

FAIR for research software

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Once upon a time lived Snow-ware, who wanted to grow up to be the FAIRest software of them all ...

1. The concept of FAIR research software
2. Work being done to define it
3. Is FAIR enough?



[Wikipedia](#)



Research Software Alliance

Research software: recognised and valued as a fundamental and vital component of research worldwide

[Learn more](#)

Mission: To bring research software communities together to collaborate on the advancement of research software.



Challenges to recognition of software

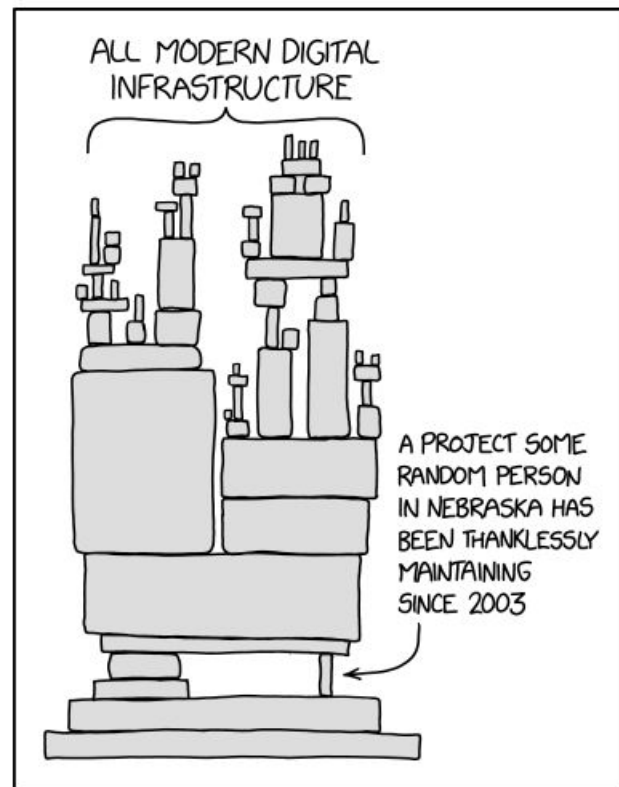
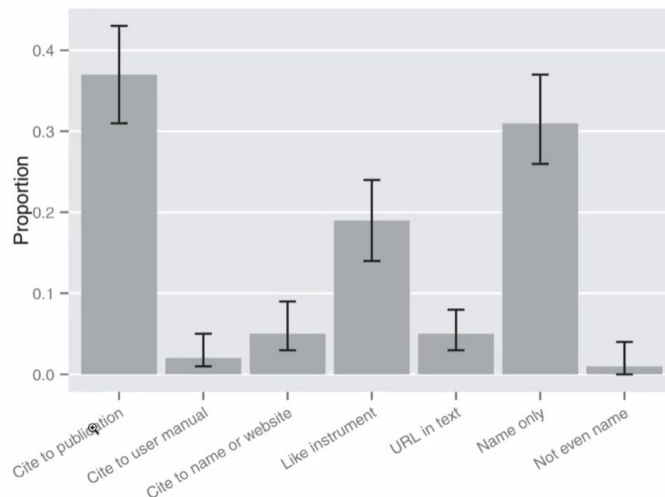
2021 OECD broadened the 2006 Recommendation on Access to Research Data to include "bespoke algorithms, workflows, models and software (incl. code) that are essential for their interpretation". (Paic, 2021, [Making data for science as open as possible to address global challenges](#))

Proportion of software cited is low

(Howison & Bullard, 2015, [Software in the scientific literature: Problems with seeing, finding, and using software mentioned in the biology literature](#))

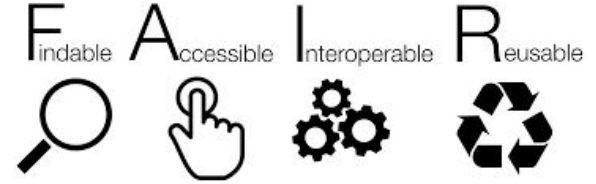
For <50% of papers can obtain code and build it with some effort

