

Prioritizing Researcher Perspectives in Driving Adoption for Research Data Management

John Borghi
Daniella Lowenberg



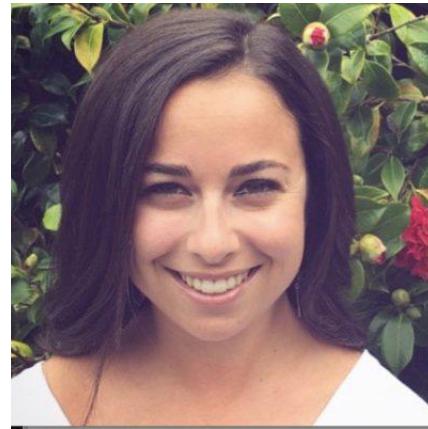
University of California
CDL
California Digital Library

UC3
UC Curation Center

The logo for UC3 (UC Curation Center) includes a stylized orange sunburst icon to the left of the text "UC3" in a large, bold, gray sans-serif font. Below "UC3", the text "UC Curation Center" is written in a smaller, gray sans-serif font.



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Bridging Communities of Practice:

Developing Data Management Tools for Researchers and Service Providers

John Borghi, PhD

Different Stakeholders

-  Research Community
-  Institutions
-  Libraries and Research IT
-  Funders
-  Publishers



Lots of Jargon

Research Data Management
Data Curation
Data Sharing
Data Publication
Data Storage/Preservation
Sensitive Data
Data Management Plan (DMP)
Metadata
Repository



What term(s) do you use to describe the stage of your research that involves preparing or outlining your procedures for managing data?

What term(s) do you use to describe the stage of your research that involves preparing or outlining your procedures for managing data?

“Data management planning”

“Survey design”

“Study planning”

“Setting up”

“Research plan”

“Research outline”

“Research design”

“Research data management”

“Proposal writing”

“Data organization”

“Data analysis”

“Background research”

“Preparation”

“Preliminary research”

“Methodology”

“Materials and methods”

“Grant writing”

“Discovery”

“I don’t have a name for this”

Does your institution provide any technical infrastructure to foster research data management and/or data sharing (e.g. tools for file sharing, storage, collaboration provided by the library/ITS)?

Does your institution provide any assistance, training, or consulting services on topics related to research data management (e.g. data storage, organization, and security)?

Does your institution provide assistance, training, or consulting services on topics related to scholarly publishing and/or data sharing (e.g. public access, digital preservation, and data sharing mandates)?

Does your institution provide any technical infrastructure to foster research data management and/or data sharing (e.g. tools for file sharing, storage, collaboration provided by the library/ITS)?

No + Not Sure + Yes (but I haven't taken advantage): **54.86%**

Does your institution provide any assistance, training, or consulting services on topics related to research data management (e.g. data storage, organization, and security)?

No + Not Sure + Yes (but I haven't taken advantage): **72.22%**

Does your institution provide assistance, training, or consulting services on topics related to scholarly publishing and/or data sharing (e.g. public access, digital preservation, and data sharing mandates)?

No + Not Sure + Yes (but I haven't taken advantage): **85.42%**



Existing Tools

The Data Lifecycle



Data Curation Profiles

Module 1 – The Data Set

Please provide a brief description of the data:

Module 2 – The Lifecycle of the Data Set

1. Initial Data Stage: _____

- Approximately how many data files exist at this stage?

- What is the approximate average size of each file at this stage?

(Please include the unit of measurement – kb, MB, GB, etc.)

- What format(s) are the data in?

(For example: MS Excel 2007, MySQL database, JPEG 2000 images, a raw data file from a Campbell CR10 data logger, etc.)

2. Second Data Stage: _____

- Approximately how many data files exist at this stage?

- What is the approximate average size of each file at this stage?

(Please include the unit of measurement – kb, MB, GB, etc.)

- What format(s) are the data in?

(For example: MS Excel 2007, MySQL database, JPEG 2000 images, a raw data file from a Campbell CR10 data logger, etc.)

Please continue on to the next page

Module 3 – Sharing

1. In the previous module you identified the stages that your data goes through during its lifecycle.

In the table below, please indicate what data you would be willing to share and with whom? (Please place a checkmark in as many boxes as apply)

