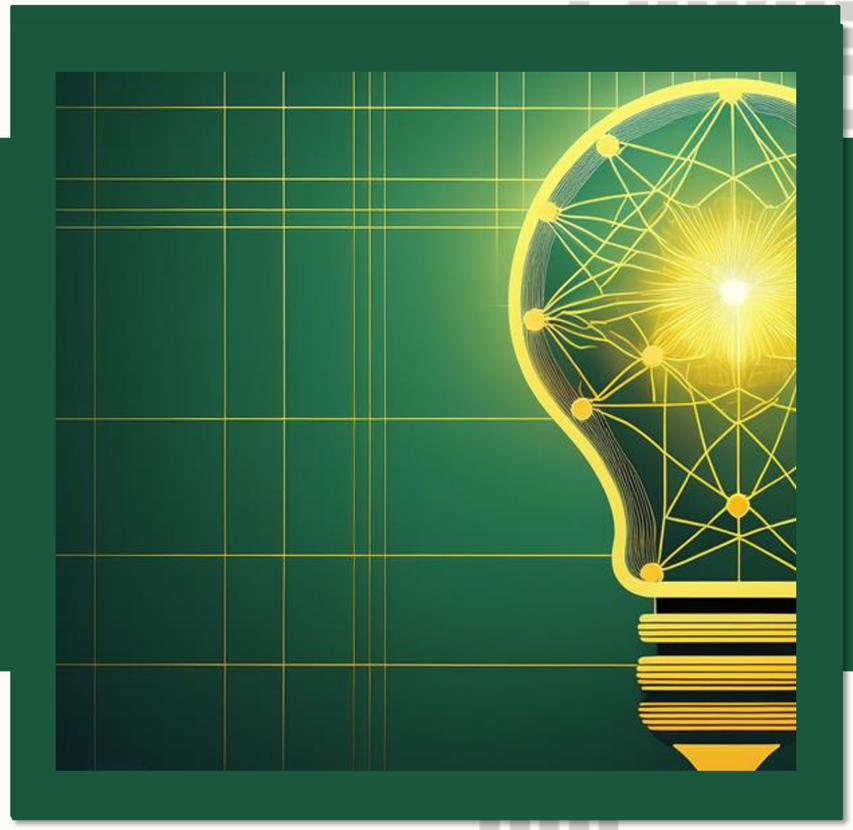
Collaborative Notes: https://docs.google.com/document/d/1s4eBGp1udXQxuRCmYmSN7cvvpmSk9USe
Group webpage: https://www.rd-alliance.org/groups/software-source-code-ig

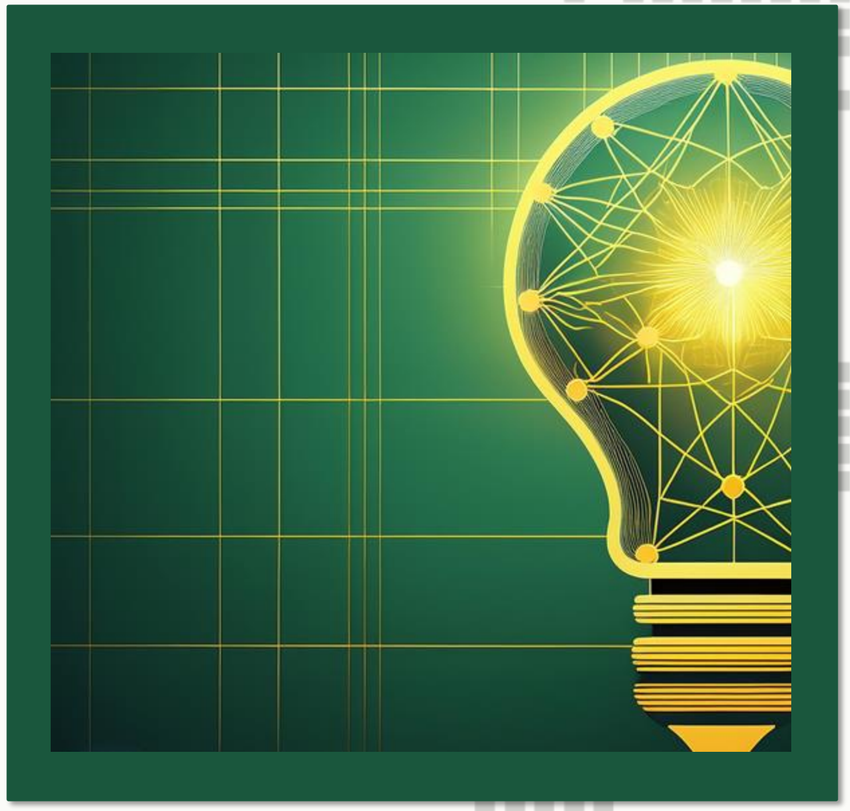


The FAIR Principles for Research Software: three years on

RESEARCH DATA ALLIANCE
24th Plenary Meeting
V I R T U A L
Data for Emerging Technologies

Neil Chue Hong, Julia Collins, Morane Gruenpeter
Software Source Code IG

Welcome new RDA members!



6 Guiding Principles are at the heart of the RDA community

- OPENNESS
- COMMUNITY-DRIVEN
- CONSENSUS
- NON-PROFIT AND TECHNOLOGY-NEUTRAL
- HARMONISATION
- INCLUSIVITY

JOIN THE RDA
https://www.rd-alliance.org/register/

RESEARCH DATA ALLIANCE

RDA 24th (Virtual) Plenary Meeting
7-11 April 2025

research data sharing without barriers

www.rd-alliance.org

Agenda

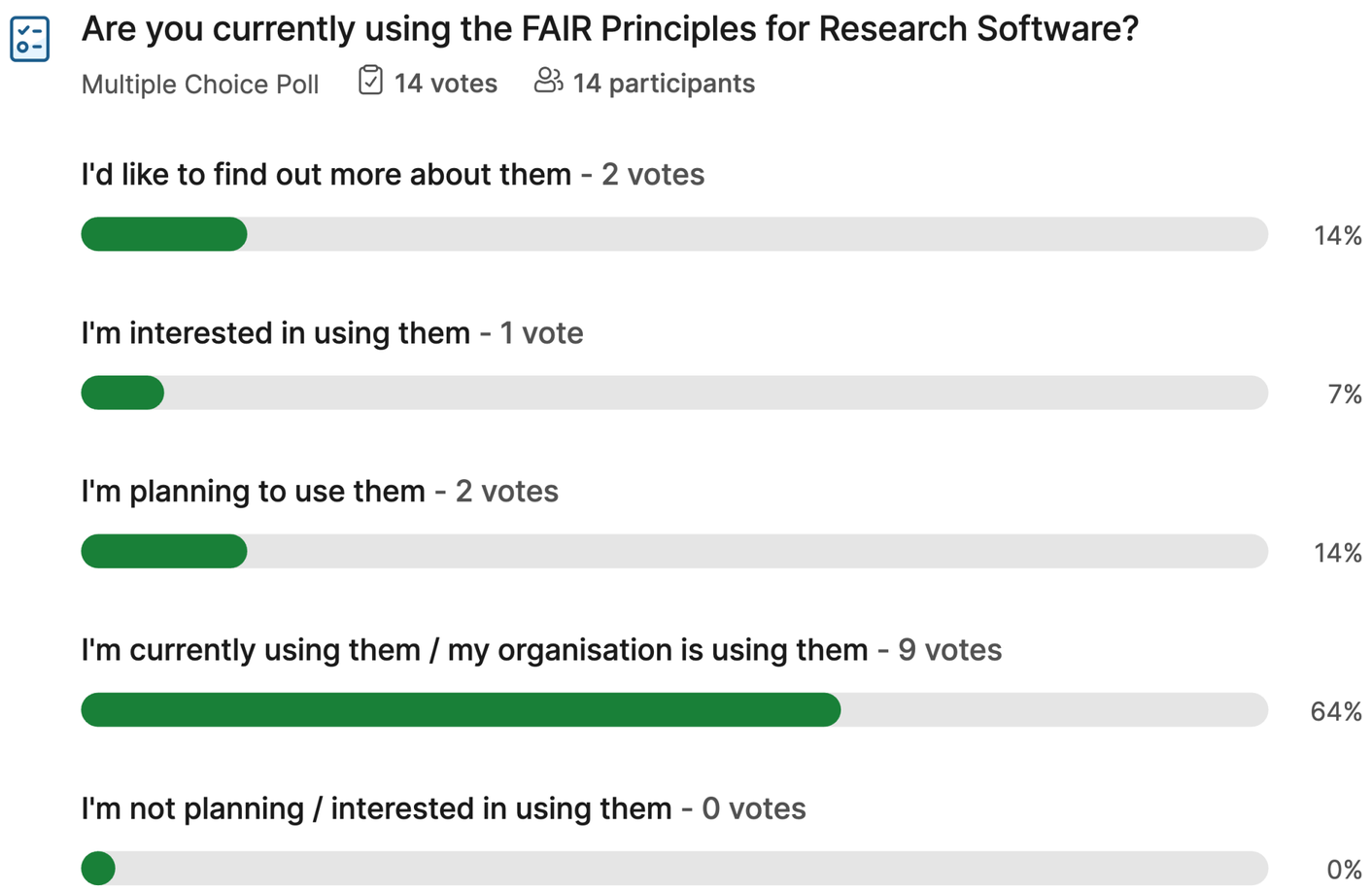
1. Introduction to the group & Participant Icebreaker – Neil Chue Hong (10 mins)
2. Update: FAIR4RS two year review – Tom Honeyman (15 mins)
3. Update: Actionable Guidelines for FAIR Research Software – Bhavesh Patel (10 mins)
4. Update: Tools for FAIR assessment: FAIR software checklist & howfairis – Faruk Diblen (10 mins), F-UJI – Elena Breitmoser (5 mins)
5. Discussion: where next for FAIR research software? – Neil Chue Hong (30 mins)
6. Wrap-up (10 mins)

Software Source Code IG

A forum to discuss issues on management, sharing, discovery, archival and provenance of software source code, paying special attention to source code that generates research data and plays an important role in scientific publications.

