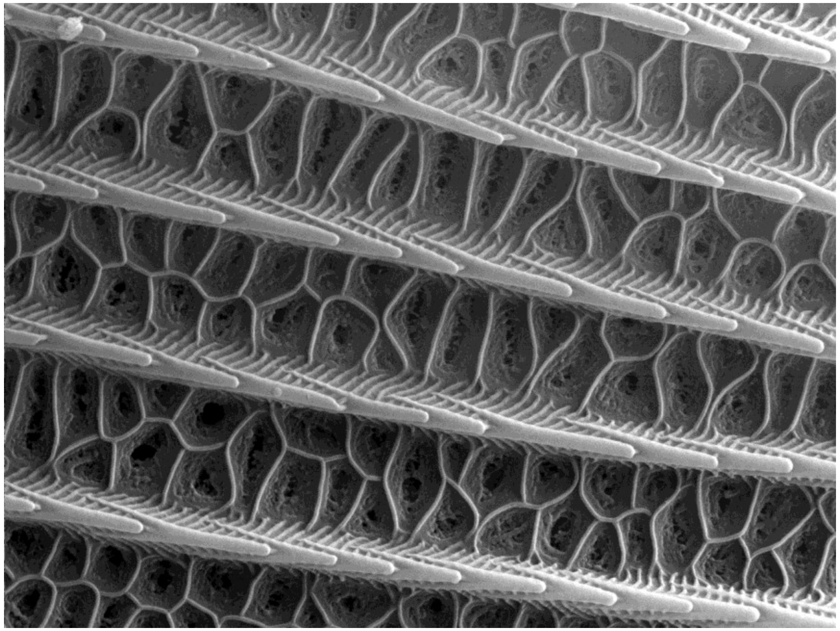
A Case Study: Butterfly Wings



Butterfly research project: files

- Images (in multiple file formats)
- Data in tabular format (some captured on the fly) about each specimen collected (visual characteristics, time, location, weather, etc.)
- Project documents (grant proposal, etc.)
- PDFs of related literature
- And more…

Example file structure systems/directory hierarchy conventions:

/[Project]/[Grant Number]/[Event]/[Date]
/[Project]/[Sub-project]/[Run of an experiment]/[Person]/[Date]
/[Research area]/[Project]/[Data vs. documentation]/[Date]
/[Project]/[Type of file]/[Person]/[YYYYMMDD]
/[Instrument]/[Date]/[Sample]

For the butterfly project:

/butterfly/images/mcneill/20140117
/butterfly/tabular/mcneill/20140117
/butterfly/projectDocs/
/butterfly/literature/subject/

Techniques: File Naming – *what to call data so you know what it is*

Researcher Video

- Professor Jeff Haywood, Vice Principal, CIO University of Edinburgh (field of research: learning technologies)
- http://www.youtube.com/watch?v=i2jcOJOFUZg

Create a file naming system: why?

- Organization - important for future access and retrieval
- Provides contextual information: a filename is a key identifier for a research data file (data files are not self-describing and you can't always embed metadata)
- Create logical structure for skimming through many files and versions; data files are distinguishable from each other within and across folders
- Eases data sharing: clear organization is intuitive to team members and colleagues

Good Practices for file naming

- Document your system and use it consistently!
- First: define the types of data and file formats for the research
- Be Clear, Concise, Consistent, Correct, and Conformant
- Context: provides content-specific or descriptive information
- Avoid using generic data file names that may conflict when moved from one location to another.
- Consistency - choose a naming convention and ensure that the rules are followed systematically
- Keep file names short but meaningful
- Reserve the 3-letter file extensions for the codes the system assigns to the file type, e.g. WRL, CSV, TIF (don't modify)
- Domains may have specific file naming recommendations
  - E.g., GIS datasets from the state of Massachusetts, http://www.mass.gov/mgis/dwn-name.htm
- Don't rely on file names as your sole source of documentation

Possible elements for file names

- Project/grant name and/or number
- Date of creation: useful for version control, e.g., YYYYMMDD
- Name of creator/investigator: last name first followed by (initials of) first name
- Name of research team/department associated with the data
- Description of content/subject descriptor
- Data collection method (instrument, site, etc.)
- Version number

Some specific considerations

- Capital letters or underscores (alternative: %20) can differentiate between words (avoid spaces)
- Avoid special characters such as: &-amp; * % $ £] { ! @ / as these are often used for specific tasks in a digital environment
- Number order files only if using leading zeros: e.g., 001, 002, 003, etc. will order files up to 999
- Consider how scalable your data file naming policy needs to be: e.g., don't limit your project number to two digits, or you can only have ninety nine projects.
- Capitals in file names affect ordering – be consistent.
- Note that not all systems/software are case-sensitive and recognize capitals; assume that TANGO, Tango and tango are the same