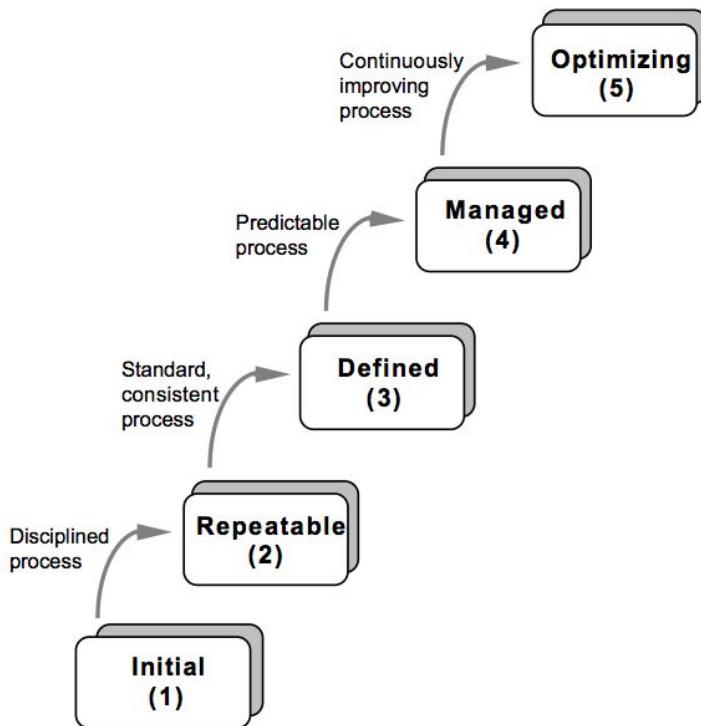
	Would not share with anyone	Would share with my immediate collaborators	Would share with others in my research center or at my institution	Would share with others in my field	Would share with others outside of my field	Would share with anyone
Initial Data Stage						
Second Data Stage						
Third Data Stage						
Fourth Data Stage						
Fifth Data Stage						
Additional Data Stage(s) – (If needed)						

2. In the table above, if you indicated that you would be willing to share any of your data with:

- others in your field,
- others outside of your field, or
- with anyone

then please indicate when you would be willing to share the data with each group:
(ex. immediately after the results are published, 6 months after the project is completed, etc.)

Maturity-Based Frameworks



	Level 1 Initial	Level 2 Development	Level 3 Defined	Level 4 Managed	Level 5 Optimised
Institutional policies & procedures	Policies & procedures may be undeveloped, not up to date, and/or inconsistent.	Policies & procedures are developed & harmonised.	Policies & procedures are promulgated & absorbed into behaviours.	Policies & procedures accepted as part of the culture & subject to audit.	Policies & procedures are subject to review & improvement.
IT infrastructure	IT infrastructure provision is patchy, disorganised & poorly publicised. Responsibilities are defined. Processes are established, defined & documented.	Funds are invested in technology & skills. Responsibilities are defined. Processes are established, defined & documented.	Management shows active support. Facilities are well-defined & communicated, standardised & integrated.	Funding adapted to need. Management actively engaged. Documentation kept up to date.	Concerted efforts to maintain, update & publicise infrastructure. Metrics & feedback used to optimise services.
Support services	Training is ad hoc, curation & preservation services are disorganised, data management planning is unsupported & other services inconsistent & poorly publicised.	Investment in skills. Services identified & staffed. Responsibilities are defined. Documentation & training developed.	Active participation in training & widespread availability of services.	Widespread take up of services. Curation & preservation acknowledged as critical to the institutional mission.	Customer feedback used extensively to update & improve services.
Managing metadata	Metadata management is chaotic & understood by only a few.	Responsibilities are defined & skills developed. Processes are established, defined & documented. Metadata applied to key datasets & shared externally.	Processes are standardised & integrated. Metadata applied to new datasets & shared externally.	Metadata quality metrics collected. All datasets described & metadata shared.	Continuous improvement applied to processes & capabilities.