- *Discuss issues*
- *Develop guidelines and publish use cases*
- *Contribute software-related expertise to other groups in the RDA*

- It is also the *maintenance home for the FAIR4RS principles*, enabling reporting back on progress, concerns or queries about the principles



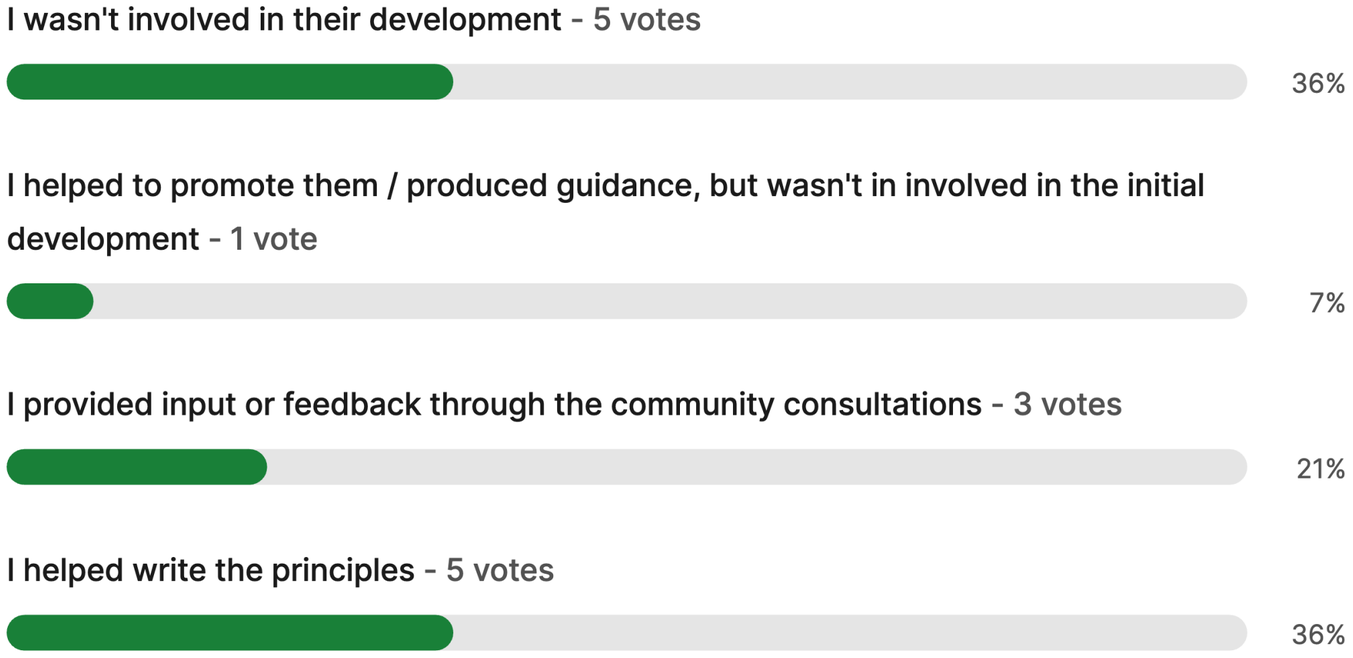
Are you using FAIR4RS

- Like to find out more (14%)
- Interested in using them (7%)
- Planning to use them (14%)
- Currently using them (64%)
- Not planning / interested (0%)

slido

What is your involvement with the development of the FAIR Principles for Research Software?

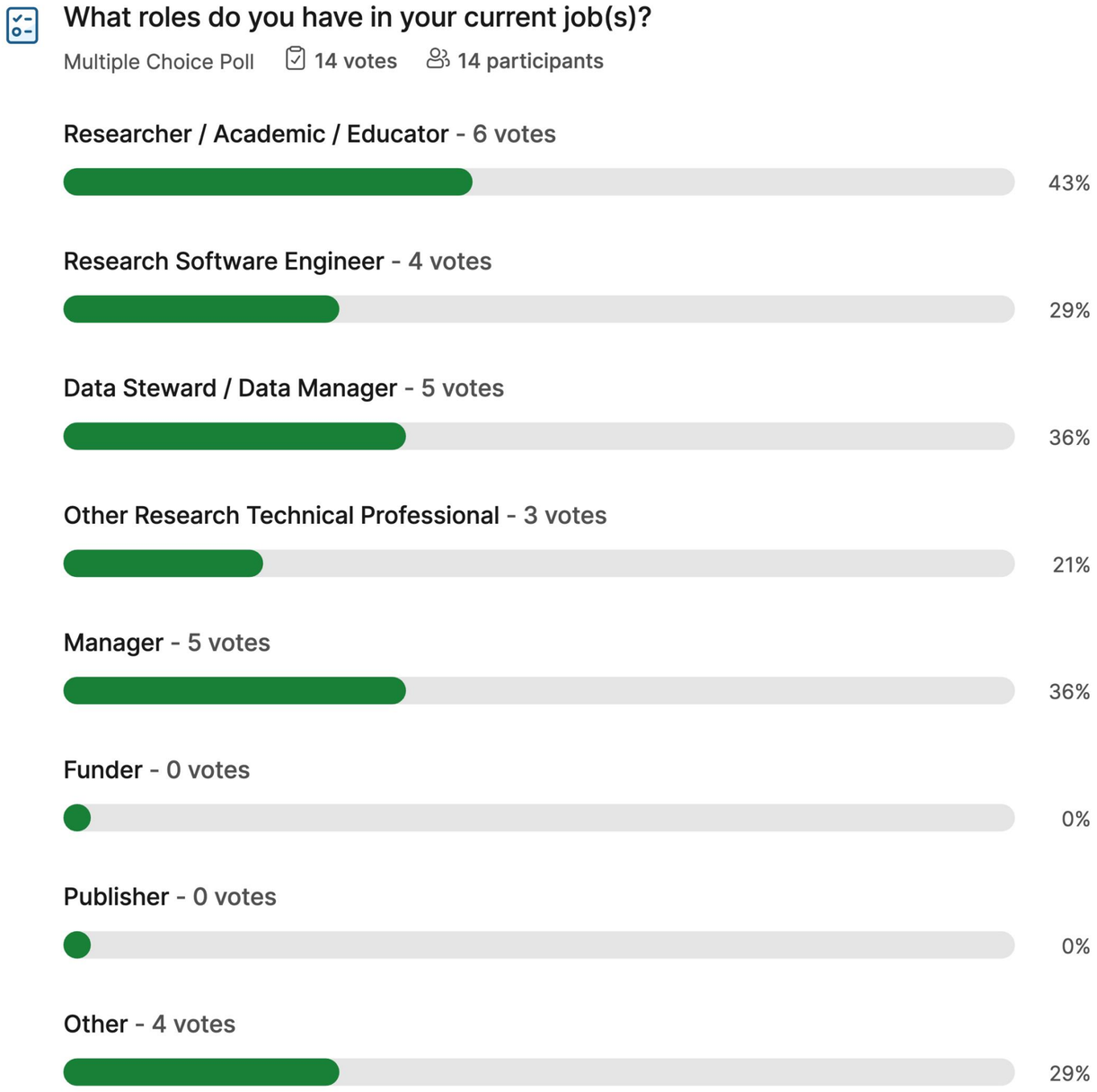
Multiple Choice Poll | 14 votes | 14 participants



slido

Level of involvement

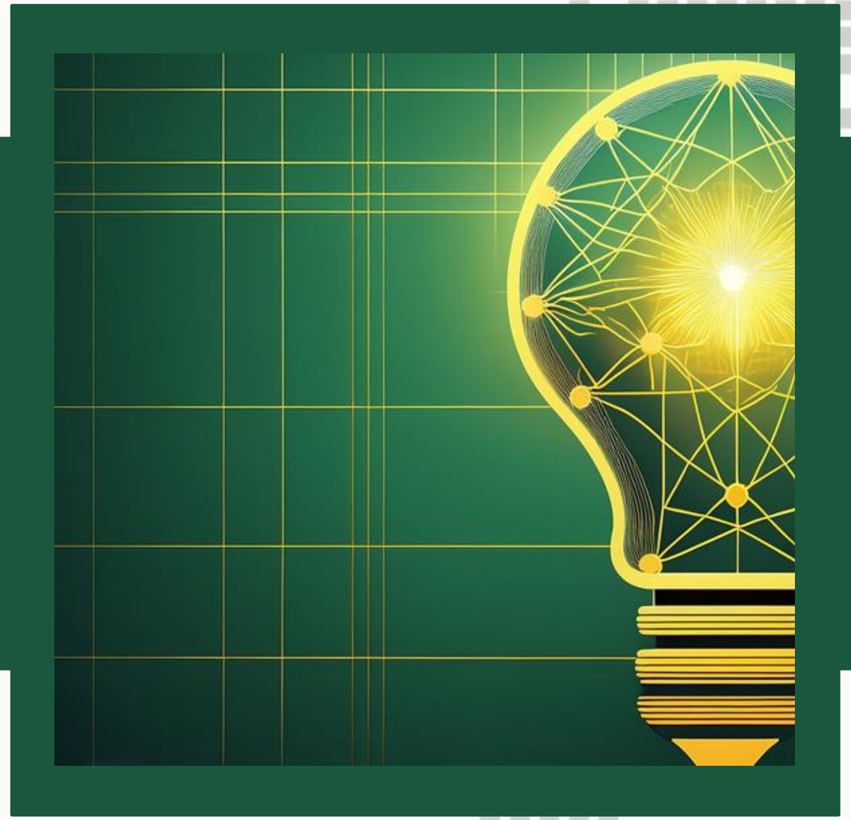
- Wasn’t involved (36%)
- Helped promote / produce guidance (7%)
- Provided input through consultations (21%)
- Helped write the principles (38%)



Roles of RDA VP24 session participants

- Researcher / Academic / Educator (6 votes)
- Research Software Engineer (4 votes)
- Data Steward / Data Manager (5 votes)
- Other RTP (3 votes)
- Manager (5 votes)
- Other (4 votes)

Multiple votes allowed



FAIR4RS two year review
Tom Honeyman

RESEARCH DATA ALLIANCE
24th Plenary Meeting
V I R T U A L

Data for Emerging Technologies

RESEARCH DATA ALLIANCE
RDA 24th
(Virtual)
Plenary Meeting
7-11 April 2025

research data sharing without barriers

www.rd-alliance.org

<ReSA>
Research Software Alliance

RDA
RESEARCH DATA ALLIANCE

FORCE11
The Future of Research Communications and e-Scholarship

Are the FAIR4RS Principles working?

research data sharing without barriers
rd-alliance.org

25th November, 2024

Review co-organizers

A ReSA task force:

- Tom Honeyman, University of New South Wales, Sydney
- Leyla Jael Castro, Semantic Technologies team, ZB MED Information Centre for Life Sciences
- Neil Chue Hong, Software Sustainability Institute & EPCC, University of Edinburgh
- Morane Gruenpeter, Software Heritage, Inria
- Daniel S. Katz, University of Illinois Urbana-Champaign
- Anna-Lena Lamprecht, Institute of Computer Science, University of Potsdam
- Carlos Martinez-Ortiz, Netherlands eScience Center

Survey

- Survey is complete - 63 responses
  - Many issues raised outside of reviewing the principles
  - Reflective of a broad views, but still global north bias

Core question areas:

(1) If/When to review again?

