EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Quantitative Biology Center
(QBiC)

Barletta Solari, F., & Pawar, S. (2025). Research Data Management Life Cycle. Zenodo. https://doi.org/10.5281/zenodo.15016612

FAIR-Datenmanagement in Biobanken:

Mehrwert und Anwendungsszenarien

Steffen Greiner

13. Nationales Biobanken-Symposium 2025

Berlin, 22.09.2025 - 23.09.2025

https://doi.org/10.5281/zenodo.17160126

Wofür steht FAIR

Auffindbarkeit *(**F**indable)*:

Globale Persistente Identifier (PID)
Metadaten Verlinkung und Indexierung

Zugänglichkeit *(**A**ccessible)*:

Standardisierte Kommunikationsprotokolle zum Datenabruf, Authentifizierung und Rechtemanagement.

Interoperabilität *(**I**nteroperable)*:

Standardisierte zugängliche Sprache
Maschinenlesbarkeit

Wiederverwendbarkeit *(**R**e-usable)*:

Eindeutige Lizenz zur Datennutzung
Provenance
Erfüllung domänenspezifischer Standards

Definition of FAIR data, National Library of Medicine
https://www.nlm.nih.gov/

Wofür steht FAIR nicht?

- FAIR ≠ Standard
- FAIR ≠ Schema Dogmatismus
- FAIR ≠ Human-Readable
- FAIR ≠ Open Data
- FAIR ≠ Domänen spezifisch

FAIR - Vorteile

- **Findable**

  Domänen- und Regionsübergreifende Forschung

- **Accessible**

  Klare Zugriffsanforderungen und Lizenzen

- **Interoperable**

  Einheitliche Datenauswertung statt “Data Wrangling”

- **Reusable**

  Neue Erkenntnisse statt Datenredundanz

Roche DG, Kruuk LEB, Lanfear R, Binning SA (2015) Public Data Archiving in Ecology and Evolution: How Well Are We Doing?. PLOS Biology 13(11): e1002295., Figure 1 https://doi.org/10.1371/journal.pbio.1002295