Researcher Assessment Tools

DM_Vitals_v2.1

Has documented context of data collection (location, temp, etc.)											
2. Describe your day-to-day work with regard to data. What data do you have? What kind of data?		2.2 Are these files yours or do they belong to a wider group or to the institution? Who owns the Intellectual Property?									
2.1.1 General Category (experimental, creative, etc.)	NO	Have you read UVA's Laboratory Notebook and Recordkeeping?	3.1.1 Management Plan	3.2 How do you share data - among lab group or other colleagues (e-mail, shared drive, removable devices, CD, etc.)	4.1.1 What challenges have you faced in terms of storage, formats, costs, and continued access to your data?	5.1 Have you been asked to provide or share your data? Could or should your data be reused or repurposed by others, and if so, how and by whom?	5.2 What does the future of your data look like? Does all of it need to be kept?	5.2.1 Raw or processed data or both	5.2.2 Who decides? Who has authority?	5.2.3 Where?	5.2.4 How long?
2.1.2 Creation Rights	NO	Have you read UVA's Ownership Rights in researcher's mind, has not been published?	3.2.1 File sharing	4.1.1 Do they have older files?	5.1.1 Publisher requirement	5.1.2 Funder requirement	5.1.3 Restrictions (Confidentiality, Sensitivity)	5.1.4 Storage space (Also see 3.1.6 & 4.1.5 Costs)	5.1.5 Data is de-identified	5.1.6 Following regulations for protecting and backing up data	5.1.7 Costs
2.1.3 Data Type (docs, emails, etc.)	NO	Basic, Informal DMP exists and has been developed.	3.2.2 Version control issues:	NO data types are current	4.1.2 Obsolete data formats	5.1.8 Encryption of sensitive data	5.1.9 Archiving of reusable media	5.1.10 Using file naming conventions for specific disciplines	5.1.11 Making original document "read only"	5.1.12 Ensuring always used when storing and transferring sensitive data.	5.1.13 Documenting data sources used
2.1.4 Data Format (MS Word, Excel, etc.)	NO	DMP has been improved to include all 8 categories.	NO Versions are managed	NO File changes are recorded	NO Up-to-date data formats	NO Data stored securely	NO Basic, Informal DMP exists and has been communicated	NO Has documented data sources used	NO Has documented context of data collection (location, temp, etc.)	NO Has documented context of data collection (location, temp, etc.)	NO Has documented context of data collection (location, temp, etc.)
NO software file types	NO	DMP has been reviewed	NO Record every change to versions	NO Uses file version numbers (including SVN)	NO Data is de-identified	NO Encrypted sensitive data	X Basic, Informal DMP exists and has been communicated	X Has documented data sources used	X Has documented context of data collection (location, temp, etc.)	X Has documented context of data collection (location, temp, etc.)	X Has documented context of data collection (location, temp, etc.)
Software specific formats used	NO	NO DMP is being followed by the research team	3.1.2 Naming Conventions:	3.1.3 Making original document "read only"	3.1.4 Documentation	3.1.5 UVA IR	3.1.6 Using file naming conventions	3.1.7 Using a consistent file structure	3.1.8 Using same structure	3.1.9 Documented for sharing	3.1.10 Software specific for reuse
Open standard representation	NO	Common software or file type used by the research community	NO Using file naming conventions	NO Files are organized and can be found	NO Using a consistent file structure	NO Using same structure	NO Documented for sharing	NO Software specific for reuse	NO Documented for sharing	NO Software specific for reuse	NO Documented for sharing
Common software or file type used by the research community	NO	NO Using file naming conventions	3.1.3 File Organization	3.1.4 Documentation	3.1.5 UVA IR	3.1.6 Using file naming conventions for specific disciplines	3.1.7 Using a consistent file structure	3.1.8 Using same structure	3.1.9 Documented for sharing	3.1.10 Software specific for reuse	3.1.11 Create and use standardized filename convention schema
2.1.5 Amount (files, etc.)	NO	NO Using file naming conventions	3.1.3 File Organization	3.1.4 Documentation	3.1.5 UVA IR	3.1.6 Using file naming conventions for specific disciplines	3.1.7 Using a consistent file structure	3.1.8 Using same structure	3.1.9 Documented for sharing	3.1.10 Software specific for reuse	3.1.11 Create and use standardized filename convention schema
2.1.6 Software	NO	NO Using file naming conventions	3.1.3 File Organization	3.1.4 Documentation	3.1.5 UVA IR	3.1.6 Using file naming conventions for specific disciplines	3.1.7 Using a consistent file structure	3.1.8 Using same structure	3.1.9 Documented for sharing	3.1.10 Software specific for reuse	3.1.11 Create and use standardized filename convention schema

DM_Vitals_v2.1

The diagram illustrates the Data Management Maturity Level continuum, showing a progression from Level 1 (Initial) to Level 5 (Optimizing). Each level is represented by a blue arrow pointing right, with a red arrow pointing left. The levels are labeled as follows:

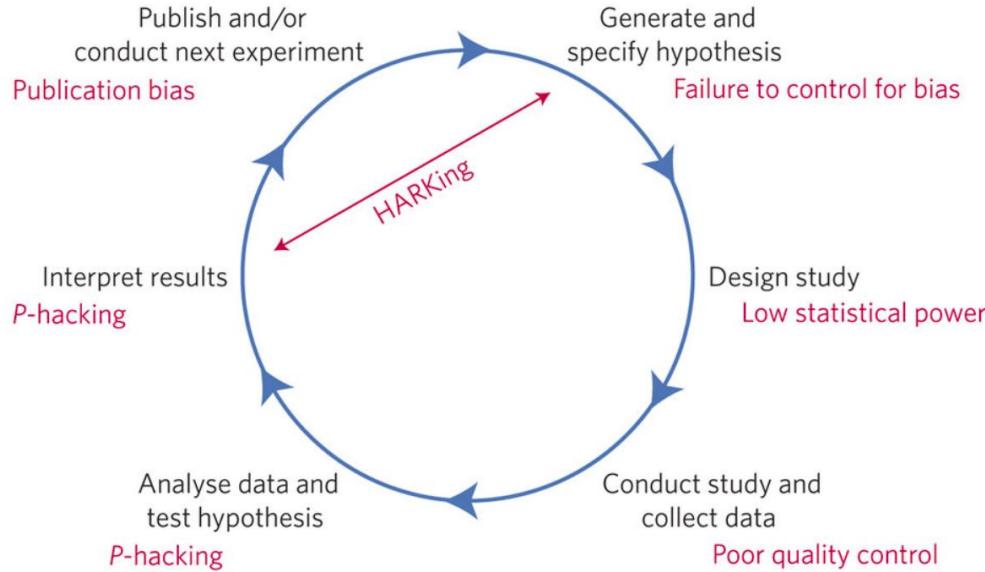
- Level 1 "Initial"**
- Level 2 "Development"**
- Level 3 "Defined"**
- Level 4 "Managed"**
- Level 5 "Optimizing"**

