



# Research Data Management: From Planning and Organization to Publication

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Presenter: Kevin Lang  
Thursday, 29.09.2022

# Agenda

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- 1) Introduction**
- 2) Why Research Data Management?**
- 3) Policies for Research Data Management**
- 4) Data Management Plan**
- short break -*
- 5) Models for handling Research Data**
  - 5S Data Model
  - 3-2-1 Backup-Rules
  - FAIR Data Principles

# Which will not be covered here...

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- Legal Aspects (copyright, data privacy, ...)
- Open Science

# Introduction

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# About myself...

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## Kevin Lang, Master of Science

- 2011 – 2016: Bachelor Degree, Medieninformatik
- 2016 – 2018: Master Degree, Computer Science and Media
- Student Assistant activities:
  - Natural Language Processing, Machine Learning, Artificial Intelligence und Big Data
- since 2018:
  - Contact person for Research Data Management at Bauhaus-Universität Weimar
  - Member of the Thuringian Competence Network for Research Data Management (TKFDM)

**Bauhaus-Universität Weimar**

Stabsstelle Forschungsdatenmanagement

# Strategie zur Digitalisierung (12/2017)

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## Topics about Research Data Management:

- Competence Network
- RD-Policy
- Open Data (Open Science)
- Digital Library Thuringia
- Infrastructure
- National Research Data Infrastructure



(aus [Thüringer Strategie zur Digitalisierung im Hochschulbereich](#), 2017, zuletzt aufgerufen am 17.06.2019)

# Strategie zur Digitalisierung 2021-2025

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## New Topics about Research Data Management :

- Competence Network (TKFDM) and Thuringian Center for Learning Systems and Robotics (TZLR)
- Fields of action: Networking, Training, Open Science, Long-term Archiving, High-Performance Computing, Legal Support and Integration in Curricula
- Founding of a User Advisory Board



(aus [Thüringer Strategie zur Digitalisierung im Hochschulbereich](#), 2021, zuletzt aufgerufen am 17.05.2021)

# TKFDM: Portal

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Suche

Deutsch | English

AKTUELLES VERANSTALTUNGEN AKTIVITÄTEN MATERIALIEN ÜBER UNS

FDM  
THÜRINGEN

**WILLKOMMEN AUF DEN SEITEN DES THÜRINGER KOMPETENZNETZWERKS  
FORSCHUNGSDATENMANAGEMENT (TKFDM)**

[www.forschungsdaten-thueringen.de](http://www.forschungsdaten-thueringen.de)



# TKFDM: Services

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- **Consulting**
  - Data Management Plans, Data Protection, Applications, Web Services, Formats, ...
- **Training**
  - Thuringia-wide Information Events, Workshops, Train-the-Trainers or Coffee Lectures
  - Also possible on request
- **Networking**
  - Between Universities, Data Centers, NFDI-Consortia and other Facilities



# Materials

- Various information flyers
- Fact Sheets, Best-Practices & Posters
  - RDM Funding and Requirements, Research Data Repositories, Open-Source, Data Protection, ...
  - Quality Control Methods, eLabFTW, GitLab, LaTeX, BEXIS, RDM in courses, ...
  - FAIR Assessment Tools
- 23 Things about RDM
- Research Data ScaryTales
  - Based on the "Black Stories" card game
  - 60 stories about bad data management



# Organisations

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Rat für  
Informations  
Infrastrukturen



Deutsche Initiative für  
Netzwerkinformation e.V.



# Why Research Data Management?

# Research data reusability issues

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[Data Sharing and Management Snafu in 3 Short Acts](#) by NYU Health Sciences Library

# Problems with the reusal of Research Data

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- Data is not public, although the project was publicly funded
- Lack of planning of project folder structures
- Choice of storage medium (e.g. USB stick)
- Missing data backup
- Use of proprietary formats
- No metadata or documentation of the data
- Missing ID for authors

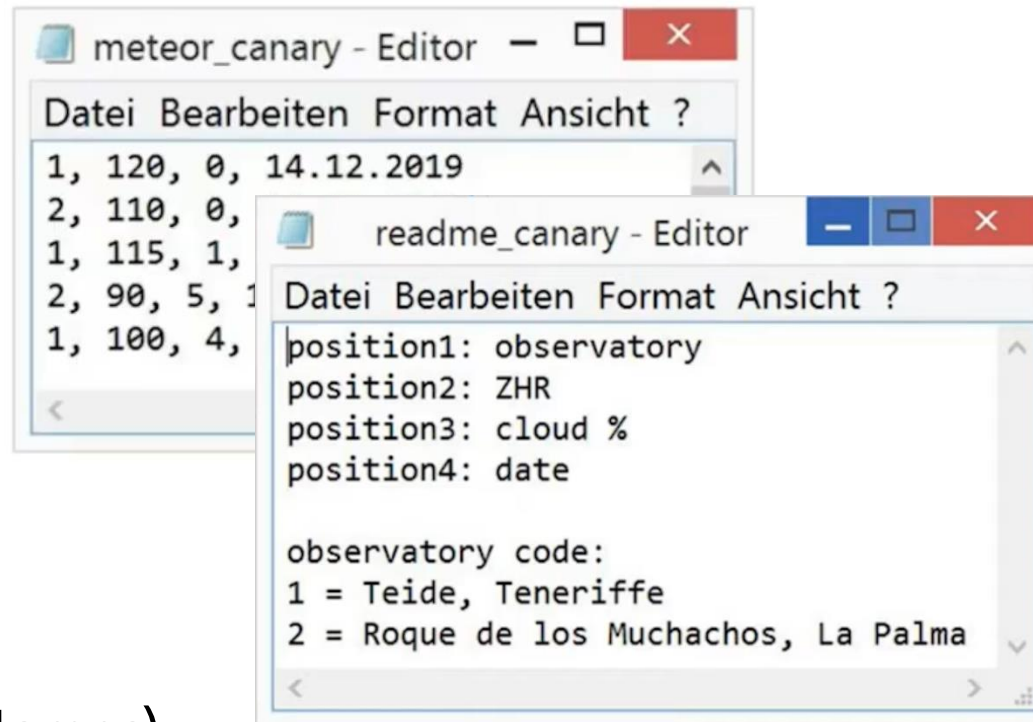


## Further Examples

- Research: shooting stars from various observatories
- Records: Date, Cloudiness, Zenithal Hourly Rate, State

	A	B	C	D
1	date	cloud %	ZHR	observatory
2	19-12-14	2	105	NSW
3		5	80	TAS
4		0	130	WA
5	19-12-15	40	25	NSW
6		15	40	TAS
7		0	135	WA
8	19-12-16	10	70	NSW
9		5	90	TAS
10		0	140	WA

- Incomplete records
- Various defined abbreviations
- Different formats (such as timestamps)



# Policies for Research Data Management

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# What is a Research Data Policy?

