Open science is all very well but how do you make it FAIR in practice?

Open science is about increasing the reuse of research, and making sure that publicly funded research is accessible to all. Key to achieving this is adhering to FAIR principles: ensuring the findings and data behind research results are findable, accessible, interoperable, and reusable. **Rachel Bruce** *and* **Bas Cordewener** *share findings from a recent report which takes stock of how far FAIR principles are supporting open science in the UK and how they are understood and adopted by the research community. There remains some way to go, with further investment in education, training, and skills required. However, it is important to recognise that a "one-size-fits-all" approach may not work, with different research communities having different norms and practices that should be respected as we define what FAIR means and decide how to monitor progress towards this goal.*

For research to be truly "open" both the findings and the data behind these results need to findable, accessible, interoperable, and reusable (FAIR), which means rethinking the research landscape as it stands. At a recent workshop of world experts organised by McGill University, The Wellcome Trust, The Gates Foundation, Research England, and Jisc – part of the defining success in open science project – FAIR success measures and a better understanding of implementation were identified as vital for progress in open science. In order to assess the UK's progress in this area we commissioned a report, "FAIR in practice", to take stock of how far FAIR principles are supporting open science, and to better understand how they play out in the research community.

The state of play

"FAIR in practice" highlights some key findings about where we are and where we need to head to realise an open research culture in the UK:

- There is a lack of knowledge and understanding about what FAIR means and what the benefit of FAIR data and processes could be for research. This is unevenly distributed over disciplines and stakeholders; change is needed to educate and invest in training and skills for researchers.
- At present, development of tools and processes are not focused on "FAIRness" so research potential is limited. Adhering to the FAIR principles should guide development of data services to support open research, and this is central to the European Open Science Cloud (EOSC).
- Efforts and initiatives on research being FAIR are scattered but the greatest benefits to the research community come from adopting the principles across the board. This requires coordination of activities and policy development at cross-disciplinary, national, and international levels.

Across disciplines and borders

The report offers a unique insight in the actual situation in the UK around FAIR data. Expectations and progress really differ across the disciplines, and this is explored within biological sciences, digital humanities (including history and archaeology), chemistry (including computational chemistry and crystallography), and social sciences, indicating that a "one-size-fits-all" approach just won't work to create open research.

Coincidentally, SURF in the Netherlands published a report, "FAIR Data Advanced Use Cases", and its conclusions come very close to the three mentioned above. It states, "FAIR is seen as part of a cultural change", "there is a tension between domain specific and interoperability needs", and "policies cannot be about FAIR alone". For the future, the SURF report suggests "integrated approaches with domain-specific guidance" and that "FAIR takes effort but it is worth it".

We are engaged in the EOSC, and along with Science and Technology Facilities Council, this is an important European initiative, developing a state-of-the-art research environment and infrastructure. It will promote best practice for research data and FAIR is a key underpinning. Defining FAIR within and across disciplines, and seeking to ensure the UK is engaged and able to progress in this area, is therefore essential.

Measures of success

Although the FAIR data principles are clearly formulated, it is not so easy to come up with a measurement to indicate the level of "FAIRness". Metrics are needed to indicate the level of data, processes or tools which are FAIR, to keep check on our progress.

The FAIR Metrics group, in which Susanna Sansone – one of the experts contributing to the FAIR in practice report – participates, is working to create more clarity on how measurement is carried out internationally. Here again it is important to recognise there is no one-size-fits-all approach, different research communities have different norms and practices and these must be respected in the process of defining what FAIR means and how we monitor progress towards this goal.

Where next?

With this report, we hope to fuel the discussion in the research community on what to do next. A consultation between stakeholders in the UK on the feasibility of a national GoFAIR node, and a Jisc workshop to coordinate uptake of FAIR, are just two possibilities. The Open Research Data Taskforce will also be key to taking the agenda forward, as will the European Commission's H2020 project investment in this area.

The report also shines a light on the drivers for successful adoption of FAIR principles, including political, economic, social, and technological aspects. To support researchers to deliver open results and open data, the policies and technology available need to support FAIR from the outset.

To ensure reproducibility of research and good research data management, which increases research impact, the FAIR principles are inseparable from open science; they are gaining enormous traction in Europe – the "Integrated advice of the Open Science Policy Platform, Recommendations FAIR Data" delivers strong recommendations:

> "Funders and Research Performing Organisations should give credit for Findable, Accessible, Interoperable and Reusable (FAIR) data resulting from research work."

> "Output Management Plans (OMPs), including Data Management Plans, (DMPs) and their implementation should be mandatory for all research projects. OMPs should be machine readable and regularly modified to reflect ongoing research developments."

> "Data resulting from publicly funded research must be made FAIR and citable, and be as open as possible, as closed as necessary".

It is increasingly important for research to be of good quality and widely understood, and FAIR data contributes to this. Technology offers a lot of opportunities to help make sure research is findable, interoperable, accessible, and reusable. However, the move toward FAIR is not just a technical matter but one of cultural change, for a global research community to embrace.

The full report, "FAIR in practice – Jisc report on the Findable Accessible Interoperable and Reuseable Data Principles", is available for download from Zenodo.

This blog post originally appeared on the Jisc blog and is licensed under a CC BY-NC-ND 2.0 UK license.

Featured image credit: John Schnobrich, via Unsplash (licensed under a CC0 1.0 license).

Note: This article gives the views of the authors, and not the position of the LSE Impact Blog, nor of the London School of Economics. Please review our comments policy if you have any concerns on posting a comment below.

About the authors

Rachel Bruce is Director, open science and research lifecycle at Jisc, leading research activities in the area of open science and the creation and management of research across the whole research lifecycle. She also leads the development of Jisc's research strategy, crossing the whole range of research support undertaken. Another part of Rachel's role includes work on international projects, including the European Open Science Cloud, and international partnerships, such as the Knowledge Exchange partnership, where Jisc works with similar organisations in Denmark, Finland, France, Germany, and the Netherlands to advance open scholarship. She tweets @rachelbruce.

Bas Cordewener is international facilitator at Jisc.