Research Data Management in a Nutshell

BERD@BW Data Literacy Snack, 26.5.2021

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Irene Schumm, Lorena Steeb

Mannheim Univ. Library, Research Data Center

The BERD@BW project

- Center for Business, Economic and Related Research Data, founded by the University of Mannheim and ZEW
- Connecting research and infrastructure for a better Research Data Management (RDM) in Business, Economics and related areas
- Funded by the state Baden-Württemberg

Agenda for today

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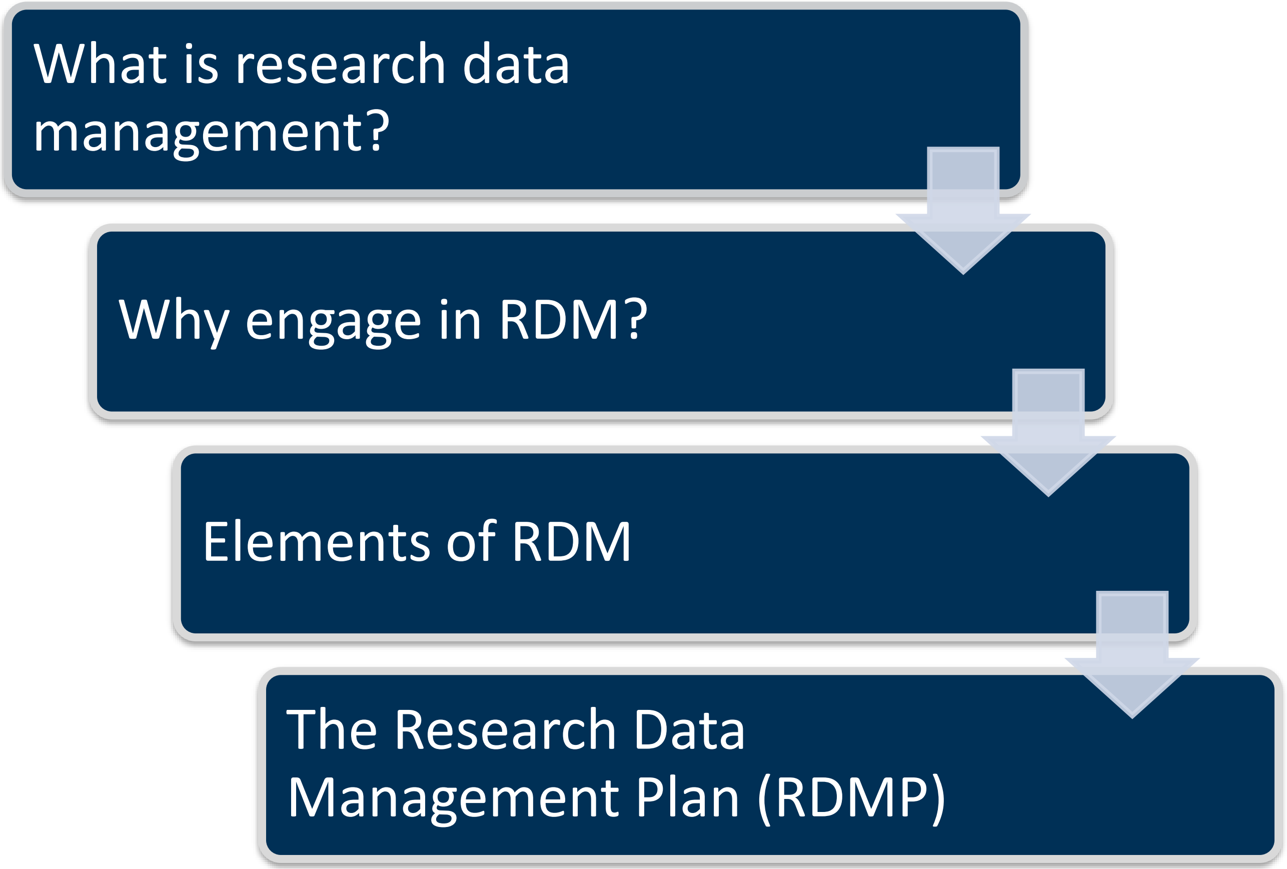


What is research data management?

Why engage in RDM?

Elements of RDM

The Research Data Management Plan (RDMP)

What is research data management?