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- **Definition**
  - Describes how members of an institution should handle research data.
- **Reasons**
  - Create awareness about research data management (top down)
  - Favouring early planning
  - Make data findable, understandable and reusable
  - Work with funders (DFG, BMBF, Europe Horizon Program, ...)

# Policies by various Organizations

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- 2010 [Grundsätze zum Umgang mit Forschungsdaten](#)
- 2014 [Management von Forschungsdaten - eine zentrale strategische Herausforderung für Hochschulleitungen](#)
- 2015 [Leitlinien zum Umgang mit Forschungsdaten](#)
- 2019 [Leitlinien zur Sicherung guter wissenschaftlicher Praxis](#)

# Policies by Bauhaus-Universität Weimar

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- 2012 [Guidelines for ensuring good scientific and artistic practice](#)
- 2014 [Strategie zur Sicherung und Verwertung von geistigem Eigentum](#)
- 2015 [Leitlinienpapier zur Forschungsförderung](#)
- 2016 [Open-Access-Policy](#)
- ...
- 2020 [Guideline for handling research data](#)
- 2021 [Recommendations for Handling Research Data](#)

**Bauhaus-  
Universität  
Weimar**

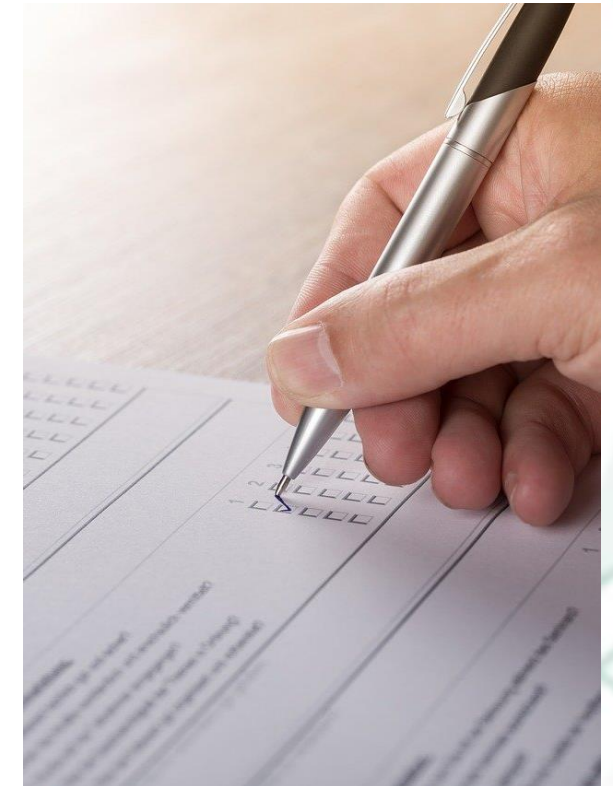
# Content: Definitions

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## Definition of Research Data and Research Data Management

Research data are data resulting from scientific and artistic research that are generated, collected, processed or analysed during the research process. These include the results of the research and any tools or procedures that may be required, which have been developed during the research process.

Research data management encompasses the entire planning, recording, processing, documentation, archiving and publication of research data.



# Content: Introduction

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## Preamble

The Bauhaus-Universität Weimar – represented by the members of the University Directorate and Senate – is committed to the responsible handling of research data in accordance with the principles of the Alliance of Science Organisations in Germany and the guidelines of the German Research Foundation (DFG). In addition, the university is committed to finding ways of adequately translating these basic principles to artistic research and projects, provided that data is collected.

The Bauhaus-Universität Weimar strives for fundamentally free access to and long-term security of research data. The process of data collection should be comprehensible, traceable and reproducible. This promotes the recognition of research achievements of scientists, artists and designers as well as members of the Bauhaus-Universität Weimar.

# Content: Responsibility

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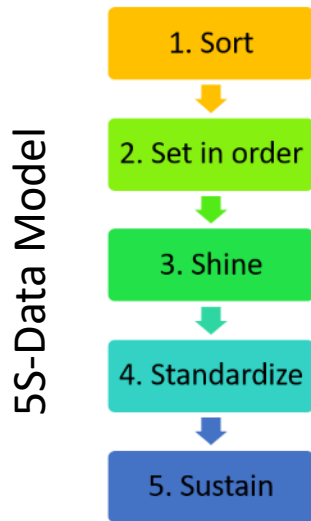
The managers of a research project are obliged to introduce research data management in accordance with the principles of good scientific and artistic practice. **All members of the project must be instructed** in the handling of research data.



# Content: Documentation & Preservation

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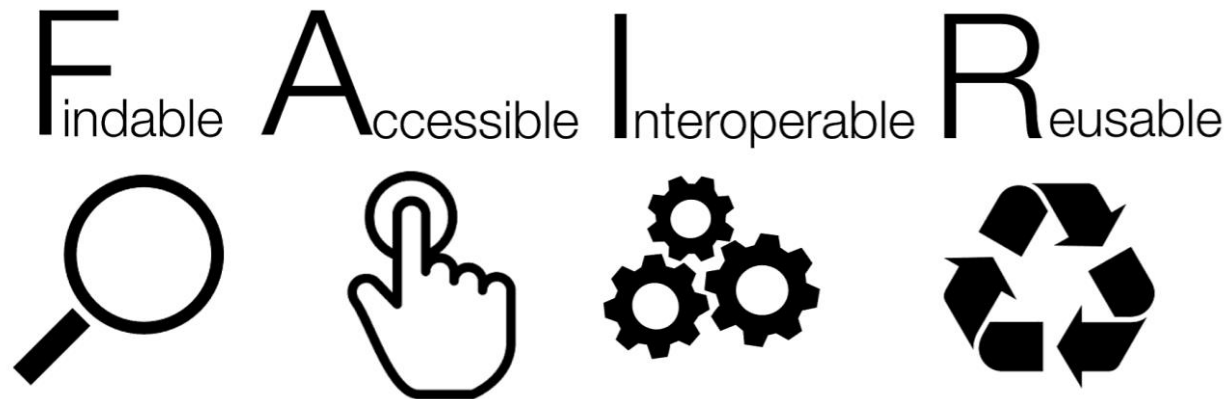
Over the course of the research project, the **source, type and processing** of the research data shall be documented. Established **methods and standards** are to be applied and rights of use defined. The scientifically relevant research data should be retained for an appropriate period of **at least 10 years** at the original facility or in a repository.



# Content: Publishing

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Research data should be published promptly according to the FAIR principles in recognised archives and specialised repositories. Materials, information, methods applied and software used should be made available to the extent possible and reasonable. When publishing research data, the protection of personal data, copyright and the legitimate interests of third parties must be respected, among other things.





