



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

The document sets out a draft FAIRsFAIR framework, 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’). We welcome your comments on this draft, and responses to the specific consultation questions you can find below, at the end of this Introduction.

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 e.g. universities, research institutes. While Science Europe’s guide is aimed at strategic-level management of the organisation, **ACME-FAIR targets 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 *Turning FAIR into Reality*⁶ (henceforth TFIR), the recommendations of the European Commission’s Expert Group on FAIR data.

Covering key practical issues

ACME-FAIR covers 7 key issues. These address the FAIR-enabling practice themes highlighted in a number of FAIRsFAIR deliverables, together with recommendations from the *Turning FAIR into Reality* report. The table below shows the corresponding areas covered by the Science Europe *Guide to Sustainable Research Data*.

<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)

Why use ACME-FAIR?

ACME-FAIR aims to be useful for services providing support to researchers on FAIR implementation in Research Performing Organisations (RPOs). 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 engagement with research community practices, and the organisational maturity of the support offered for FAIR data.
2. To aid colleagues’ in identifying areas of improvement in an organisation’s support for FAIR data management.
3. For national or international coordination initiatives to facilitate sharing of consistent information between peer organisations about their current levels of maturity, and to encourage community engagement around FAIR-enabling practices.

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

⁶ Collins, S., Genova, F., Harrower, N., Hodson, S., Jones, S., Laaksonen, L., ... & Wittenburg, P. (2018). Turning FAIR into reality: Final report and action plan from the European Commission expert group on FAIR data.

The ultimate aim of ACME-FAIR is to improve availability of information on the implementation of support for FAIR data across disciplines and communities of practice. ACME-FAIR is partly based on the Digital Curation Centre's *RISE* self-evaluation framework for research data service development⁷ and partly on the guide '*Do I-PASS for FAIR*', which was produced in the context of the Dutch Coordination Point Research Data Management.⁸

How ACME-FAIR is structured

ACME FAIR uses a scale comprising, for each of the 7 issues, the following dimensions: -

- 3 levels of **maturity**
- 3 levels of **community engagement**

The maturity levels are a simplified version of the first 3 levels of the widely adopted *CMMI* (Capability Maturity Model Integration) which has been widely adopted as a tool to guide process improvement, especially in software development contexts.⁹

in ACME-FAIR 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 dimension, or areas to target for further action in your organisation.

The maturity and community engagement dimensions both indicate progression from ad-hoc project-level coverage of practice areas, through to organisation-wide coverage. These levels are:

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.** Coverage delivering the full intent of the area of focus, minimally in some aspects, or lacking full alignment with overall organisational standards and practice. The approach 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.

⁷ 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

⁸ Taco de Bruin, Sarah Coombs, Jutta de Jong, Irene Haslinger, Henk van den Hoogen, Frans Huigen, Mijke Jetten, Jacko Koster, Margriet Miedema, Sief 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>

⁹ See e.g. 'Capability Maturity Model Integration' Wikipedia article (accessed 24.11.2021) https://en.wikipedia.org/wiki/Capability_Maturity_Model_Integration

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.

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.

ACME covers the issues listed in Table 1, each with a two-dimensional rubric (maturity and community engagement).

Consultation questions

Please use [this form](#) to give your feedback. It asks how far you agree with 4 simple statements, and invites you to add any comments you wish. Please note that the form collects no personal information.

You are also welcome to add comments directly to [this google doc](#) (these may identify you by your Google ID). If you prefer, please email the FAIRsFAIR task lead Dr Angus Whyte (a.whyte@ed.ac.uk) or the Project Coordination Office (pco@fairsfair.eu).

ACME Checklist

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

Supporting Data Management Planning - ACME Rubric

Supporting Data Management Planning	Maturity			Maturity level (1-3)
	1) Initial	2) Managed	3) Defined	
	<p>1) Initial May be incomplete and falling short of the intent of the area of focus. Aware of and addressing performance issues</p>	<p>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.</p>	<p>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.</p>	
<p>Aligning policy on DMPs with FAIR principles</p>	<p>Our organisation’s policy The RPO policy on recognises that DMPs are data management planning recognises that this is essential for the implementation of the FAIR principles and Open Science. We offer basic guidance on It , offering guidelines about how to do data management planning for parts of the research lifecycle.</p>	<p>We work with colleagues across the organisation to ensure that data management planning is supported across the entire research lifecycle, so that data can be “born FAIR” and kept “FAIR enough” over time. We offer guidance to assist researchers in using their DMP to identify which data they will 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 our organisation provides.</p>	<p>We use FAIR data criteria to offer constructive feedback on DMPs, helping ensure that the DMPs contain appropriate steps to prepare data that will be FAIR. Guidance is periodically reviewed for alignment to recommendations on following FAIR principles.</p>	
<p>Designing and delivering DMP guidance</p>	<p>We help researchers to meet the requirements of funders or other stakeholders to plan Research Data Management (RDM) in their project. Our organisation is establishing a support process, offering feedback on DMP content, notifying relevant stakeholders of any resourcing implications, and helping researchers to manage risks and costs associated with making data FAIR.</p>	<p>Our organisation has established 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.</p>	<p>We provide organisation-wide guidance on data management planning. Support is offered across the research lifecycle, from evaluation of the initial DMP through to assistance with end-stage reporting of RDM actions performed, including revisions to the DMP during the project. The support service is monitored against objectives for reducing RDM costs or risks identified.</p>	

Supporting Data Management Planning	Maturity			Maturity level (1-3)
	1) Initial	2) Managed	3) Defined	
	May be incomplete and falling short of the intent of the area of focus. Aware of and addressing performance issues	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.	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.	
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, with automated processes throughout the research lifecycle, including processes that are available locally and from funders or research infrastructures (for example to handle data storage requirements, ethical approval requirements, meet repository requirements for outputs to be checked for FAIRness).	

	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.	Engagement level (1-3)
Communicating and developing DMP capabilities	Our organisation advocates 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.	Our organisation enables 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.	Our organisation ensures that domain-specific support to implement the DMP is available locally (research group, faculty/department). Researchers and data stewards are encouraged to contribute to the development and maintenance of domain-relevant guidance. We have agreed on templates and recommendations that are applicable across the organisation.	