RDM describes the

a) organization

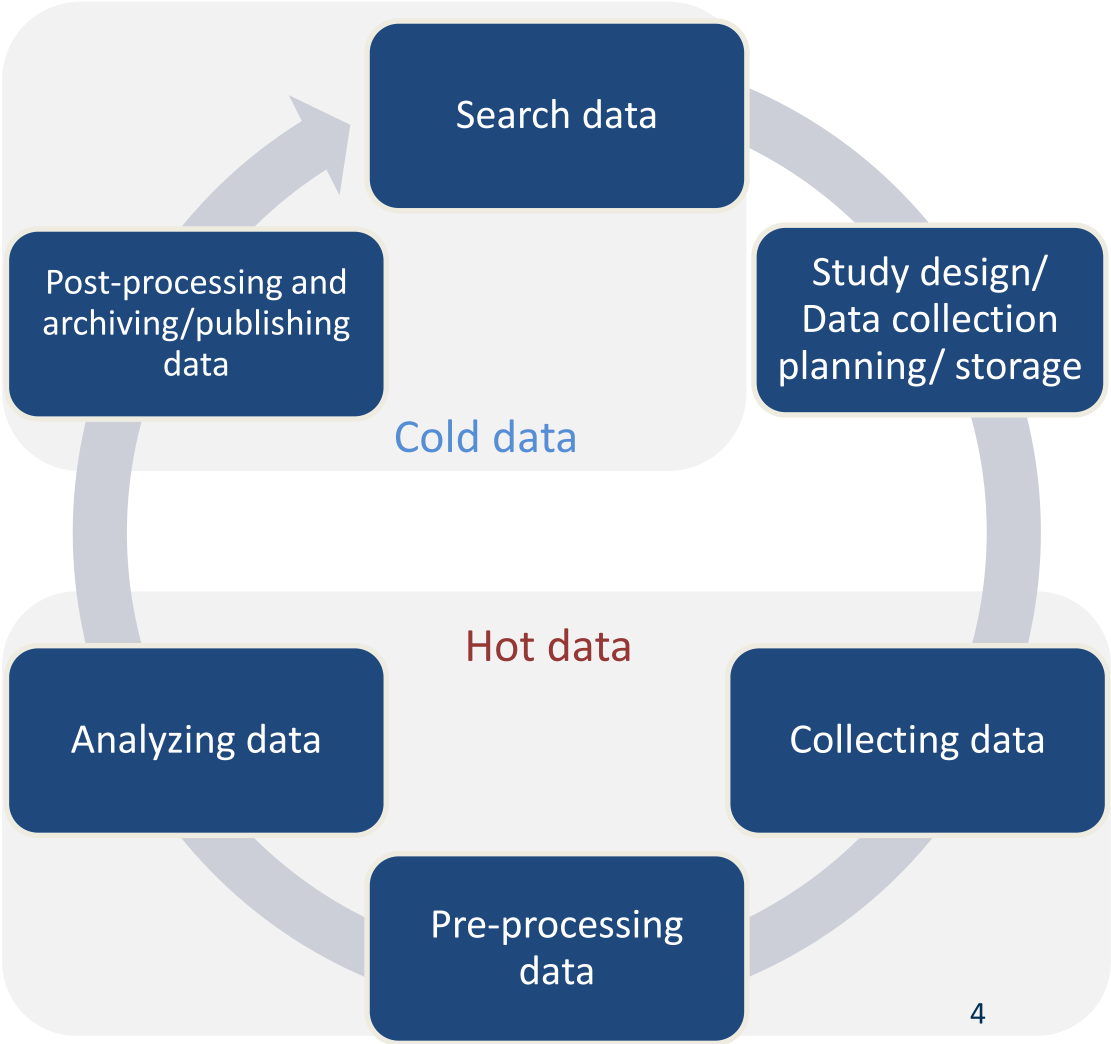
b) storage

c) preservation, and

d) sharing

of data collected and used along the

research data cycle:


Search data
Study design/ Data collection planning/ storage
Collecting data
Pre-processing data
Analyzing data
Post-processing and archiving/publishing data
Cold data
Hot data

Verbund Forschungsdaten Bildung (2015): Checkliste zur Erstellung eines Datenmanagementplans in der empirischen Bildungsforschung. Version 1.1. fdbinfo Nr. 2.

Why engage in RDM?

Knowledge preservation: Data (especially digital data) is **fragile, easily lost and often expensive to collect**

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Improve **collaborative work**

Validation and **replication** of (own) research findings

Reusability of data: Enhanced visibility, faster retrieval, better understanding

Why engage in RDM?

Reference to: http://phdcomics.com/comics.php?f=1689; "Piled Higher and Deeper" by Jorge Cham, www.phdcomics.com; all content copyright Piled Higher and Deeper Publishing, LLC. Dreamhosted!

Why engage in RDM?