# Recommendations for Handling Research Data

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- Extension of the policy
- 10 pages with index
- Overview of actions in project:
  - planning
  - implementation
  - completion

## Contents

1	Preamble .....	3
2	Project planning .....	4
3	Project implementation .....	5
3.1	File organisation .....	5
3.2	Rights and obligations .....	5
3.3	Documentation.....	5
3.4	Versioning and backups.....	6
3.5	Virtual research environments.....	6
3.6	Using external IT services .....	7
4	Project completion .....	8
4.1	Publication in accordance with FAIR data principles .....	8
4.2	Research data repositories.....	8
4.3	Selection and deletion.....	9
4.4	Licensing .....	9
4.5	Long-term availability.....	9
5	Central service facilities.....	10
5.1	University Library .....	10
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5.3	Computer centre (SCC).....	10
5.4	Legal and other advice .....	10
5.5	Bauhaus Research School.....	10

# Data Management Plan

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# What is a Data Management Plan?

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A DMP is a document for planning and documenting the data within a project.

## Reasons

- Coordination between project partners
- Understanding and reusing data
- Early identification of problems
- Basis for third party funding...



# Research Funding Organizations

Organization	Requirement	Submission	Content Guidelines	Updating
 <p><b>Horizon Europe</b> THE NEXT EU RESEARCH &amp; INNOVATION PROGRAMME (2021 – 2027)</p>	DMP	Yes	<a href="#">Horizon Europe Programme Guidelines Data Management Plan Template</a>	In case of big changes, Living Document
 <p><b>DFG</b> Deutsche Forschungsgemeinschaft</p>	Some statements	Yes	<a href="#">Checklist for handling research data</a>	No
 <p>Bundesministerium für Bildung und Forschung</p>	Depending on the project	Depending on the project	Depending on the project (z.B. <a href="#">empirischen Bildungsforschung Checklist</a> )	Depending on the project
 <p>Volkswagen<b>Stiftung</b></p>	DMP	Yes	<a href="#">Practical Guide von Science Europe</a>	No

# Notes on Writing

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- Living document
- Short and simple descriptions
- Everyone in the project gets involved
- Include stakeholders (donors, institutes, research community, employees, etc.)



# Content: General Information

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- Permanent ID
- Sponsor
- Project title
- Project description (abstract)
- Participant names (and IDs)
- Contact project management or departments
- Creation or modification date (version, if applicable)
- Specifications / references from third parties



# Content: Origin or Collection of the Data

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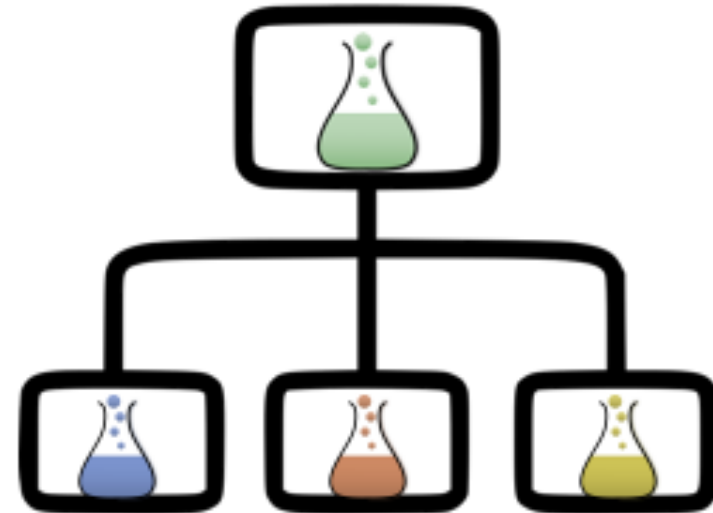
- Reason for the creation?
- Existing data sets?
- Connection of data sets?
- Limitations?
- Software? Methods?
- Documentation of the data collection?
- Formats, types and sizes?
- Reasons for formats?



# Content: Documentation and Quality

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- Which metadata standards?  
(such as DDI, TEI, EML, MARC, CMDI)
- Organization of the data?  
(Folder structure, version control, ...)
- Type of documentation?  
(Database, wiki, readme, code books, ...)
- Tools for (further) use of the data?
- Control of data quality?





# Content: Storage and Backup

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- Data storage devices?
- (Automatic) backup?
- Set up for the services?
- Recovery plan?
- Access to the data and organization?
- Policies or guidelines?



# Content: Legal and Ethical Aspects

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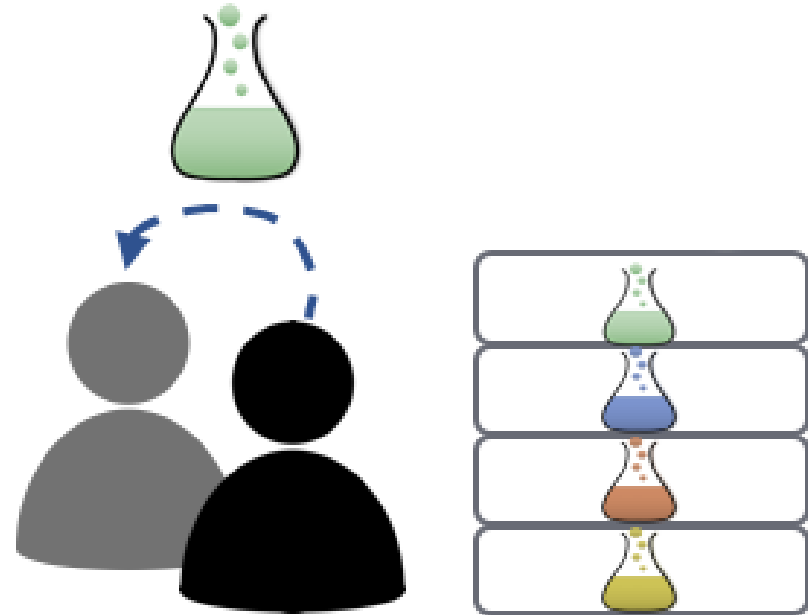
- DSGVO/GDPR compliant?
- Consent to the creation/collection?
- Pseudonymization/anonymization?
- Storage and Encryption?
- Authorized access?
- Rights to the data?
- Violations or interests of third parties?
- Institutional or international guidelines?



# Content: Distribution, Publication and Preservation

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- When to publish or archive?
- Choice of platform?
- Inquiries or access to the data?
- Restrictions or only partial publications? (e.g. embargo)
- Deletion of data?
- Reasons for further use?
- Tools to view/edit?



# Content: Resources and Responsibilities

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- Roles and duties?
- Collaborations?
- Creation and update of the DMP?
- Costs for time and staff?
- Hardware requirements and costs?
- Costs for compliance with the FAIR principles?



# External Help and offers

- [Sample plans](#)
- [Research Data Management Organiser](#)
  - [forschungsdaten.info](https://forschungsdaten.info)
- [DMPonline](#)
- [Data Stewardship Wizard](#)
- [ARGOS](#)



Short break until ...



