eosc | EVERSE

Research Software Quality

An overview of indicators, dimensions and assessment tools in the EVERSE project

Funded by
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15 | 04 | 2025 by Daniel Garijo

Background: Research Software Quality

EVERSE Objective #1: Build a collaborative, community-led structure for **evaluating, verifying, and improving the quality of research software and code**, by actively involving researchers, software developers, and other stakeholders in the research community.

- **Lots of work done in Software Quality! Including**
  - ISO standards
  - EOSC Task force on Infrastructures for Quality Research Software
  - Elixir biohackathon on software quality indicators
  - Best practices for research software (Carpentries, Community Health Analytics in Open Source Software, OpenSSF Best Practices Badge Program, etc.)

The EVERSE framework for RS quality

A top-down view

RS quality dimension

Dimensions “represent **criteria relevant for assessing quality**. Each **quality dimension must have one or more indicator to measure it.** “ inspired by W3C Data Quality Vocabulary (https://www.w3.org/TR/vocab-dqv/#dqv:Dimension)

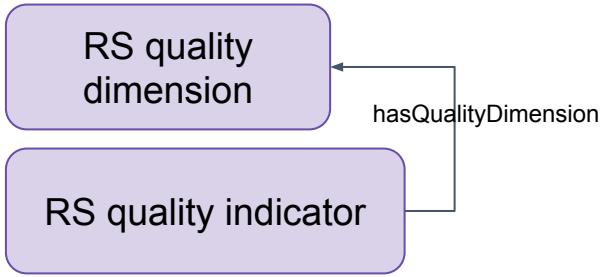
Dimensions may be defined in **a hierarchy.**

Example of a dimension:

- Reliability: “Degree to which a system, product or component performs specified functions under specified conditions for a specified period of time.” (https://iso25000.com/index.php/en/iso-25000-standards/iso-25010?start=5
- F4. Metadata are FAIR, searchable and indexable. (https://doi.org/10.15497/RDA00068)

The EVERSE framework for RS quality

A top-down view



A software quality indicator represents a specific aspect of software quality **that can be measured** (e.g., FAIRness, test coverage, documentation coverage, etc.)" (from https://w3id.org/everse/rsqi#)

- This definition is inspired by the W3C Data Quality Vocabulary, where a "metric" reads as "Represents a standard to measure a quality dimension.

Example of an indicator:

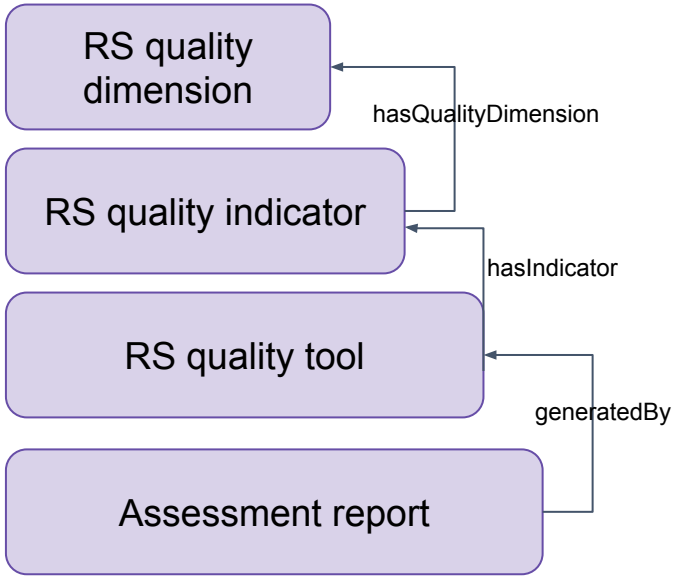
- "A software code repository has a licence in a LICENSE file" (binary value)
- "Percentage of documented functions" (float value)

Not an indicator:

- "Software is described with rich metadata" (without defining what "rich metadata" means)
- "Degree to which a product or system provides accurate results when used by intended users." (too abstract)