(Collberg & Proebsting, 2015, [Repeatability in computer systems research](#))



[xkcd: Dependency](#)

The concept of FAIR



- [FAIR Guiding Principles](#) (Wilkinson et al., 2016) are intended to apply to all research objects
- Have been extensively applied to data
- We need to be able to discover, access, integrate, and reuse data AND associated research objects, e.g., algorithms, software, and workflows
- BUT software is not (just) data

Work on FAIR software 2017-

“Applying FAIR Principles to Software” at the 2017 Workshop on Sustainable Software Sustainability (WOSSS17)

“Making Software FAIR” at the DTL Communities@Work 2018 Conference

“FAIRness assessment for software” at the 2018 DBCLS/NBDC BioHackathon

“Sharing Your Software – What is FAIR?” at the 2018 American Geophysical Union (AGU) Fall Meeting

Top 10 FAIR Data & Software Global Sprint, including “10 easy things to make your software FAIR” 2019

“FAIR principles for Software” at 2019 Workshop on Sustainable Software Sustainability (WOSSS19)

“FAIR Software” Birds of a Feather meeting at deRSE 2019

“Five recommendations for FAIR software” at NL-RSE 2019

TIB Training workshops on FAIR Data and Software 2018 - 2019

Towards FAIR principles for research software 2019 DOI: 10.3233/DS-190026

FAIR Computational Workflows 2020 DOI: 10.1162/dint_a_00033

FAIRsFAIR T2.4: FAIR assessment for research software

From FAIR research data toward FAIR and open research software

Lorentz Workshop 9-13 March 2020 (Automated Workflow Composition in the Life Sciences)

BRDI NAS Washington 16-17 March 2020

<https://www.rd-alliance.org/fair-principles-research-software>

<https://www.rd-alliance.org/group/software-source-code-ig/wiki/fair4software-reading-materials>

FAIR for Research Software (FAIR4RS)



Defining FAIR principles for research software

- **Late March 2021** - Complete first draft of principles
- **April - June 2021** - Engage community around drafts
- **July 2021** - Finalise principles and disseminate
- **August 2021 onwards** - Create adoption guidelines



Thanks to our supporters:

- Wellcome Trust
- Alfred P. Sloan Foundation

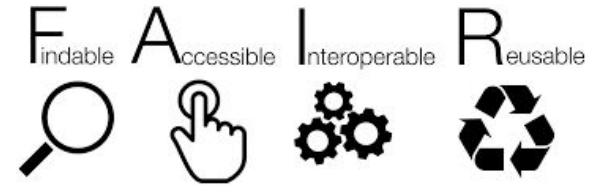


| FAIR data principles (Wilkinson et al. 2016) via GO FAIR | FAIR software principles (Katz et al. 2021), changes in bold | Changes |
|--|---|---|
| F. Findable The first step in (re)using data is to find them. Metadata and data should be easy to find for both humans and computers. Machine-readable metadata are essential for automatic discovery of datasets and services, so this is an essential component of the FAIRification process. | <i>F. Findable The first step in (re)using software is to find it. Metadata and software should be easy to find for both humans and computers. Machine-readable metadata are essential for automatic discovery of software, so this is an essential component of the FAIRification process.</i> | "Data" replaced by "software" |
| F1. (Meta)data are assigned a globally unique and persistent identifier | <i>F1. Software is assigned a globally unique and persistent identifier</i> | "Data" replaced by "software" |
| F2. Data are described with rich metadata (defined by R1 below) | <i>F2. Software is described with rich metadata (defined first by R1 below, and then by the original FAIR principles for metadata)</i> | "Data" replaced by "software"; no need to redefine principles for metadata |
| F3. Metadata clearly and explicitly include the identifier of the data they describe | <i>F3. Metadata clearly and explicitly include the identifier of the software they describe</i> | "Data" replaced by "software" |
| F4. (Meta)data are registered or indexed in a searchable resource | <i>F4. Software is registered or indexed in a searchable resource</i> | "Data" replaced by "software" |

Wilkinson et al., 2016. The FAIR Guiding Principles for scientific data management and stewardship.