# Models for handling Research Data

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# Overview

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- **5S Data Model**
  - Organization of research data
- **3-2-1 Backup Rules**
  - Preservation of research data
- **FAIR Principles**
  - Publication of research data



# 5S Data: Origin

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- 5S comes from the concept of "Kaizen" from the Toyota Production System, which means something like: „*The act of making bad things better.*“

1	<b>Seiri</b> (整理)	<b>Sort</b>	<b>Aussortieren</b>
2	<b>Seiton</b> (整頓)	<b>Set in Order</b>	<b>Aufräumen</b>
3	<b>Seisō</b> (清掃)	<b>Shine</b>	<b>Arbeitsplatzsauberkeit</b>
4	<b>Seiketsu</b> (清潔)	<b>Standardize</b>	<b>Anordnung zur Regel machen</b>
5	<b>Shitsuke</b> (躰)	<b>Sustain</b>	<b>Alle Punkte einhalten und verbessern</b>

改善  
"kai" "zen"

- Used by companies such as Boeing or Hewlett-Packard
- Reference to research data created in 2019 by University of Helsinki
- [5S Data Week with comic](#) organized by TKFDM in 2021

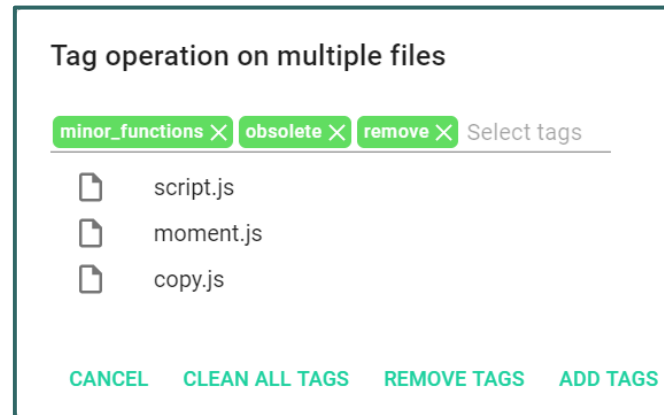
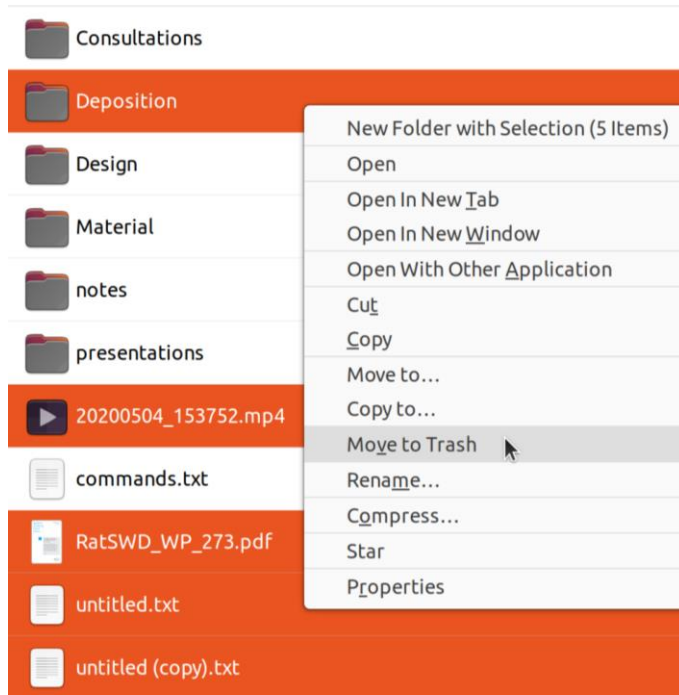
# 5S: 1) Sort

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- Goal:
  - Make search for data more efficient
  - Save data storage space
- Implementation:
  - Delete unnecessary files/folders, or mark them for scheduled deletion
  - Keep clean of temporary files



# Deletion, Marking and Suppression



source: [TagSpaces](#)

## .gitignore

```
10
11 # Generated files
12 bin/
13 gen/
14 out/
15
```

source: [GitHub](#)

# 5S: 2) Set in Order

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- Goal:
  - Build a system to simplify structures and workflows
- Implementation:
  - Useful folder structures
  - Naming conventions
  - Documenting structures and exceptions

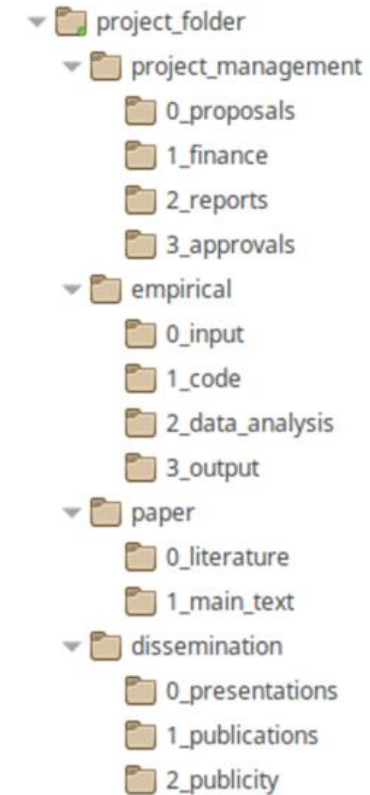


# Structure of Folders

## Bad example:

Name	Date Modified	Size	Kind
▶ 1_PROJEKTIT	9 May 2019 at 11.39	--	Folder
▶ 2_PEOPLE	25 Mar 2019 at 9.10	--	Folder
▶ 3_MANUSCRIPTS	25 Apr 2019 at 13.05	--	Folder
▶ 4_APPLICATIONS AND GRANTS	Yesterday at 23.46	--	Folder
▶ 5_SEMINARS and MEETINGS	12 Mar 2019 at 20.54	--	Folder
▶ 6_PERSONAL	21 Dec 2018 at 12.44	--	Folder
▶ 7_ADMIN	28 Mar 2019 at 9.48	--	Folder
▶ 8REFEREE TASKS	7 May 2019 at 13.27	--	Folder
▶ 9ABSTRACTS AND PRESENTATIONS	28 Feb 2019 at 10.52	--	Folder
▶ 10LUENNOT JA OPETUS	8 May 2019 at 21.38	--	Folder
▶ 11POPULAR SCIENCE	17 Jan 2019 at 21.34	--	Folder
▶ Articles	21 Dec 2018 at 12.27	--	Folder
▶ Bernasconi_thesis	6 Jul 2016 at 14.48	--	Folder
▶ elokuvia	18 Dec 2017 at 4.44	--	Folder
▶ Jonna's documents_old	Today at 13.08	--	Folder
▶ Photos	14 May 2019 at 0.15	--	Folder
▶ photos_from_anytrans	15 Nov 2017 at 23.12	--	Folder
▶ R	31 Jan 2019 at 9.03	--	Folder
▶ Sample lists	20 Jul 2015 at 12.03	--	Folder
▶ Team speciant	12 Mar 2018 at 13.53	--	Folder