Kosten nicht FAIRer Daten

- **10.2 Milliarden Kosten**

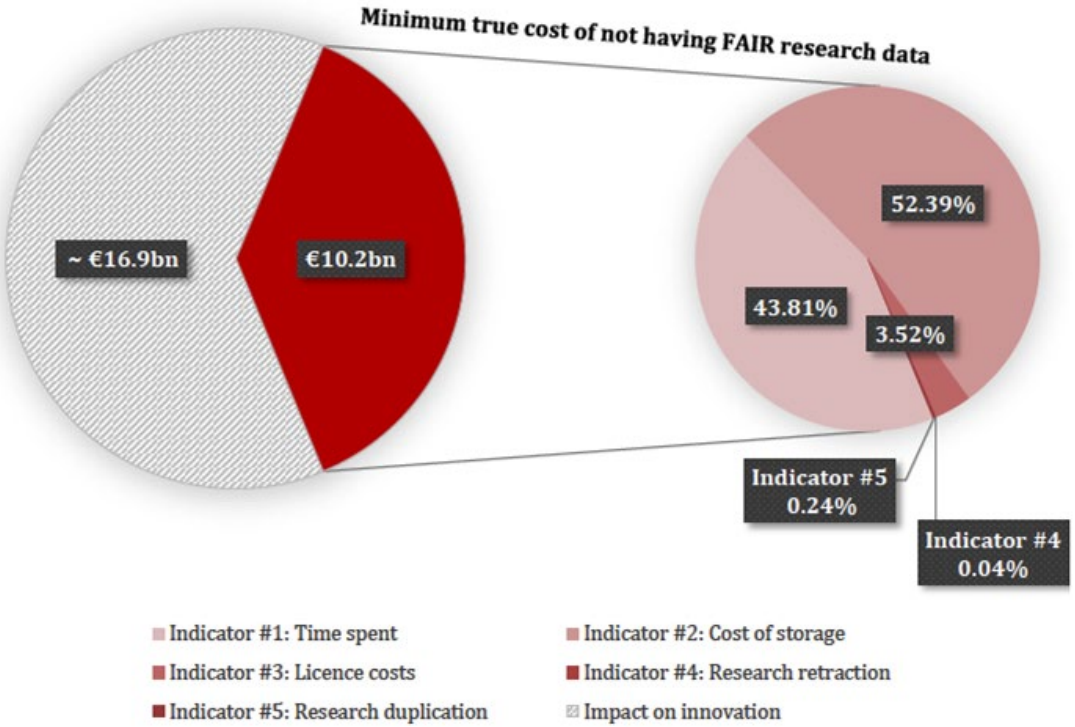
  Zeitverlust → ~ 4.45 Mrd €

  Redundante Speicherung → ~ 5.33Mrd €

- **Hohe Dunkelziffer:**

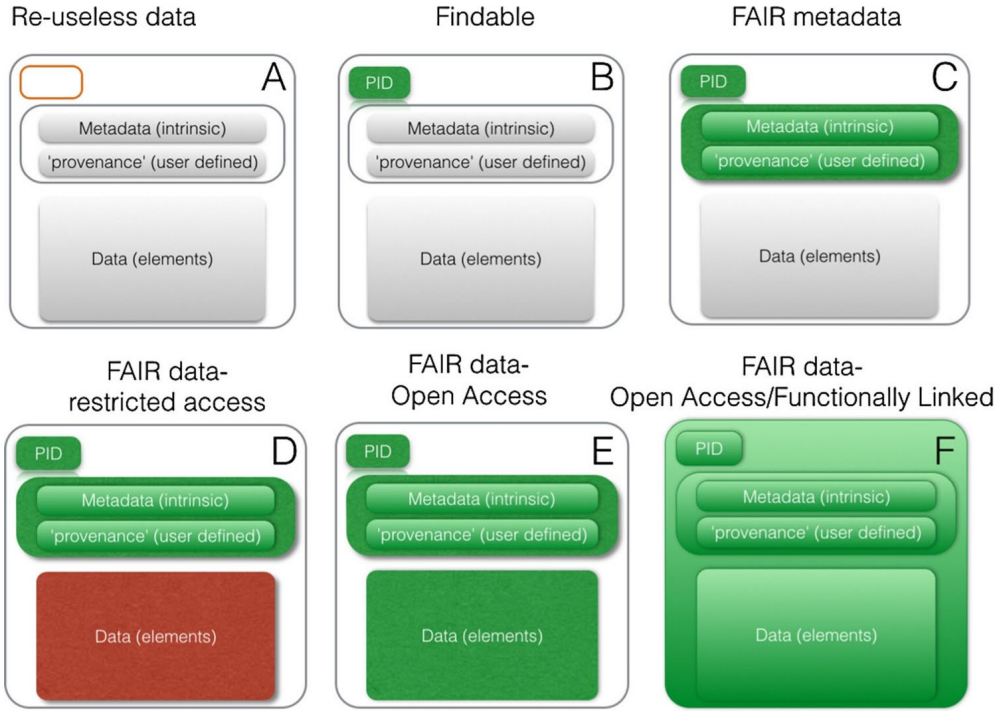
  Domänenübergreifender Austausch

  Wirtschaftliches Potenzial



Europäische Kommission, Generaldirektion Forschung und Innovation und PwC EU Services, Cost-benefit analysis for FAIR research data : cost of not having FAIR research data, Publications Office, 2018, https://data.europa.eu/doi/10.2777/02999. Figure 5: Cost breakdown.

FAIR Spektrum



Adapted from Mons B, Neylon C, Velterop J, Dumontier M, da Silva Santos LOB, Wilkinson MD. Cloudy, increasingly FAIR; revisiting the FAIR Data guiding principles for the European Open Science Cloud.
Information Services and Use. 2017;37(1):49-56. doi:10.3233/ISU-170824. Figure 1.

