



FAIRsFAIR
Fostering Fair Data Practices in Europe

Supporting Data Management Planning

Key issue #4 in Assessing Capability Maturity and Engagement with FAIR-enabling Practices (ACME-FAIR)

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Supporting Data Management Planning

Introduction

Data management plans (DMPs) are recognised as an important element of good practice in research management, including by the European Commission and Science Europe.¹ Especially since the beginning of the EC Horizon 2020 programme, funders at national and international level expect research grant holders to complete a DMP demonstrating they have planned how data will be managed from the outset of a research project. Research Producing Organisations (RPOs) are expected to play their part, to help their researchers in producing data that is FAIR, and in depositing it in a trustworthy repository that can keep it in FAIR condition. And in some cases including the EC Horizon Europe programme, there is a need for DMPs to cover all research outputs (data, code, models, samples etc.), to be updated throughout the project, and ultimately made available as a project deliverable.

There are technical as well as policy factors driving universities, other RPOs, repositories and research infrastructures to enhance the support they offer researchers on DMPs. As research becomes ever more digital, the needs for FAIR data management expand alongside the risks and opportunities from data science. Services to support research similarly need to build up the range and scale of data management capabilities they offer, and tackle the opportunities for greater automation to make this affordable. With standards emerging for 'machine-actionable' DMPs,² there are opportunities to help data support staff to do their job more effectively by automating some of the response to researchers' needs.

The role of DMPs in implementing FAIR principles is recognised in the Turning FAIR into Reality report and action plan.³ As well as calling on RPOs to ensure DMPs are done, its recommendations include that they should be treated as 'living documents', accompanied by guidance relevant to research disciplines, evaluated accordingly, and the results used to improve FAIR data practices.

FAIRsFAIR has made further recommendations in line with Turning FAIR into Reality.⁴ These call on data stewards to work with research communities to Formalise and support appropriate data management plans (DMPs) for FAIR data. Similarly, FAIRsFAIR recommends that RPOs work with DMP tool providers, repositories and data infrastructures, and develop the roadmaps, guidance and workflows for machine-actionable DMPs needed to inform FAIR data stewardship.

This guide aims to help Research Performing Organisations consider responding to such recommendations, by assessing their own needs to support DMPs, taking into account what they currently have in place and where improvements may be needed. Further ACME-FAIR guides are available on 'Enabling the policy environment' and related topics.

¹ Science Europe (2021) Practical Guide to the International Alignment of Research Data Management - Extended Edition <https://doi.org/10.5281/zenodo.4915861>

² Miksa, T., Walk, P., & Neish, P. (2019). RDA DMP Common Standard for Machine-actionable Data Management Plans. <https://doi.org/10.15497/rda00039>

³ Directorate General for Research and Innovation (European Commission). Turning FAIR into reality. <https://doi.org/10.2777/1524> (2018).

⁴ Molloy, L., Nordling, J., Grootveld, M., van Horik, R., Whyte, A., Davidson, J., Herterich, P., Martin, I., Méndez, E., Principe, P., Vieira, A., & Asmi, A. (2020). D3.4 Recommendations on practice to support FAIR data principles. Zenodo. <https://doi.org/10.5281/zenodo.3924132>

Introducing ACME-FAIR

ACME-FAIR is a set of guides produced in the FAIRsFAIR project, whose main purpose is to help those managing and delivering relevant professional services to self-assess how they are enabling researchers, and colleagues who support them, to put the FAIR principles into practice (for short we refer to this as ‘FAIR-enabling practice’). ACME-FAIR can be used independently, or it can be used to complement Science Europe’s *Practical Guide to Sustainable Research Data*.⁵ Both guides include ‘capability maturity’ matrices (or ‘rubrics’), for Research Performing Organisations (RPOs) e.g. universities, research institutes. While Science Europe’s guide targets their strategic-level management, **ACME-FAIR aims to support the operational levels of the organisation**. It can optionally be used to follow up an assessment based on the Science Europe maturity matrices. ACME-FAIR is also strongly informed by the recommendations of the European Commission’s Expert Group on FAIR data, *Turning FAIR into Reality*.⁶

Covering key practical issues

ACME-FAIR covers 7 key issues for FAIR-enabling practice themes highlighted by FAIRsFAIR, in response to recommendations from the *Turning FAIR into Reality* report, and issues covered by the Science Europe *Guide to Sustainable Research Data*. The table below shows how the FAIRsFAIR and Science Europe guides complement each other.