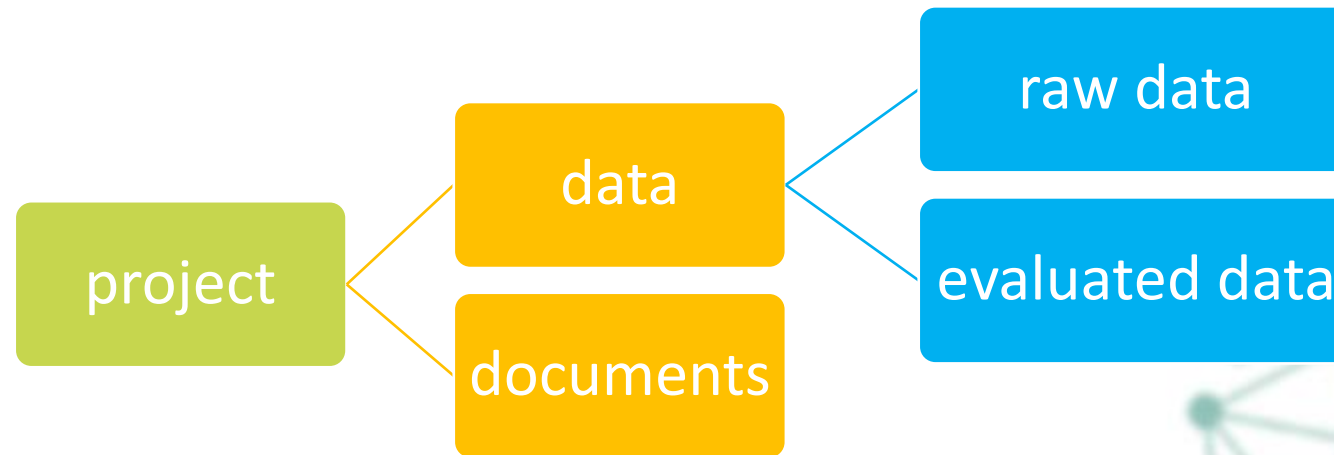
## Good example:



# Rules for Folder Structures

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- Clear, hierarchical structures representing existing content and processes
- Short, easily comprehensible names
- Rule of thumb: 3 folders in depth, 7 folders in width



# Problems with file names

news\_release\_2015-07-14.doc  
news\_release\_2015-07-15.doc  
news\_release\_2015-07-16.doc  
news\_release\_7172015.doc

COMPANY\_LOGO\_SMALL.JPG  
photo.jpg  
393923022\_30252433004.png

Picture#2\_v01!.jpg

mockup\_final.psd  
mockup\_v6\_final.psd  
mockup\_v6\_final2.psd  
mockup2\_v6\_final\_revised3.psd

Untitled-1.txt  
Untitled-2.txt  
Untitled-3.txt

index-copy.html  
index-copy-2.html  
copy-of-index-copy.html

projects.php  
projects-david.php

source: [20px.com](http://20px.com)



```
'Scenario A: Barcode does not match database
If Dir(Global_FilePath) = "" Then
    Result.Value = InputBarcode & " is not found in database. Inform
Else
'Scenario B: Barcode does match database

'Disable concurrent access
Do While Dir(Global_FilePath &
```

Microsoft Visual Basic

Run-time error '52':  
Bad file name or number

OK Help

source: [stackoverflow.com](http://stackoverflow.com)

# Naming Conventions

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## Technical:

- **No special characters** (e.g.: !?:#,\*,~.)
- "\_" or "-" instead of **spaces**
- **No Umlauts** or similar characters (ü, ö, ä, ß, é, ç, ...)
- **No upper case**
- Max. **256 characters** (incl. file path)

## ➤ **Examples:**

- vfu\_overview\_v04.csv
- 20201104\_tkfdm\_fact\_sheet\_open\_source\_software.pdf

## Content-related:

- Timestamp
- Author
- Category
- Title
- Version (v001..v999, approved, submission, alpha, final, ...)



# 5S: 3) Shine

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- **Goal:**
  - Maintain quality and adjust established system if necessary
  - Keep it simple and document it
- **Implementation:**
  - Check and implement workflows
  - Regular routines



# Introducing Routines

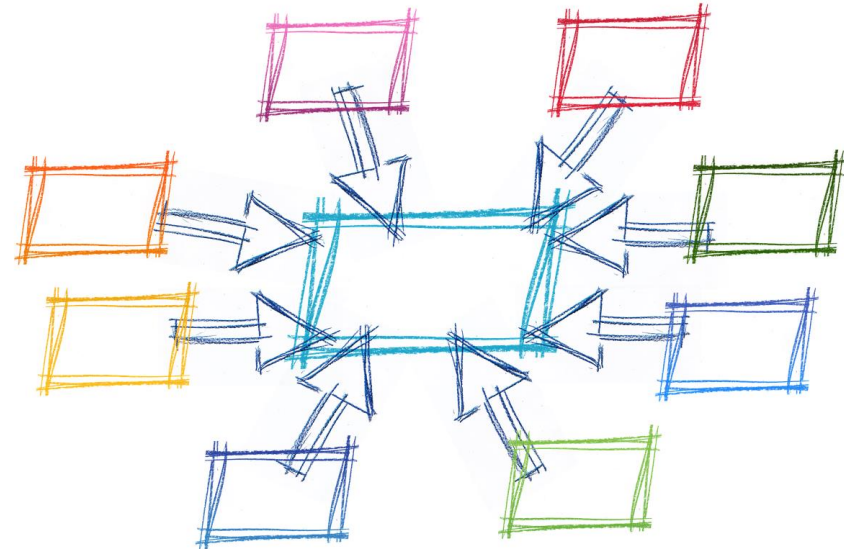


- ✓ No data junk on desktop?
- ✓ Everything sorted correctly?
- ✓ Correct naming?
- ✓ ToDos marked?