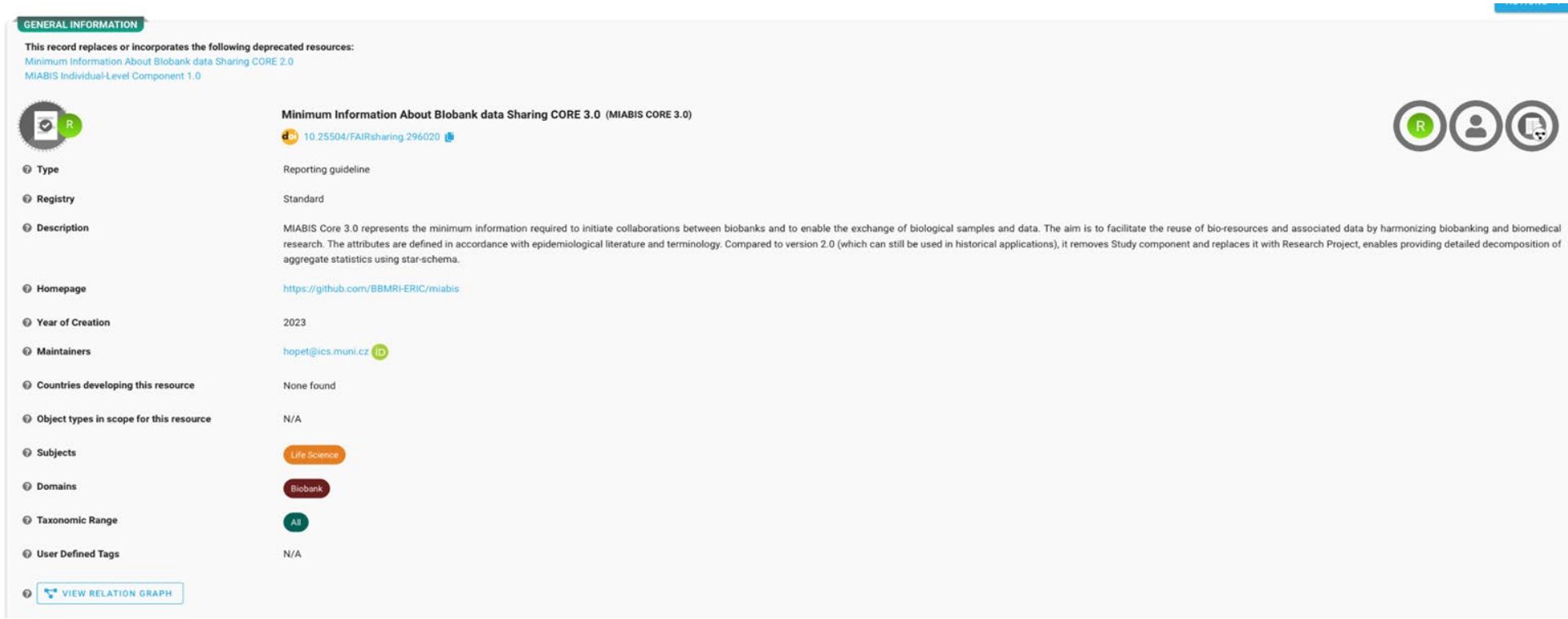
Daten FAIR-ifizierung

- **Domänenspezifische Standards, Richtlinien und Datenbanken:**

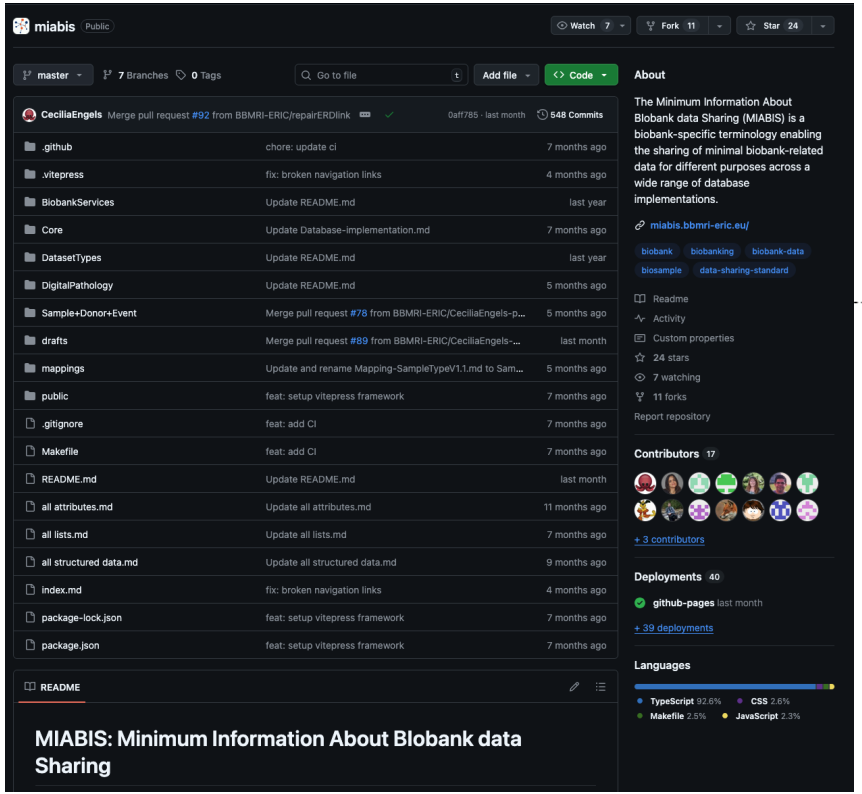
Kurierte Ressource zum Auffinden von Polices,
Organisationen, Datenbanken,
Daten und Metadaten Standards

- 28 Einträge zum Thema Biobanking (19:12, 20.09.2025)

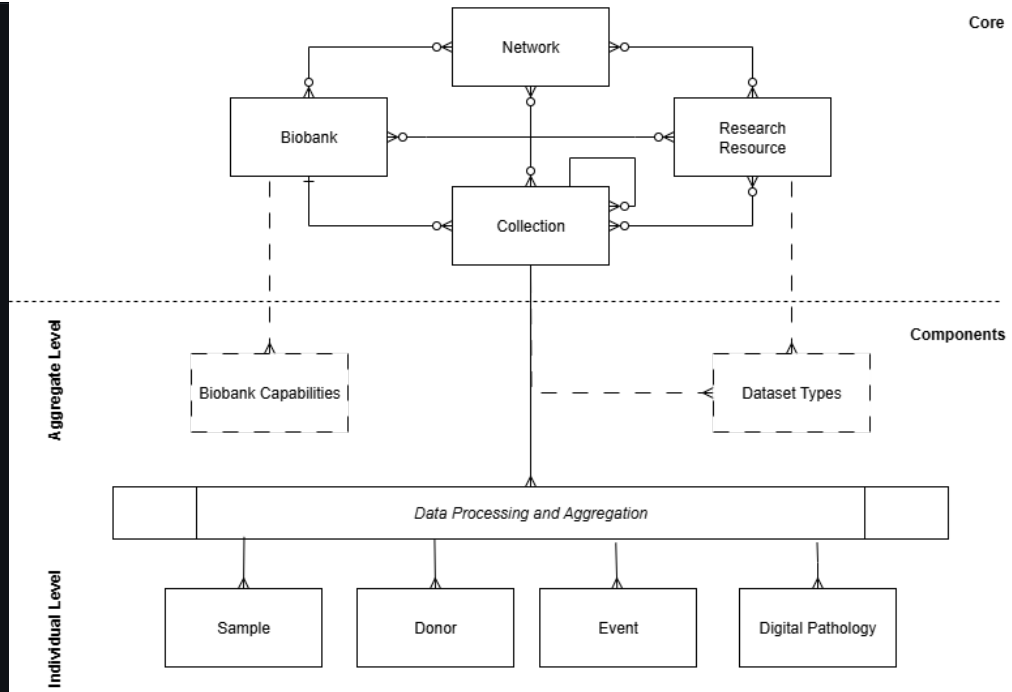
z.B. ***MIABIS, ISO 20387:2018*** etc.



FAIRsharing.org: MIABIS CORE 3.0; Minimum Information About Biobank data Sharing CORE 3.0,
DOI: 10.25504/FAIRsharing.296020, **Last Edited:** Tuesday, March 25th 2025, 14:15, **Last Editor:**delphinedauga,
Last Accessed: Saturday, September 20th 2025, 19:05, **Last Reviewed:** Tuesday, March 25th 2025, 14:15



https://github.com/BBMRI-ERIC/miabis, accessed 20.09.2025



https://github.com/BBMRI-ERIC/miabis/blob/master/drafts/assets/2025%20ERD%20MIABIS%20general.png, accessed 20.09.2025

Daten FAIR-ifizierung

- Vergleich der (Meta)-daten

  RDA Indikatoren

- Best Practices Beispiele zum FHIR Datenstandard:

  FHIR for FAIR
  MIABIS for FHIR

Ziel: FAIR Konformität (Meta)-Daten

10.3 **FAIR Data Maturity Indicators and priority**

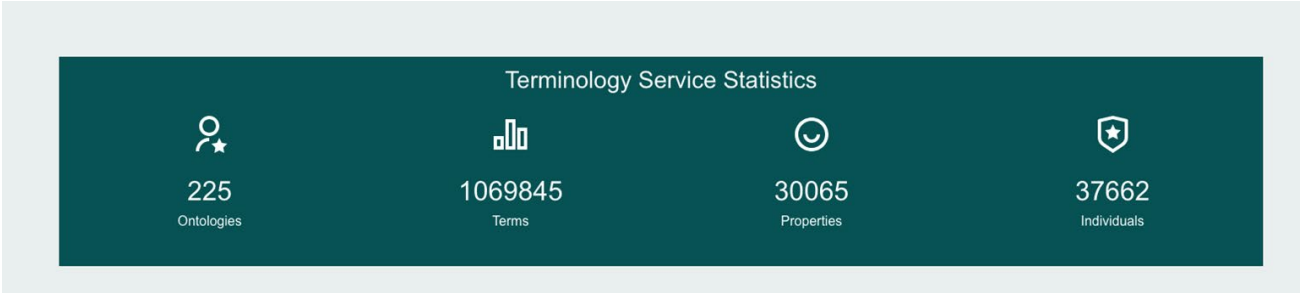
	PRINCIPLE	INDICATOR_ID	FAIR DATA MATURITY INDICATOR	PRIORITY
F	F1	RDA-F1-01M	Metadata is identified by a persistent identifier	Essential
	F1	RDA-F1-01D	Data is identified by a persistent identifier	Essential
	F1	RDA-F1-02M	Metadata is identified by a globally unique identifier	Essential
	F1	RDA-F1-02D	Data is identified by a globally unique identifier	Essential
	F2	RDA-F2-01M	Rich metadata is provided to allow discovery	Essential
	F3	RDA-F3-01M	Metadata includes the identifier for the data	Essential
	F4	RDA-F4-01M	Metadata is offered in such a way that it can be harvested and indexed	Essential
A	A1	RDA-A1-01M	Metadata contains information to enable the user to get access to the data	Important
	A1	RDA-A1-02M	Metadata can be accessed manually (i.e. with human intervention)	Essential
	A1	RDA-A1-02D	Data can be accessed manually (i.e. with human intervention)	Essential
	A1	RDA-A1-03M	Metadata identifier resolves to a metadata record	Essential
	A1	RDA-A1-03D	Data identifier resolves to a digital object	Essential
	A1	RDA-A1-04M	Metadata is accessed through standardised protocol	Essential
	A1	RDA-A1-04D	Data is accessible through standardised protocol	Essential
	A1	RDA-A1-05D	Data can be accessed automatically (i.e. by a computer program)	Important
	A1.1	RDA-A1.1-01M	Metadata is accessible through a free access protocol	Essential
	A1.1	RDA-A1.1-01D	Data is accessible through a free access protocol	Important
	A1.2	RDA-A1.2-01D	Data is accessible through an access protocol that supports authentication and authorisation	Useful
	A2	RDA-A2-01M	Metadata is guaranteed to remain available after data is no longer available	Essential
I	I1	RDA-I1-01M	Metadata uses knowledge representation expressed in standardised format	Important
	I1	RDA-I1-01D	Data uses knowledge representation expressed in standardised format	Important
	I1	RDA-I1-02M	Metadata uses machine-understandable knowledge representation	Important
	I1	RDA-I1-02D	Data uses machine-understandable knowledge representation	Important
	I2	RDA-I2-01M	Metadata uses FAIR-compliant vocabularies	Important
	I2	RDA-I2-01D	Data uses FAIR-compliant vocabularies	Useful
	I3	RDA-I3-01M	Metadata includes references to other metadata	Important
	I3	RDA-I3-01D	Data includes references to other data	Useful
	I3	RDA-I3-02M	Metadata includes references to other data	Useful
	I3	RDA-I3-02D	Data includes qualified references to other data	Useful
	I3	RDA-I3-03M	Metadata includes qualified references to other metadata	Important
	I3	RDA-I3-04M	Metadata include qualified references to other data	Useful
R	R1	RDA-R1-01M	Plurality of accurate and relevant attributes are provided to allow reuse	Essential
	R1.1	RDA-R1.1-01M	Metadata includes information about the licence under which the data can be reused	Essential
	R1.1	RDA-R1.1-02M	Metadata refers to a standard reuse licence	Important
	R1.1	RDA-R1.1-03M	Metadata refers to a machine-understandable reuse licence	Important
	R1.2	RDA-R1.2-01M	Metadata includes provenance information according to community-specific standards	Important
	R1.2	RDA-R1.2-02M	Metadata includes provenance information according to a cross-community language	Useful
	R1.3	RDA-R1.3-01M	Metadata complies with a community standard	Essential
	R1.3	RDA-R1.3-01D	Data complies with a community standard	Essential
	R1.3	RDA-R1.3-02M	Metadata is expressed in compliance with a machine-understandable community standard	Essential
	R1.3	RDA-R1.3-02D	Data is expressed in compliance with a machine-understandable community standard	Important

MIABIS on FHIR Implementation Guide, 1.0.0, RDA Indicators Figure 10.3 https://build.fhir.org/ig/HL7/fhir-for-fair/RDAMetrics.html, accessed 21.09.2025

