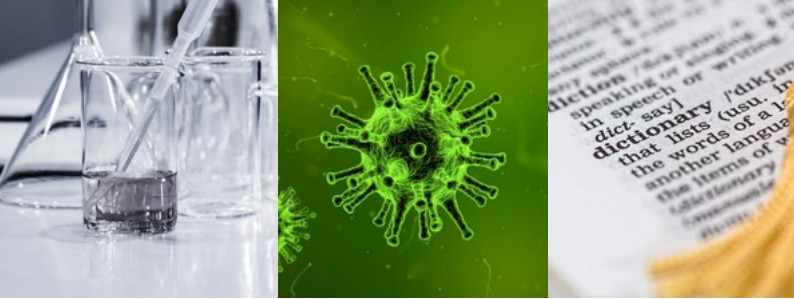


RESEARCH DATA MANAGEMENT

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► RESEARCH DATA

refers to all data generated in the course of a scientific project, for example, through source research, experiments, measurements, surveys, or interviews (DFG 2009).

► RESEARCH DATA MANAGEMENT (RDM)

RDM is the systematic handling of this data throughout the entire data life cycle. It ranges from collection to analysis and further processing of the data towards archiving and, if applicable, publication.

► FUNDING

For the approval of third-party funding, demonstrating a structured data management during and after the completion of the research process is becoming increasingly important. Additionally, good data management offers many advantages beyond that.

► ADDED VALUE FOR RESEARCH

- „Data treasure“ is secure and, for example, accessible for AI/Big Data applications.
- Data is available and rules for access can be implemented effectively
- Knowledge is secured independently of individuals
- Compliance with good scientific practice and legal requirements

further information at
forschungsdaten.info

„Quality-assured research data form a cornerstone of scientific knowledge and can [...] serve as a basis for further research. The sustainable safeguarding and provision of research data therefore does not serve only the examination of previous results, but to a large extent also the achievement of future results.“

From the preamble of the „Principles for the Handling of Research Data“, Alliance of Science Organisations in Germany, 2010.



► HOW TO MAKE YOUR RESEARCH DATA FAIR?



Findable

Describe your research data with meaningful metadata that is available in a searchable database and reference it using a persistent identifier (PID).



Accessible

Ensure that access to (meta)data is technically feasible and define the required authentication and authorization process.



Interoperable

Use established standards for the formats of your research data as well as for the metadata and metadata vocabularies.



Re-useable

The metadata for your research data are detailed, relevant, domain-specific, and machine-readable. Be clear on how your data was created and under which conditions others may reuse it.

Data Management Plans

PLANNING THE HANDLING OF DATA,
STRUCTURE AND COORDINATE

WHAT IS A DATA MANAGEMENT PLAN (DMP)?

A **data management plan** (DMP) is an important tool to improve the way you deal with your research data. A DMP can serve as checklists, as well as a basis for ongoing documentation: from the survey to the long-term storage or publication of the data. More and more research funders, e.g., the EU or the German Federal Ministry of Education and Research (BMBF), require the creation of a DMP.

WHAT INFORMATION DOES A DMP CONTAIN?

A DMP compiles information on the handling of the resulting research data in a structured form. This includes, among other things, the definition of responsibilities, existing rights and obligations as well as information on procedures and aspects of storage and archiving.

ADVANTAGES

- Facilitates agreements on data exchange for large projects
- Simplifies documentation for reporting obligations
- Clarifies structures, making the reuse of data
- Reduces the risk of data loss

DMP at the RWTH

FILL IN ONLINE - OFF TO THE APPLICATION!

With **RDMO** (Research Data Management Organizer), researchers at RWTH have the opportunity to easily create a DMP online.

The data management of individual and collaborative research projects can be documented using pre-designed questionnaires.

The user-friendly web application enables collaborative editing of a DMP across multiple roles and facilitates an overview of the data in larger research projects.

With the help of the stored templates, DMPs can be created that meet the requirements of research funding bodies and can be used directly for submitting applications.