(2) Are the principles effective, or do they need changing?

(2) How do we know if they're working?

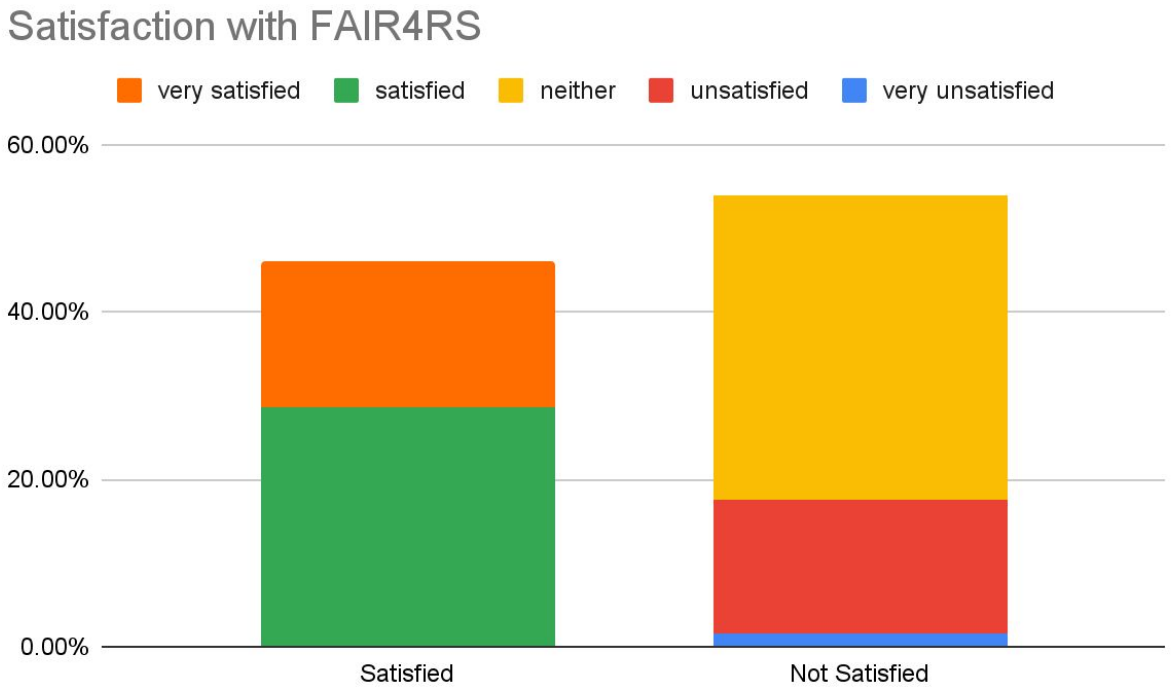
Satisfaction?

Evidence of use or uptake?

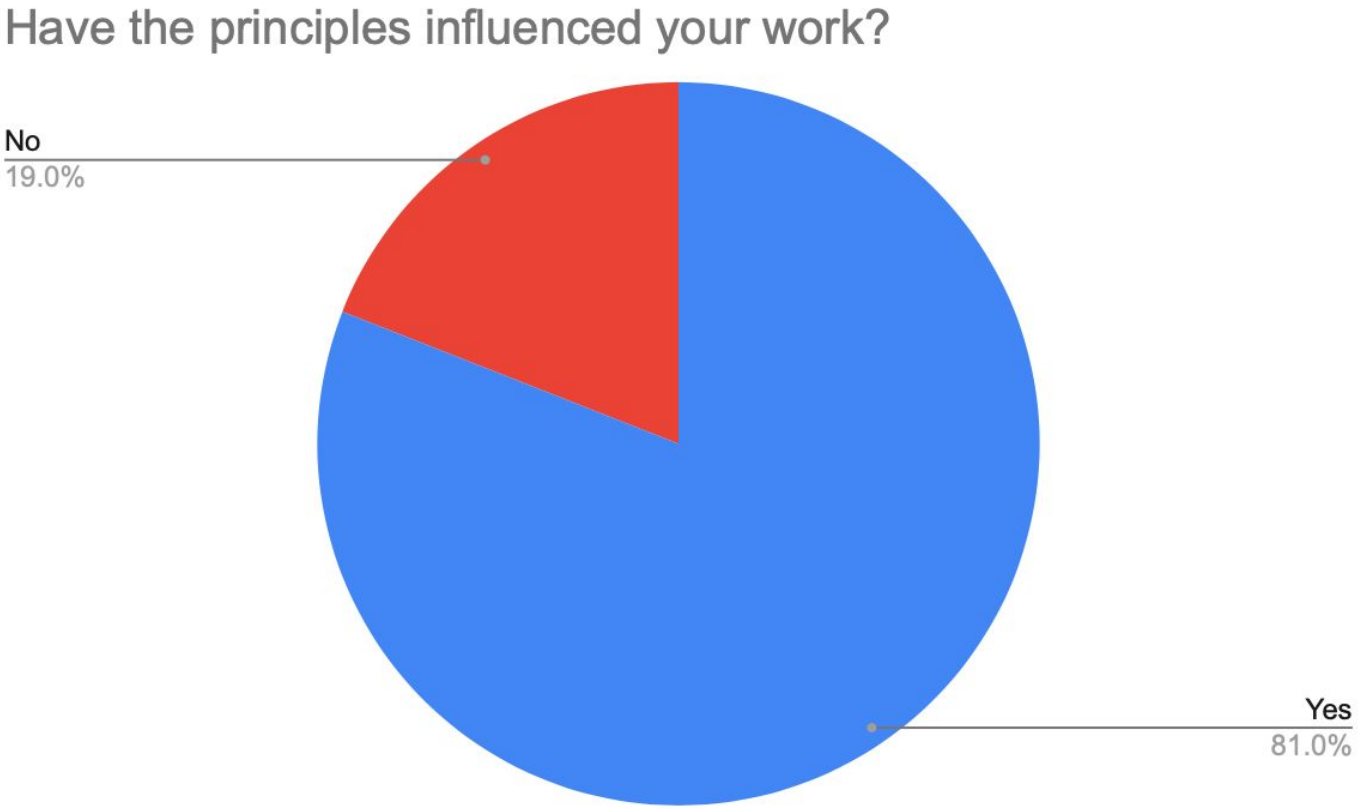
Evidence of understanding? Feedback?

Feedback on useability?

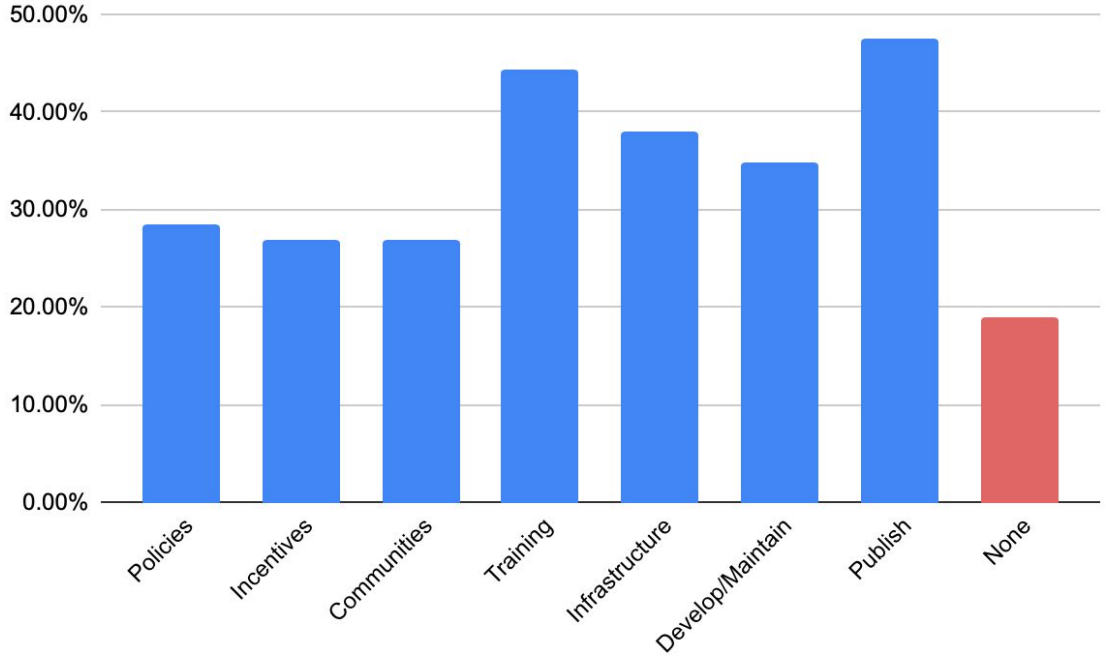
Satisfaction?