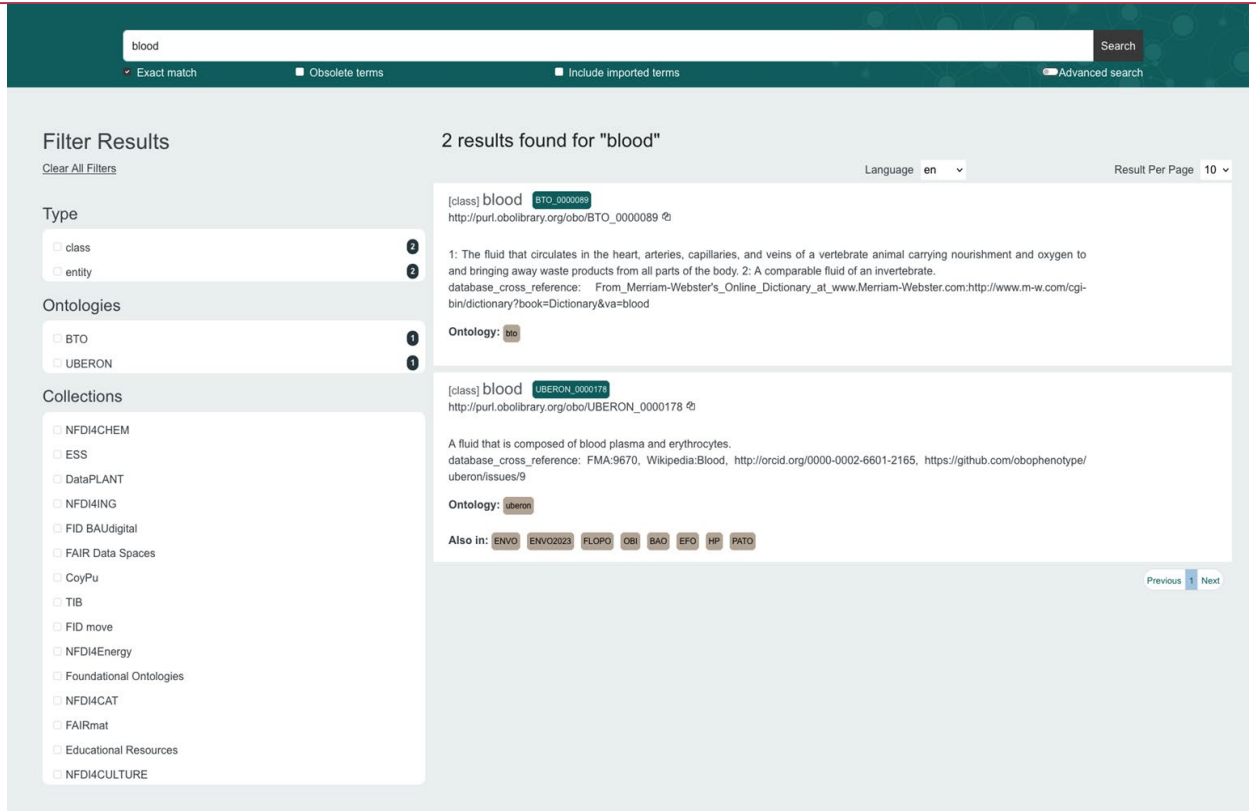
Domänenspezifisch - Ontologien

- Einheitliches Domänenspezifisches Vokabular
- Maschinlesbarkeit
- **TIB Terminology Service**

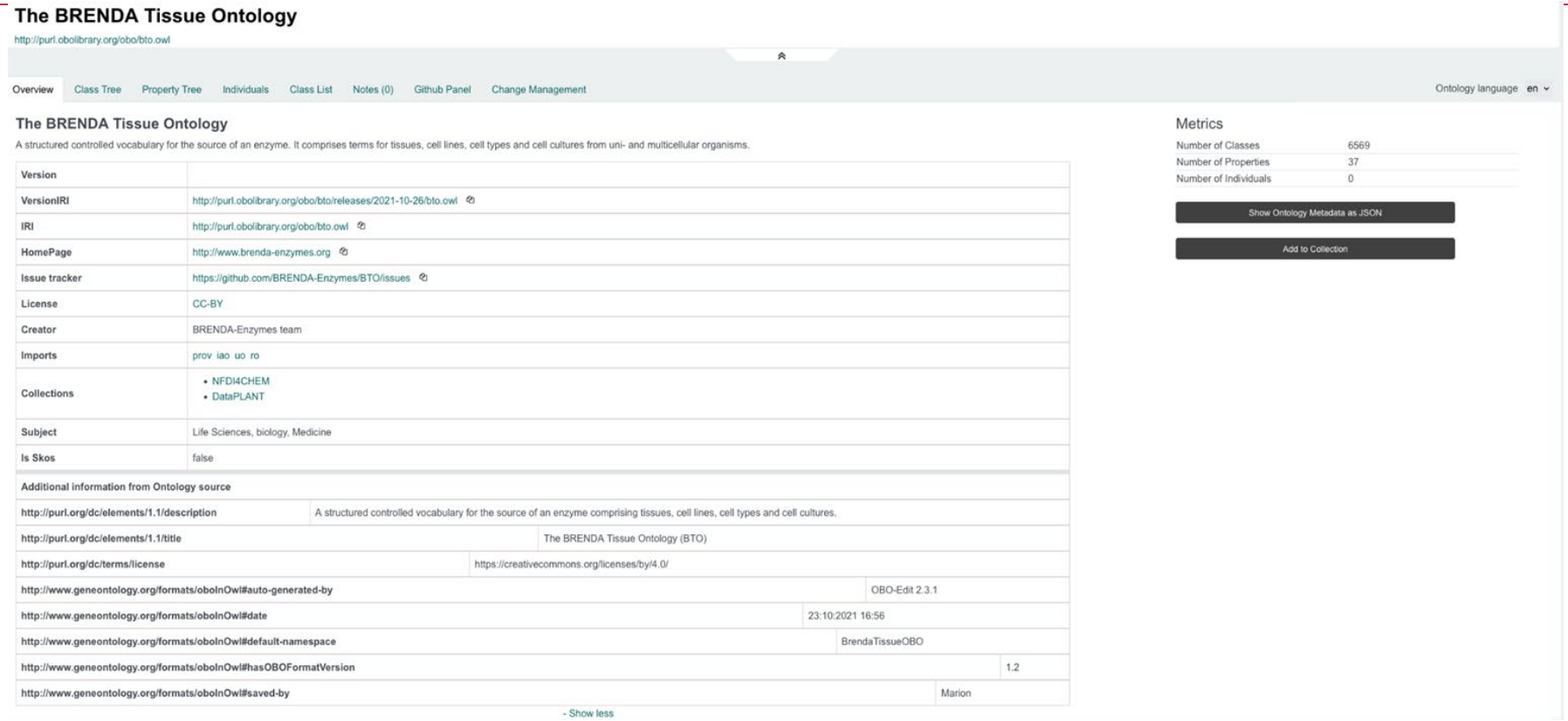
TIB LEIBNIZ-INFORMATIONSZENTRUM TECHNIK UND NATURWISSENSCHAFTEN UNIVERSITÄTSBIBLIOTHEK



Terminology Service Statistics". Technische Informationsbibliothek (TIB), 2025. https://terminology.tib.eu/ts.