<https://doi.org/10.1038/sdata.2016.18>

Katz et al., 2021. A Fresh Look at FAIR for Research Software. <https://arxiv.org/abs/2101.10883>

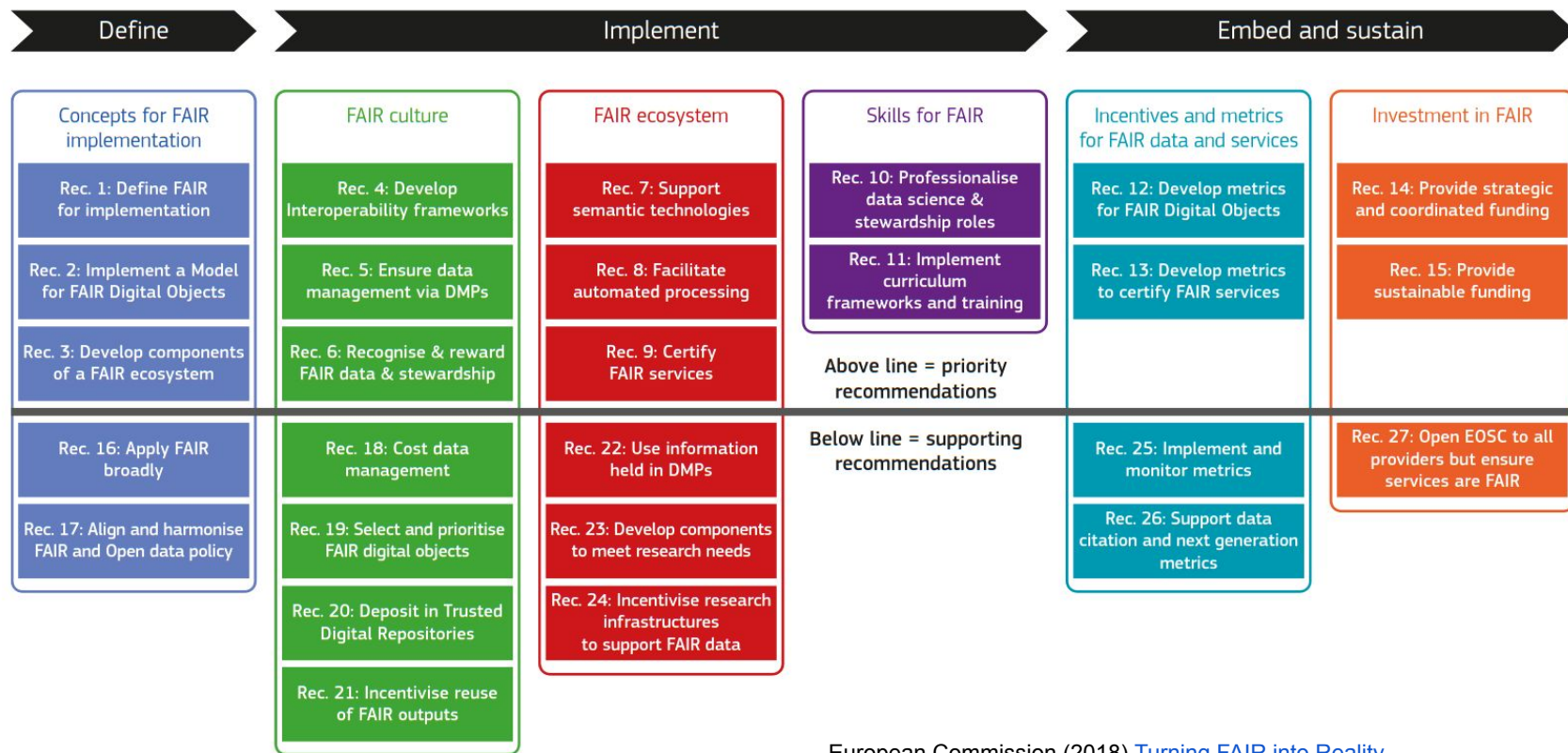


How do we balance between principles that are very general and specific, actionable instructions?

Is a digital research object only “fully FAIR” if the objects it builds on are also FAIR?