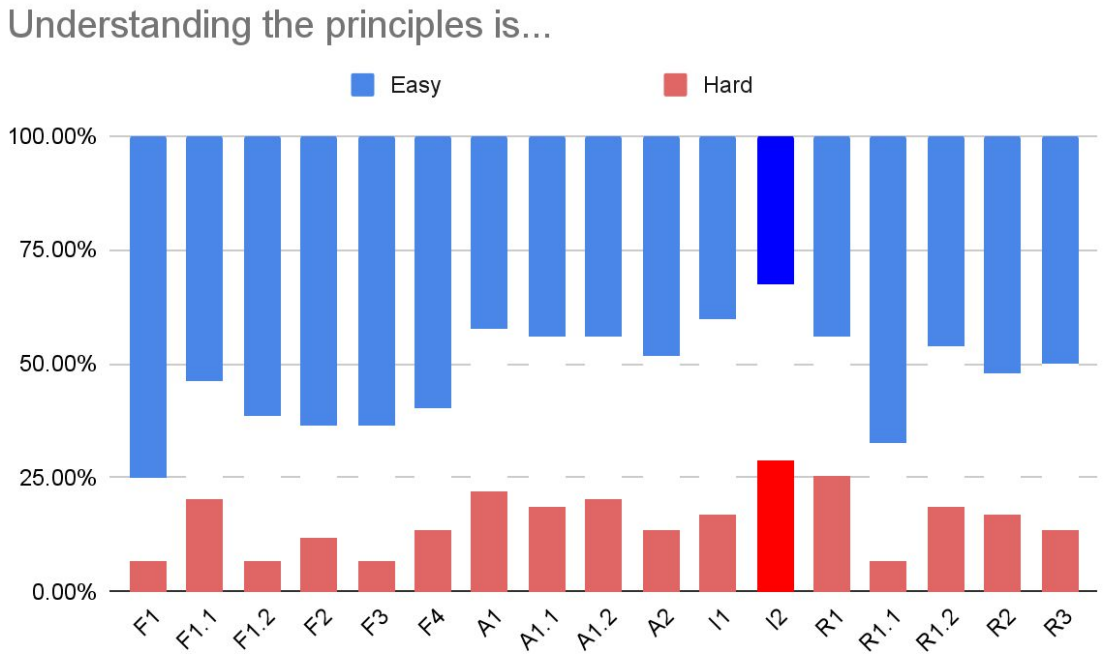
Uptake, influence?



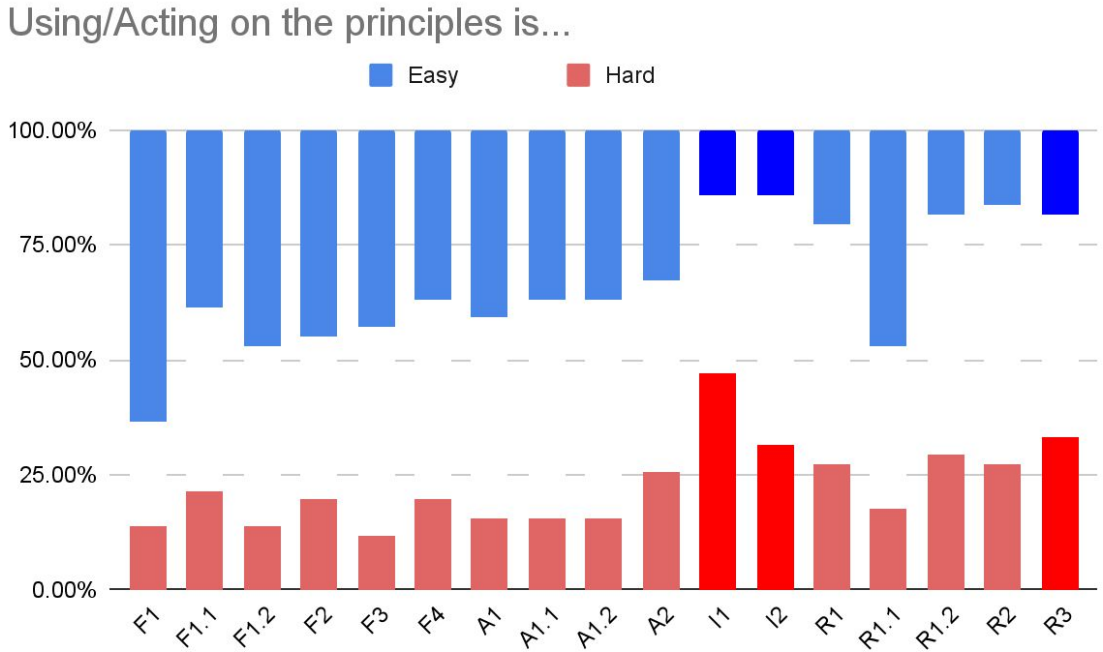
Uptake, influence?



Are the FAIR4RS principles understandable?



Are the FAIR4RS principles useable/actionable?



Understanding and Using

Hard to understand and use:

- Both vague and excessively technical language
- Complicates open source practices
- Where the tools and infrastructure don’t exist

Easy:

- High level concepts are clear
- Aligns with open source practices
- Where the tools and infrastructure already exist
- Aligns with good software development practices

Overall suggestions

Extend beyond:

- Incorporate specific software engineering practices
- Make Open Source more prominent

Alter existing:

- Embrace reproducibility as a core aim
- Change wording so it's easier to understand
- "domain relevant community standards"

Expand/transfer leadership

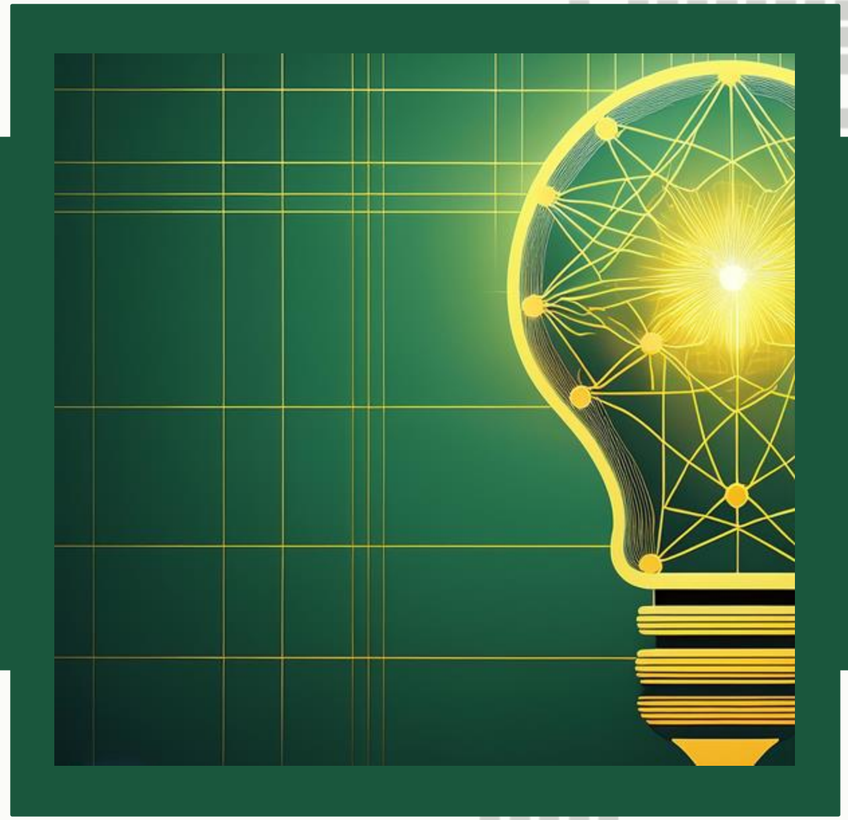
Outside the activity:

- *Provide funding*
- *Fill infrastructure gaps*
- *Mandate dependencies in scope for FAIRness*
- *Drop/ignore FAIR (no mandate)*
- *Create guidance*
  - *Name actions for specific types of software*
  - *Create mechanisms for compliance*
  - *Name what the community standards are*

Recommendations

- Review/refresh leadership for a focussed activity to:
  - Draft specific amendments for the most problematic or controversial of language
  - Run a robust process to capture agreement on the changed wording
- Suggest alternative activities (esp. guidance development, I1, I2, R3 examples, compliance etc) and promote existing ones (ReSA TF)
- Review in 3 years time
  - Update the governance text to reflect this

Thanks



Actionable Guidelines for FAIR Research Software

Bhavesh Patel

RESEARCH DATA ALLIANCE
24th Plenary Meeting
V I R T U A L

Data for Emerging Technologies

RESEARCH DATA ALLIANCE

RDA 24th
(Virtual)
Plenary Meeting
7-11 April 2025

research data sharing without barriers

www.rd-alliance.org

Actionable Guidelines for Making Research Software FAIR

Bhavesh Patel, Ph.D.
Research Professor

Background

Background

Started around December 2021

We develop software to make data FAIR

We should make our software FAIR!

How to make research software FAIR?

Background
FAIR4RS Principles

FAIR Principles for Research Software (FAIR4RS Principles, 2022)
are set of 17 principles tailored for research software

F1. Software is assigned a globally unique and persistent identifier.
F1.1. Components of the software representing levels of granularity are assigned distinct identifiers.
F1.2. Different versions of the software are assigned distinct identifiers.
F2. Software is described with rich metadata.
F3. Metadata clearly and explicitly include the identifier of the software they describe.
F4. Metadata are FAIR, searchable and indexable.

(and more)

https://doi.org/10.1038/s41597-022-01710-x

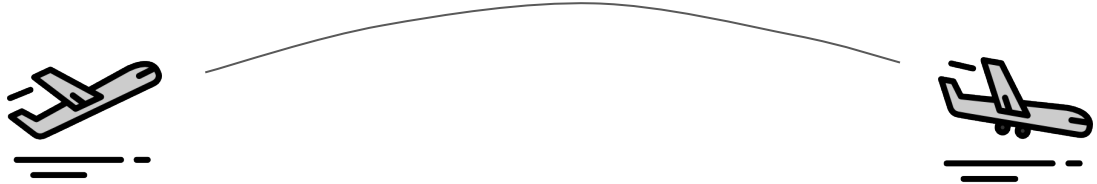
FAIR-BioRS Guidelines

FAIR-BioRS Guidelines

About

FAIR Biomedical Research Software (FAIR-BioRS) Guidelines

Minimal, actionable, step-by-step guidelines for complying with each of the FAIR4RS principles



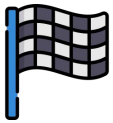
December 2021
Beginning of this effort

August 2023
Manuscript published

https://doi.org/10.1038/s41597-023-02463-x

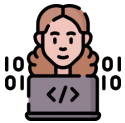
FAIR-BioRS Guidelines

Snapshot



Before starting

- Work from a version controlled system platform (e.g. GitHub)
- Select a license and include a LICENSE file



While developing the software

- Record dependencies
- Maintain a README

When releasing a new version

- Include metadata in codemeta.json and CITATION.cff files
- Archive source code on a DOI-issuing repository like Zenodo

Full guidelines: https://doi.org/10.1038/s41597-023-02463-x

FAIR-BioRS Guidelines

Codefair

Open source and free GitHub app that acts as your personal assistant for making software FAIR

1. Install the app from GitHub Marketplace
2. Code and develop software as usual
3. Address GitHub issues and pull requests from the app

codefair.io

Actionable FAIR4RS Task Force

Actionable FAIR4RS Task Force

Background

Actionable Guidelines for FAIR Research Software Task Force
started in December 2024 under the Research Software Alliance (ReSA)

Establish actionable guidelines to make any research software FAIR in line with the FAIR4RS Principles

https://www.researchsoft.org/taskforces

Actionable FAIR4RS Task Force

Members

~12 active members

Various geographical locations (USA, Canada, Germany, Spain, UK, Netherland, etc.)