Terminology Service Search". Technische Informationsbibliothek (TIB), 2025. https://terminology.tib.eu/ts/search?q=blood&page=1&exact=true, accessed 20.09.2025



The BRENDA Tissue Ontology

http://purl.obolibrary.org/obo/bto.owl

Overview | Class Tree | Property Tree | Individuals | Class List | Notes (0) | Github Panel | Change Management | Ontology language en

The BRENDA Tissue Ontology

A structured controlled vocabulary for the source of an enzyme. It comprises terms for tissues, cell lines, cell types and cell cultures from uni- and multicellular organisms.

Version	
VersionIRI	http://purl.obolibrary.org/obo/bto/releases/2021-10-26/bto.owl
IRI	http://purl.obolibrary.org/obo/bto.owl
HomePage	http://www.brenda-enzymes.org
Issue tracker	https://github.com/BRENDA-Enzymes/BTO/issues
License	CC-BY
Creator	BRENDA-Enzymes team
Imports	prov iao uo ro
Collections	• NFDI4CHEM • DataPLANT
Subject	Life Sciences, biology, Medicine
Is Skos	false

Additional information from Ontology source	
http://purl.org/dc/elements/1.1/description	A structured controlled vocabulary for the source of an enzyme comprising tissues, cell lines, cell types and cell cultures.
http://purl.org/dc/elements/1.1/title	The BRENDA Tissue Ontology (BTO)
http://purl.org/dc/terms/license	https://creativecommons.org/licenses/by/4.0/
http://www.geneontology.org/formats/oboInOwl#auto-generated-by	OBO-Edit 2.3.1
http://www.geneontology.org/formats/oboInOwl#date	23:10:2021 16:56
http://www.geneontology.org/formats/oboInOwl#default-namespace	BrendaTissueOBO
http://www.geneontology.org/formats/oboInOwl#hasOBOFormatVersion	1.2
http://www.geneontology.org/formats/oboInOwl#saved-by	Marion

- Show less

Metrics

Number of Classes	6569
Number of Properties	37
Number of Individuals	0

Show Ontology Metadata as JSON

Add to Collection

Terminology Service Statistics". Technische Informationsbibliothek (TIB), 2025. https://terminology.tib.eu/ts., accessed 20.09.2025

Universell - Personen & Organisationen

Domänenübergreifend:

ORCID = **O**pen **R**esearcher and **C**ontributor **ID**

ROR = **R**esearch **O**rganization **R**egistry

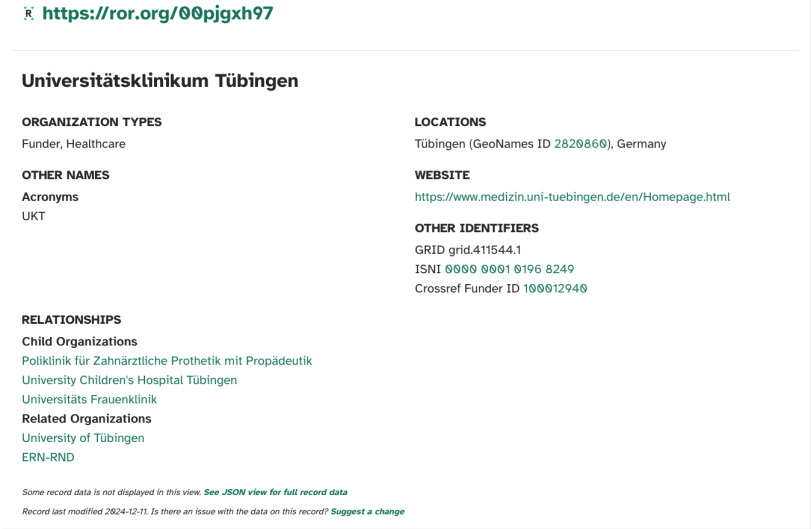
ORCID Repository

- 16-stellige Zeichenkombination in URI

- PIds und Metadaten > 2490000 Einträgen
- Creative Commons(CC) 0 Lizenz
- REST API & Sandbox Instance

Research Organisation Registry ROR

- 7-stellige Zeichenkombination in URI
- PIds und Metadaten > 116000 Organisationen
- Creative Commons(CC) 0 Lizenz
- REST API



https://ror.org/00pjgxh97

Universitätsklinikum Tübingen

ORGANIZATION TYPES
Funder, Healthcare

OTHER NAMES
Acronyms
UKT

LOCATIONS
Tübingen (GeoNames ID 2820860), Germany

WEBSITE
https://www.medizin.uni-tuebingen.de/en/Homepage.html

OTHER IDENTIFIERS
GRID grid.411544.1
ISNI 0000 0001 0196 8249
Crossref Funder ID 100012940

