The Research Data Management Workbook

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About this Book

Description

The Research Data Management Workbook is made up of a collection of exercises for researchers to improve their data management. The workbook contains exercises across the data lifecycle, though the range of activities is not comprehensive. Instead, exercises focus on discrete practices within data management that are structured and can be reproduced by any researcher.

The book is divided into chapters by phases of the data lifecycle, with one or more exercises in each chapter. Every exercise comes with a description of its value within data management, instructions on how to do the exercise, original source of the exercise, and the exercise itself.

The workbook is intended as a supplement to existing data management education. If you would like to learn more about the principles of data management, please see the article “Foundational Practices of Research Data Management” by Briney, Coates, and Goben Briney et al. [2020] or read the book “Data Management for Researchers” Briney [2015].

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The Author

Kristin Briney is the Biology & Biological Engineering Librarian at the California Institute of Technology and author of the books “Data Management for Researchers” (Pelagic Publishing, 2015) and, with Becky Yoose, “Managing Data for Patron Privacy” (ALA Editions, 2022). She has a PhD in chemistry and an MLIS, both from the University of Wisconsin-Madison. Her research

Figure 1: Headshot of author, Kristin Briney

focuses on research data management, institutional data policy, and patron privacy vis-a-vis library data handling. Kristin is an advocate for the adoption of the international date standard ISO 8601 (YYYY-MM-DD) and likes to spend her free time making data visualizations out of yarn and fabric.

Chapter 1

Introduction

Chapter 2

Documentation

2.1 Evaluate a Laboratory Notebook

Description: **

Instructions: **

2.2 Write a Project-Level README.txt

Description: *Data files living on a computer often need extra documentation for someone to understand what research they correspond to. In particular, it is useful to record the most basic project information and store it in the top-level folder of each research project. This can be done with a README.txt. The name, "README", indicates that the file conveys important information and the file type, TXT, can be opened by many different software programs, making the content maximally accessible. This exercise walks you through the key information needed in a project-level README.txt file. The same information can also be recorded at the front of a physical laboratory notebook.*

Instructions: *Pick a research project and answer the following questions. Copy all of the text into a TXT file and save it with the name "README.txt". Store this file in the top-level of the project folder on your computer, alongside the project files.*

Source: *This exercise was adapted from the "Project Close Out Checklist" Briney [2020].*

What is the title of the project?

What is the project description?

What is the time period the project was done over?

Who worked on the project?

Where are the files are stored?

How are files organized? Are any naming conventions used and, if so, what are they (see Chapter 3)?

2.3 Create a Data Dictionary

Description: *Ideally, a spreadsheet is formatted with a row of variable names at the top, followed by rows of data going down. This makes easy for data to be used in any data analysis software (interoperability is a good thing) but makes it impossible to document a spreadsheet within the file itself. For this reason, it's useful to create a data dictionary to describe the spreadsheet so that others* *can interpret the data. This exercise walks you through the major information you should record for each variable in the spreadsheet, adding up to a complete dictionary to accompany the spreadsheet file.*

Instructions: *Fill out the question in each row for each variable in the spreadsheet; note that you will likely have more variables than columns in this table. Copy this information into a text document and save it next to the spreadsheet. It is useful to save the data dictionary with the same root name as its data file by appending "_dictionary" on the end of the file name; for example, the data dictionary for the file "myData.xlsx" would be "myData_dictionary.txt".*

Source: *This exercise was adapted from the "Leveling Up Data Management" Briney [2023].*

Question	Variable1	Variable2	Variable3
Variable name			
Variable description			
Variable units			
Relationship to other variables			
Variable coding values and meanings			
Known issues with the data			
Anything else to know about the data?			