The EVERSE framework for RS quality

A top-down view

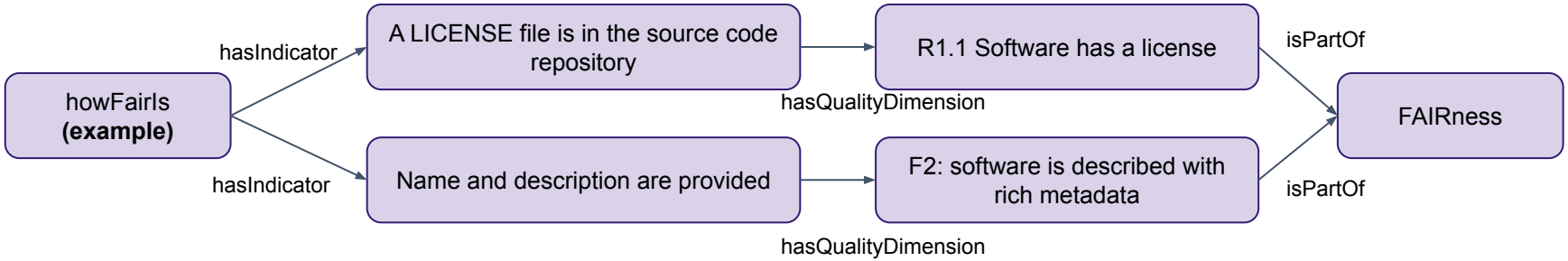


A Research quality tool **measures a set of indicators**, generating a set of **assessment results**

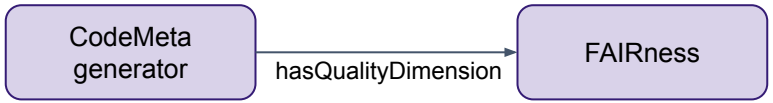
In line with other FAIR assessment projects in EOSC like OSTrails and FAIRCore4EOSC.

From tools to indicators and dimensions

A tool may be used to **calculate an indicator**



Or it may be associated with **a dimension**



Example of an indicator

Indicators are reused from quality assessment tools

We are collecting indicators: https://github.com/EVERSE-ResearchSoftware/indicators

Based on Schema.org

W3C® CodeMeta


```
{
        "@context": "https://w3id.org/everse/rsqi#" ,
        "@id": "https://w3id.org/everse/indicators/license_availability",
        "@type": "SoftwareQualityIndicator",
        "title": "License is available in a README file",
        "description": "This indicators states whether the target repository has a license in a LICENSE file. This is an important for checking the R1 reusability principle in FAIR. As a measurement, the repository URL must be provided. The indicator will return True if a license file is found ",
        "status": "active",
        "identifier": "https://w3id.org/everse/indicators/license_availability",
        "qualityDimension":"https://w3id.org/fair/principles/terms/R1.1",
        "version": "0.0.1"
}
```


Indicators should describe:
What is being measured?
Why should we measure it?
What must be provided for the measurement?
How is the measurement executed?
What is/are considered valid result(s)?

From tools to quality pipelines

Work in progress: first set of indicators

Quality pipelines are being set as GitHub actions

https://github.com/EVERSE-ResearchSoftware/QualityPipelines/issues/1#issuecomment-2786209678

Howfairis

- Description: Checks compliance against the five recommendations from https://fair-software.eu/
- Dimension: FAIRness
- Indicator: hasLicense
- GitHub action: yes

Gitleaks

- Description: Detects leaks in repo
- Dimension: Security
- Indicator: hasSecurityLeak
- GitHub action: yes

CFFconvert

- Description: Converts CITATION.cff file to different formats and do validation of CITATION.cff file
- Dimension: FAIRness
- Indicator: hasCffFile
- GitHub action: yes

Super-linter

- Description: Programming language agnostic linter
- Dimension: Quality
- Indicator: hasLintingIssues
- GitHub action: yes

Different components using the quality framework

Practices

{RSQ}kit

https://everse.software/RSQKit/

Tools

http://everse.software/TechRadar/

Pipelines

https://github.com/EVERSE-ResearchSoftware/DashVERSE

Where to find more information?