Knowledge preservation: Data (especially digital data) is **fragile, easily lost and often expensive to collect**

Policies and requirements
→ Research institutions
→ Publishers
→ Funders

Growing **public awareness and interest** in Open Data

Improve **collaborative work**

Validation and **replication** of (own) research findings

Reusability of data: Enhanced visibility, faster retrieval, better understanding

Why engage in RDM? – Policies of research institutions

Example**: Code of Good Research Practice**, Univ. of Mannheim (2014)

- "**Studies shall be replicable**. Therefore, publications shall include a complete and detailed description of the methods of data collection, the statistic analysis and the results in order to allow for verification of the results through replication."
- „After its publication, research data shall **be passed on for further scholarly use** provided that this does not violate any legal or contractual regulations. "
- „The **person responsible for the research project** shall make sure that the original data set, on which publications, patents and/or follow-up works are based, is **stored on durable and secure data storage devices for at least ten years** after publication or patenting."

Source: https://www.uni-mannheim.de/media/Universitaet/Dokumente/Richtlinie_gute_wissenschaftliche_Praxis_en.pdf

Why engage in RDM? – Policies of publishers

Example: **Data and Code Availability Policy,** American Economic Association

- “It is the policy of the American Economic Association to publish papers only if the **data and code used in the analysis are clearly and precisely documented** and **access to the data and code is non-exclusive to the authors**.”
- “Authors of accepted papers that contain empirical work, simulations, or experimental work **must provide, prior to acceptance, information about the data, programs, and other details of the computations sufficient to permit replication**, as well as information about access to data and programs.”
- “Data and programs should be archived in the *AEA Data and Code Repository*.“

Source: https://www.aeaweb.org/journals/data/data-code-policy

Why engage in RDM? – Policies of funders

	DFG	EU Horizon Europe (2021-2027)
What?	**Suggestion**: Archive/publish data, materials, information, methods, source code and software used to obtain the research findings, as far as possible and reasonable; in the **proposal**: description of type, extent, documentation of data originating or used in the project, archiving plans and options for reuse.	In the **proposal**: „Applicants generating/collecting data and/or other research outputs […] must provide maximum 1 page on how the data/research outputs will be managed in line with the FAIR principles“ → Month 6: **DMP deliverable**
Where?	Archives/repositories in your own institution or other, well-established infrastructure	Not specified
How long?	10 years	Not specified
Source?	https://www.dfg.de/foerderung/antrag_gutachter_gremien/antragstellende/nachnutzung_forschungsdaten/	https://www.forschungsdaten.org/images/8/8a/WS2_2_Foerderer_CouvsonLiebe_EU_NKS.pdf

Elements of RDM

Searching and finding data

- Commonly used or official data sources (e.g. Datastream, Administrations, GSOEP, GESIS, ICPSR…)

- … and the „long tail“
  - re3data: search engine for data repositories → find data repository (institutional, discipline-specific…) and continue data search there
  - Zenodo: multidisciplinary dataset repository
  - Google Dataset Search: multidisciplinary dataset search engine

Legal issues to watch out for: re-using data, proprietary data

- In general: mind copyright issues and licences
- Proprietary data (e.g. from commercial providers): license agreements, sometimes regulations not very transparent
- Data from data repositories/research data centers: do often come with a license
- Data from the web: copyright situation and license often unclear

→ Exemptions from copyright for researchers (e.g. for TDM)

Data protection, confidentiality, ethics

- When processing personal data, data protection regulations have to be taken into account (EU: GDPR + national/state legislation)
- Exemptions/permissions for research – under conditions, e.g.:
  - Informed consent or protects public interest
  - Immediate pseudonymzation, anonymization as soon as possible
- Involve data protection official and/or ethics committee as needed
- Also use due diligence for confidential data

See also: Data Protection Guide by RatSWD; Video tutorial: Umgang mit personenbezogenen Forschungsdaten - Rechtliche Grundlagen, Methoden und Hilfsmittel by Frauke Ziedorn et al.

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Data Literacy Snack

Privacy Law Basics for Research Data

June 9, 1pm

More info: https://www.berd-bw.de/snacks

Documentation: data and code

Project/study level information (e.g. ReadMe)
guidance through the materials (data and code files, …)
needed to understand and reproduce analysis results

Data level documentation
(e.g. codebooks, data dictionaries,
DDI metadata standard)

Code level documentation

→ More: Slides from Data Literacy Snack „Reproducible Data Analysis 101“ by Juli Tkotz

File management

Reference to: http://phdcomics.com/comics.php?f=1531, "Piled Higher and Deeper" by Jorge Cham, www.phdcomics.com; all content copyright Piled Higher and Deeper Publishing, LLC. Dreamhosted!