Join the [FAIR4RS Working Group](#)

The FAIR4RS Roadmap outlines how to make FAIR research software a reality.



European Commission (2018) [Turning FAIR into Reality](#)

Indicators

metrics

maturity models

certification

curriculums

career profiles

reward structures

policy change

certification of FAIR services

interoperability frameworks

metadata

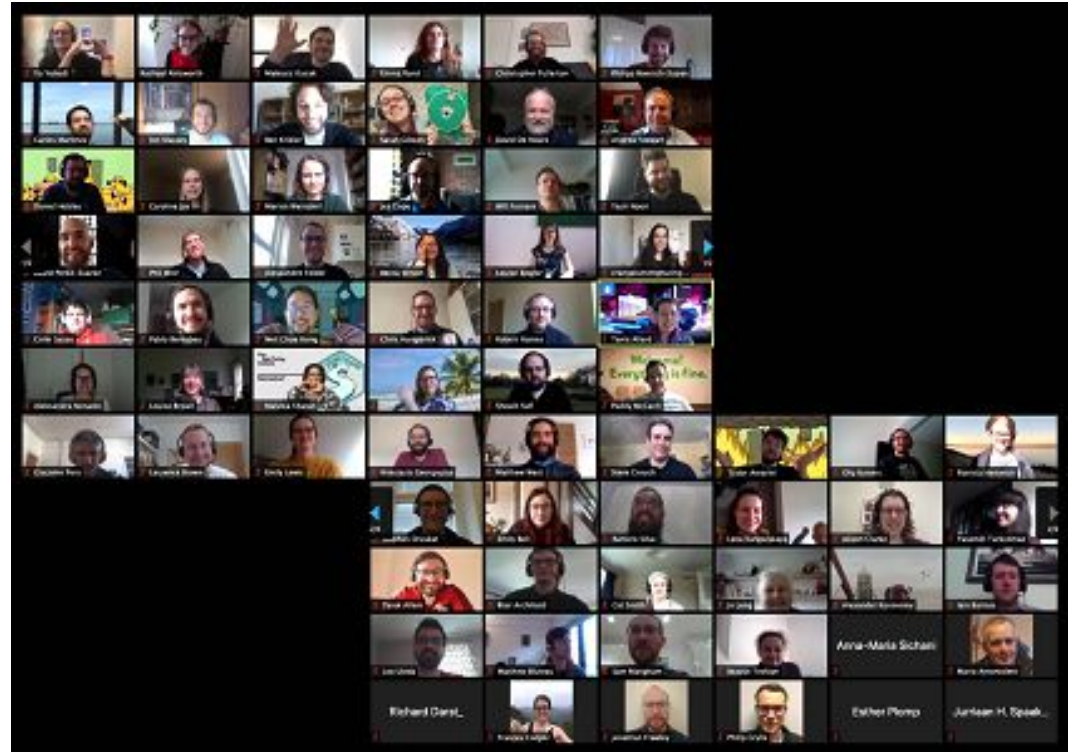
The FAIR4RS Roadmap outlines
how to make FAIR research software a reality.

- Map FAIR4RS projects into framework to guide investment
- Identify potential collaborators/leads and **resourcing needed**
- Identify opportunities for FAIR data initiatives

[FAIR4RS Metrics Working Group](#) formed Feb 2021

Thanks to Wellcome Trust for their support.

What would success look like?



[Highlights from CW20](#)

OECD OURdata index (Open, Useful & Reusable data index)



Source: Open, Useful and Re-usable data (OURdata) Index: 2019
 OECD Policy Paper, 2020



Is FAIR enough?