Various research domains (Biomedical, Data Science, Knowledge Representation, etc.)

Email me to join! bpatel@calmi2.org

Actionable FAIR4RS Task Force

Progress

Task 1: Interpretation of the FAIR4RS Principles (Dec 2024 - March 2024)

1. Identifier
2. Metadata for software publication & discovery
3. Standards inputs/outputs
4. Qualified references
5. Metadata for software reuse
6. License

Actionable FAIR4RS Task Force

Timeline

July 2025
Complete sub-groups investigations

September 2025
Release first draft of the guidelines for community feedback

January 2026
Publish first version of the guidelines

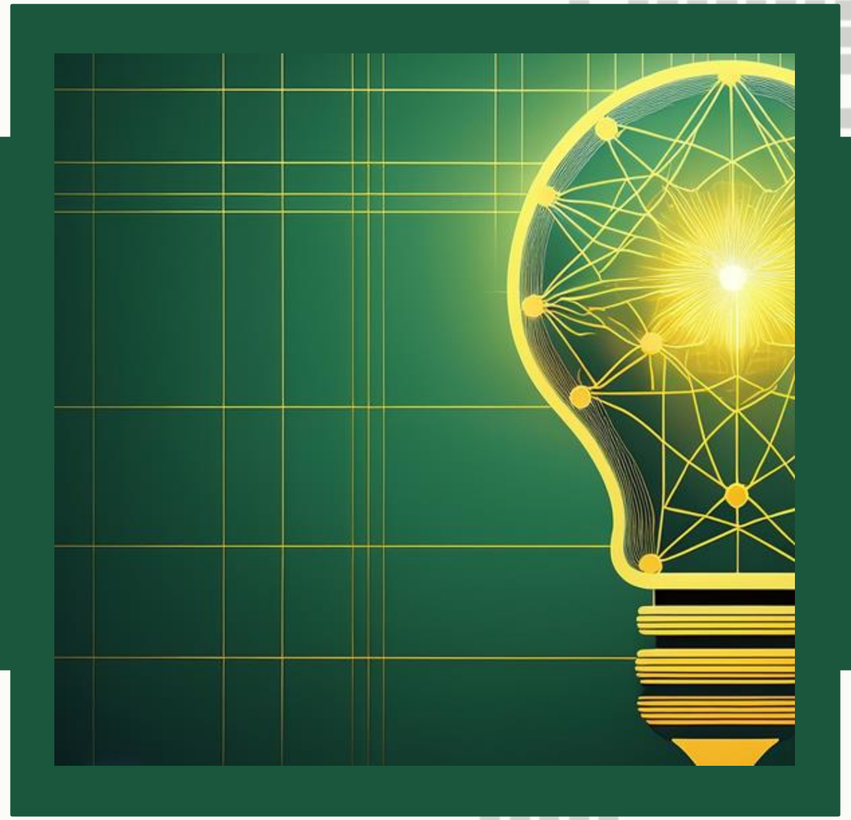
February 2026
Maintain guidelines

We will soon have a dedicated page on the ReSA website will all the details and outcomes (https://www.researchsoft.org)

Thank You!

bpatel@calmi2.org

fairdataihub.org



Tools for FAIR assessment

Faruk Diblen
Elena Breitmoser

RESEARCH DATA ALLIANCE
24th Plenary Meeting
V I R T U A L

Data for Emerging Technologies

Tools for FAIR assessment

howfairis & FAIR software checklist

RDA VP24 session on The FAIR Principles for Research Software

netherlands eScience center

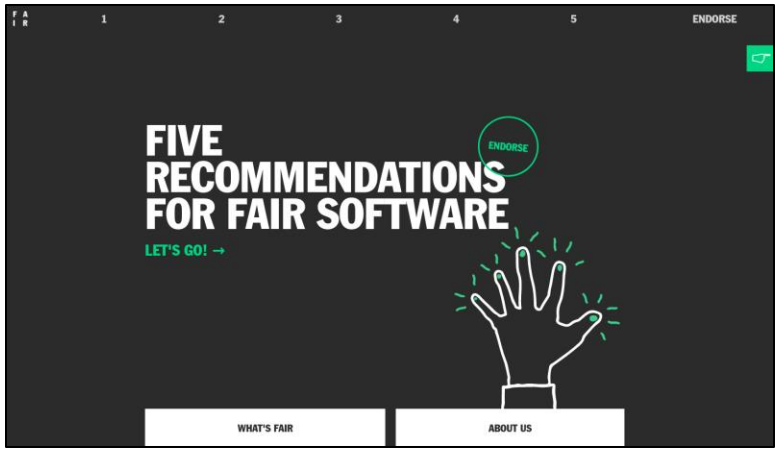
Faruk Diblen, f.diblen@esciencecenter.nl

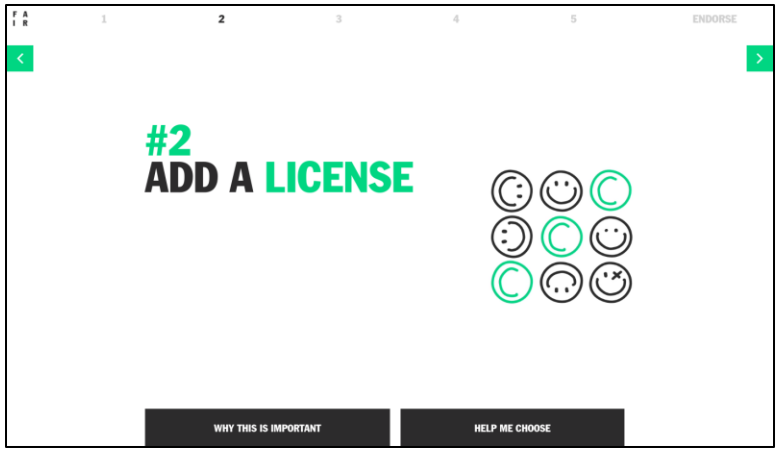
netherlands eScience center

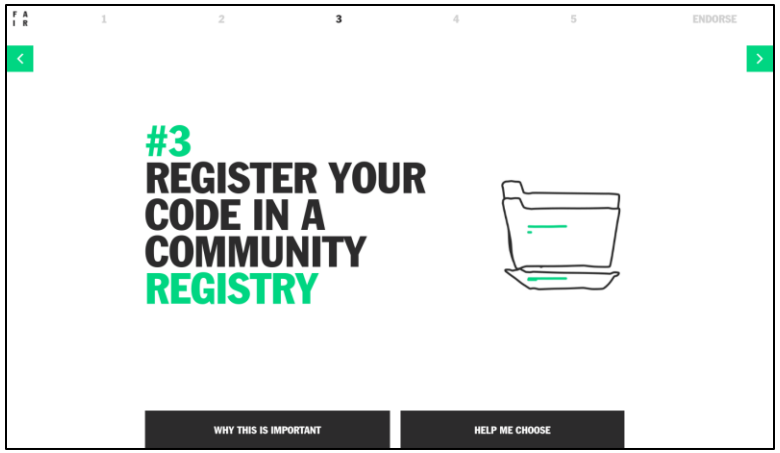
Howfairis

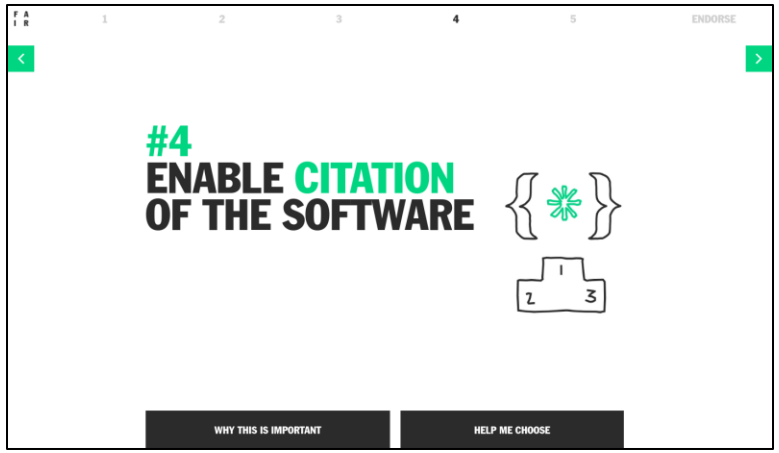
how-FAIR-is?

