



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

tu data

# USING SHACL SHAPES TO CREATE SEMANTIC (META)DATA

# BACKGROUND

TU data

Subject-specific research data management requires subject-specific metadata

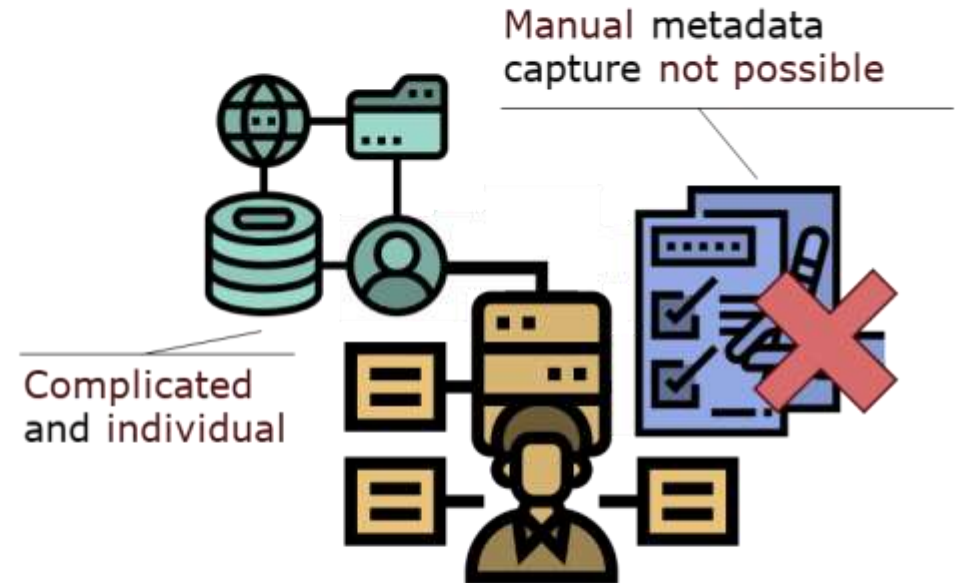


**Generic metadata**  
standardised and available

**Research data** are  
heterogeneous and often  
consist of large amounts of  
data.



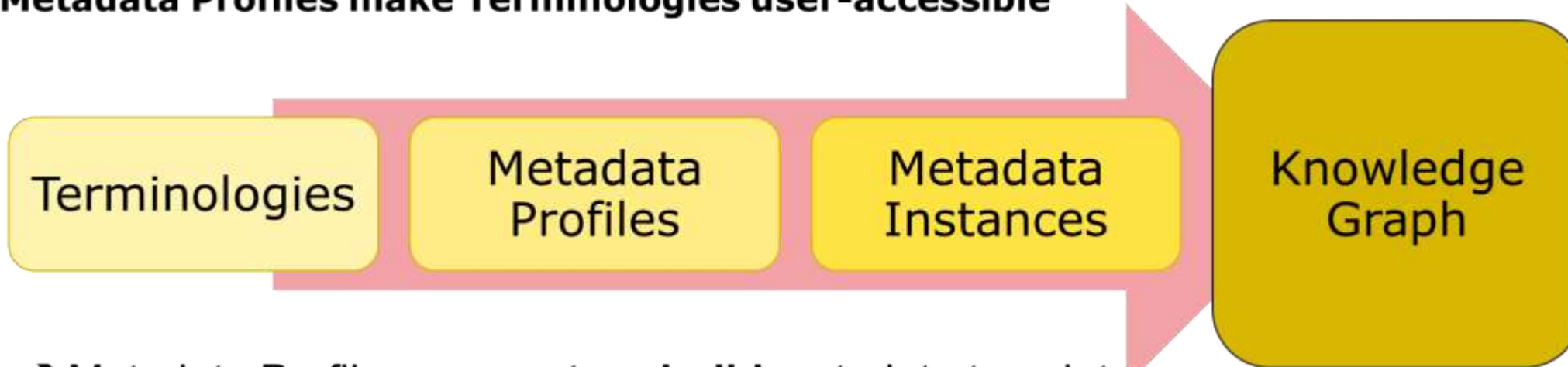
**Subject-specific metadata**  
undocumented, inconsistent



**Documentation** must be **flexible** and  
**machine-readable**. **Metadata schema**  
should be reusable and interoperable.

