Writing an Effective Data Management Plan

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1. Discuss challenges in developing data management plans (DMPs)
2. Review examples of agency guidelines
3. Highlight best practices for data management
4. Evaluate a sample plan
5. Experiment with DMP Tool
6. Explore resources for writing DMPs
1. What challenges do you face in dealing with data?
2. Examples of agency guidelines
Nearly All **Federal Funding Agencies** (& Some Nonprofits) **Require** or Will Soon Require DMPs

- NSF (specific guidelines by directorate)
- NIH
- CDC
- NEH Office of Digital Humanities
- DOE
- DOT
- FDA
- NOAA
- USAID
- USGS
- Moore Foundation
- Alfred P. Sloan Foundation
- ...

...
Why do funding agencies require DMPs?

- Facilitate replication of results
- Allow alternative hypotheses to be tested
- Enable comparative studies
- Promote new research
- Foster education
- Maximize investment of research money
**Some Principles** Underlying Data Management/ Sharing Requirement

- **Data**: “the recorded factual material commonly accepted in the scientific community as necessary to validate research findings”
- Values openness for fostering scientific progress & integrity.
- Respects norms of disciplinary communities.
- Recognizes constraints such as confidentiality & intellectual property.
- Promotes “timely access” while respecting rights of researchers to analyze data & publish results.
Rice University’s Research Data Management Policy

- PI is the primary steward of data & is responsible for:
  - Educating research team on “obligations regarding research data”
  - Ensuring accuracy, security & management of data
  - Complying with sponsor requirements
- Researcher has right to choose research directions, publish work & share findings.
- Rice holds legal title to data.
- Normal retention period for data = 5 years after grant expiration.
Information to Include in NSF DMPs

Guidelines vary by directorate, but generally require:

- Types of data
- Standards to be used for data & metadata
- Policies for access and sharing (including IP)
- Policies and provisions for re-use & re-distribution
- Plans for archiving data and for preserving access
Read the Guidelines.

- Pay attention to the specific requirements of your funding agency.
- Typically DMPs are 2 pages long.
DMPs and Compliance

- Proposals without DMPs will not be reviewed.
- Some agencies/directorates (e.g. NSF Bio) require reporting on DMP implementation in annual & final reports.
- Some directorates will consider DMP implementation in evaluating future proposals.
- Pay attention to policies governing how data should be handled, e.g. HIPAA.
1. Understand your data.

- What kind of data will you produce/ use?
  - What computing resources are needed?
  - What will be the workflow for managing data?
  - How much data will you be generating?
- What costs will be associated with managing data?
  These can often be written into grants.
- Are there restrictions on the data (e.g. HIPAA)?
2. Draw upon data management norms for your discipline.

- Ecology: British Ecological Society and ESA
- Environmental science: DataONE
- Social science: ICPSR, Dataverse & The American Economic Review: Data Availability Policy

>> Know up front what is required to share data through your discipline’s repository (e.g. ICPSR).
3. Describe your data.

- **Document your data**, recording information like title, creator, dates, subject, context & methods.
- Use established **metadata standards** so data are discoverable & interpretable.
  - e.g. [Ecological Metadata Language](https://www.ecoinformatics.org/) or [Data Documentation Initiative (DDI)](http://www.ddialliance.org/)


Example of Metadata for Data: Dryad

Based on Dublin Core standard

4. Use effective storage strategies.

- Keep 3 copies of data in multiple locations: “original, near and far” (e.g. hard drive, external drive, server)
- Manage versions of files (e.g. using Subversion or GitHub)
- Determine who needs access to files & ensure they are trained in properly handling them.
- Provide appropriate security for data (e.g. anti-virus protection, access control, encryption, de-identification of data).
- Store data in non-proprietary formats (e.g. .txt not .doc)
**Storage Options at Rice**

**Crate:** “research storage solution for Rice researchers; 500GB per research award”

**Archive:** “research solution for long-term retention of completed work”

**Box:** “enterprise cloud-based storage & collaboration service”

### Rice Storage, File Sharing, and Backup Solutions

<table>
<thead>
<tr>
<th>Storage, File Delivery, &amp; Backup</th>
<th>Faculty</th>
<th>Staff</th>
<th>Grad Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual and Collaborative Storage Solutions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual User U: Drive (FAQ)</td>
<td>5GB</td>
<td>5GB</td>
<td>5GB</td>
</tr>
<tr>
<td>Google Drive (FAQ) (Login) - NOT recommended for sensitive data</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
</tr>
<tr>
<td>Rice Box (FAQ) (Login)</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
</tr>
<tr>
<td>Department Share (FAQ)</td>
<td>40GB shared</td>
<td>40GB shared</td>
<td>40GB shared**</td>
</tr>
</tbody>
</table>

### Research Storage Solutions

- **Crate (FAQ)**: 500GB***
- **Archive (FAQ)**: varies

### Lease-based Storage & Scratch Solutions

- **RNAS (FAQ)**: varies ‡ varies ‡ *

### File Delivery, Version, & Backup Solutions

- **Crashplan for Backup for Rice-owned PCs and Macs (FAQ) (Login)**: $§ unlimited $§ unlimited
- **Subversion/SVN (FAQ) (Login)**:
5. Share data through an appropriate data archive.

