CHALLENGES IN EVALUATING COMPLIANCE WITH THE FAIR PRINCIPLES
RDA 13 - SHARC session - Philadelphia, April 2019

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THE FAIR PRINCIPLES
FAIR PRINCIPLES

Findable:
F1. (meta)data are assigned a globally unique and persistent identifier;
F2. data are described with rich metadata;
F3. metadata clearly and explicitly include the identifier of the data it describes;
F4. (meta)data are registered or indexed in a searchable resource;

Accessible:
A1. (meta)data are retrievable by their identifier using a standardized communications protocol;
A1.1. the protocol is open, free, and universally implementable;
A1.2. the protocol allows for an authentication and authorization procedure, where necessary;
A2. metadata are accessible, even when the data are no longer available;

Interoperable:
I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
I2. (meta)data use vocabularies that follow FAIR principles;
I3. (meta)data include qualified references to other (meta)data;

Reusable:
R1. (meta)data are richly described with a plurality of accurate and relevant attributes;
R1.1. (meta)data are released with a clear and accessible data usage license;
R1.2. (meta)data are associated with detailed provenance;
R1.3. (meta)data meet domain-relevant community standards;

https://www.nature.com/articles/sdata201618
Do you find any of the FAIR Principles... weird?

Source: Mark D. Wilkinson
What about this one:

F3: Metadata clearly and explicitly include the identifier of the data it describes

That’s an unusually specific rule, given the generality of the other Principles! ...why?

Source: Mark D. Wilkinson
Understanding the Objective/Purpose of each Principle helps clarify the basis of a “Maturity Indicator” we designed to measure it

FAIR Principles Explained:
https://www.go-fair.org/fair-principles/

Source: Mark D. Wilkinson
FAIRNESS ASSESSMENT CHALLENGES
WHY TO ASSESS?

- Because everybody is talking about FAIR and my resources should be seen as FAIR, whatever this means?

- To satisfy funders requirements?

- To serve as a guideline for achieving higher levels of interoperability and reuse with clarity on the concrete benefits (help improve)?
WHAT TO ASSESS?

- Metadata and data?
- Only metadata?
- Only data?
  - What do you mean by data?
  - In the FAIR principles, data refers to a variety of different resources, e.g., “traditional” data, services, software, APIs, vocabularies, ontologies, articles, etc.
HOW TO ASSESS?

- **Manual**
  - Takes advantage of human understandable artifacts, which are currently prevalent
  - May lead to subjective assessments and, therefore, harder to compare resources
  - Harder to scale
  - Harder to evaluate FAIR for machines, which is the main goal of the FAIR principles

- **Automatic**
  - Requires more rigor on the assessed resources
  - More likely to produce objective assessments
  - Easier to scale
  - Able to check if machines can, in fact, “work” with the (meta)data
HOW TO “READ” THE ASSESSMENTS?

- Need for a scoring system
  - One score for the 4 aspects of FAIR? Does not seem useful.
  - One score per aspect (F, A, I and R)?
  - One score per principle? What about the sub-principles?
  - Is there a hierarchy among the principles? Is there an order of precedence? Or different weights?
  - Is there an acceptable minimal FAIR level? Should it be across domains and applications or domain/community-dependent?
  - Do we use a pass/fail approach or introduce intermediary compliance levels in each/some evaluation?

- Need for a visual representation of the scores
  - To facilitate quick perception of the FAIRness level, a visual representation of the FAIR scores is required, e.g., stars, bars, etc.
WHAT MAKES A MEASUREMENT “GOOD”?  

● Clear: so that anybody can understand what is meant.

● Realistic: so that anybody can report on what is being asked of them.

● Discriminating: so that we can distinguish the degree to which a resource meets a specific FAIR principle, and can provide instruction as to what would maximize that value.

● Measurable: The assessment can be made in an objective, quantitative, machine-interpretable, scalable and reproducible manner → transparency of what is being measured, and how.

● Universality: The extent to which the MI is applicable to all digital resources.

Source: Mark D. Wilkinson
RUBRIC FOR DESIGNING AN MI

We designed a set of parameters that must be considered for every MI.

The parameters are designed to help ensure that the MI you are designing is “good”.

Source: Mark D. Wilkinson
<table>
<thead>
<tr>
<th>MI Identifier</th>
<th>MI Name</th>
<th>To which principle does it apply?</th>
<th>What is being measured?</th>
<th>Why should we measure it?</th>
<th>What must be provided?</th>
<th>How do we measure it?</th>
<th>What is a valid result?</th>
<th>For which digital resource(s) is this relevant?</th>
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<tbody>
<tr>
<td>FAIR MIs should, themselves, be FAIR objects, and thus should have globally unique identifiers.</td>
<td>human-readable name for the MI</td>
<td>MIs should address only one sub-principle, since each FAIR principle is particular to one feature of a digital resource; MIs that address multiple principles are likely to be measuring multiple features, and those should be separated whenever possible.</td>
<td>A precise description of the aspect of that digital resource that is going to be evaluated</td>
<td>Describe why it is relevant to measure this aspect</td>
<td>What information is required to make this measurement?</td>
<td>In what way will that information be evaluated?</td>
<td>What outcome represents &quot;success&quot; versus &quot;failure&quot;</td>
<td>If possible, a MI should apply to all digital resources; however, some MIs may be applicable only to a subset. In this case, it is necessary to specify the range of resources to which the MI is reasonably applicable.</td>
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</tbody>
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GENERAL CHALLENGES

- Clarify that nobody has been asked to be 100% FAIR. Many times a lower FAIRness level is perfectly adequate.
- Consider different preparedness levels from different communities;
- How to deal with the conflicting forces that, from one side want to push the communities towards a better (and FAIRer) data landscape and, from the other side, want to preserve the status quo (existing “kingdoms”) but labeling themselves FAIR?
- Who will define the assessment criteria?
- Who will execute the assessments based on the defined criteria?
- Should we have a unique set of assessment criteria? Or a core set for general comparison and domain-specific sets on top of the core for the specific needs of a given domain/application?
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