# 5S: 4) Standardize

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- Goal:
  - Establish processes and standards
  - Enable collaboration
- Implementation:
  - Document best practices, guidelines and rules
  - Implement a Standard Operating Procedure (SOP)
  - Clarify responsibilities by discussing them with colleagues



# Standard Operating Procedure (SOP)

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- Folder structure
- Allowed formats
- Designation of folders and files
- Places of storage and procurement measures
- Rights and obligations towards usage and expansion
- Application of international and/or discipline-specific standards



# Organisations about Standardisation

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**NIST**  
National Institute of  
Standards and Technology



**W3C<sup>®</sup>**

# Find standard specifications for metadata ...

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RESEARCH DATA ALLIANCE

<http://rd-alliance.github.io/metadata-directory/>  
<https://rdamsc.bath.ac.uk/>



<https://www.dcc.ac.uk/guidance/standards/metadata>



<https://terminology.tib.eu/ts>

# 5S: 5) Sustain

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- Goal:
  - Maintain the developed system with self-discipline and through habit
- Implementation:
  - Workshops and training sessions
  - Briefing of new staff
  - Evaluate new methods/technologies



# Workshops and Feedback


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- Regular workshops to introduce the system and documentation
- Explaining the use of tools (e.g. console commands, GitLab, LaTeX, eLabFTW)
- Discuss new methods and technologies





# Handout about the 5S Data Model



## The 5S Methodology in Research Data Management

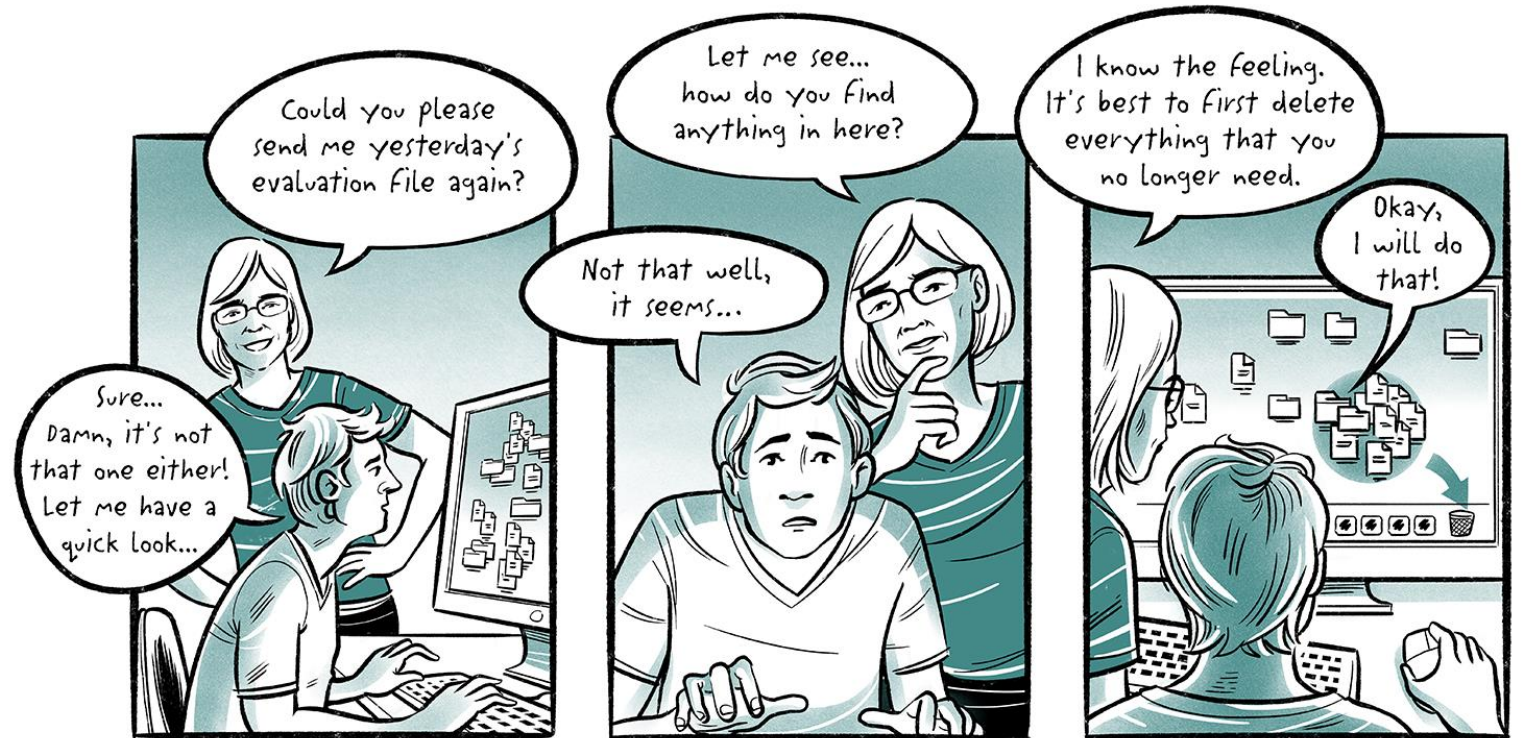
Structuring and maintaining file organization

Developed by the Thuringian Competence Network for Research Data Management

Contributors: Kevin Lang (Bauhaus-Universität Weimar)  
Annett Schrötter (Friedrich-Schiller Universität Jena)  
Roman Gerlach (Friedrich-Schiller Universität Jena)  
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Anne Lehmann (Universität Erfurt)

Version: 1.0, 08.02.2021  
DOI: 10.5281/zenodo.4494257

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[doi.org/10.5281/zenodo.4494257](https://doi.org/10.5281/zenodo.4494257)

# 3-2-1 Backup Rules: Origin

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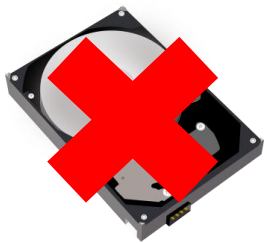
- Historic golden rule in companies to organize backup systems
- Formalized in 2009 by photographer Peter Krogh
  - 3 copies
  - 2 different technologies
  - 1 external location
- Extended as 3-2-1-0 or 3-2-1 = 0 backup rules
  - 0 recovery failures



# 3-2-1 Backup Rules: 3 Copies

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- 1 working copy on the workstation, 2 backup copies
- Why 3? → **Probability theory!**



1 to  
100



1 to  
10 000!



1 to  
1000 000!!!

- 2 copies are usually sufficient for private use
- 3 or more copies for institutions and businesses

# 3-2-1 Backup Rules: 2 different Technologies

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- Different error rates in different storage technologies and media types
- Differences in:
  - Number of read / write cycles
  - Durability of the material
  - Interfaces
  - Security aspects
- Data loss can be reduced by media discontinuity



# 3-2-1 Backup Rules: 1 External Location

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- What can happen if all the copies are in one place?
- Possible problems:
  - Fire
  - Flooding
  - Power failure
  - Hacker attacks
  - Network commands / software updates
- Separate rooms and technology



# 3-2-1 Backup Rules: 0 Errors

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- 0 error tolerance when restoring files
- What problems can occur?
  - Process/contact
  - Backup/versioning deactivated (default settings)
  - Intervals too large
  - Type and status of the files backed up
- Always test the system and configure it correctly



# FAIR Principles: Origin

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- First published in March 2016

- **F**indable
- **A**ccessible
- **I**nteroperable
- **R**eusable



- High acceptance in many organizations (G20, GO FAIR, CODATA, RDA, DFG, ...)