File management

- File naming → establish conventions
  - Top level identifying information (e.g. project name or acronym, study title)
  - Include date (YYYYMMDD) and/or version (v01, v02)
  - If you use numbering, use leading zeroes
  - Not too long
  - more: guide from Stanford Univ. Libraries
- Code versioning: GitHub

Information security in RDM

- Encryption (e.g. Bitlocker, Cryptomator, encrypted zip file)
- Keep operating system and software updated
- Password protection
- Cloud storage (as backup)
- Lock up physical devices when not in use
- Local storage device (as additional backup)
- Institutional file servers (with backup routines)

And as the data gets colder…

What to publish/preserve?

Reference to: https://www.ru.nl/rdm/archiving-data/what-data-should-archived/

Licenses for sharing research data and code

Research data

cc creative commons

Code

GPLv3 Free Software

GNU General Public License (GPL)

MIT License

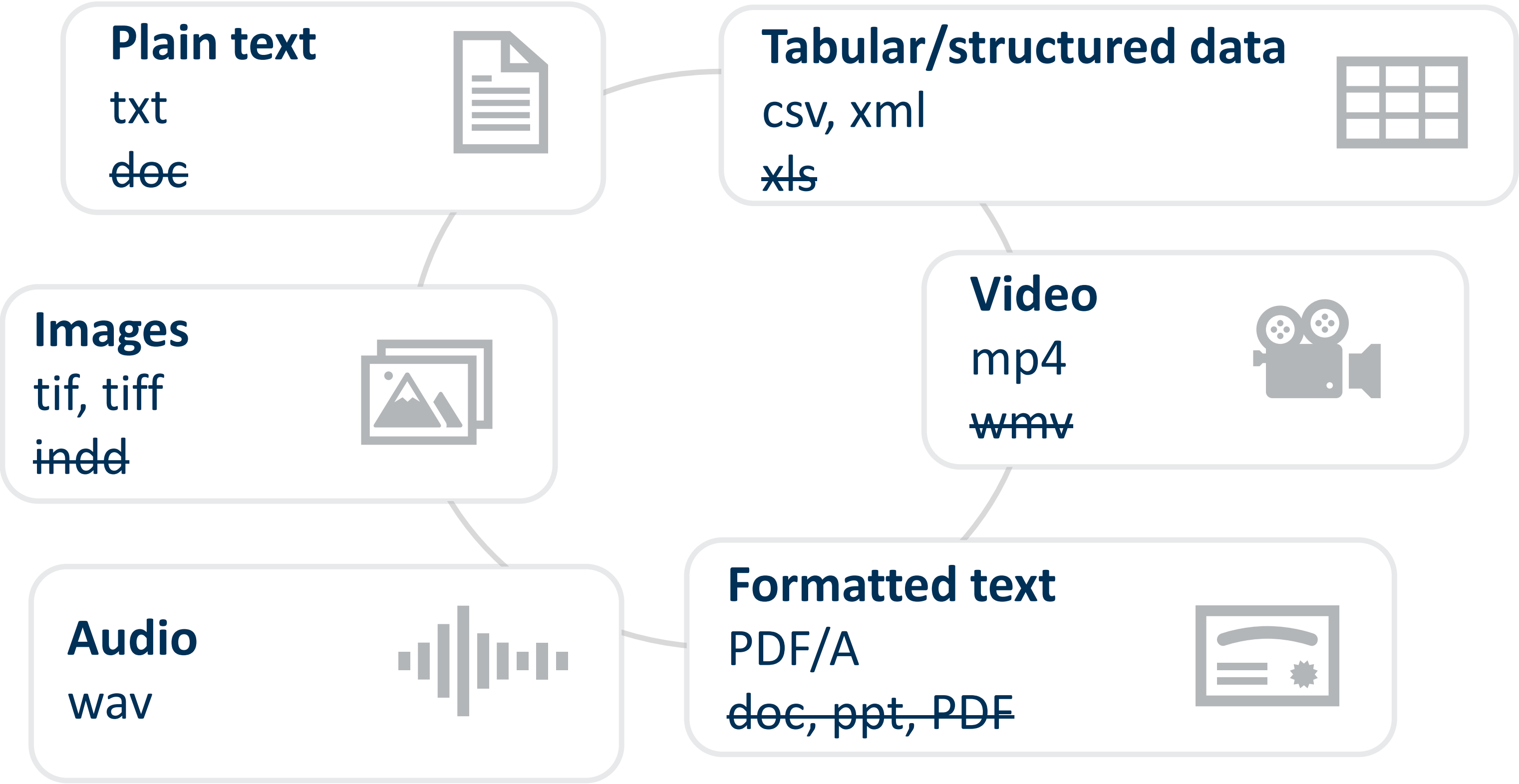
More: https://choosealicense.com/

→ Mind restrictions if you re-use data or code

Image sources and licenses:
CC logo by https://creativecommons.org/, CC BY 4.0
GPL logo by Free Software Foundation, Inc., CC BY-ND 4.0
MIT logo, public domain

File formats for preservation

→ Non-proprietary, open standard, uncompressed, unencrypted



Plain text
txt
~~doc~~

Tabular/structured data
csv, xml
~~xls~~

Images
tif, tiff
~~indd~~

Video
mp4
~~wmv~~

Audio
wav

Formatted text
PDF/A
~~doc, ppt, PDF~~

Where to publish/archive?