Agencies permit different approaches to data sharing. Perhaps the best is to use a national data archive.

Why share?

- **Increase citations**
- Meet reproducibility & data sharing standards
- Facilitate future research

http://www.re3data.org/
Share Small to Medium Datasets through the Rice Digital Scholarship Archive

https://scholarship.rice.edu/handle/1911/77660
4. Evaluate a sample plan
## How to Evaluate a DMP

### Center for Digital Research & Scholarship, Columbia University Libraries, “Reviewer’s Worksheet for NSF Data Management Plans”

<table>
<thead>
<tr>
<th>Research product</th>
<th>Source</th>
<th>Format</th>
<th>Size</th>
<th>Preserved</th>
<th>Shared</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g., Tables, images, computer code, curriculum items, physical samples</td>
<td>Data repository, Instrument, interviews, PI’s prior project</td>
<td>JPG, MATLAB, Excel table, device’s format</td>
<td>&gt;1TB, 20K files</td>
<td>Discarded, PI retains, data archive</td>
<td>By request, website, repository</td>
</tr>
</tbody>
</table>

### Data Sharing

- Is data publicly accessible?
- When will data be shared?
- Who administers?
- Describes audience to benefit.

### Data management during project:

- Storage: has a backup plan
- Location & media used:
  - 2+ copies with 1 off-site
  - Specifies who is responsible
- Data security / access controls
  - Has conventions for naming & organizing files
Exercise: Let’s evaluate a sample plan

Use the “Reviewers’ Worksheet” to evaluate either “Rio Grande Basin” or the workshop on Afro-Caribbean Labor (NEH) [10 minutes]

Consider:

- What are this plan’s strengths? Weaknesses?
- What is your overall evaluation?
5. Experiment with DMP Tool
Creating DMPs Using DMPTool

https://dmptool.org
Exercise: Sketch out a DMP

- Log into [https://dmptool.org](https://dmptool.org)
- Select the NSF-Earth Sciences template.
- Create a draft DMP for “Rio Grande...” Try to improve upon the plan that you’ve been provided.
- Alternatively, you can create a DMP for your own (real or imagined) project using the appropriate template.
6. Data Management Resources at Rice & Beyond
Help Provided by the Rice Research Data Management Team

- Assistance developing data management plans.
- Consultation on organizing and managing data.
- Assistance identifying appropriate data repositories.

>> W: [http://researchdata.rice.edu/](http://researchdata.rice.edu/)

>> E: researchdata@rice.edu
Help Provided by the Office of Proposal Development

- Assist in developing your proposal, including the DMP
- Identify components that should be included in the DMP
- Draft the non-technical parts of the DMP
- Review, edit, and format the final version of the DMP
- Connect you with other data management resources on campus and online

>>[Office of Proposal Development](#)
DMP Components*

NSF - program solicitation or NSF GPG

NIH - FOA or Application Guide

DOE - FOA or Statement of Digital Data Management

*good idea to reference elements of research plan

Another Resource: Office of Research Compliance
Help Provided by Rice’s Center for Research Computing

- “Operating best-in-class on-premise shared compute, visualization and data-storage facilities;
- Facilitating access to on-premise, regional, national and commercial cloud facilities;
- Delivering user services and training for best use of shared facilities;
- Offering application and proposal consulting support-services.”
Helpful Resources

- Data Carpentry and Software Carpentry
- Data One, Primer on Data Management
- NISO Primer, Research Data Management
- U of Oregon Libraries, Research Data Management Best Practices
- UK Data Service Costing Tool
- UNC Research Data Toolkit: Example Language
- USGS Data Management
More Helpful Resources

- DataOne Primer on Data Management
- Dataverse, Data Management Plans
- ICPSR Guide to Social Science Data Preparation and Archiving
- Oak Ridge National Lab Distributed Active Archive Center, Best Practices for Preparing Environmental Data Sets to Share and Archive
- Svend Juul et al, “Take good care of your data”
- UK Data Archive, Managing and Sharing Data: Best Practices for Researchers