Example file naming convention systems:

[investigator]_[method]_[subject]_[YYYYMMDD]_[version].[ext], or
[project #] _[method]_[version]_[YYYYMMDD].[ext], or
[YYYYMMDD] _[version]_[subject]_[datacollector].[ext]
[type of file]_[specimen number]
[version][collector]_[YYYYMMDD]_[geolocation].[ext]
[type of file]_[author]_[date].[ext]

For the butterfly project:

image_12345_v1_mcneill_20140117_42.3598N71.0921W.tif
article_gonzalez_2013.pdf

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Data collection equipment: file naming

- Check to see if your instrument, software, or other equipment that outputs your data files can be set with a file naming system
- Less work than retrospectively changing filenames
- But if you still have to change many file names downstream…

Batch renaming of files

- Useful for retrospectively aligning file/folder names with naming conventions
- Software tools can organize files and folders in a consistent and automated way through batch renaming (also known as mass file/bulk renaming)
- CAVEATS:
  - Take care that your bulk renaming software doesn’t change the file format extension by mistake (common)
  - Given the importance of file names, ideally you’d want to keep track of the old file names along with the new ones

Batch renaming tools

Windows:

- Adobe Bridge (via any Creative Cloud products): http://ist.mit.edu/adobe-creative-cloud
- Ant Renamer: http://www.antp.be/software/renamer
- Bulk Rename Utility: http://www.bulkrenameutility.co.uk/
- ImageMagick: http://www.imagemagick.org/
- PSRenamer: http://www.powersurgepub.com/products/psrenamer.html
- RenameIT: http://sourceforge.net/prpjects/renameit

Mac:

- Adobe Bridge (via any Creative Cloud products): http://ist.mit.edu/adobe-creative-cloud
- ImageMagick: http://www.imagemagick.org/
- Name Changer: http://web.mac.com/mickeyroberson/MRR_Software/NameChanger.html
- PSRenamer: http://www.powersurgepub.com/products/psrenamer.html
- Renamer4Mac : http://renamer4mac.com/
- Name Mangler: http://manytricks.com/namemangler/

Linux:

- GNOME Commander: http://www.nongnu.org/gcmd/
- GPRename: http://gprename.sourceforge.net/
- ImageMagick: http://www.imagemagick.org/
- PSRenamer: http://www.powersurgepub.com/products/psrenamer.html

Unix

- The use of the **grep** command to search for regular expressions

Version control: *keeping track of data* (briefly)

Subtitle:

It's surprisingly easy to lose track of the current version of a data file (much less try to go back to an old one)

Versioning: program vs. data files

- Ideal: keep the original version of the data file the same and save iterative versions of the analysis/program/scripts files
- If you need to modify data files: save a copy of every iteration of a data file

Version control: principles

- Document your convention and be consistent
- Record every change
- Consider: discard or delete obsolete versions (while retaining the original 'raw' copy) if appropriate
- Consider your version control needs regarding:
  - single site vs. across locations
  - single vs. multiple users
  - different versions to be stored vs. files to be synchronised