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- Institutional data repository (e.g. MADATA) or research data center
- Journal data archives (e.g. American Political Science Review)
- Discipline-specific repository (e.g. GESIS)
- Multi-disciplinary repository (e.g. Zenodo)
- Data journal (e.g. Research Data Journal for the Humanities and Social Sciences)
- Code repository (e.g. GitHub)

→ re3data.org

REGISTRY OF RESEARCH DATA REPOSITORIES

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Typical meta data in a data repository (here: MADATA)

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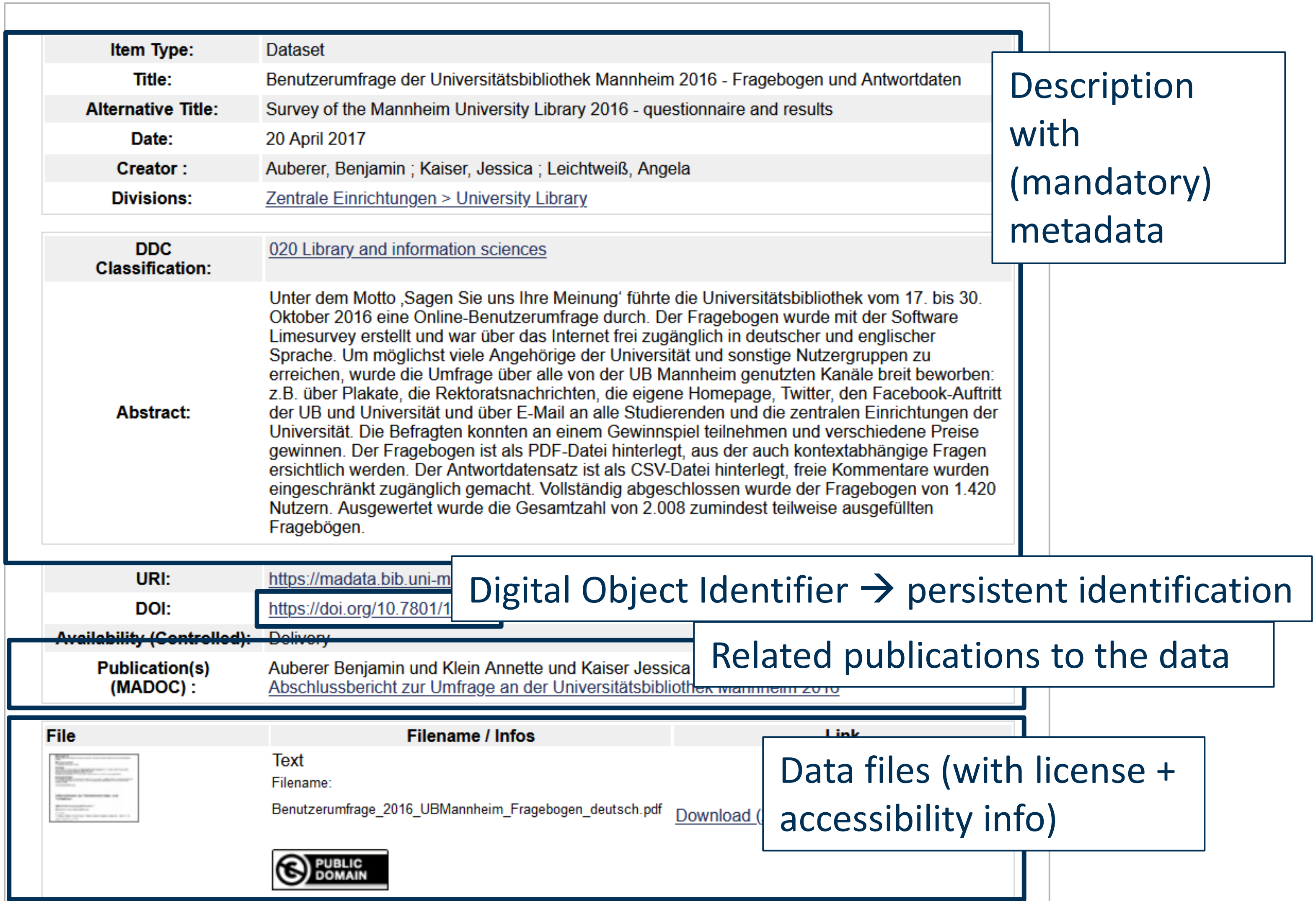