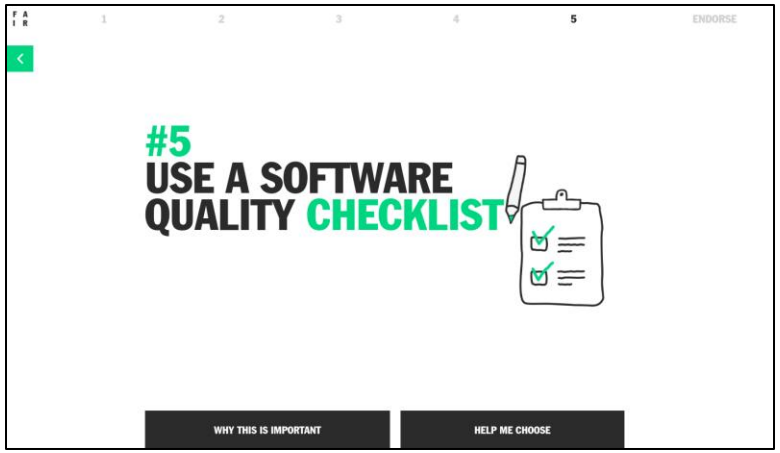
Five recommendations







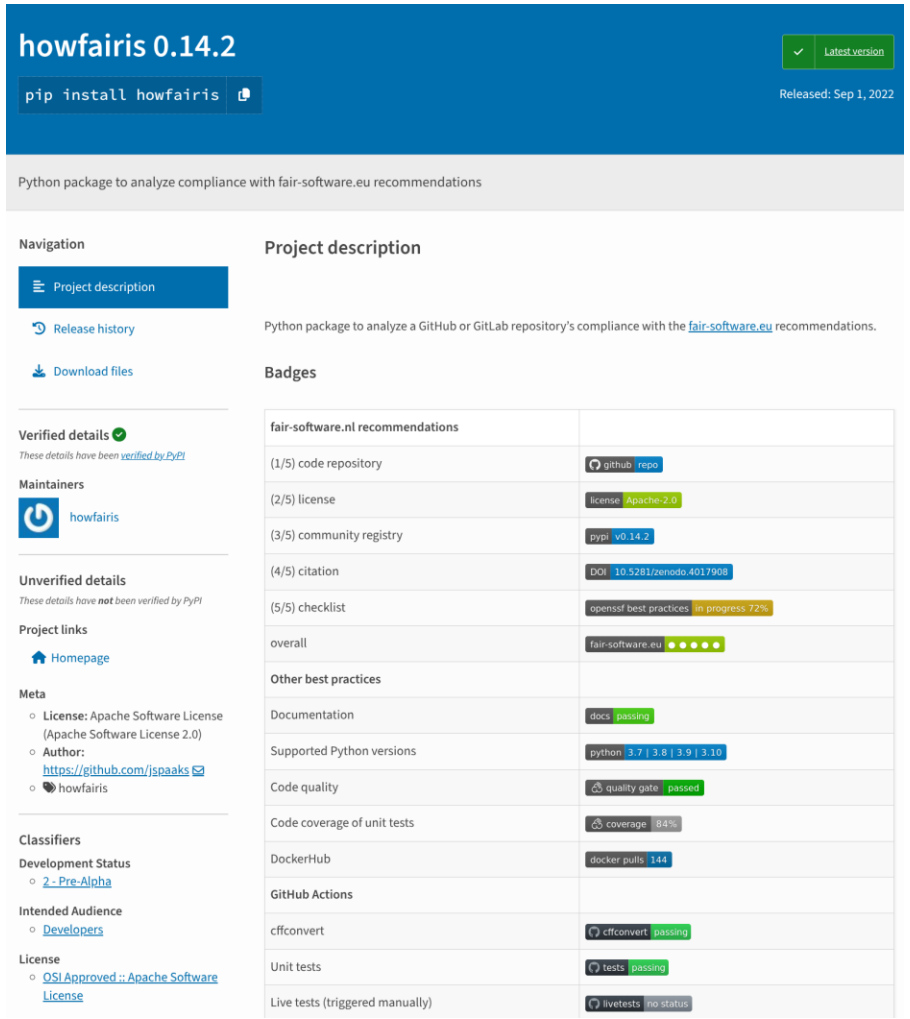




In 2019, eScience Center and DANS created **https://fair-software.eu** with 5 practical recommendations on how to make your software FAIR

How can we check the compliance automatically?

Howfairis Python package



Installation

```
pip3 install --user howfairis
```

Usage

```
howfairis https://github.com/<owner>/<repo>
```

`howfairis` supports URLs from the following code repository platforms:

1. `https://github.com`
2. `https://gitlab.com` (not including self-hosted instances)

Badges

~400 badges on GitHub

Gitlab? (self-hosted instances)

https://pypi.org/project/howfairis

https://github.com/fair-software/howfairis

https://doi.org/10.5281/zenodo.7193991

Howfairis GitHub Action

https://github.com/fair-software/howfairis-github-action

Assess compliance with fair-software.eu

To enable this checker, add the following snippet as `.github/workflows/fair-software.yml` in your GitHub repository.

```yaml
name: fair-software

on: push

jobs:
  verify:
    name: "fair-software"
    runs-on: ubuntu-latest
    steps:
      - uses: fair-software/howfairis-github-action@0.2.1
        name: Measure compliance with fair-software.eu recommendations
        env:
          PYCHARM_HOSTED: "Trick colorama into displaying colored output"
        with:
          MY_REPO_URL: "https://github.com/${{ github.repository }}"
```

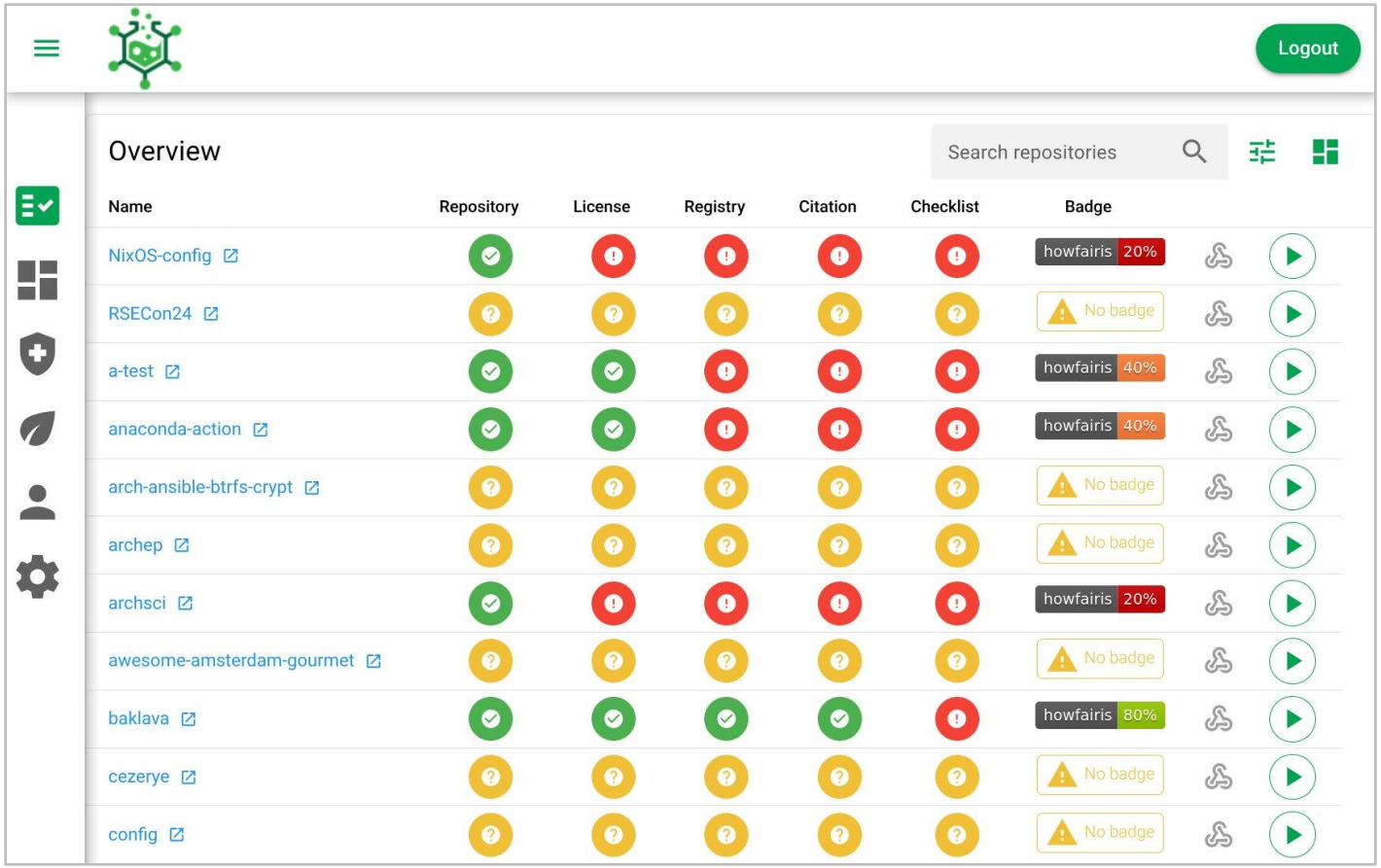
https://doi.org/10.5281/zenodo.7193991

Howfairis as a cloud service

- Cloud service to check compliance using howfairis
- No need to install any tools
- Overview of the compliance
- Interactive dashboard (WIP)
- Extra metrics (e.g. community health)

How can you get involved?

- You can give a try and provide feedback



Try it yourself!

https://www.howfairis.com

https://app.howfairis.com

netherlands eScience center

Self-assessment checklist for FAIR research software

ARDC FAIR-software checklist

This checklist is a collaborative effort by Netherlands eScience Center and Australian Research Data Commons.

https://fairsoftwarechecklist.net

Juriaan Spaaks – Tom Honeyman

The goals

1. *Promote **transparency***: the badge links back to this page, and contains the required data to check the appropriate answers. This way, users of your software can easily get an idea of the FAIRness state of the project.

2. *Discover **best practices***: as you go through the questions, you may learn about practices to improve FAIRness that you were not aware of previously.

3. *Become an **ambassador of FAIR***: By putting the badge in your README, your project will help promote the previous 2 aspects.

How does it work?

Findable

"The first step in reusing software is to discover that it exists in the first place."

1. **Is information from the metadata consumed by search engines to help rank their results? For the definition of "the metadata", see section above.**

   - ◉ No
   - ○ No, but some of the metadata is machine-readable

     E.g. There is a setup.cfg file with keywords, authors, and a description, but the software is not published to PyPI.
   - ○ No, the software is published on a platform with minimal Search Engine Optimization

     E.g. the software is on GitHub or GitLab.
   - ○ Yes, the software is findable via an associated web page which employs Search Engine Optimization.

     E.g. the software is published to a package manager (e.g. PyPI, CRAN, NPM) or a dedicated publishing platform (e.g. the Research Software Directory). The associated pages on those platforms can be shown to contain relevant metadata by using Search Engine Optimization tools such as schema.org's validator or OpenLink's Structured Data Sniffer.

Findable
Accessible
Interoperable
Reusable

Get the badge

Findable

'The first step in reusing software is to discover that it exists in the first place."

Accessible

"In order to reuse software, one must have access to it."