Data Management Maturity level on the above Data Management Practice continuum

From Research Data Management Framework: Capability Maturity Guide: <http://ands.org.au/guides/dmframework/dmf-capability-maturity-guide.html>

Applicable?	Interview Topic	Sustainability	Phase	Time	Cost	Action Statement
X	Has documented data sources used	1	1			Properly document data sources used.
X	Basic, Informal DMP exists and has been communicated	1	1			A DMP is the basis of all data management, and is a critical tool in protecting the continuity of your research projects. Once in place, it can be updated, provided to new members of the lab as guidelines, and easily be applied to future grant proposals. We encourage you to develop an appropriate plan for managing your data. This is a fundamental first step in improving process.
X	Has read UVA's Laboratory Notebook and Recordkeeping?	1	1			Read UVA's "Laboratory Notebook and Recordkeeping" Policy: https://policy.virginia.edu/policy/policydisplay?id=RES-002 .
X	Has read UVA's Ownership Rights in Copyrightable Material policy?	1	1			Read UVA's "Ownership Rights in Copyrightable Material" Policy: https://policy.virginia.edu/policy/policydisplay?id=RES-001 .
X	DMP has been improved to include all 8 categories	2	2			Informal DMP has been improved to include these 8 categories: File Formats and Data Types, Organizing Files, Security/Storage/Funding Guidelines, Copyright & Privacy/Confidentiality, Data Documentation & Metadata, Archiving & Sharing Data, and Citing Data.
X	Using a consistent file structure					Use a consistent file structure for all of your files.
X	Using file naming conventions for specific disciplines					Create and use standardized filename convention schema
X	Software specific for reuse	2	1			Use non-proprietary or non software specific file types

Open Science Tools



Summary of the eight standards and three levels of the TOP guidelines

Levels 1 to 3 are increasingly stringent for each standard. Level 0 offers a comparison that does not meet the standard.

	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3
Citation standards	Journal encourages citation of data, code, and materials—or says nothing.	Journal describes citation of data in guidelines to authors with clear rules and examples.	Article provides appropriate citation for data and materials used, consistent with journal's author guidelines.	Article is not published until appropriate citation for data and materials is provided that follows journal's author guidelines.
Data transparency	Journal encourages data sharing—or says nothing.	Article states whether data are available and, if so, where to access them.	Data must be posted to a trusted repository. Exceptions must be identified at article submission.	Data must be posted to a trusted repository, and reported analyses will be reproduced independently before publication.
Analytic methods (code) transparency	Journal encourages code sharing—or says nothing.	Article states whether code is available and, if so, where to access them.	Code must be posted to a trusted repository. Exceptions must be identified at article submission.	Code must be posted to a trusted repository, and reported analyses will be reproduced independently before publication.
Research materials transparency	Journal encourages materials sharing—or says nothing	Article states whether materials are available and, if so, where to access them.	Materials must be posted to a trusted repository. Exceptions must be identified at article submission.	Materials must be posted to a trusted repository, and reported analyses will be reproduced independently before publication.
Design and analysis transparency	Journal encourages design and analysis transparency or says nothing.	Journal articulates design transparency standards.	Journal requires adherence to design transparency standards for review and publication.	Journal requires and enforces adherence to design transparency standards for review and publication.
Preregistration of studies	Journal says nothing.	Journal encourages preregistration of studies and provides link in article to preregistration if it exists.	Journal encourages preregistration of studies and provides link in article and certification of meeting preregistration badge requirements.	Journal requires preregistration of studies and provides link and badge in article to meeting requirements.
Preregistration of analysis plans	Journal says nothing.	Journal encourages preanalysis plans and provides link in article to registered analysis plan if it exists.	Journal encourages preanalysis plans and provides link in article and certification of meeting registered analysis plan badge requirements.	Journal requires preregistration of studies with analysis plans and provides link and badge in article to meeting requirements.
Replication	Journal discourages submission of replication studies—or says nothing.	Journal encourages submission of replication studies.	Journal encourages submission of replication studies and conducts blind review of results.	Journal uses Registered Reports as a submission option for replication studies with peer review before observing the study outcomes.

The Problems

1. Researchers face constantly evolving expectations about how they should manage and share their data.
2. Data stakeholders have different perspectives and use different terminology.
3. Existing tools, while excellent, are not always user friendly or researcher-focused.