Item Type:	Dataset
Title:	Benutzerumfrage der Universitätsbibliothek Mannheim 2016 - Fragebogen und Antwortdaten
Alternative Title:	Survey of the Mannheim University Library 2016 - questionnaire and results
Date:	20 April 2017
Creator :	Auberer, Benjamin ; Kaiser, Jessica ; Leichtweiß, Angela
Divisions:	Zentrale Einrichtungen > University Library

DDC Classification:	020 Library and information sciences
Abstract:	Unter dem Motto ‚Sagen Sie uns Ihre Meinung' führte die Universitätsbibliothek vom 17. bis 30. Oktober 2016 eine Online-Benutzerumfrage durch. Der Fragebogen wurde mit der Software Limesurvey erstellt und war über das Internet frei zugänglich in deutscher und englischer Sprache. Um möglichst viele Angehörige der Universität und sonstige Nutzergruppen zu erreichen, wurde die Umfrage über alle von der UB Mannheim genutzten Kanäle breit beworben: z.B. über Plakate, die Rektoratsnachrichten, die eigene Homepage, Twitter, den Facebook-Auftritt der UB und Universität und über E-Mail an alle Studierenden und die zentralen Einrichtungen der Universität. Die Befragten konnten an einem Gewinnspiel teilnehmen und verschiedene Preise gewinnen. Der Fragebogen ist als PDF-Datei hinterlegt, aus der auch kontextabhängige Fragen ersichtlich werden. Der Antwortdatensatz ist als CSV-Datei hinterlegt, freie Kommentare wurden eingeschränkt zugänglich gemacht. Vollständig abgeschlossen wurde der Fragebogen von 1.420 Nutzern. Ausgewertet wurde die Gesamtzahl von 2.008 zumindest teilweise ausgefüllten Fragebögen.
URI:	https://madata.bib.uni-m
DOI:	https://doi.org/10.7801/1
Availability (Controlled):	Delivery
Publication(s) (MADOC) :	Auberer Benjamin und Klein Annette und Kaiser Jessica Abschlussbericht zur Umfrage an der Universitätsbibliothek Mannheim 2016

File	Filename / Infos	Link
	Text Filename: Benutzerumfrage_2016_UBMannheim_Fragebogen_deutsch.pdf PUBLIC DOMAIN	Download (