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

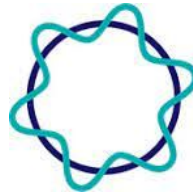


Research Software Engineers acknowledged in publications:

42-53% (Philippe, 2018, [What do we know about RSEs? Results from our international surveys](#))



[International Council of
RSE Associations](#)



**Academic
Data Science
Alliance**

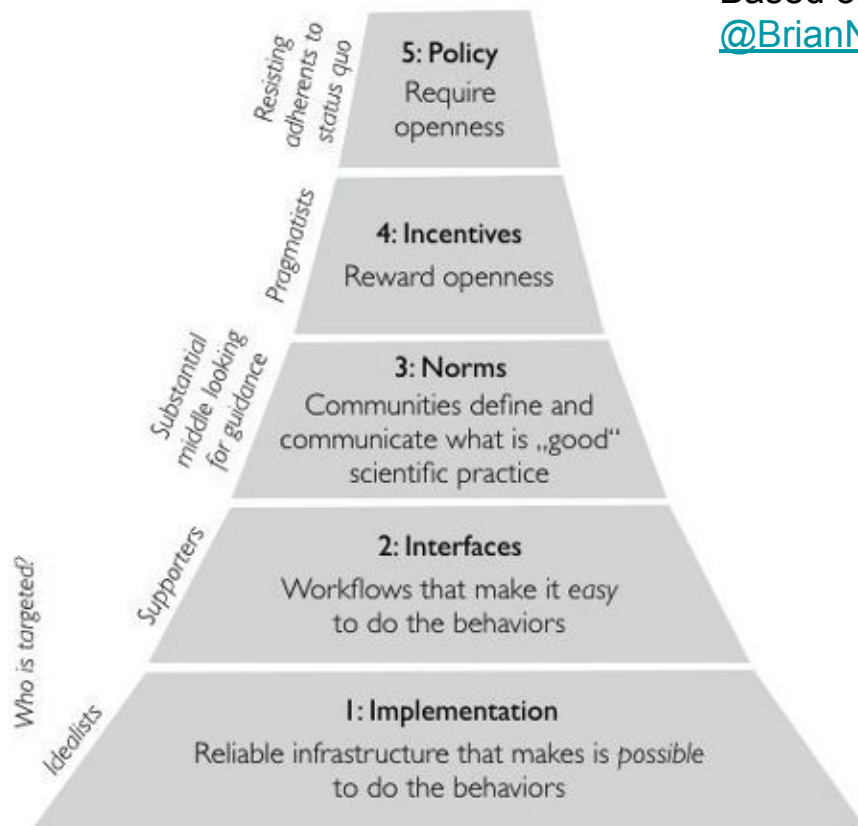


[Wikipedia](#)

<ReSA>
Research Software Alliance

How to achieve a cultural change towards open science

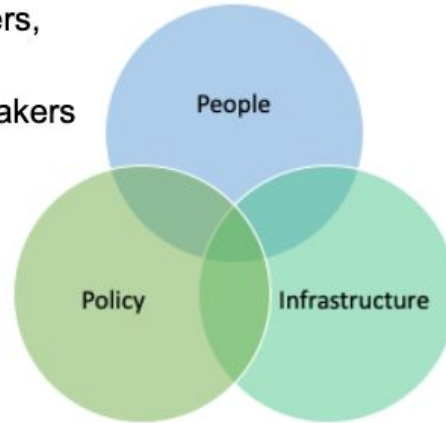
Based on a [tweetstorm](#) by [@BrianNosek](#)



3 focus areas

People

- Aim: improved individual's behaviour and skills; social infrastructure of communities
- Who: Researchers, Research Software Engineers, trainers, community leaders, decision-makers, policy makers



Policy

- Aim: policy advances to improve funding, careers and reward structures
- Where: international, national, disciplinary, organisational levels, etc

Infrastructure

- Aim: identify and support needed infrastructure
- What:
 - Physical: software repositories and registries
 - Frameworks: standards, guidelines
 - Structural: tools that enable rewards and recognition

What do we (not) know about Research Software Engineering?



- Infrastructure**
 - What software should be preserved and/or maintained?
 - How much research software is already open source?
- People**
 - What skills will a new RSE need in 5 years need?
 - Why do people become RSEs?
- Policy**
 - What are suitable merit evaluation schemes / metrics for RSEs?
 - How can support for RSE groups be improved?

How can you help?

- Subscribe to the [ReSA email list](#)
- Join the [FAIR4RS Working Group](#)
- Run your own FAIR events - eg [New Zealand eScience Infrastructure](#)
- Engage in FAIR events