An RDM Guide for Researchers

Characteristics

1. Helps researchers and data service providers speak the same language.
2. Builds on previous efforts and our own research.
3. Emphasizes accessibility, usability, and adoption.
4. Emphasizes flexibility and adaptability.

RDM Maturity Rubric

	Ad Hoc	One-Time	Active and Informative	Optimized for Re-Use
Planning a project	When it comes to my data, I have a "way of doing things" but no standard or documented plans.	I create some formal plans about how I will manage my data, but I generally don't refer back to them.	I develop detailed plans about how I will manage my data that I actively revisit and revise over the course of a project.	I design my plans for managing data to streamline future use by myself or others.
Organizing your data	I don't follow a consistent approach for keeping my data organized, so it often takes time to find things.	I have an approach for organizing my data, but I only put it into action after my project is complete.	I have an approach for organizing my data that I implement prospectively, but it is not necessarily standardized.	I organize my data so that others can navigate, understand, and use it without me being present.
Saving your data	I decide what data is important while I am working on it and typically save it in a single location.	I know what data needs to be saved and I back it up after I'm done working on it to reduce the risk of loss.	I have a system for regularly saving important data while I am working on it. I have multiple backups.	I save my data in a manner and location designed to maximize opportunities for re-use by myself and others.
Getting your data ready	I don't have a standardized or well documented process for preparing my data for analysis.	I have thought about how I will need to prepare my data, but I handle each case in a different manner.	My process for preparing data is standardized and well documented.	I prepare my data in such a way as to facilitate use by both myself and others in the future.
Analyzing your data	I often have to redo my analyses or examine their products to determine what procedures or parameters were applied.	After I finish my analysis, I document the specific parameters, procedures, and protocols applied.	I regularly report the specifics of both my analysis workflow and decision making process while I am analyzing my data.	I have ensured that the specifics of my analysis workflow and decision making process can be put into action by others.
Publishing your data	I share the results of my research, but generally I do not share the underlying data.	I share my data only when I'm required to do so or in response to direct requests from other researchers.	I regularly share the data that underlies my results and conclusions in a form that enables use by others.	Because of my excellent data management practices, I am able to efficiently share my data whenever I need to with whomever I need to.

One Page Guides

Planning for Data

A plan detailing how you'll manage your data, code, and other research materials (including physical samples) over the course of a project will help your research proceed efficiently. Creating a comprehensive, specific, and instructive plan is an important step in developing a new research project, but the best plans also evolve as a project proceeds.

What does it mean to plan for data?

Planning for data means documenting how data and other materials will be managed over the course of a research project.

Requirements and How to Meet Them

Many funding agencies and institutions now require that researchers compose a short document called a Data Management Plan (DMP) that provides details about the type of data to be collected and managed within a research project as well as the individuals responsible for managing the data, how and where data will be archived and shared, and how the financial cost of managing data will be met.

The DMPTool (<https://dmptool.org/>) is a free tool that provides guidance for creating a data management plan. The RDM team at your institution also provides DMP-related services.

Things to Think About

- Planning for data is not a one time activity. You should create a plan as you develop your project, but you should also revisit and revise your plan as your project proceeds.
- Plans should identify the data you intend to collect, as well as how you plan to transform, analyze, and share it. Be as specific as possible.
- A plan is really only useful if people can follow it. Be sure your plans are documented and communicated to your collaborators.
- Even if you do not have a Data Management Plan (DMP), you may have a document that describes your . This could be included in a lab protocol, an IRB proposal, etc.
- While planning for data you may encounter unfamiliar terms or familiar terms used in unfamiliar ways. If you have any questions, do not hesitate to reach out to The RDM team at your institution.

Saving Data

There is a lot more to saving data than ensuring you have appropriate backups. How and where you save your data depends on a number of factors including the size and content of your data and your intentions about making your data available at the conclusion of your research project.

What does it mean to save data?

Saving data means storing research materials in a manner so that they can be accessed and used – by yourself or others – at a later date. Here are three factors to consider when saving your data.

Location	When possible, save multiple copies of your data across a variety of storage mediums. Hard drives, cloud storage, and other options have different levels of reliability, but all will eventually fail or become obsolete, so you want to be sure any data you save can be accessed later.
Time	Saving data takes time, but losing data wastes time. Backing up data should be a regular part of your research practice, but you should also have a plan for how data will be saved after your research is concluded.
Format	Data should be saved in a format that enables later use. This may involve saving data in open file formats, using version control, or simply storing your data alongside the documentation and other research materials needed to make use of it.

Requirements and How to Meet Them

There are specific requirements about how and where sensitive data can be saved. For example, if your data contains participant names or other personally identifying information, it will need to either be de-identified or stored in a secure system like Secure Box or RedCap.

Things to Think About

- The characteristics of your data determine how much flexibility you will have about where it can be saved. If you have large quantities of data or data containing sensitive information, it can be challenging to move it.
- Saving data should also involve saving research materials (e.g. documentation, code, etc) needed to make sense of or use that data.