Chapter 3

File Organization and Naming

3.1 Set Up a File Organization System

Description: **

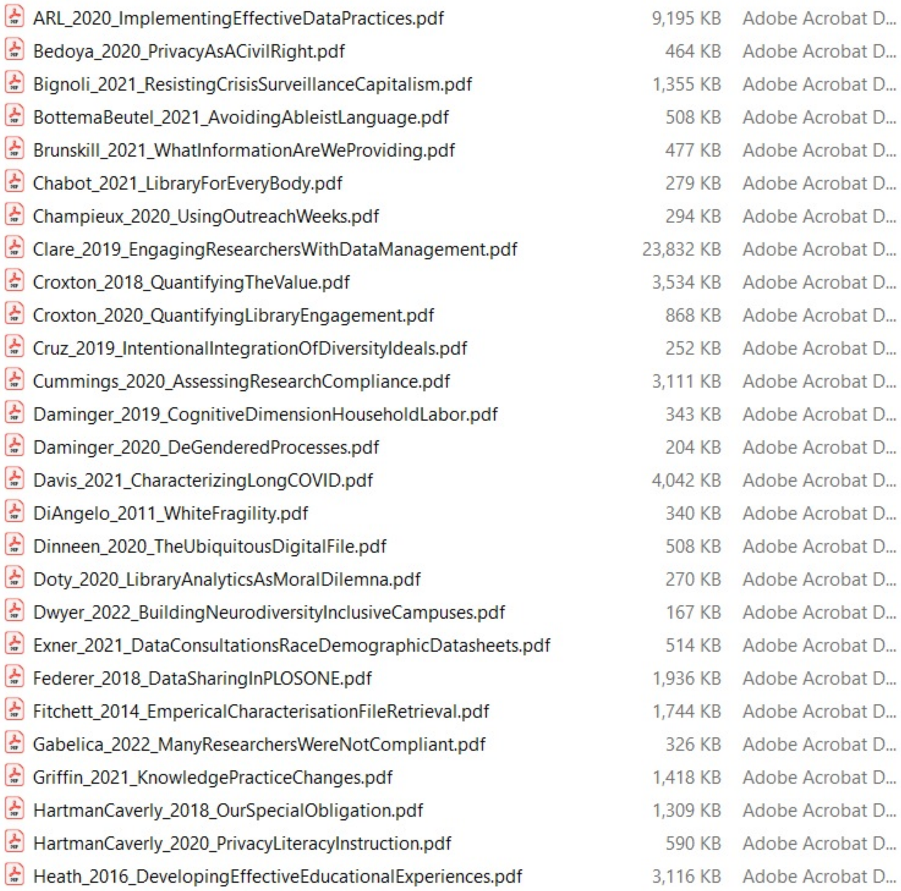
Instructions: **

3.2 Create a File Naming Convention

Description: *File naming conventions are a simple way to add order to your files and help to find them later. Rich and descriptive file names make it easier to search for files, understand at a glance what they contain, and tell related files apart.*

Instructions: *This exercise guides researchers through the process of creating a file naming convention for a group of related files. Fill in each section for a group of related files following the instructions; an example for microscopy files is provided. This exercise may be redone as needed, as different groups of files require different naming conventions.*

Source: *This exercise is based on the "File Naming Convention Worksheet"* **?**_*file*_*2020.*