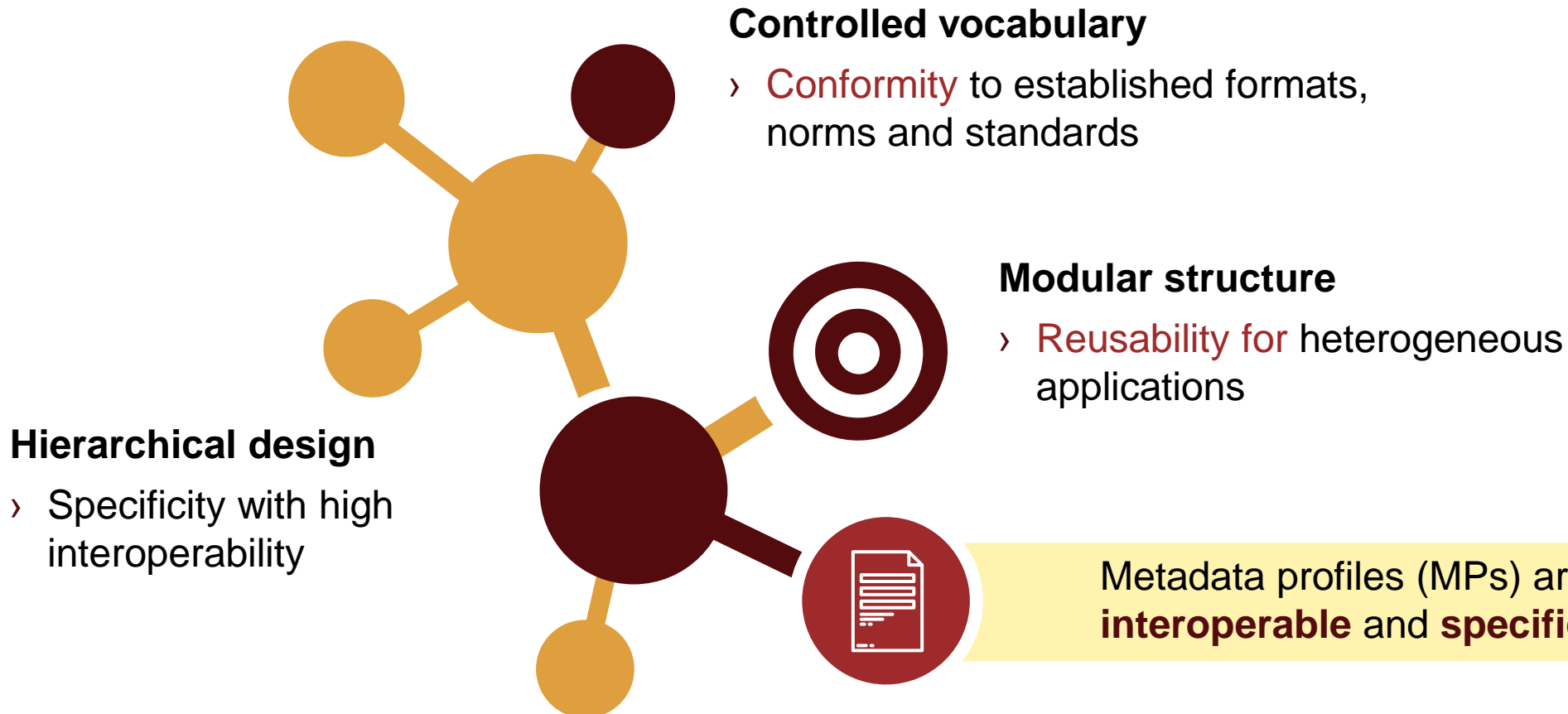
# BACKGROUND

Metadata Profiles make Terminologies user-accessible



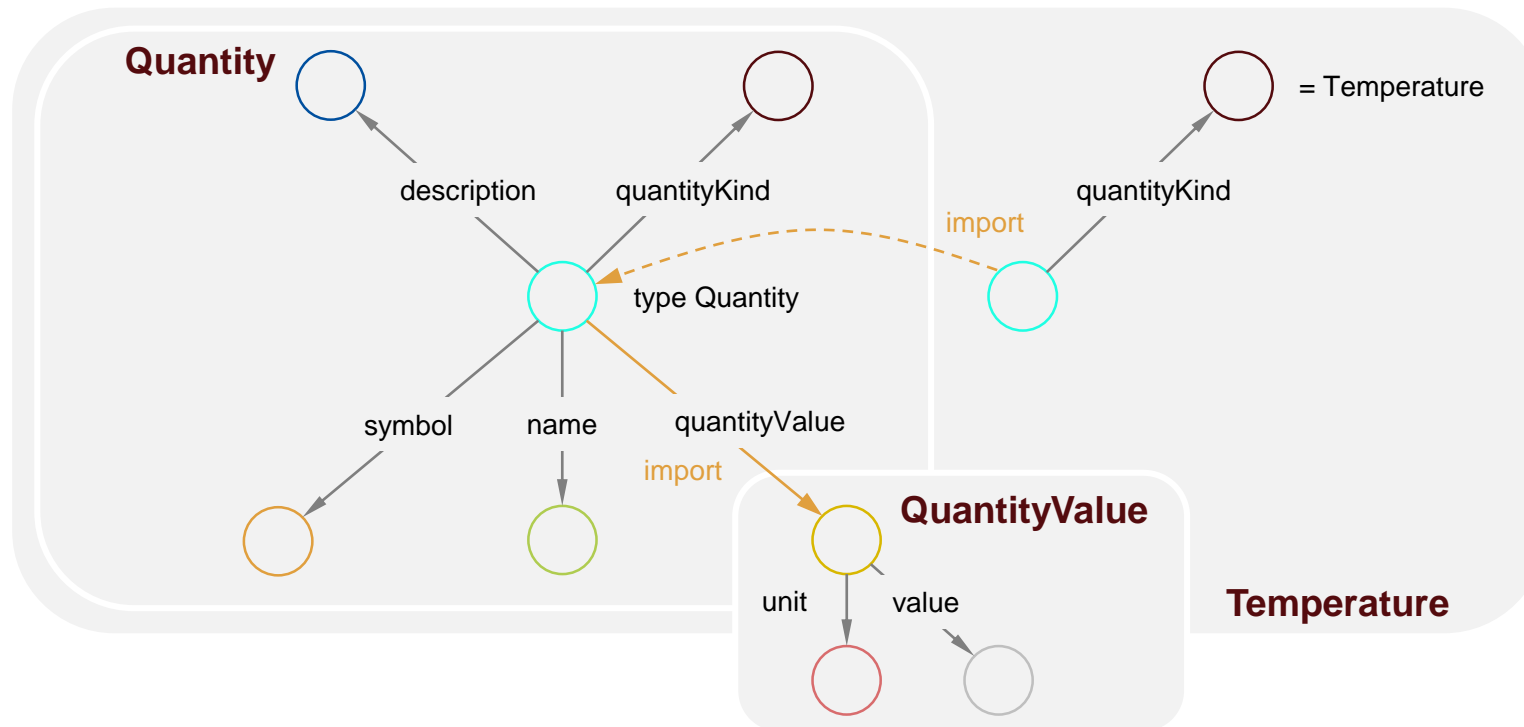
- Metadata Profiles are **custom-build** metadata templates
- Controlled **semantic terms** as building blocks
- **Validatable** (SHACL shapes)
- Make data **consistent**, **machine-actionable** and **interoperable**
- Crystallization of **quasi-standards** (e.g. for projects or working groups)
- Technical realization: **SHACL** Shapes (W3C recommendation)

# DESIGN STRATEGY





# EXAMPLE PROFILE



# METADATA PROFILE SERVICE



- Developed as collaboration between researchers and infrastructure providers (TU Darmstadt and RWTH Aachen University)
- Available as NFDI4Ing Service: <https://profiles.nfdi4ing.de>
- Functions:
  - Creation and curation of semantic metadata profiles (SHACL shapes)
  - Sharing and reuse of metadata profiles
  - GUI supporting combining terms from existing ontologies
  - Validation, upload and discovery of RDF metadata

# SHACL FORM GENERATOR

- Demo available at <https://ulb-darmstadt.github.io/shacl-form/#intro>
- HTML5 web component for editing/viewing RDF data based on SHACL shapes
- Uses SHACL shapes to