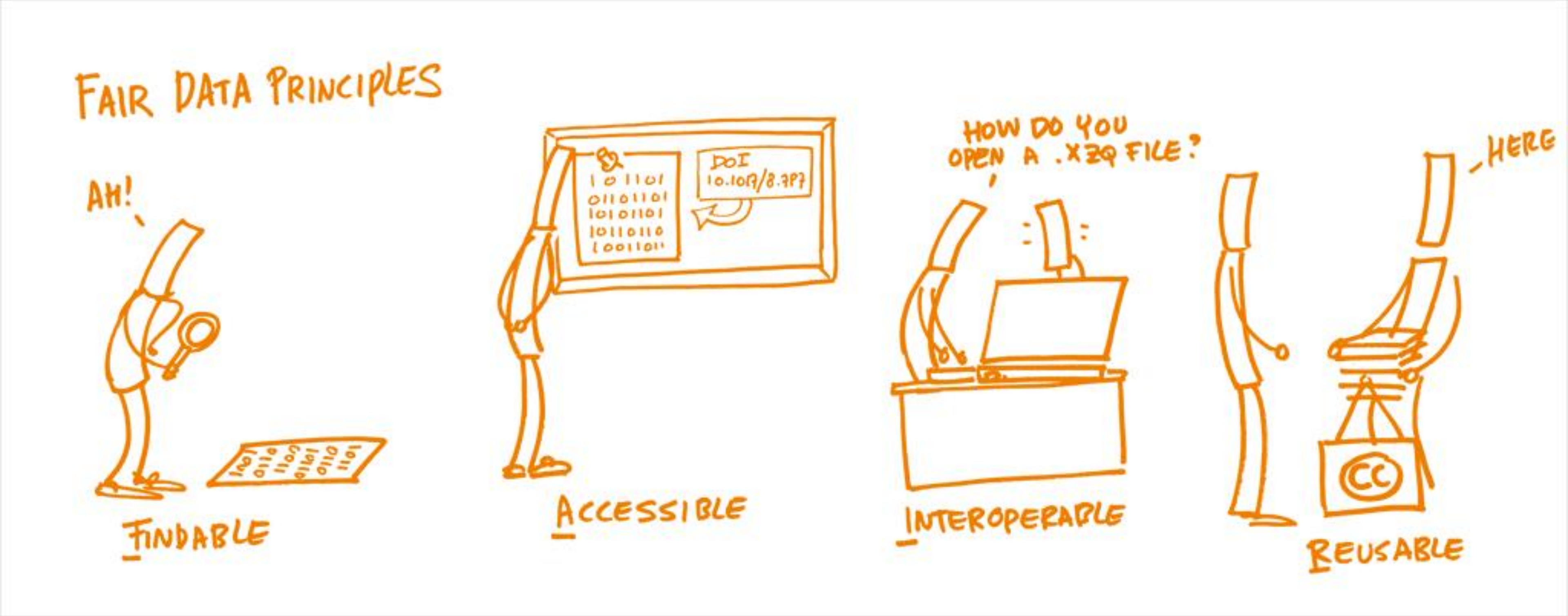
Description with (mandatory) metadata

Digital Object Identifier → persistent identification

Related publications to the data

Data files (with license + accessibility info)

FAIR Data Principles



https://www.fosteropenscience.eu/trainers-materials

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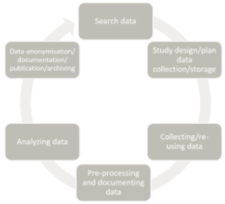
A Research Data Management Plan (RDMP) …


Search data
Study design/plan data collection/storage
Collecting/re-using data
Pre-processing and documenting data
Analyzing data
Data-anonymisation/ documentation/ publication/archiving

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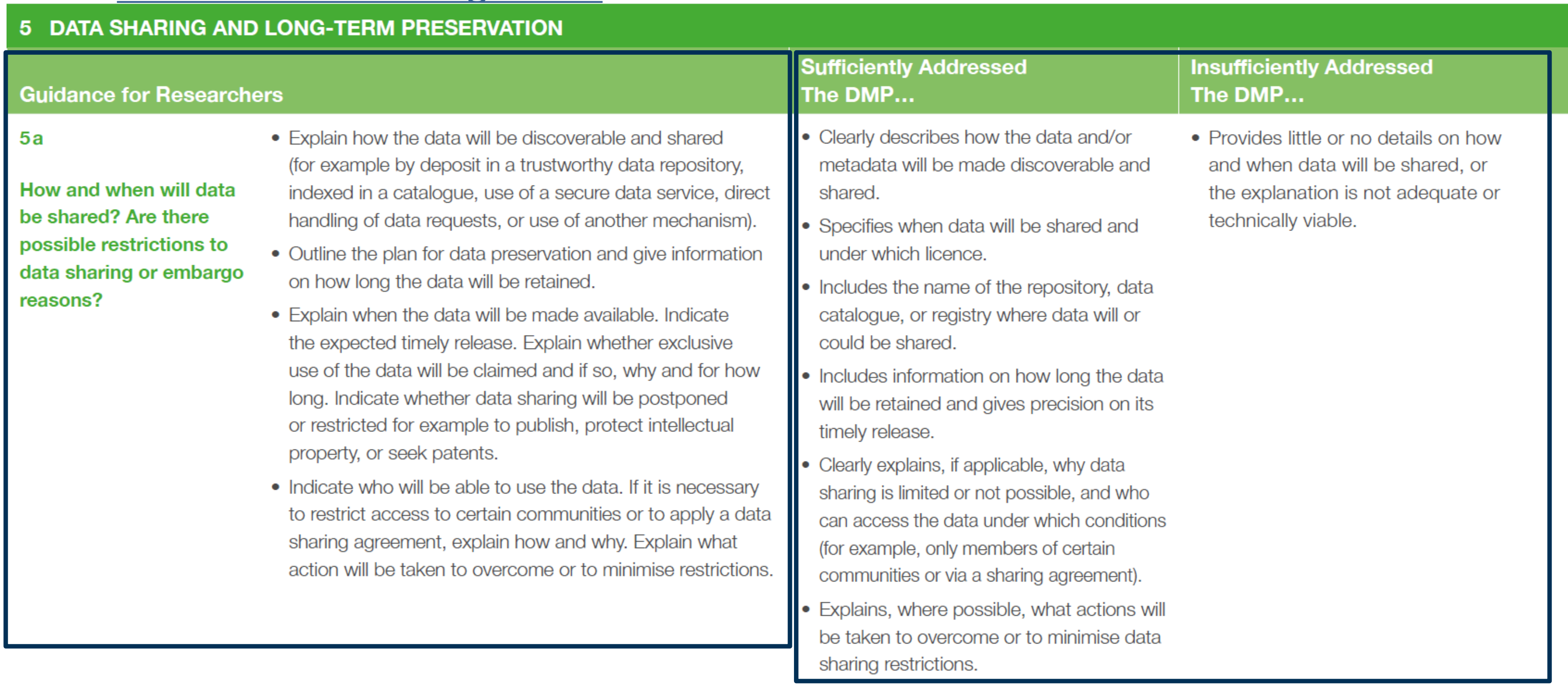
… is a „living document“ which keeps record of **what research data is created** and **what happens to that data during** and **after the project**.