EVERSE metadata schemas. Repo: https://github.com/EVERSE-ResearchSoftware/schemas

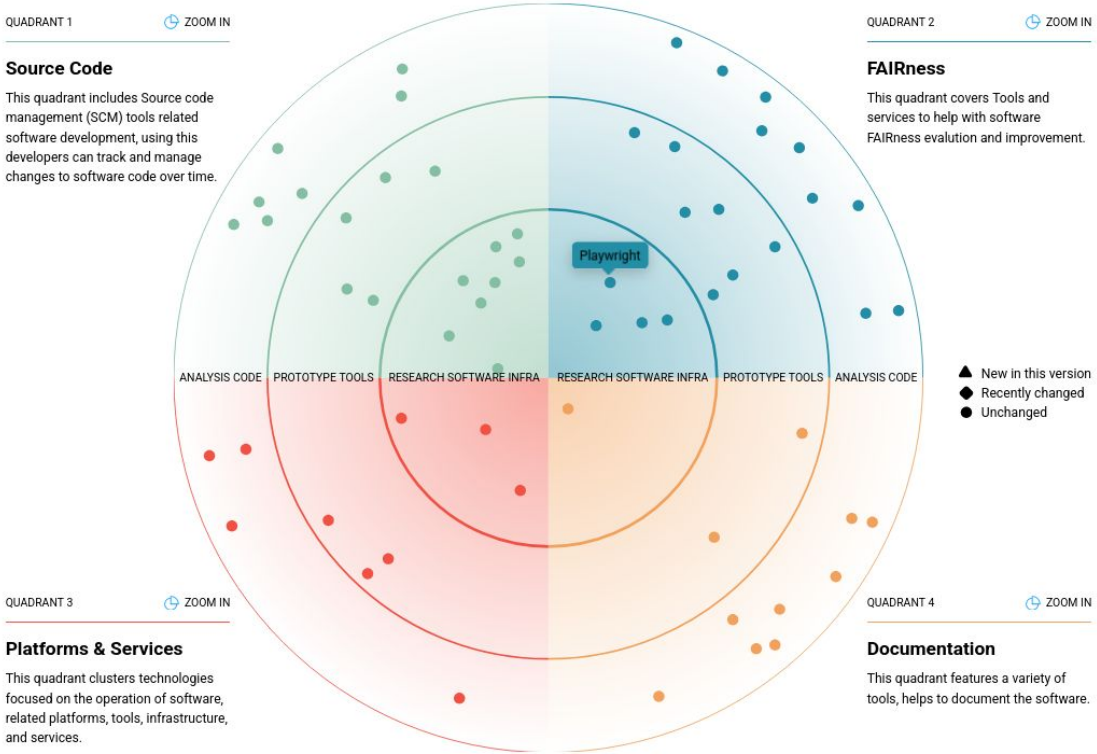
Tools schema: https://w3id.org/everse/rs

Indicator schema: https://w3id.org/everse/rsqi

Dimensions schema: https://w3id.org/everse/rsqd

Quality indicators and dimensions: https://github.com/EVERSE-ResearchSoftware/indicators

Tool Example: techRadar



Software metadata schema in a nutshell

https://w3id.org/everse/rs#

Attribute	Vocabulary term	Expected value
Application category	schema:applicationCategory	rsqd:SoftwareQualityDimension (URL)
Applies to Programming language	rs:appliesToProgrammingLanguage	schema:Text (string)
Author	schema:author	schema:Person or schema:Organization (URL)
Description	schema:description	schema:Text (string)
How to use the tool? (service, CI/CD, etc.)	rs:howToUse	schema:URL (string)
Name of the tool	schema:name	schema:Text (string)
Identifier	schema:identifier	schema:URL (string)
Is accessible for free?	schema:isAccessibleForFree	schema:Text (string)
Quality indicator(s) the tool addresses	rs:hasQualityIndicator	schema:Text (string)
Quality dimension(s) the tool addresses	schema:hasQualityDimension	schema:Text (string)
License	schema:license	schema:License (URL)
Maintainer	codemeta:maintainer	schema:URL (string)
URL	schema:url	schema:URL (string)
Cluster/Community using the tool	rs:usedBy	schema:Text (string)

Extensions based on D3.1 requirements (TechRadar)

Schema.org

CodeMeta