<ol style="list-style-type: none">1. Defining the policy environment2. Developing sustainable business models3. Professionalising roles through training, mentoring, and recognition4. Supporting data management planning5. Defining data interoperability frameworks6. Selecting data, services, and repositories for FAIR7. Ensuring trusted curation	<ul style="list-style-type: none">- Policy environment- Financial aspects- Training  <p>Technical preparedness</p>
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Table 1. Mapping key issues addressed in ACME-FAIR (left) to Science Europe’s guidance (right)

The ACM-FAIR guides are a series, with one guide for each of the issues in Table 1. Each includes a brief introduction, together with the explanation above, followed by a checklist describing the scope of the capabilities covered. Each guide then offers a rubric or set of tables describing maturity and community engagement dimensions of these capabilities.

Why use ACME-FAIR?

The ACME-FAIR aims to be useful to services providing researchers with support on FAIR implementation. Its fundamental role is to offer a framework for discussion within and between organisations. It has 3 main use cases:

1. For the service to self-assess its readiness to support FAIR, by establishing current and desired levels of communication and adoption of community practices and the organisational maturity of the support offered for these.

⁵ Tommaso Boccali, Anne Elisabeth Søltnes, Mark Thorley, Stefan Winkler-Nees, & Marie Timmermann. (2021). Practical Guide to Sustainable Research Data. <https://doi.org/10.5281/zenodo.4769703>

⁶ European Commission, Directorate-General for Research and Innovation, (2018). *Turning FAIR into reality : final report and action plan from the European Commission expert group on FAIR data*, Publications Office. <https://data.europa.eu/doi/10.2777/54599> (p.57)

2. Provide a basis for dialogue with colleagues to set out a roadmap for improving on current support, e.g. through training and skills development to improve the communication and adoption of community practices.
3. Support sharing of consistent information between peer organisations about their current levels of maturity and community engagement around FAIR-enabling practices, e.g. with national or international coordination and facilitation.

Organisations that perform research vary a great deal, both in how they are organised internally, and the environments they operate in. No capability model can take all of these factors into account, so anyone involved in planning a roadmap for their organisation's services in this area is likely to want or need more specific guidance on the topics covered. The ACME-FAIR guides will be developed further to reference some of these. FAIRsFAIR also offers a set of examples in the form of 'Implementation Stories' that cover the same themes.⁷

Background

ACME FAIR is partly based on the Digital Curation Centre's *RISE* self-evaluation framework for research data service development⁸, and partly on the guide '*Do I-PASS for FAIR*', which was produced in the context of the Dutch Coordination Point Research Data Management.⁹

ACME FAIR uses a two-dimensional scale, comprising 0-3 maturity levels for each of the 7 issues, and 0-3 levels of communication and adoption of practice. The **maturity levels** are a simplified version of the first 3 levels of the widely adopted *CMMI* (Capability Maturity Model Integration) framework¹⁰.

The levels of "**community engagement**" are separated out from maturity for the following reasons:

- Community engagement is essential for all of the practice areas covered.
- While the maturity goal of optimising alignment with *organisational* standards and practice is relevant to Research Performing Organisations, for research data support it is equally important to align with *community* standards, as defined by research domains and professional communities of practice.
- Identifying areas where maturity and engagement are at differing levels may be helpful to identify pockets of good practice in one or the other, or areas to target for further action.

Capability dimensions: maturity and community engagement

The maturity and community engagement dimensions both indicate progression from no activity (level 0), through ad-hoc coverage of some practice areas (e.g. varying widely across research projects), through to more standardised approaches across the organisation. The maturity and community engagement dimensions are described in more detail as follows:

Maturity

0. **Not addressed.** The relevant professional services for research support do not coordinate any support capability for researchers in this area of focus. Some staff may help but it is not a formally recognised part of their job.

⁷ <https://fairsfair.eu/implementation-adoption-stories>

⁸ Rans, J and Whyte, A. (2017). 'Using RISE, the Research Infrastructure Self-Evaluation Framework' v.1.1 Edinburgh: Digital Curation Centre: www.dcc.ac.uk/guidance/how-guides

⁹ Taco de Bruin, Sarah Coombs, Jutta de Jong, Irene Haslinger, Henk van den Hoogen, Frans Huigen, Mijke Jetten, Jacko Koster, Margriet Miedema, Sjeff Öllers, Inge Slouwerhof, Ingeborg Verheul, & Jacqueline Ringersma. (2020). Do I-PASS for FAIR. A self assessment tool to measure the FAIR-ness of an organization (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.4080867>

¹⁰ CMMI. e.g. https://en.wikipedia.org/wiki/Capability_Maturity_Model_Integration

1. **Initial.** May be incomplete and falling short of the intent of the area of focus. Aware of and addressing performance issues.
2. **Managed.** Complete coverage delivering the full intent of the area of focus, minimally in some aspects. Lacking full alignment with overall organisational standards and practice, but identifies and monitors performance objectives. Includes and builds on level 1.
3. **Defined.** Complete coverage that delivers the full intent of the area of focus and aligns with overall organisational standards and practice. Identifies and monitors performance objectives that expand alignment to the whole organisation. Includes and builds on level 2.

