FAIR DESIGN JAM: A CASE STUDY ON CO-CREATING COMMUNICATION ABOUT FAIR DATA PRINCIPLES

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Abstract: *While many researchers are interested in making their data open, it is not always clear what they should do to ensure that their data is FAIR: Findable, Accessible, Interoperable and Reusable. This paper reports how we applied the Design Jam method to help experts and policymakers ideate user-friendly solutions to implement the FAIR Data Principles into simple and actionable instructions for researchers. We suggest that visual prototyping and co-design methods can be successfully used in policy implementation to facilitate collaboration while exploring and concretizing complex ideas.*

1. Introduction

Today's science is data-driven. The ubiquitous access to data and the volume of digital information are transforming the research process [Nelson 2009]. In data-driven science, the significance of good data management should not be underestimated because it promotes discovery and efficiency through data access and reuse, as well as increases scientific reliability by ensuring data transparency and facilitating meta analysis.

Good data management includes, among many other things, understandable agreements, terms of use and licences, and good documentation practices. Unfortunately, the existing ecosystem surrounding scholarly data does not support data management sufficiently [HLEG EOSC 2016]. Partially in response to this, science funders, infrastructure providers and governmental agencies are beginning to require data management and stewardship plans for data generated in publicly funded research. At the same time, European copyright law is being renewed, proposing to introduce mandatory exception for text- and data mining for research organizations [LERU 2016]. There is no legally binding practice for research data management, and best practices and funder requirements have a strong role in defining and modifying the data management process. Horizon 2020, the EU funding instrument, is encouraging beneficiaries to manage their research data by the FAIR principles [H2020 Programme 2016].

In this paper, after a brief overview of the challenges of scientific data management, we introduce the Design Jam, a workshop method that facilitates the ideation and concretization of user-centered services and communications. We then report our reflections on the Helsinki FAIR Design Jam, where the method was used to help experts and policy makers communicate to researchers the FAIR Data Principles.

2. FAIR principles

What constitutes «good data management» is largely undefined, and is often left as a decision for the data or repository owner. Good data management does not have an agreed-upon tradition. Datasets are heterogeneous and scattered, with a multitude of discipline-specific practices, services and standards developing in parallel. In this context, the description of data, represented by metadata[1], is essential. For digital data, good metadata is the threshold in data survival: without quality metadata, the resource soon becomes unusable and not accessible. In addition to being able to understand what the data is about, we need to know who owns the data and how it can be re-used (licenses; terms of use; attribution); how it should be cited through permanent identifiers (copyright); and we should be able to mine it and link it to other datasets.

To find a common agreement on good data management, the FAIR Data Principles [FORCE11 2016(a)] were developed: data should be Findable, Accessible, Interoperable and Re-usable. The FAIR principles represent a minimal set of community-agreed guiding principles and practices (Table 1). They were set out as a common effort by the FORCE11 work group [FORCE11 2016(b)], with contributions from several organizations, initiatives and individuals.

To be Findable:	**To be Accessible:**
F1. (meta)data are assigned a **globally unique and eternally persistent identifier.** F2. data are described with **rich metadata.** F3. (meta)data are **registered or indexed in a searchable resource.** F4. metadata **specify** the data identifier.	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.
To be Interoperable:	**To be Re-usable:**
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.	R1. meta(data) have 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 their **provenance.** R1.3. (meta)data **meet domain-relevant community standards.**

Table 1: FAIR Data Principles [FORCE11 2016(b)]

These principles should be reflected in national and international guidelines for data infrastructures [E-IRG & ESFRI 2009], funding principles and agreements concerning research materials, so they are translated into action by the people who are expected to comply: the researchers. Data producers and owners are expected to manage their materials in accordance with the FAIR principles by making sure that they 1) create, manage, distribute and publish *at least* their metadata, 2) follow file formats and best practices suitable for their discipline to ensure interoperability and findability, and 3) ensure data re-usability by securing integrity and availability and curating the materials. On the other hand, the FAIR principles are also meant to guide implementers in checking that the system they are building is actually supporting both manual and automated data deposition, exploration, sharing and use.

3. The challenges of communicating data management principles

The digitalization of research processes is not done by infrastructures and IT systems, but by humans. This is achieved by managing the meaning of information content and knowledge. As the objective of the FAIR

[1] Metadata means «data about data» (https://www.merriam-webster.com/dictionary/metadata; all Internet sources accessed on 9 January 2017).

principles is to enable effective use of data, the implementation stresses how to agree and communicate how to be FAIR. For many researchers, these are not familiar concepts. Even open science experts may struggle with operationalising the requirements and explaining them to others. The challenges for communicating good data management principles in this environment culminate in a) sufficient understanding of good data management, b) understanding of interdisciplinary needs, c) skills to pick tacit knowledge, and d) good communication.