Version control: tips and resources: 1

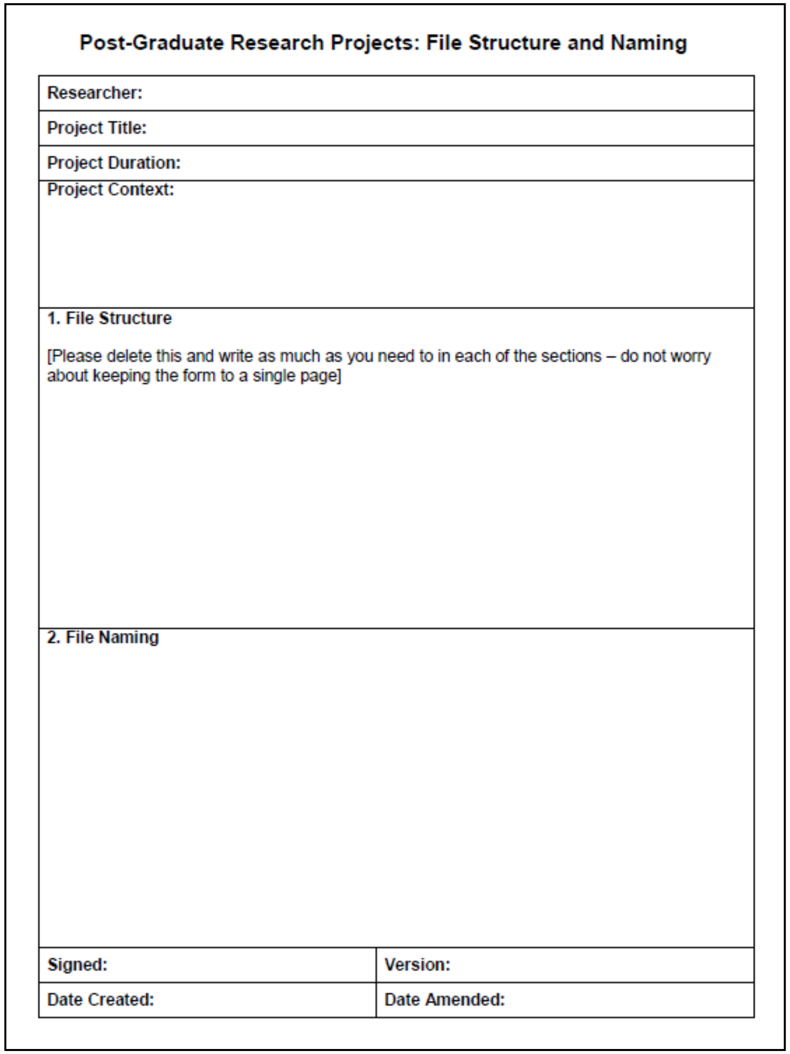
- In the file/folder names, use ordinal numbers (1,2,3, etc.) for major version changes and the decimal for minor changes e.g v1, v1.1, v2.6
- Beware of using imprecise labels: revision, final, final2, definitive_copy as you may find that those aren't as definitive as you thought
- May put old versions in separate folder
- May create a version control table or file history w/in or alongside data file

Version control: tips and resources: 2

- Record relationships between files, e.g. data file and documentation; similar data files
- Keep track of file locations, e.g., laptop vs. PC
- Some software has built in version control facilities, e.g.:
  - control rights to file editing: read/write permissions (*Windows Explorer)*
  - versioning or tracking features in collaborative documents (Wikis, GoogleDocs)
  - versioning/file sharing software: check files out/in
- Consider using version control software e.g., GIT, GNU RCS, Mercurial (Hg) or Apache Subversion, TortoiseSVN

Exercise: Planning File Structures and Naming Conventions for Your Data

Exercise: Project File Structure and Naming: ~5 minutes



Post-Graduate Research Projects: File Structure and Naming

Researcher:	
Project Title:	
Project Duration:	
Project Context:	
1. File Structure [Please delete this and write as much as you need to in each of the sections – do not worry about keeping the form to a single page]	
2. File Naming	
Signed:	**Version:**
Date Created:	**Date Amended:**

- Understanding the structure of your own data.
- Allows others to understand your data.
- Establishes good practice early by helping form working habits.
- Print out and stick on the wall above your desk!

Summary

- Don’t count on remembering things about your data
- Investing time at the beginning in an efficient system can save time in the long run
- Plan ahead and establish a system
- Make a system that works for you (and your collaborators)

Resources

- Libraries' guide to Data Management and Publishing: http://libraries.mit.edu/guides/subjects/data-management/
- Libraries' services for managing your information: http://libguides.mit.edu/manage-info
- JISC: http://www.jiscdigitalmedia.ac.uk/guide/choosing-a-file-name
- Digital Curation Centre: http://www.dcc.ac.uk/

Shared workshop materials which contributed to this presentation

- Aaron Collie, Hailey Mooney, and Shawn Nicholson. (2012). Research Data Management for Undergraduate Students. Michigan State University (emailed from author)
- EDINA and Data Library. (2012). Research Data MANTRA [online course], University of Edinburgh.
- Julie McLeod et al. (2011). DATUM for Health. Northumbria University.
- Lindsay Lloyd-Smith. (2012) DataTrain: Open Access Post-Graduate Teaching Materials in Managing Research Data in Archaeology. Cambridge University Library.
- Louise Corti, Veerle Van den Eynden, Libby Bishop and Bethany Morgan-Brett. (2011). Managing and Sharing Data - Training Resources. UK Data Archive, University of Essex. (ISBN 1-904059-82-1)
- Sudamih Project, Oxford University Computing Services. (2011). Research Information Management: Organising Humanities Material. Oxford University.

Conclusion

- Questions?
- Other tips for your peers?
- Feel free to contact us: data-management@mit.edu