- Attempts to expand:

- More detailed explanations of the implementation
- CARE principles
- Open Data



# FAIR Principles: Findable

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- Goal:
  - The data should be findable with plenty of context.
- Implementation:
  - Persistent identifier
  - Lots of metadata
  - Repository (→ [re3data.org](https://re3data.org))
  - Findable in search engines or registers





# Find the right repository...

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- Search at:  **re3data.org**  
REGISTRY OF RESEARCH DATA REPOSITORIES



PID of data set



PID of authors



Meta data



Download/Export



Description



Access



Licences



Overview/Preview



Versioning



Log in/Edit



Global Search Engine

# General Research Data Repositories

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**DRYAD**



**figshare**



# Persistent Identifiers

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- Authors: ORCID, ResearcherID
- Publications: DOI, URN, HDL
- **\*new\*** Institutions: ROR

## ➤ Advantages:

- Cross-platform
- Always available (unique resource)
- Stays the same even after moving, changing institutions or changing your name
- Listing of metadata



# Meta data

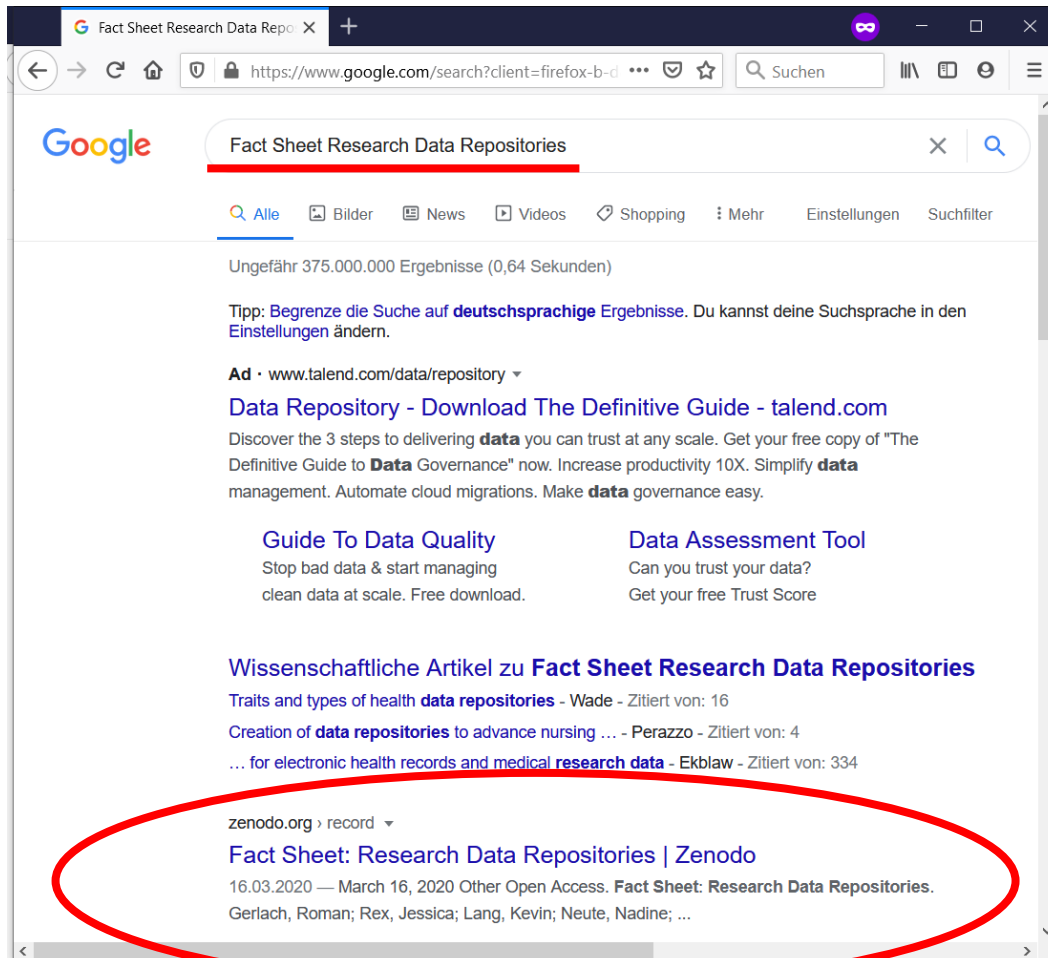
The screenshot shows a metadata page for a 'Fact Sheet: Research Data Repositories'. The page is dated March 16, 2020, and is in English. It includes a definition of research data repositories, a list of quality features for repositories, and a table of files. The table has columns for Name, Size, and actions (Preview, Download). The files listed are:

Name	Size	Preview	Download
fact_sheet_research_data_repositories.pdf	431.0 KB		
fact_sheet_research_data_repositories.pdf	431.0 KB		

The page also includes sections for 'Communities' (Thüringer Kompetenzzentrum Forschungsdatenmanagement), 'Publication date' (March 16, 2020), 'DOI' (10.5281/zenodo.3900922), 'Keywords' (research data repositories, Forschungsdatenmanagement, etc.), 'Communities' (Thüringer Kompetenzzentrum Forschungsdatenmanagement), 'License (for files)' (Creative Commons Zero v1.0 Universal), 'Versions' (Version 2: 10.5281/zenodo.3900922, Version 1: 10.5281/zenodo.3703048), 'Share' (Cite as: Gerlach, Roman, Rex, Jessica, Lang, Kevin, Neude, Nadine, & Schwartz, Volker. (2020, March 16). Fact Sheet: Research Data Repositories. Zenodo. http://doi.org/10.5281/zenodo.3900922), and 'Export' (BibTeX, CSL, DataCite, Dublin Core, DCAT, JSON, JSON-LD, GeoJSON, MARCXML, Merdley).

- Persistent identifier
- Title
- Authors (with ID such as ORCID)
- Release date
- Publications
- Keywords
- Categories / groups
- Versions
- Traffic
- ...