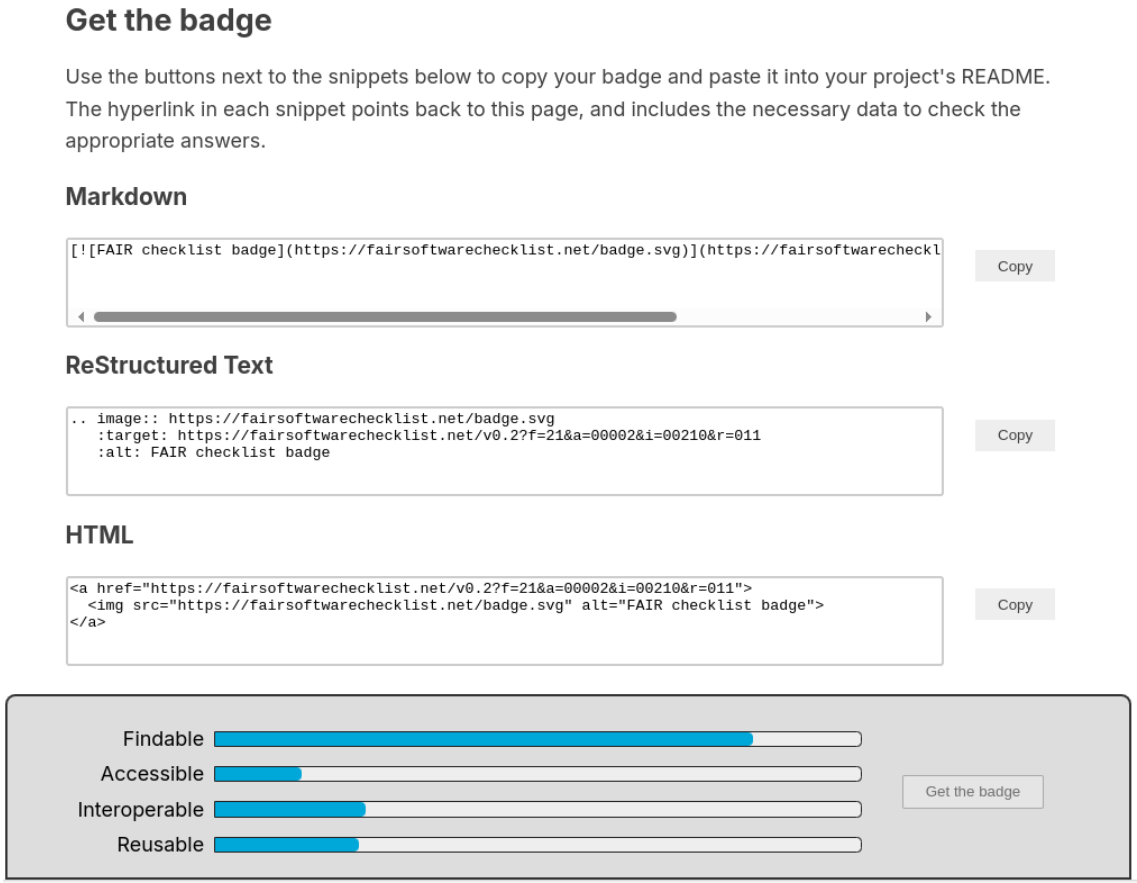
Interoperable

"Software must interact with data and other software to maximize its potential."

Reusable

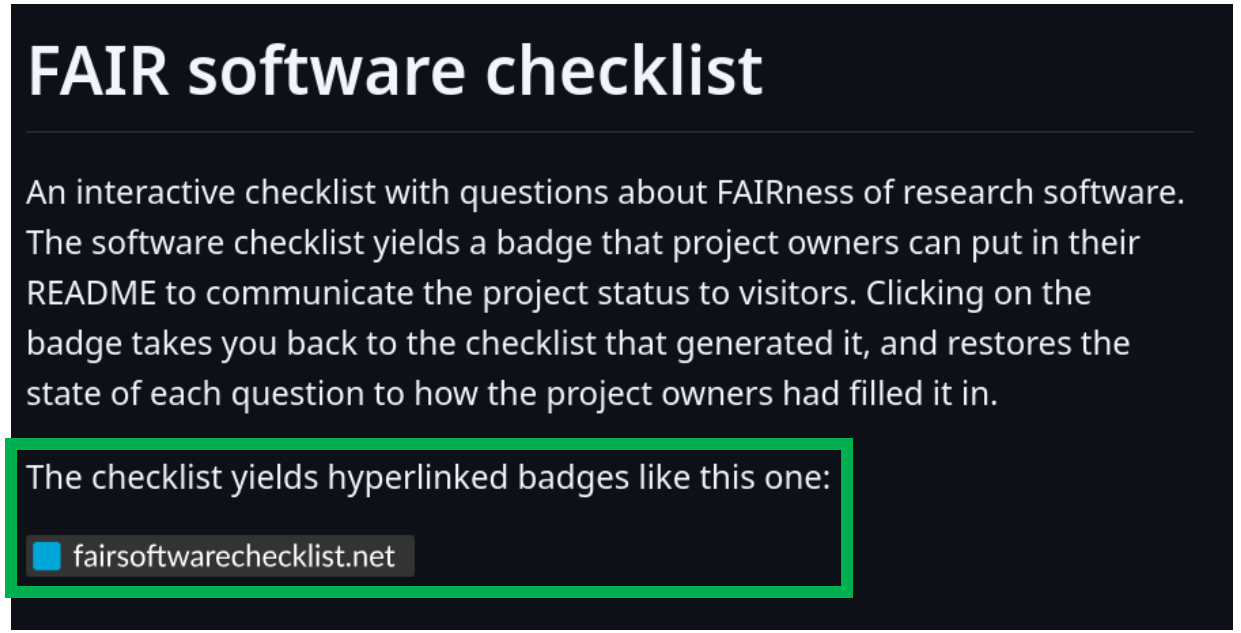
"Software should be usable and reusable."

The badge



Badge formats

- Markdown
- ReStructured Text
- HTML



Have suggestions? Report an issue https://github.com/ardc-fair-checklist/ardc-fair-checklist.github.io

Visit https://fairsoftwarechecklist.net and get your badge!

Future work

- **Howfairis**
  - Aligning with FAIR4RS principles (WIP)
  - More modular design (plugins) (WIP)
  - Open to collaborations

- **Self-assessment checklist**
  - Community feedback
  - Increasing adoption
  - Can you think of an improvement? Let us know!

netherlands eScience center

Thank you!
Questions?

eosc | FAIR-IMPACT
Expanding FAIR solutions across EOSC

Tools for FAIR assessment: F-UJI for Research Software

RDA VP24

April 9th, 2025

Elena Breitmoser and Neil Chue Hong
e.breitmoser@epcc.ed.ac.uk,
n.chuehong@epcc.ed.ac.uk

University of Edinburgh

Funded by
the European Union

FAIR metrics for Research Software

EPCC/SSI: T5.2 with DCC, KNAW-DANS, INRIA, UBremen

1. D5.2 “**Metrics for automated FAIR software assessment in a disciplinary context**” (2023): Definition of the metrics based on the FAIR4RS principles
    - Domain-agnostic metrics
    - Social Science-specific implementation
2. MS5.6 “**Practical tests for automated FAIR software assessment in a disciplinary context**” (2024): Implementation of some of the metrics into one of the automated assessment tools
    - Currently performed on (github) repositories only

Additional report “**Comparison of tools for automated FAIR software assessment**” (2024):

- F-UJI, howfairis, FAIR-Enough, FAIR-Checker

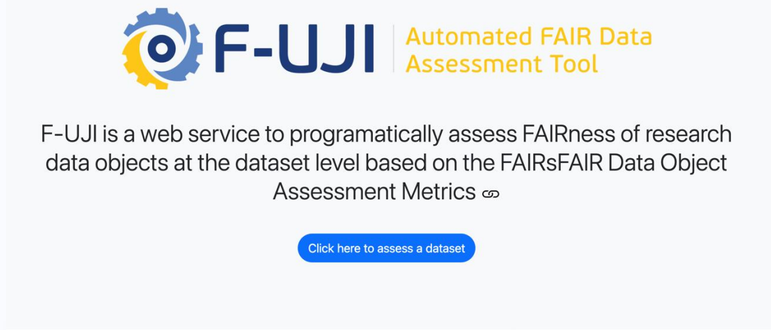
Research Software Support Action Open Call: Test the extended F-UJI tool & usefulness of the metrics, use feedback for future improvements

- 11 participants plus 1 observer
- Total of 3 workshops (May, June, October 2024)

F-UJI: Automated assessment tool for the FAIRness of RS

Extension of F-UJI to Research Software

- Existing automated assessment tool for data: F-UJI https://www.f-uji.net/
  - Next version release will include our changes for Research Software, available through their web client
  - Metrics based on FAIRsFAIR
- F-UJI extension for Research Software (POC): https://github.com/softwaresaved/fuji/
  - Merged back into original F-UJI repo
  - Metrics based on FAIR4RS Principles
  - Not all metrics have been implemented yet
    - General, agnostic test implementations
    - Domain-specific test implementations (compliance with CESSDA/Social Sciences guidelines)
  - M5.6 Practical tests for automated FAIR software assessment in a disciplinary context



DOI 10.5281/zenodo.10890043

FAIR Research Software Metrics

Identifier	Name
FRSM-01	Does the software have a globally unique and persistent identifier?
FRSM-02	Do the different components of the software have their own identifiers?
FRSM-03	Does each version of the software have a unique identifier?
FRSM-04	Does the software include descriptive metadata which helps define its purpose?
FRSM-05	Does the software include development metadata which helps define its status?
FRSM-06	Does the software include metadata about the contributors and their roles?
FRSM-07	Does the software metadata include the identifier for the software?
FRSM-08	Does the software have a publicly available, openly accessible and persistent metadata record?
FRSM-09	Is the software developed in a code repository / forge that uses standard communications protocols?

Identifier	Name
FRSM-10	Are the formats used by the data consumed or produced by the software open and a reference provided to the format?
FRSM-11	Does the software use open APIs that support machine-readable interface definition?
FRSM-12	Does the software provide references to other objects that support its use?
FRSM-13	Does the software describe what is required to use it?
FRSM-14	Does the software come with test cases to demonstrate it is working?
FRSM-15	Does the software source code include licensing information for the software and any bundled external software?
FRSM-16	Does the software metadata record include licensing information?
FRSM-17	Does the software include provenance information that describe the development of the software?

D5.2 - Metrics for automated FAIR software assessment in a disciplinary context.

DOI 10.5281/zenodo.10047401

F-UJI for RS demo

https://www.f-uji.net/?action=test

Getting Started | User Guide - SPACe... | Timex | Inbox (134) - ebreit... | Buchhandlung Dr. O... | SWR Bestenliste - S... | Guide for Residents... | nginx details - EPC... | EIDF User Documen... | WP5 Workspace - G... | WIRED - The Latest ... | Wel

F-UJI Home Assess About Methods Docs Ontology Code

FAIR assessment

F-UJI is a web service to programatically assess FAIRness of research data objects (aka data sets) based on metrics developed by the FAIRsFAIR project.

