Preface

About the FAIR Principles

When “The FAIR Guiding Principles for Scientific Data Management and Stewardship” were initially published they addressed a very important aspect for the data management community: even though everyone in the RDM community knew, that the management of research data was important, it was very hard to communicate the goals and benefits to anyone outside the RDM teams. Data Managers faced a lot of backlash, because they had difficulties to properly explain why documantration of data was useful, how it was supposed to be organized, and what the additional value would be. At his point the FAIR guiding principles offered a relatively simpe narrative, describing the high level goals of RDM through four terms. The data should become Findable, Accessible, Interoperable and Reusable. The RDM community could very well identify themselves with these goals. In addition, four more concrete level principles (F1-4, A1-4, I1-4, R1-4) were listed, which outline particular practices aimed to achieve the higher level goals.

What happened was, that the data mangers tailored their data infrastructuires and ecosystems to conform with the lower level goals.

The FAIR principles as described by Wilkinson et al. pose implementers with the following limitations:

1. **Not a technical standard:** FAIR describes desired outcomes but does not prescribe a specific technical implementation.

2. **No detailed implementation guidance:** The principles do not specify which formats, systems, or metadata standards should be used.

3. **Dependent on community standards:** FAIR can only work effectively if research communities agree on shared standards and apply them consistently.

4. **FAIRness is gradual:** Data can fulfil individual FAIR principles to different degrees.

5. **Limited machine actionability:** Complete automated understanding and processing of data is often not achievable.

6. **Metadata alone is insufficient:** Even rich metadata does not ensure interoperability without shared vocabularies and clearly defined semantic relationships.

7. **FAIR does not mean open:** Access-restricted data can still be FAIR if their metadata and access conditions are clearly described.

8. **Not a complete governance model:** FAIR focuses on digital research objects and does not cover all responsibilities of data producers, repositories, and institutions.

The central limitation can therefore be summarized as follows: FAIR defines the properties that a well-managed digital research object should exhibit, but it does not provide the common standards or coordinated implementation required to produce those properties. Its practical success depends on research communities agreeing upon and consistently applying persistent identifiers, metadata schemas, semantic vocabularies, protocols, provenance practices, and licences.

Introduction

The Character of This Wiki

Welcome to the wiki of Helmholtz Metadata Collaboration (HMC) Hub Earth and Environment! This platform is a permanent work in progress and represents our perspectives as the HMC Hub Earth and Environment and our community. More formal results are derived from here and published on the HMC website, our Hubs website, or in other resources.

The Helmholtz Metadata Collaboration

The HMC promotes the qualitative enrichment of research data by means of metadata – and implements this approach across the whole organization.

HMC develops and implements concepts and technologies for a sustainable handling of research data through high-quality metadata. Its main goal is to make the depth and breadth of research data produced by Helmholtz Centers findable, accessible, interoperable and reusable (FAIR Principles[1)]) for the whole science community. The intention to ensure FAIR data across Helmholtz is also contained in the “Recommendations for Policies of the Helmholtz Centers on Research Data Management”[2)].

Many people and stakeholder groups produce data relevant for research data, information and knowledge systems. In order to create a harmonized interoperable and ultimately **FAIR data space**, practices and processes need to be aligned across our data systems and implemented by these people and stakeholders.

The Content of This Wiki

In this Wiki, the HMC Hub Earth and Environment and its partners will **formulate recommendations** for such aligned practices for the community. We are making concrete suggestions for the implementation and support with practical suggestions for such procedures.

To achieve FAIR data across the various Helmholtz Earth and Environment data infrastructures (DIS), we have developed the **Road-to-FAIR-Strategy**. This strategy describes a number of coordinated efforts. As a first step, the existing DIS and their interfaces are examined to identify best practices that can serve as models. Based on this, different committees work together to develop concrete implementation steps for specific goals. For each agreed-upon building block, concrete recommendations are formulated and documented. These recommendations are developed and presented in this Wiki as a living handbook and will evolve over time as work progresses.

The resulting recommendations are consistently documented using the same guiding questions and a harmonized structure. Two perspectives must therefore be considered: on the one hand, the discussion and agreement on content; on the other, the administrative and technical implementation. Each individual step required for implementation must be examined. The perspectives and roles of the various stakeholders are taken into account to ensure that all influencing factors are considered in detail. In addition, the decision-making processes that lead to established procedures are

outlined—both from the bottom up and from the top down.

This provides a foundation for optimizing the procedures concerning the individuals involved, their responsibilities, and the necessary actions. In order for the FAIR approach to be successful, it is essential that identified stakeholders take on specific responsibilities.

Contributions

The contributors to this wiki are

- HMC Hub Earth and Environment
- Working group Arbeitskreis Metadaten
- Working group Arbeitskreis Semantik

Both working groups are formed by the HMC Hub Earth and Environment and the DataHub Earth and Environment.

For questions, comments and suggestions, please write to hmc-hub_ee@geomar.de.

1)
Wilkinson, M. D. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci. Data 3:160018 doi: 10.1038/sdata.2016.18 (2016).
2)
Empfehlungen für Richtlinien der Helmholtz-Zentren zum Umgang mit Forschungsdaten, 2019, Helmholtz Open Science, https://os.helmholtz.de/open-research-data/forschungsdaten-policies/ doi: doi.org/10.2312/os.helmholtz.002

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