  - generate forms for entering and manipulating RDF data
  - view RDF Data

# RDF STORE

- Source code at <https://gitlab.ulb.tu-darmstadt.de/rokit>
- Dockerized application combining a triple store with an SHACL-Form based entry and exploration GUI
  - Demo at <https://budibase-test.ulb.tu-darmstadt.de/rdf-store/> (currently only open to TUDa network)
- Uses SHACL shapes to
  - generate forms for entering and manipulating RDF data
  - view RDF Data
  - store and browse RDF Data



# NFDI4ING DATA INGEST SERVICE

- Available at <https://ingest.nfdi4ing.de/>
- Current focus on architecture and civil engineering, but discipline-agnostic approach
- Data repository with metadata based on SHACL Shapes
- Makes use of SHACL Form Generator and Metadata Profile Service
- Extracts metadata from known data formats
- Display and preview functions for 3d models
- Supports AI-based feature detection and metadata generation

# CSV RDF MAPPER

- Demo available at <https://ulb-darmstadt.github.io/csv-rdf-mapper/>
- Supported workflow:
  - Upload SHACL Shape(s)
  - Upload CSV Files
  - Map CSV-Columns to RDF attributes
  - Convert data to RDF
- Proof-of-concept, supposed to be developed into a full-fledged RDM pipeline in the future