Community engagement: practice awareness, adoption, and collaboration

This dimension identifies the level of engagement the organisation (or the relevant services it offers) has with the communities it serves, about maintaining and updating data stewardship practices and identifying new areas for the development of policy and implementation standards. It includes actively communicating and promoting existing and emerging approaches to the immediately impacted communities and the wider data infrastructure landscape.

0. **Not addressed.** The relevant professional services for research support do not coordinate any support capability for researchers in this area of focus. Some staff may help but it is not a formally recognised part of their job.
1. **Awareness:** the service monitors data stewardship practice in the community or communities it serves, and makes local practitioners aware of it.
2. **Adoption:** the service or its host organisation also supports practitioners to embed community practice locally.
3. **Collaboration:** the service also engages with the design, development, and review of community practice. Consults and collaborates widely, potentially also taking a community coordination and leadership role.

Please give us your feedback

The Digital Curation Centre (DCC) maintains ACME-FAIR. Feedback on this guide was gathered in the FAIRsFAIR project, and changes have been made to reflect that. DCC very much welcomes your thoughts on how to improve it further, especially suggestions of guidance to reference on each of its themes. Please give your feedback using this [short questionnaire](#). It asks how far you agree with 4 simple statements, and invites you to add any comments you wish. Please note that it collects no personal information.

ACME Checklist: Supporting data management planning

The ACME-FAIR checklist identifies four main capability areas under this theme. Three capability areas are assessed on the *maturity* scale, measuring integration of the capability with organisation-level standards and practices. Another capability area is assessed on the *community engagement* scale, measuring adoption of broader community standards and practices.

The Science Europe *Practical Guide to Sustainable Research Data* includes a capability maturity matrix that complements ACME-FAIR at a high level. The relevant capabilities it describes include:

- Policy environment: articulating the principles and practices on RDM established by the RPO and to be followed by its researchers, together with the necessary support to its researchers.

- Organisational engagement and commitment: acknowledging the need to develop solutions for sustainable research data and being committed to seek alignment of approaches with other research stakeholders (such as other RPOs, funders, infrastructures, research communities).

The scales used in the Science Europe guide are broadly consistent with ACME-FAIR. It may be helpful to use it prior to using ACME-FAIR, but this is not necessary to use ACME-FAIR effectively.

As a first step, consider the capabilities in the checklist below that are relevant to your organisation. This may help you narrow down your goals in using ACME-FAIR, which might include assessing only those capabilities already under development, only those under consideration, or both.

Which capabilities is your organisation developing or considering doing in future?

Maturity	Current	Considering
1) Aligning policy on DMPs with FAIR principles?	<input type="checkbox"/>	<input type="checkbox"/>
2) Designing and delivering DMP guidance?	<input type="checkbox"/>	<input type="checkbox"/>
3) Implementing machine-actionable DMPs?	<input type="checkbox"/>	<input type="checkbox"/>
Engagement		
4) Communicating and developing DMP capabilities?	<input type="checkbox"/>	<input type="checkbox"/>

These capabilities might be developed by a single unit within a Research Performing Organisation, for example by a Library or Research Office. More likely, several areas of the organisation's governance will also be involved, e.g. Research Committee, Research Ethics Committee, Intellectual Property and Commercialisation Unit, and any Research Data Management service.

The next step in using ACME-FAIR is to discuss with the relevant colleagues what can realistically be achieved to meet needs of researchers, other stakeholders such as funders, and the organisation. To inform that, you may find the scope notes below helpful. They describe each capability for this theme covered in the framework..

Scope

We define capabilities as follows below, and then describe levels of maturity and engagement.

Aligning policy on DMPs with FAIR principles

- Recognition of FAIR principles in the organisation's policy on DMPs
- Working with colleagues across the organisation to offer DMP support across the research lifecycle
- Using FAIR data criteria to offer constructive feedback on DMPs, and planned steps to make data FAIR

Designing and delivering DMP guidance

- Helping researchers to meet DMP requirements of funders and other stakeholders
- Data stewardship roles and processes to coordinate service responses to DMPs
- Comprehensive and monitored guidance service for DMPs across the research lifecycle

Implementing machine-actionable DMPs

- Investigating the use-cases for integrating DMP tools with other services
- Applying machine-actionable DMP standards to integrate support offered to implement DMPs
- Comprehensive support for automating the response to DMPs across the research lifecycle

Communicating and developing DMP capabilities

- Advocating DMPs for FAIR data and communicating the contribution to (e.g.) reproducibility
- Enabling data stewards to work proactively with research communities on common practices
- Ensuring that domain-specific support is available through templates and recommendations