# Findable in Search Engines



➤ Use key words (such as title or other metadata) to find in the repository

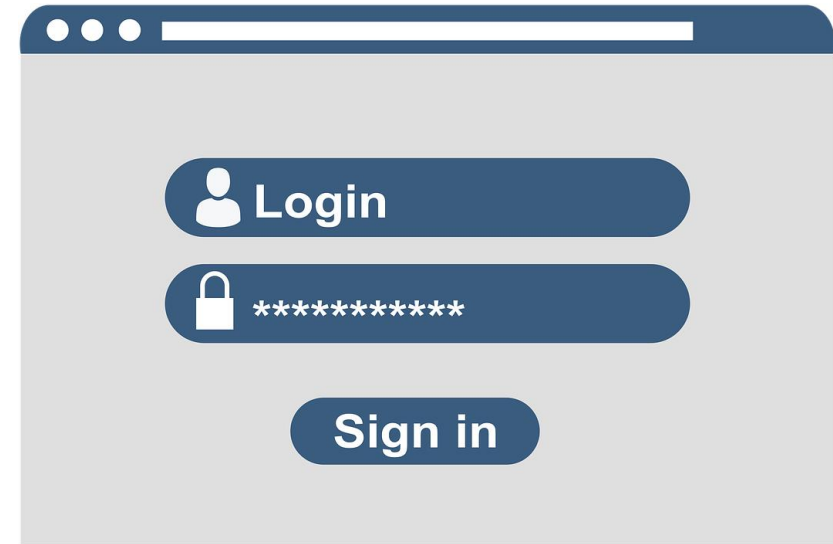
➤ Search Engines:

- Google, Bing, ...
- [Google Dataset Search](#)
- [OpenAIRE Search](#)

# FAIR Principles: Accessible

---

- Goal:
  - Clearly defined access for data
- Implementation:
  - Download options or API
  - Authentication and authorization steps
  - Conditions
  - Existing metadata



# Download Options

---

- HTML:

Files (868.9 kB)		
Name	Size	
fact_sheet_research_data_repositories.pdf	431.0 kB	<a href="#">Preview</a> <a href="#">Download</a>
md5:786a3c1dedcc4db99d44b2fd6c1464da ⓘ		
handreichung_forschungsdatenrepositorien.pdf	437.9 kB	<a href="#">Preview</a> <a href="#">Download</a>
md5:1b7b371c218dc7cd84483078e934833b ⓘ		

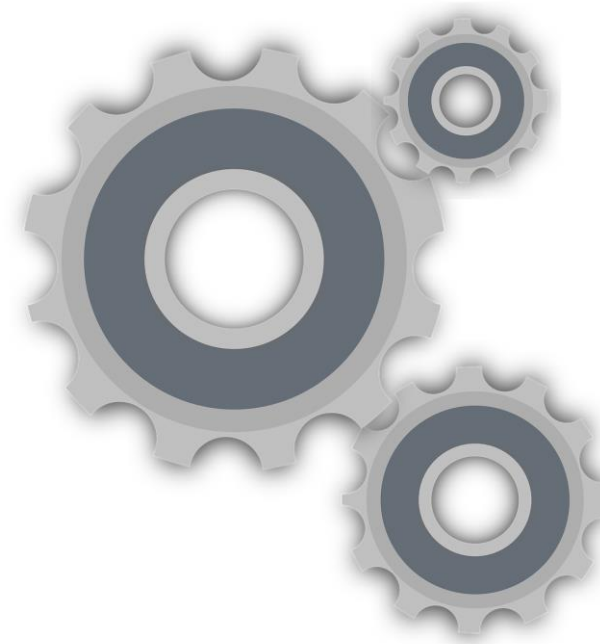
- REST API:

```
{
  "key": "my-file.zip",
  "mimetype": "application/zip",
  "checksum": "md5:2942bfabb3d05332b66eb128e0842cff",
  "version_id": "38a724d3-40f1-4b27-b236-ed2e43200f85",
  "size": 13264,
  "created": "2020-02-26T14:20:53.805734+00:00",
  "updated": "2020-02-26T14:20:53.811817+00:00",
  "links": {
    "self": "https://zenodo.org/api/files/44cc40bc-50fd-4107-b347-00838c79f4c1/dummy_example",
    "version": "https://zenodo.org/api/files/44cc40bc-50fd-4107-b347-00838c79f4c1/dummy_example",
    "uploads": "https://zenodo.org/api/files/44cc40bc-50fd-4107-b347-00838c79f4c1/dummy_example"
  },
  "is_head": true,
  "delete_marker": false
}
```

# FAIR Principles: Interoperable

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- Goal:
  - The data formats and metadata correspond to common standards
- Implementation:
  - Use of open formats
  - Vocabulary according to standards
  - References to related (meta) data





# Open formats

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Data type	Open formats	Proprietary formats
Texte	TXT, TEX, ODT, HTML, RTF	DOC, DOCX
Tabellen	CSV, TSV	XLS, SAV
Bild	PNG, SVG	PSD, AI, PUB
Audio	VORBIS, FLAC, OPUS	WMA, MP3
Video	FFmpeg, OpenH264, Xvid	MPEG-2, MPEG-4, MVC

- Text-based freely readable (no binary formats)
- Can be processed with any software
- Suitable for archiving

# FAIR Principles: Reusable

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- Goal:
  - Documentation and purpose of use
- Implementation:
  - Issued data usage license
  - Description of creation/origin and change
  - Reference to required applications



# Licences

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- Def .: Definition of the conditions of use for data
- Templates: CC (Creative Commons), ODC (Open Data Commons), GPL (GNU General Public Licenses)

Icon	Short	Description
	BY	Attribution
	NC	Non commercial
	ND	No derivatives
	SA	Share alike



Thank you for your attention.

# Further offers

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- Personalized workshops
- Handouts
- Sharing:
  - Postcards, pens, cups, ...
  - ScaryTales card game



# Sources

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- Research data management and the TKFDM:
  - [Portal von TKFDM](#)
  - [TKFDM Community auf Zenodo](#)
  - [Research Data Scarytales](#)
  - [Data Sharing and Management Snafu in 3 Short Acts](#)
  - [FDM kurz erklärt \(TIB\)](#)
  - [#2MinutenFDM](#)
- Data Management Plan:
  - Tabelle Drittmittelgeber: [20200701\\_fdmtage\\_weimar\\_kerstin\\_helbig.pdf](#)
  - Inhalte: [se\\_rdm\\_practical\\_guide\\_final.pdf](#)
  - Grafiken: [essentials-for-a-data-management-plan-for-spectroscopists](#)
- Stockimages with CC0 licence:
  - [pixabay.com](#)
  - [unsplash.com](#)

# Sources

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- Five S DATA:
  - <https://www.helsinki.fi/en/research/organizing-data-folders-with-5sdata-method>
  - <https://kanbanize.com/de/lean-management-de/wert-verschwendung/was-sind-die-5s-in-lean>
  - <https://doi.org/10.5281/zenodo.4494257>
- 3-2-1 Backup:
  - <https://www.storage-insider.de/was-ist-die-3-2-1-backup-regel-a-782641/>
  - <https://spanning.com/blog/simplifying-the-3-2-1-rule-for-data-protection-in-the-age-of-the-cloud/>
- FAIR Principles:
  - [The FAIR Guiding Principles for scientific data management and stewardship](#)
  - [FAIR Principles auf go-fair.org](#)
  - [How FAIR are your data?](#)
  - <https://www.gida-global.org/care>
  - [Making FAIReR assessments possible](#)