Organizing Data

Organizing data involves two activities: Ensuring that you can find your data and research materials when you need to and ensuring that data and materials that go together is connected.

What does it mean to organize data?

Could someone else find your work? Organizing data means arranging research materials so they can be found and used – by yourself or by others – as needed. Here are three factors to consider when organizing your data.

Names	File names should be straightforward, meaningful, and descriptive.
Structures	You can't use files you can't find. Keeping your files organized in a consistent structure helps prevent the loss of data.
Connections	Research materials should be organized in a manner that emphasizes the connections between them. This includes versions. Linking is essential.
Documentation	Don't forget to leave space for description (i.e. glossaries, data dictionaries, metadata!)

Requirements and How to Meet Them

There are specific requirements about how some human subjects data can be organized. Under most circumstances, data containing sensitive information should be stored separately from data that does not. However, you should apply the same organizational principles to both.

Things to Think About

- The size and content of your data will determine the degree of flexibility you have about keeping it organized. It is very likely that your organizational scheme will not be perfect. There may be times when you'll need to rearrange your files. Don't overcomplicate things.
- Versioning your data may be a good way of keep it organized, as long as it is done in a consistent and descriptive manner. Data_v2.csv may be informative, Data_NewEdits.csv less so.

Outputs

1. Physical collateral (brochures, guides, etc)
2. Publication describing the development of this project
3. Tools for developing discipline or institutional specific versions
4. Blog posts and project updates

A call to action

We are seeking input and collaboration!



Where Is the Adoption? Lessons Learned From Researchers About Open Data

Daniella Lowenberg (@danielowenberg, @uc3dash)



Requirements/Mandates & “Doing The Right Thing”

Not always significant to researchers

Often misinterpreted or unclear



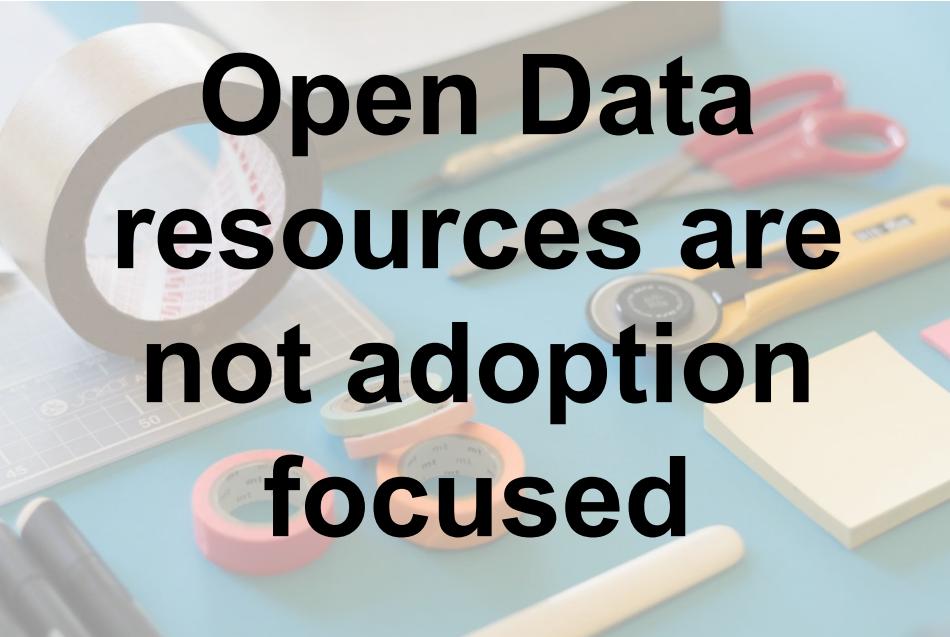


Open Data success metrics are not accurate

Repositories with high adoption
not necessarily data
publications

- e.g. CNI Presentations
in OSF

Publishers stating X papers
have open data could be SI
files/images



Open Data resources are not adoption focused

Too-tool-focused: emphasis on technology not end user

Minimal engagement with tenure committees and influencers

Engaging Researchers: Need Incentives

University of California San Francisco



University of California, San Francisco / LibCal / Library Events / Data Sharing Bootcamp

Data Sharing Bootcamp

Have you ever been asked to share your data by a journal editor or funder? Do you want to make your research more reproducible and data citable? This hands-on practical bootcamp will cover all of these topics and give you the skills to

- Comply with journal/funder data sharing policies
- Find relevant data repositories
- Upload your data into a repository
- Ensure your data is reusable
- Understand "metadata"

Please bring your laptops and your data!