ARL_2020_ImplementingEffectiveDataPractices.pdf	9,195 KB	Adobe Acrobat D...
Bedoya_2020_PrivacyAsACivilRight.pdf	464 KB	Adobe Acrobat D...
Bignoli_2021_ResistingCrisisSurveillanceCapitalism.pdf	1,355 KB	Adobe Acrobat D...
BottemaBeutel_2021_AvoidingAbleistLanguage.pdf	508 KB	Adobe Acrobat D...
Brunskill_2021_WhatInformationAreWeProviding.pdf	477 KB	Adobe Acrobat D...
Chabot_2021_LibraryForEveryBody.pdf	279 KB	Adobe Acrobat D...
Champieux_2020_UsingOutreachWeeks.pdf	294 KB	Adobe Acrobat D...
Clare_2019_EngagingResearchersWithDataManagement.pdf	23,832 KB	Adobe Acrobat D...
Croxton_2018_QuantifyingTheValue.pdf	3,534 KB	Adobe Acrobat D...
Croxton_2020_QuantifyingLibraryEngagement.pdf	868 KB	Adobe Acrobat D...
Cruz_2019_IntentionalIntegrationOfDiversityIdeals.pdf	252 KB	Adobe Acrobat D...
Cummings_2020_AssessingResearchCompliance.pdf	3,111 KB	Adobe Acrobat D...
Daminger_2019_CognitiveDimensionHouseholdLabor.pdf	343 KB	Adobe Acrobat D...
Daminger_2020_DeGenderedProcesses.pdf	204 KB	Adobe Acrobat D...
Davis_2021_CharacterizingLongCOVID.pdf	4,042 KB	Adobe Acrobat D...
DiAngelo_2011_WhiteFragility.pdf	340 KB	Adobe Acrobat D...
Dinneen_2020_TheUbiquitousDigitalFile.pdf	508 KB	Adobe Acrobat D...
Doty_2020_LibraryAnalyticsAsMoralDilemna.pdf	270 KB	Adobe Acrobat D...
Dwyer_2022_BuildingNeurodiversityInclusiveCampuses.pdf	167 KB	Adobe Acrobat D...
Exner_2021_DataConsultationsRaceDemographicDatasheets.pdf	514 KB	Adobe Acrobat D...
Federer_2018_DataSharingInPLOSONE.pdf	1,936 KB	Adobe Acrobat D...
Fitchett_2014_EmpericalCharacterisationFileRetrieval.pdf	1,744 KB	Adobe Acrobat D...
Gabelica_2022_ManyResearchersWereNotCompliant.pdf	326 KB	Adobe Acrobat D...
Griffin_2021_KnowledgePracticeChanges.pdf	1,418 KB	Adobe Acrobat D...
HartmanCaverly_2018_OurSpecialObligation.pdf	1,309 KB	Adobe Acrobat D...
HartmanCaverly_2020_PrivacyLiteracyInstruction.pdf	590 KB	Adobe Acrobat D...
Heath_2016_DevelopingEffectiveEducationalExperiences.pdf	3,116 KB	Adobe Acrobat D...

Figure 3.1: Screenshot of pdf's with consistent file names using the convention FirstAuthorLastName_YEAR_ShortTitle.pdf

1. What group of files will this naming convention cover?

You can use different conventions for different file sets.

Example: This convention will apply to all of my microscopy files, from raw image through processed image.

2. What information (metadata) is important about these files and makes each file distinct?

Ideally, pick three pieces of metadata; use no more than five. This metadata should be enough for you to visually scan the file names and easily understand what's in each one.

Example: For my images, I want to know date, sample ID, and image number for that sample on that date.

1.
2.
3.
4.
5.

3. Do you need to abbreviate any of the metadata or encode it?

If any of the metadata from step 2 is described by lots of text, decide what shortened information to keep. If any of the metadata from step 2 has regular categories, standardize the categories and/or replace them with 2- or 3-letter codes; be sure to document these codes.

Example: Sample ID will use a code made up of: a 2-letter project abbreviation (project 1 = P1, project 2 = P2); a 3-letter species abbreviation (mouse = "MUS", fruit fly = "DRS"); and 3-digit sample ID (assigned in my notebook).

4. What is the order for the metadata in the file name?

Think about how you want to sort and search for your files to decide what metadata should appear at the beginning of the file name. If date is important, use ISO 8601-formatted dates (YYYYMMDD or YYYY-MM-DD) at the beginning of the file names so dates sort chronologically.

Example: My sample ID is most important so I will list it first, followed by date, then image number.

1.
2.
3.
4.
5.

5. What characters will you use to separate each piece of metadata in the file name?

Many computer systems cannot handle spaces in file names. To make file names both computer- and human-readable, use dashes (-), underscores (_), and/or capitalize the first letter of each word in the file names.

Example: I will use underscores to separate metadata and dashes between parts of my sample ID.