Create your DMP here:
rdmo.rwth-aachen.de



Questions about the DMP can be answered by RDM team at servicedesk@rwth-aachen.de

Storage Media

WHERE SHALL I STORE THE DATA?

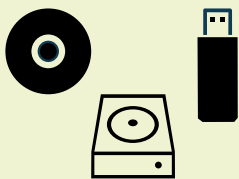


Margaret Hamilton neben dem ausgedruckten Quellcode der Software, die Sie für die Apollo Mission entwickelt hat, 1969

Storage Media

NO BACKUP – NO MERCY

Hard drives eventually give out. Often, they do not even last long enough to store research data for ten years in accordance with good scientific practice.



LIFE EXPECTANCY OF STORAGE MEDIA

Hard disks: 2-10 years

DVD: up to 30 years

USB-Sticks: 10 to 30 years

3... 2... 1... BACK UP!

Data lost–research lost. If you back up your data regularly, you are on the safe side. Clouds are convenient but problematic: it is often unclear where the data is or what happens if the provider is hacked or goes bankrupt. Security can be achieved by choosing a reliable platform (e.g., Sciebo) and an additional storage method (e.g., the university's servers).

3-2-1-RULE

At least **3** backup copies on **2** different storage media, with **1** backup copy at an external location.

STORAGE DONE RIGHT!

Hard disks can be lost, repositories cannot. Valuable data should be stored and backed up in a permanently accessible manner. This can be done through repositories or university services such as RWTH Publications and Coscine.



Questions about storage can be answered by the RDM team at servicedesk@rwth-aachen.de

Data Publication

UNDERPINNING YOUR OWN RESEARCH RESULTS AND MAKING THEM ACCESSIBLE

“Sharing is caring”—this also applies to research data. Data is not only valuable for your own research, but can also provide important impetus for other issues after the research project has been completed.

ADVANTAGES

- Data becomes comprehensible and reusable for others
- Recognition for one's own research through data citation
- Easier comparison of results
- Possibility of meta-analyses
- Interdisciplinary research is supported

HOW DO I PUBLISH DATA CORRECTLY?

Research data can be securely stored and found for a permanent period in online data repositories.

- University repositories: RWTH Publications
- Discipline-specific repository: Many subject communities already have already recognized services
- Generic repository: e.g., Zenodo, Radar
- Data journals: Focus on description and methodology of data collection
- Trade journals: Supplementary to text publications

PID and ORCID

FINDING DATA AND AUTHORS
AND BEING FOUND!

HOW WILL MY DATA BE FOUND?



Persistent Identifier (PID)

Publications and data can be assigned a unique, permanent designation—a so-called Persistent Identifier (PID). This guarantees lasting accessibility. The Digital Object Identifier (DOI) is a widely used international system for this purpose.

ORCID



Multiple names, different spellings, or a name change can make it difficult to uniquely identify researchers. A PID for researchers—the ORCID ID—can help. ORCID provides a persistent digital identifier that distinguishes you from all other researchers—like a fingerprint. ORCID can be integrated into key research processes such as manuscript and proposal submission.

CCBY4.0 UB DUE



Metadata

KNOWING WHAT YOU ARE LOOKING FOR



Metadastandards

DATA ABOUT DATA

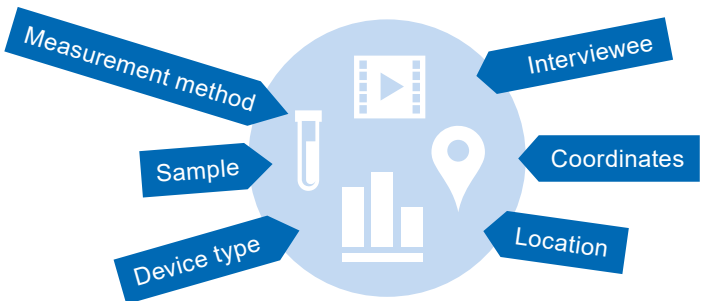
The label on a can tells you what's inside. In the same way metadata ensures that digital data and objects can be found and used. That is why it is important to put "labels" on your research data.