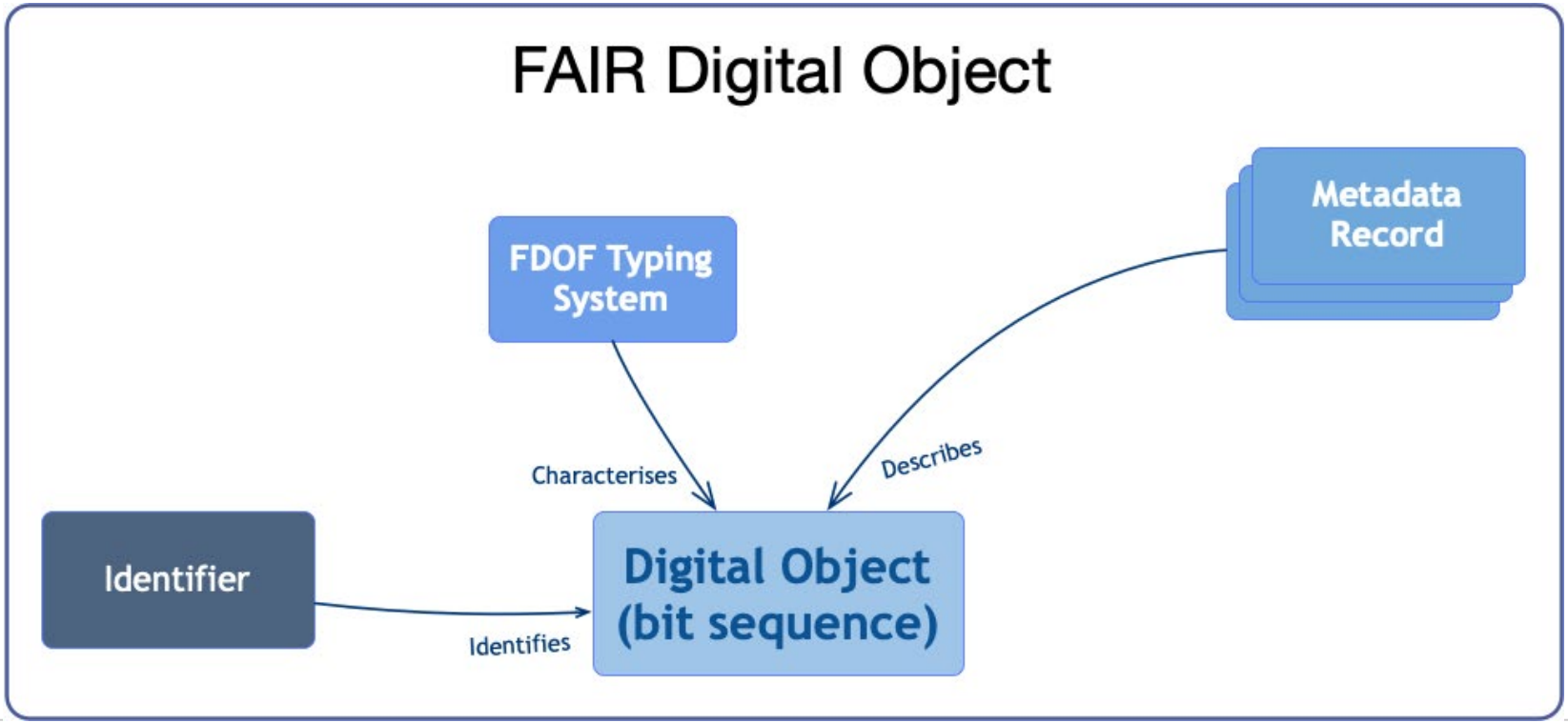
RELATIONSHIPS
Child Organizations
Poliklinik für Zahnärztliche Prothetik mit Propädeutik
University Children's Hospital Tübingen
Universitäts Frauenklinik
Related Organizations
University of Tübingen
ERN-RND

Some record data is not displayed in this view. See JSON view for full record data

Record last modified 2024-12-11. Is there an issue with the data on this record? Suggest a change

Query Result UKT Tübingen, Research Organization Registry (RoR), 2025. https://ror.org/, accessed 20.09.2025