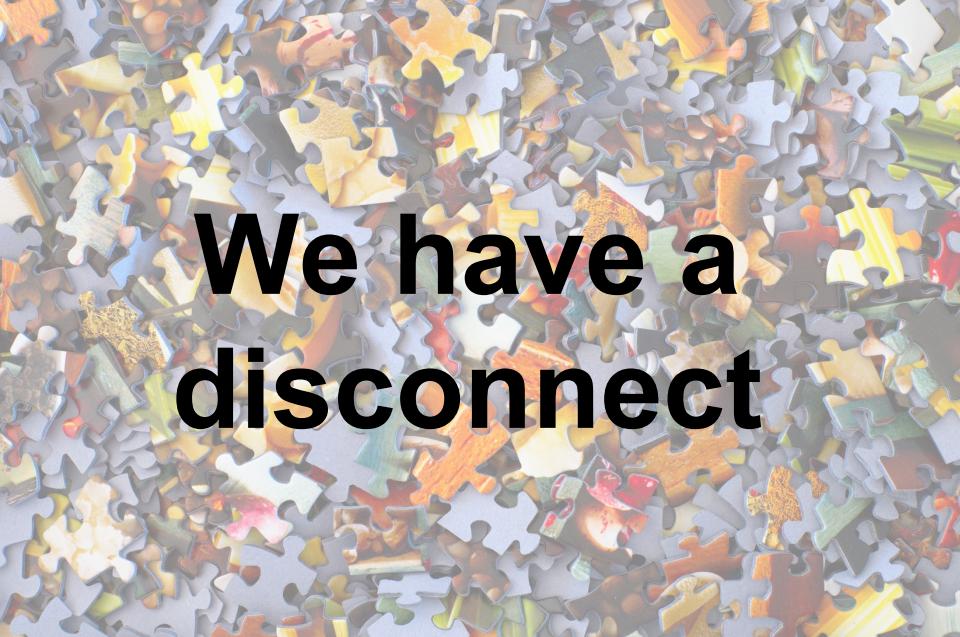


Doing it Right: Get Credit for Your Research

Join research data specialists from University of California Curation Center to talk about planning, publishing, and getting your data out there.

When: Friday, November 3rd 2:00pm

Where: BIDS, UC Berkeley Doe Library



We have a
disconnect

Library and repository language
not resonating with researchers

Incentives not apparent or
engaging

Researchers: what terminology resonates?

**Get credit for
your research**

Postdoc, UCSF

**Archive
your data**

PI, UC Berkeley

Researchers: how would you describe your labs RDM practices?

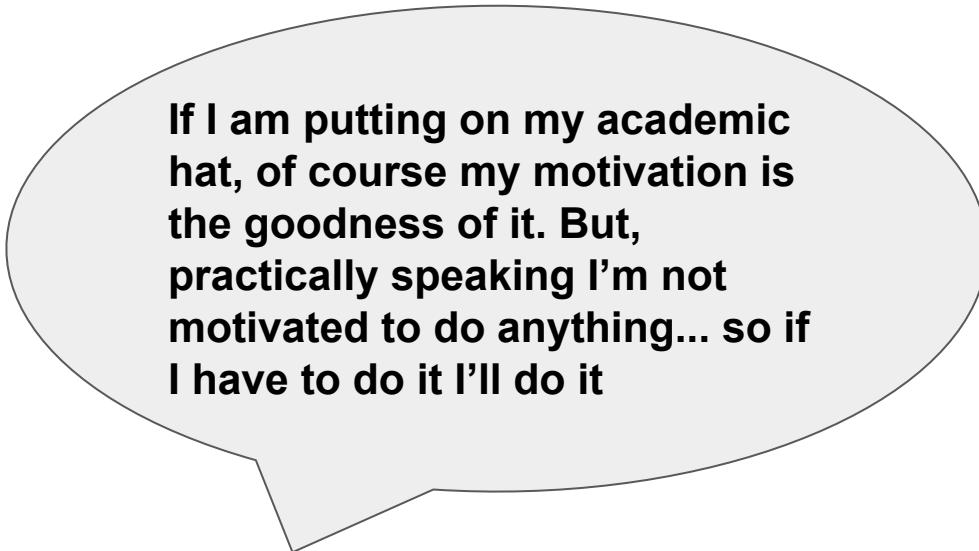
**Best described
as a s**tshow**

5th Year Grad, UCSF

**...but also please don't
ask me to go back and
find something. I
document things but
everything is poorly
organized.**

Postdoc, UCSF

Researchers: what motivates you in your research publication practices?



If I am putting on my academic hat, of course my motivation is the goodness of it. But, practically speaking I'm not motivated to do anything... so if I have to do it I'll do it

Postdoc, UCSF



Nature
papers

Grad students & Postdocs, UCSF

Researchers: would you publish your data?

**Scary to think
you're giving
away 3 possible
first author
Nature papers**

3rd Year Grad, UCSF

**Would want to say yes to
publishing data before paper but
would be hesitant in current
environment until we get a point
where a DOI is recognized as first
person who has done that data.**

PI, UC Santa Cruz

**How is it any
different than SI
files?**

Postdoc, UCSF

Lesson Learned

**The library, repository, publisher, and funder
communities need to include researchers in the
conversation and speak in researcher terms**



dash

Dash is a user tested, open source, UC developed, and standards based approach to data publishing



- ❑ Have researcher needs drive development
- ❑ Integrate into researcher workflows
- ❑ Advocate for data publication as a common practice as opposed to tool based promotion



How?