TYPES OF METADATA

Bibliographic or administrative metadata contain information about the management of the data, the origin of the entirety of the data, and is rather general and less community specific.



Descriptive or subject-specific metadata provide individual aspects or records in more detail and provides additional information. Depending on the discipline, they are structured very differently. Many disciplines already have their own metadata standards.



Questions on the subject of metadata can be answered by the RDM team at servicedesk@rwth-aachen.de

Electronic Lab Notebooks

DIGITALLY SIMPLIFYING THE WORKFLOW IN THE LABORATORY

Labor notebooks are part of everyday research: they contain measurement results, sketches of experimental setups, and analyses. But what if these data are digital? Print it out and stick it in the notebook?

Not really. **Electronic lab** notebooks (ELN) are making the leap into the digital age.

WHY AN ELN?

- Keeping a lab notebook with a PC, cell phone, or tablet
- Full text search in all content
- Work collaboratively
- Data security, access control
- Ensures data integrity, creates documentability through time stamps
- Import or link any files
- Connect other systems (API)
- Export to PDF (and other formats)



Questions on the subject of ELN can be answered by the RDM team at servicedesk@rwth-aachen.de

Archiving of Image and Audiovisual Files

ALSO KNOWN AS “BORN DIGITAL”



Archiving of Image and Audiovisual Files

“ALSO “BORN-DIGITAL”

Without a player, cassettes are plastic waste. Even digital file formats evolve over time: In the worst-case scenario, research data can no longer be opened or edited.

If you use the following formats to archive your data, you are on the safe side.

FIT FOR THE ARCHIVES: FORMATS

▶ Raster Graphics

- Tagged Image File Format (TIFF) - uncompressed
- Portable Network Graphics (PNG)
- JPEG2000

▶ Vector Graphics

- Scalable Vector Graphics (SVG)

▶ Computer-aided Design (CAD)

- AutoCAD Drawing
- Drawing Interchange Format, AutoCAD
- Extensible 3D, X3D

▶ Sound, Audio

- Waveform Audio File Format (WAV) - uncompressed

▶ Video

- FFV1 Codec in Matroska container
- Motion JPEG 2000 (ISO / IEC 15444-4)
- AVI - uncompressed



Questions on the subject of archiving can be answered by the RDM team at servicedesk@rwth-aachen.de

RWTH Services and Support for Research Data Management (RDM)



RWTH Publications

RWTH Services and Support for Research Data Management (RDM)

TRAINING AND CONSULTING

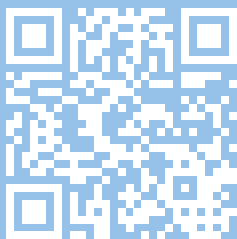
- The IT-ServiceDesk is available as a single point of contact and 1st level support for simple issues
- Technical support is provided by the RDM team, consisting of employees from the IT Center, the University Library, and the Central University Administration (2nd level)
- The RDM team provides 3rd level conceptual support for institutes
- The RDM team offers further training as blended learning within the framework of CDS/CPL

TECHNICAL INFRASTRUCTURE

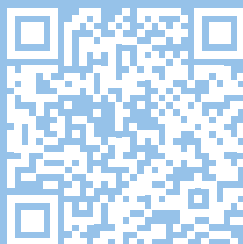
- Archive services: Coscine
- Backup/restore service
- Data Sharing & Collaboration: Sciebo, Coscine
- Persistent Identifier: ePIC, DOI
- GitLab
- Research Data Management Organiser (RDMO)
- RWTH Publications

EXPANSION OF AN RDM NETWORK

- RDM Network meetings



RWTH Aachen
University's
RDM Websites



RDM Blog

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RDM blog: <https://blog.rwth-aachen.de/forschungsdaten/en>