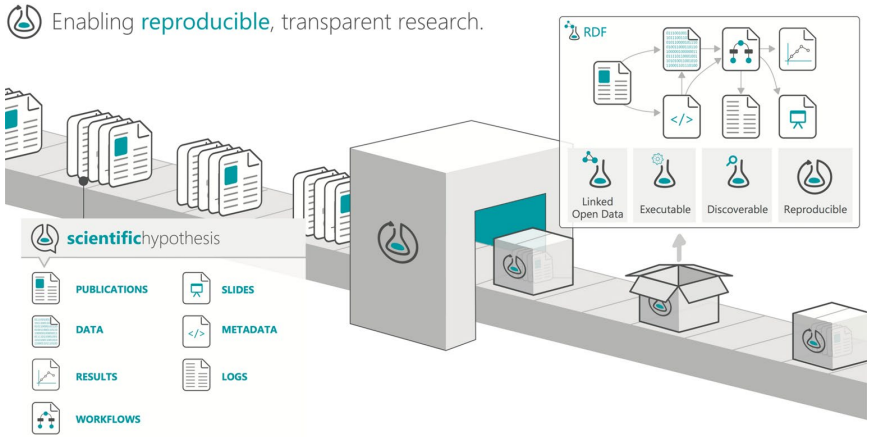
FAIR Digital Objects



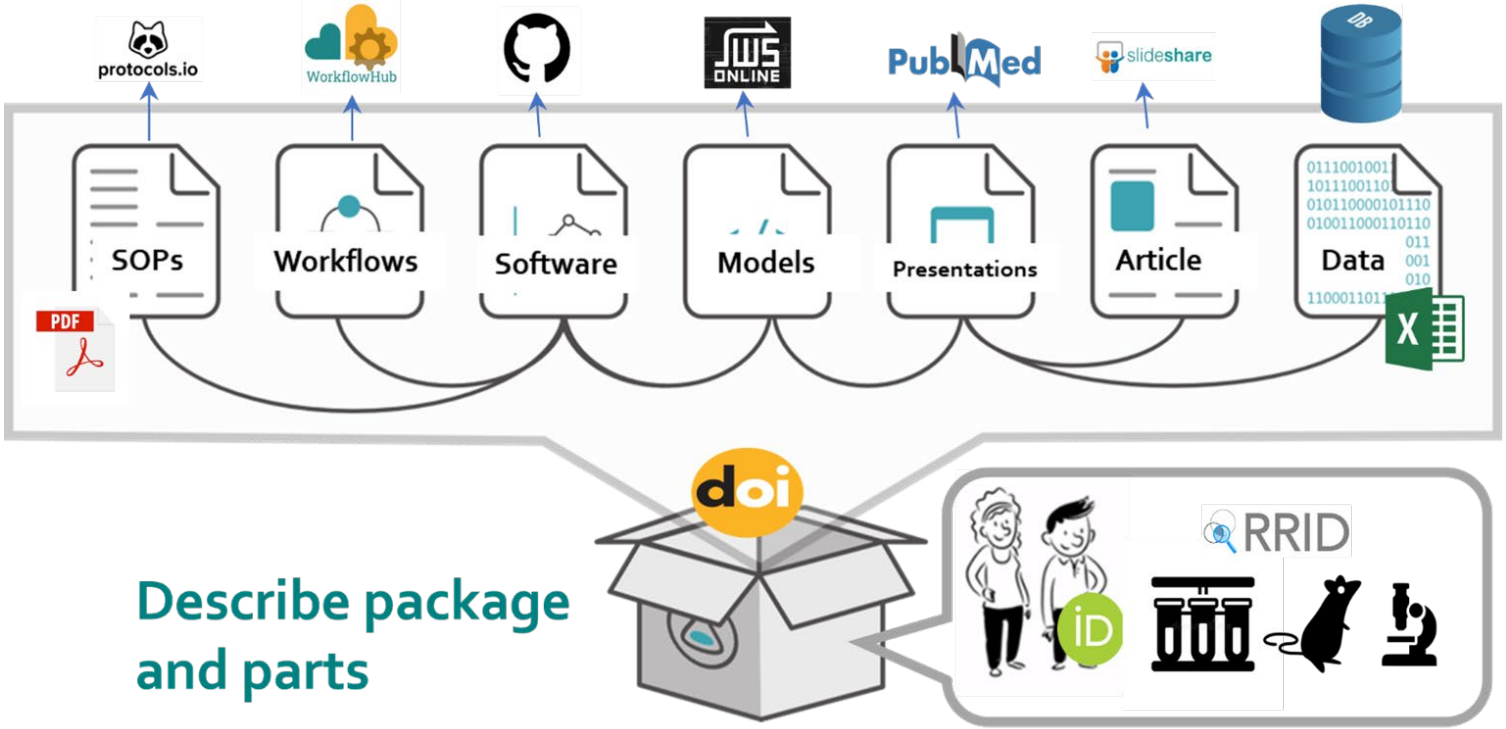
Research Object Crate

RO-Crate

- Verknüpfung von Forschungsdaten mit:
  - Rohdaten und Sekundärdaten
  - Workflows/Skripte
  - Präsentationen
  - Laborbücher (ELN-LIMS)
  - ...
- Basierend auf JSON-LD und Schema.org Notation
- Ermöglichen spezifische Profile :
  Workflow RO-Crate



"Enabling reproducible, transparent research." researchobject.org. 2025. https://www.researchobject.org/images/research-objects-illustration.png, accessed 20.09.2025



Goble, C. (2024, Februar 16). FAIR Digital Research Objects: Metadata Journeys. University of Auckland Seminar, Auckland. Zenodo. https://doi.org/10.5281/zenodo.10710142, Accessed 21.09.2025

Impulse zur FAIR-ification medizinischer Datensätze

- Wiederverwendung bestehender Datensätze statt Neu Messungen

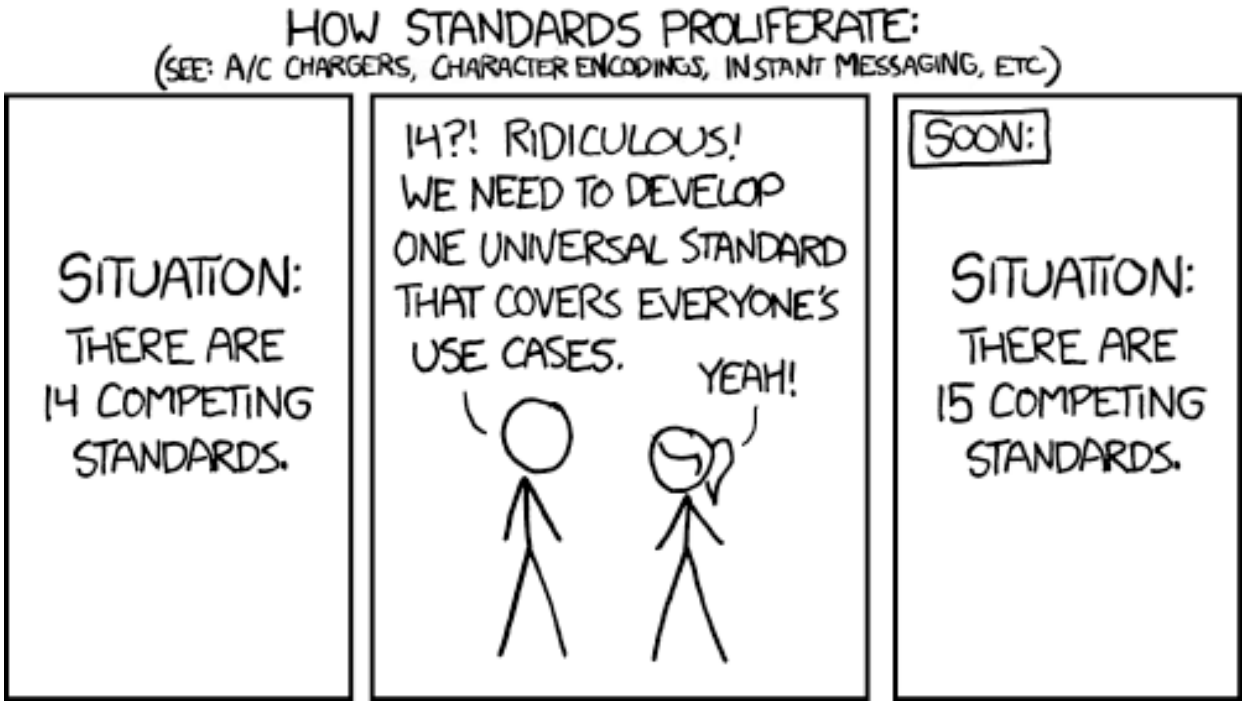
  Kollaboration mit nicht akademischen Partnern → FAIR Data Space

  Einführung und Harmonisierung FAIR Compliant Standards → FDOs

- Gezielte Förderung von FDOs als Projektergebnis statt Publikationen

  Forschungssoftware, Data Stewardship

CoARA
Coalition for Advancing
Research Assessment



Danke für eure Aufmerksamkeit!