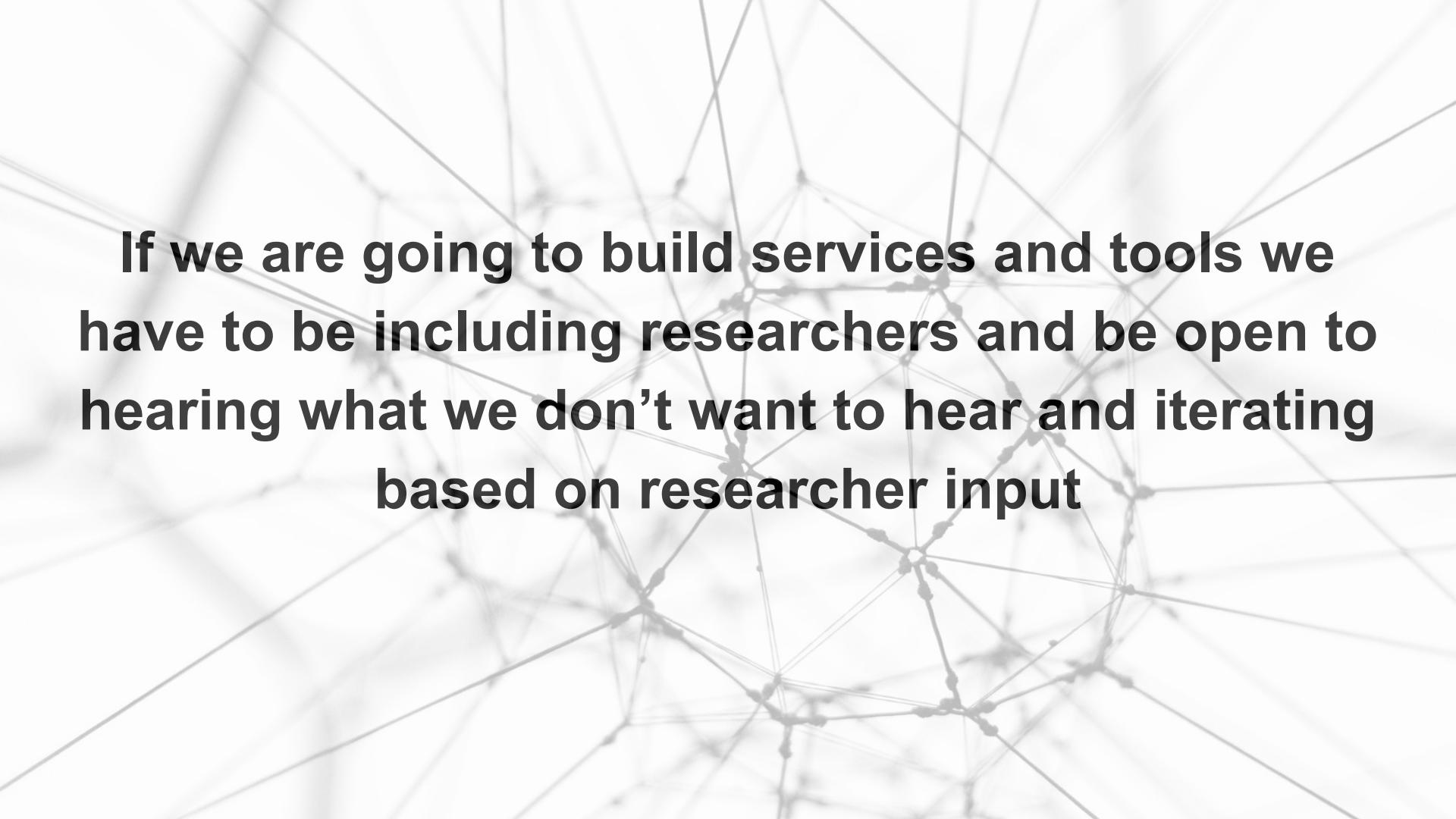
Researcher engagement as often as possible (interviews, lab visits, workshops, emails)

Integration into research workflows:

- Manifest upload
- Submission API
 - (integrations with R, online lab notebooks)
- UI Integrations (with publishers)



**Communication with
researchers is essential**



If we are going to build services and tools we have to be including researchers and be open to hearing what we don't want to hear and iterating based on researcher input

What's your experience?

Connect with us to continue these conversations

John Borghi: john.borghi@ucop.edu @johnborghi

Daniella Lowenberg: daniella.lowenberg@ucop.edu @danilowenberg, @uc3dash



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 **UC3**
UC Curation Center