… contains aspects like:

- Who is responsible for the processes of research data management?
- What data will be used/produced (type, format, size/amount, source)? How will it be processed? How will it be documented?
- Could legal or ethical problems occur in collecting, analyzing and archiving/publishing the data?
- How and where shall the data be stored during and after the project duration? How shall regular back-ups be handled?
- Is it planned to publish the (meta-)data, and if yes, under which conditions?
- How much does it cost? (Who will cover it?)

RDMP guidance

SCIENCE EUROPE: Practical Guide to the international alignment of research data management



5 DATA SHARING AND LONG-TERM PRESERVATION

Guidance for Researchers		Sufficiently Addressed The DMP…	Insufficiently Addressed The DMP…
5a **How and when will data be shared? Are there possible restrictions to data sharing or embargo reasons?**	• Explain how the data will be discoverable and shared (for example by deposit in a trustworthy data repository, indexed in a catalogue, use of a secure data service, direct handling of data requests, or use of another mechanism). • Outline the plan for data preservation and give information on how long the data will be retained. • Explain when the data will be made available. Indicate the expected timely release. Explain whether exclusive use of the data will be claimed and if so, why and for how long. Indicate whether data sharing will be postponed or restricted for example to publish, protect intellectual property, or seek patents. • Indicate who will be able to use the data. If it is necessary to restrict access to certain communities or to apply a data sharing agreement, explain how and why. Explain what action will be taken to overcome or to minimise restrictions.	• Clearly describes how the data and/or metadata will be made discoverable and shared. • Specifies when data will be shared and under which licence. • Includes the name of the repository, data catalogue, or registry where data will or could be shared. • Includes information on how long the data will be retained and gives precision on its timely release. • Clearly explains, if applicable, why data sharing is limited or not possible, and who can access the data under which conditions (for example, only members of certain communities or via a sharing agreement). • Explains, where possible, what actions will be taken to overcome or to minimise data sharing restrictions.	• Provides little or no details on how and when data will be shared, or the explanation is not adequate or technically viable.

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RDMP tools

- **RDMO – Research Data Management Organizer** of Leibniz-Institut für Astrophysik Potsdam & KIT (you can use the entity of forschungsdaten.info): different templates, like DFG, Horizon 2020, DMPonline, DMPTool
- **DMPonline** of the Digital Curation Center (UK): different templates, like Horizon 2020, UK-funders
- **DMPTool** of the University of California Curation Center (USA): different templates, like Horizon 2020, US-funders
- **ARGOS** from the EU-funded project OpenAIRE: template for Horizon 2020 projects
- **Data Stewardship Wizard**: of the Czech Technical University: different templates, e.g. Science Europe Template

THANK YOU

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Sources for digging deeper (1)

- General
  - Data Management Guide of MIT Libraries
  - Data Management Services from Stanford Univ. Libraries
  - Research Data Management by Radboud Univ.
  - Data Management Basics 1: Introduction to data management and sharing by UK Data Services
  - forschungsdaten.info (mainly in German)
- Documentation
  - ICPSR Guide to Codebooks
  - Template ReadMe for Social Science replication packages
  - Document your data by UK Data Services
- IT security
  - Basistipps zur Informationssicherheit by the Federal Office for Information Security, Germany
  - Personenbezogene Forschungsdaten - Kapitel 4: Schutz vor Datenmissbrauch by Leibniz Univ. Hannover

Sources for digging deeper (2)

- Licenses
  - Data: Creative Commons
  - Software: https://choosealicense.com/ and https://choosealicense.com/licenses/
- Data Protection
  - Umgang mit personenbezogenen Forschungsdaten – Rechtliche Grundlagen, Methoden und Hilfsmittel by Leibniz Univ. Hannover
  - Data Management Basics 2: Ethical and legal issues in data sharing by UK Data Services
- Data Management Plans
  - Practical Guide to the International Alignment of Research Data Management by Science Europe