ACME rubric: Supporting data management planning

Supporting Data Management Planning	Maturity			
	1) Initial May be incomplete and falling short of the intent of the area of focus. Aware of and addressing performance issues	2) Managed Delivering the full intent of the area of focus, though minimally in some aspects. Lacking full alignment with overall organisational standards and practice, but identifies and monitors performance objectives. Includes and builds on level 1.	3) Defined Complete coverage that delivers the full intent of the area of focus and aligns with overall organisational standards and practice. Identifies and monitors performance objectives that expand alignment to the whole organisation. Includes and builds on level 2.	Maturity level (0-3)
Aligning policy on DMPs with FAIR principles	Our organisation's policy recognises that data management planning is essential for the implementation of the FAIR principles and Open Science. We offer guidelines about how to write DMPs to take account of FAIR principles, and to meet the data policy expectations of the relevant Research Funding Organisations and other stakeholders.	We work with colleagues across the organisation to ensure that data management planning is supported across the research lifecycle, so that data can be "born FAIR" and kept "FAIR enough" over time. We offer guidance to assist researchers in updating their DMP to identify which data they make FAIR and keep FAIR, as well as advising on where data should be deposited. Standardised exceptions for sharing data are available in the policy guidance we provide.	Our organisation has processes to offer staff constructive feedback on how well their DMPs meet policy expectations, and to ensure they contain appropriate steps to prepare data that will be FAIR. Guidance is periodically reviewed for alignment with policy recommendations on following FAIR principles.	
Designing and delivering DMP guidance	We help researchers to meet the requirements of funders or other stakeholders to plan for FAIR data in their project. We are developing guidance on DMP content, and we review completed DMPs to consider the resourcing implications, helping researchers to manage risks and costs of making data FAIR.	We have data stewardship roles and processes to give feedback on DMP content and notify the relevant stakeholders of the resource implications of the plan, e.g. to initiate data storage allocation, or support the proper handling of ethically or commercially sensitive data. As they draft and revise their DMP, researchers are helped to manage the risks and costs associated with preparing FAIR data and potentially sharing that data.	Our organisation has agreed on templates and recommendations that are applicable across the organisation. Support is offered across the research lifecycle, from evaluation of the initial DMP through to assistance with end-stage reporting of actions performed, including revisions to the DMP during the project. The support service is monitored against objectives for reducing RDM costs or risks identified.	

Supporting Data Management Planning	Maturity			
	1) Initial May be incomplete and falling short of the intent of the area of focus. Aware of and addressing performance issues	2) Managed Delivering the full intent of the area of focus, though minimally in some aspects. Lacking full alignment with overall organisational standards and practice, but identifies and monitors performance objectives. Includes and builds on level 1.	3) Defined Complete coverage that delivers the full intent of the area of focus and aligns with overall organisational standards and practice. Identifies and monitors performance objectives that expand alignment to the whole organisation. Includes and builds on level 2.	Maturity level (0-3)
Implementing machine-actionable DMPs	We are investigating the potential of machine-actionable DMPs to help fulfil the support needs of research projects more effectively or efficiently through automation. Specific use cases are investigated, e.g. for integrating DMP support tools and processes for handling ethical approval, data storage, or curation requirements.	We apply standards for machine- actionable DMPs, and we are identifying benefits to the organisation from integrating DMP tools with research project support processes that can fulfil the needs identified in DMPs. We liaise with Research ethics committees on integrating ethical approval systems with DMP support processes, to reduce duplication of effort and to mitigate risks to data subjects.	Data management planning is comprehensively supported in our organisation, offering automated support processes at different points in the research lifecycle. These link DMPs to services that can fulfil needs, by integrating with systems to (e.g.) handle data storage requirements, get ethical approval, identify relevant standards and repositories, or evaluate whether outputs are FAIR.	

	Community engagement: Practice awareness, adoption and collaboration			
Supporting Data Management Planning	1) Awareness: the organisation monitors community practice and makes local practitioners aware of it.	2) Adoption: the organisation also supports practitioners to embed community practice locally. Includes and builds on level 1.	3) Collaboration: the organisation also engages with the design, development, and review of community practice. Consults and collaborates widely, potentially also taking a community coordination and leadership role. Includes and builds on level 2.	Engage-ment level (0-3)
Communicating and developing DMP capabilities	We advocate data management planning for FAIR data, to support research integrity goals, enhance data quality and contribute to reproducibility and transparency. We ensure that researchers are aware of data management planning support available, including guidance from the relevant funders, and relevant services available from research infrastructures.	We enable data stewards to work proactively with research communities and their organisations to build cooperation around data management planning, and to work with other research support colleagues as much as possible to create common practices for implementing FAIR principles.	Our organisation ensures there is collaboration between central and faculty/department-level support structures to help projects use the DMP to implement FAIR using domain-relevant approaches. Researchers and data stewards are encouraged to contribute to the development and maintenance of domain-relevant guidance.	