6. Will you need to track different versions of each file?

You can track versions of a file by appending version information to end of the file name. Consider using a version number (e.g. "v01") or the version date (use ISO 8601 format: YYYYMMDD or YYYY-MM-DD).

Example: As each image goes through my analysis workflow, I will append the version type to the end of the file name (e.g. "_raw", "_processed", and "_composite").

7. Write down your naming convention pattern.

Make sure the convention only uses alphanumeric characters, dashes, and underscores. Ideally, file names will be 32 characters or less.

Example: My file naming convention is "SA-MPL-EID_YYYYMMDD_###_status.tif" Examples are "P1-MUS-023_20200229_051_raw.tif" and "P2-DRS-285_20191031_062_composite.tif".

8. Document this convention in a README.txt (or save this worksheet) and keep it with your files.

Chapter 4

Data Storage

4.1 Back Up the Data

Description: **

Instructions: **

Chapter 5

Data Management

5.1 Write a Living Data Management Plan

Description: ****

Instructions: ****

5.2 Determine Data Stewardship

Description: *It is often helpful to be up front about requirements and permissions around research data. This exercise encourages you to discuss these issues with supervisors and peers to make sure that there are no misunderstandings about who has what rights to use, retain, and share data.*

Instructions: *Determine which research data should be discussed. Bring together the Principle Investigator, the researcher collecting the data, and anyone else who works with that data. As a group, answer the questions in the exercise, making sure that everyone agrees on the final decisions. Record the results of the discussion and save them with the project files.*

Source: *This exercise was adapted from the "Project Close Out Checklist" Briney [2020].*

What data do these agreements apply to?

Are there security or intellectual property restrictions on the data and, if so, what are they?

Who will store the copy of record of the data and for how long?

Are there any requirement to share the data and, if so, what are they?

Who is allowed to reuse the data after the project ends? Are there any requirements for reuse?

Who keeps any physical research notebooks after the project ends?

Chapter 6

Data Sharing

6.1 Pick a Data Repository

Description: **

Instructions: **

6.2 Share Data

Description: **

Instructions: **

Chapter 7

Project Wrap Up

7.1 Prepare Files for Future Use

Description: **

Instructions: **

Source: *This exercise was adapted from the "Project Close Out Checklist" Briney [2020].*

Prepare Data

Convert data to more open/common file formats (e.g. .CSV or .TXT)

Create a Project-Level README File

Work through Exercise 2.2: Project-Level README.txt.

Store a copy of the README file with the data.

7.2 Create an Archive Folder

Description: *To save your future-self time spent digging through all of your research files, set aside the most important files into a separate "Archive" folder. Do this at the end of the project while you still remember which files are important and where they are located. The Archive folder should only contain a small subset of the most important documents that are likely to be reused; you may still need to go through all of your files but, in the majority of instances, you will save time by easily finding what you need in the Archive folder.*

Instructions: *This exercise consists of a checklist of the key documents that are likely to be most useful in a research project archive. Create a separate folder within the larger project folder (or in a highly visible place within the storage system) labelled "Archive". Copy – do not move – the files on this checklist into the Archive folder. Add copies other important research documents, as needed. Remember, the Archive folder does not need to be comprehensive, so focus on the subset of files that are most likely to be reused or referenced in the future.*

Source: *This exercise was adapted from the "Project Close Out Checklist" Briney [2020].*

Project Documentation

README file of project information

Data Snapshots

Raw data

Key data analyses

Final data

Code

Analysis code

Record software version, as appropriate

Other Research Documents

Protocols

Survey instruments

Research Notes

Scan of research notebook

Digital notes

Images

Flat files of figures (e.g. .JPG or .TIFF)

Editable image files (e.g. Photoshop)

Publications

Published article in .PDF format

Final version of the article in editable document format (e.g. .DOCX)

Posters

Administrative Documents

Grant proposals

Grant progress reports and final report

7.3 Separate from the Institution

Description: **

Instructions: **

Source: *This exercise was adapted from the "Data Departure Checklist" Goben and Briney [2023].*

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