Please use the form below to enter an identifier (e.g. DOI, URL) of the data set you wish to assess. Optionally you also can enter a metadata service (OAI-PMH, SPARQL, CSW) endpoint URI which F-UJI can use to identify additional information.

Research Data Object (URL/PID):*

Enter a valid PID or URL of the dataset's landing page (e.g. a DOI)

Metric:

FsF Metrics v0.5

Settings

Start FAIR Assessment

About Feedback Privacy Policy Terms of Use Legal Notice

F-UJI is a result of the FAIRsFAIR "Fostering FAIR Data Practices In Europe" project which received funding from the European Union's Horizon 2020 project call H2020-INFRAEOSC-2018-2020 (grant agreement 831558).

F-UJI for RS demo

Metric Specification:	https://doi.org/10.5281/zenodo.6461229
Software version:	3.2.0

Summary:

8.89%

	Score earned:	Fair level:
Findable:	0 of 20	incomplete
Accessible:	0 of 2	incomplete
Interoperable:	0 of 7	incomplete
Reusable:	4 of 16	initial

Report:

Findable

FRSM-01-F1 - Does the software have a globally unique and persistent identifier?

FRSM-02-F1.1 - Do the different components of the software have their own identifiers?

FRSM-03-F1.2 - Does each version of the software have a unique identifier?

FRSM-04-F2 - Does the software include descriptive metadata which helps define its purpose?

F-UJI for RS demo

FRSM-15-R1.1 - The software source code includes licensing information for the software and any bundled external software.

FAIR level: 3 of 3 advanced

Score: 2 of 3

Output:


```
[
    {
        "license": "Apache License 2.0",
        "osi_approved": true,
        "details_url": "http:\/\/spdx.org\/licenses\/Apache-2.0.html"
    }
]
```


Metric tests:

Test:	Test name:	Score:	Maturity:	Result:
FRSM-15-R1.1-1	License file is included.	1	1	
FRSM-15-R1.1-2	The source code includes licensing information for all components bundled with that software.			
FRSM-15-R1.1-3	Recognized licence is in SPDX format.	1	3	

Debug messages:

Level:	Message:
INFO	License verification name through SPDX registry -: Apache License 2.0
INFO	Found SPDX license representation -: http://spdx.org/licenses/Apache-2.0.json
SUCCESS	Found SPDX license representation (spdx url, osi_approved)
SUCCESS	Found licence file: ['LICENSE'].
INFO	Will consider all SPDX licenses as community specific licenses for FRSM-15-R1.1
INFO	This test is not defined in the metric YAML and therefore not performed: FRSM-15-R1.1-CESSDA-1
WARNING	Test for license information of bundled components is not implemented (FRSM-15-R1.1-2).
INFO	This test is not defined in the metric YAML and therefore not performed: FRSM-15-R1.1-CESSDA-3
INFO	This test is not defined in the metric YAML and therefore not performed: FRSM-15-R1.1-CESSDA-2

FRSM-16-R1.1 - Does the software metadata record include licensing information?

Automated assessment tool – Feedback on F-UJI extension

- Definite interest & need for automated FAIR assessment tools
  - Improve F-UJI tool for Research Software – implement more tests
  - But: human-readability needs to be maintained!

- Need for transparency & precise guidelines:
  - What exactly is/not measured?
  - Why does my repo fail for a given test – what can I do to improve it (quickly)?
  - Why do I get different scores for very similar repos?

References

- Metrics for automated FAIR software assessment in a disciplinary context https://zenodo.org/records/10047401
- Practical tests for automated FAIR software assessment in a disciplinary context https://zenodo.org/records/10890043
- Comparison of tools for automated FAIR software assessment https://zenodo.org/records/13268685
- FAIR Principles for Research Software (FAIR4RS Principles). Research Data Alliance. https://doi.org/10.15497/RDA00065

Questions

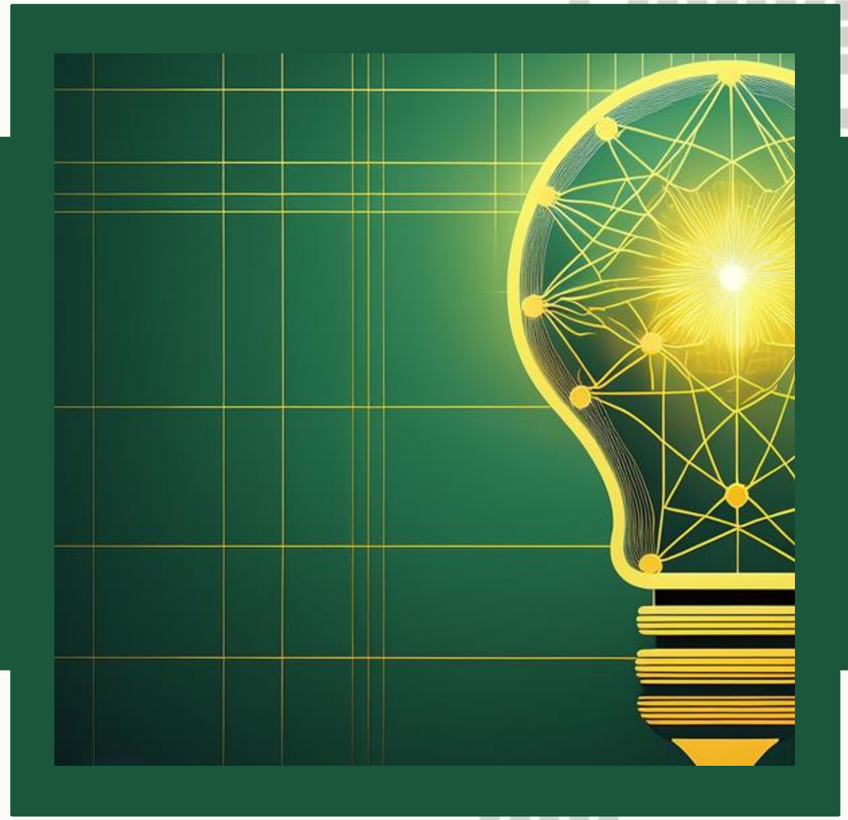
Thanks!

eosc | FAIR-IMPACT

@fairimpact_eu

/company/fair-impact-eu-project

Funded by
the European Union



Where next for FAIR software?

RESEARCH DATA ALLIANCE

24th Plenary Meeting

V I R T U A L

Data for Emerging Technologies

RESEARCH DATA ALLIANCE

RDA 24th
(Virtual)
Plenary Meeting
7-11 April 2025

research data sharing without barriers

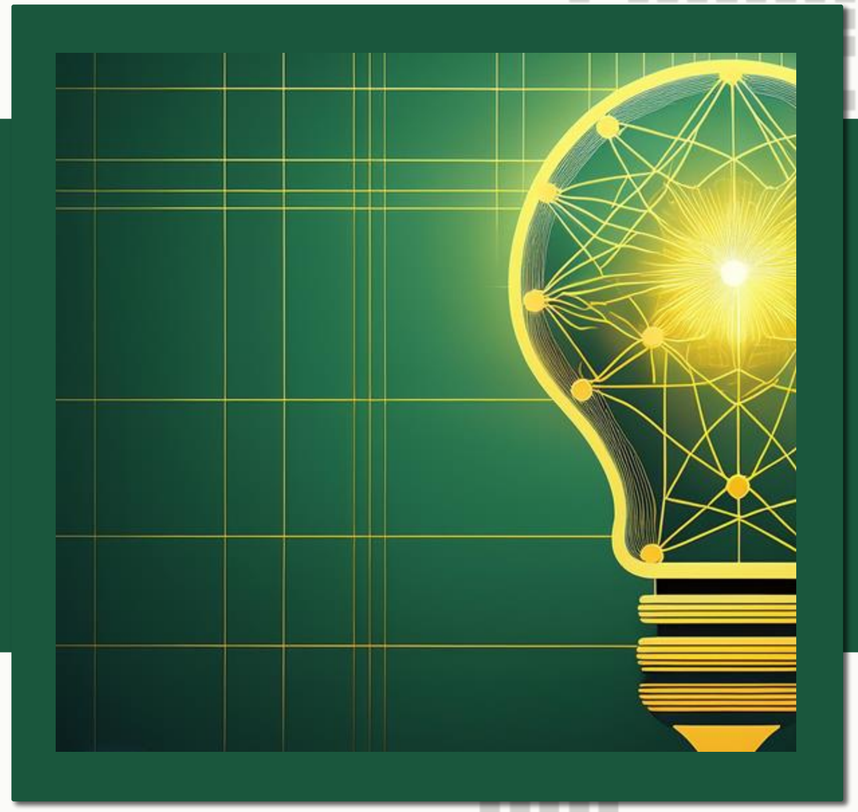
www.rd-alliance.org

What is stopping greater adoption of the FAIR principles for research software?

- Benefits and Incentives
  - Lack of clear / direct benefits (x4)
- Guidance
  - Lack of specific guidelines (x2)
  - Concrete examples to follow
  - Learning curve
  - FAIR Literacy
- Awareness
  - Success stories
  - Awareness of existing efforts
  - Lack of awareness
- Integration with existing processes / infrastructures
  - Incorporation with repositories
  - Default part of spinning up a project
- Continuing challenges
  - Resources and time (x2)
  - Interoperability is still difficult to address
- Other
  - Relevance to sub communities of software
  - Some are tired of hearing FAIR

What should we do (as a community) around FAIR4RS in the next three years?

- Clear terminology for defining domain expert components and developer language
- Infrastructure for research domains to develop their own principles
- Software provides references to other software, needs to be enabled by registries
- Make it simple to implement, integrated into the typically software development workflow and highlight benefits.
- ”Cookie-cutter project" idea -- a GitHub repo with a generic project
- In addition to tools that *check* for FAIRness, what about tools for actually making software FAIR (e.g., automatic registration of DOIs)?
- Continue "evangelisation"
- Increase awareness of this work in the potential users
- More recognition of software in academia
- Highlighting examples with return on investment
- Institutions can do more training and advocacy
- Hands-on training
- Have an IG meeting displaying adoption success stories
- Some typical examples of perfectly FAIR software



THANK YOU

RESEARCH DATA ALLIANCE
24th Plenary Meeting
V I R T U A L

Data for Emerging Technologies

RESEARCH DATA ALLIANCE

RDA 24th
(Virtual)
Plenary Meeting
7-11 April 2025

research data sharing without barriers

www.rd-alliance.org