Interdisciplinarity is needed for collaboration on new research questions arising in the grey area between established disciplines, where new research questions often are formulated. At the moment, however, the bottleneck is even more subtle: how can we involve researchers from different fields to commit to FAIR principles, through tools that are usable and suitable for different disciplines, and will in time allow creative data reuse across disciplines? While certain fields produce data that is less problematic in terms of both format and sensitivity, other fields may face material and ethical doubts on how to pursue data preservation – and may be harder to get on board.

For this we need good, clear, understandable *communication*. Good communication fosters openness and availability of data and related services, but to persuade researchers and other stakeholders to modify their practices, these possibilities need to be communicated in a way that is enticing, simple, and practical – and still makes sense across diverse domains. Good communication should be considered both in persuading researchers to participate in open science, as well as in creating services, interfaces and instructions that support their intention to do so.

However, to achieve this goal, those tasked with designing systems, tools, and information materials for the whole community need to gain a deep understanding of the needs, aspirations, problems, and emotions of those affected. At the same time, they need to understand the rationale behind the policy indications of experts, and then translate it into information and services that are usable and meaningful also for non-experts. This means that good communication depends on eliciting *tacit knowledge*. When knowledge is explicit, it is set out in a tangible form, readily shareable and understandable by those involved. If asked, those who possess this knowledge can easily verbalize it. Instead, tacit knowledge is extremely difficult to externalize in a tangible form, because it is deeply rooted in actions, routines, values, and emotions [Nonaka et al. 2000]. Currently, several challenges faced by those tasked with implementing the FAIR Principles have to do with tacit knowledge: what do FAIR Principles actually mean for researchers.

4. Responding to the challenges: the case study

The main impulse for the case study came from the national study of openness of research organisations in Finland [Evaluation of openness... 2016]. The openness of activities was first evaluated in 2015 when universities, universities of applied sciences and research institutes were assessed with respect to their policies on and implementation of open science practices. In 2016, this evaluation was repeated and extended to cover university hospitals and research funding organisations. The evaluation of research funding organisations included a comparison with selected European research funding organisations. The results of the study demonstrated that organizations saw the need to manage their data well, and were willing to do so, but did not know how. At the same time, FAIR principles were forming to be the common best practice guidelines for research data.

We wished to bring together people from different organizations, different disciplines, different occupations and different interests, to agree what the FAIR Principles could mean in practice and how the Principles could be communicated so they are translated into action by those who are impacted. Our short case study on the Helsinki FAIR Design Jam focuses on the format chosen to bring people together and let the tacit knowledge cross-pollinate the ideas from different disciplines – and also challenge them.

5. What is a Design Jam and how we implemented it

A Design Jam is a workshop format that resembles hackathons and service jams: events where motivated people from different fields come together to respond to real-world problems or issues by developing rough prototypes of the solution, rather than simply brainstorming for ideas. The idea of applying the Design Jam approach to policy- or law-related communication challenges was developed by Stefania Passera as a by-product of her PhD studies and first applied by her and Helena Haapio at Legal Design Jam events in 2013 at the University of Aegean to the Convention on Contracts for the International Sale of Goods (CISG) [Legal Design Jam 2013(a)] and – together with Margaret Hagan of Stanford University and Yana Welinder of Wikimedia Foundation – to Wikimedia Trademark Policy [Legal Design Jam 2013 (b, c); Hagan 2013; Haapio 2014]. At these events, the goal was for lawyers, designers, policymakers, and students to give an extreme user-centric makeover to a complex document. During intensive, hands-on sessions, the groups brainstormed and prototyped new versions of sections of the document at hand, rethinking it in terms of structure and language, as well as creating visualizations in order to further clarify the text.

This approach is grounded in co-design practice, where end-users are involved to work together with designers, as partners, during one or more phases of the design development process [Sanders & Stappers 2008]. While not all people are trained designers, end-users become part of the designing team as «experts of their own experiences» [Sleeswijk Visser et al. 2005]. It is also acknowledged that everyone is creative, even if creativity can take «lighter» forms of involvement, such as simply *adapting* situations and technologies, or *making* something with one's own hands [Sanders 2006]. It then becomes the role of traditional designers to conscript end-users' creativity and expertise through facilitation and the careful design workshop tools and experiences [Sleeswijk Visser et al. 2005]. In a Design Jam, the participants may not be able to finalize their ideas in a finished solution, but nonetheless they can provide meaningful ideas and embody them in simple prototypes that can be passed on to a design team for further development.

A second feature of this approach is that it is prototype-driven, as prototype creation is seen as an activity to better understand, explore and communicate fuzzy, early ideas, and get a feeling of what it could be like to interact with such a solution in real life [Buchenau & Fulton Suri 2000]. In the beginning of a design process, moreover, prototypes do not need to be highly polished or realistic, because they serve to elicit ideas and continuous feedback: this makes their creation an accessible activity for non-designers, too. The ability of sketching and visualizing ideas is particularly important, as Jam participants are tasked with creating so-called paper prototypes – hand-drawn representations of the interface or system to be – rather than fully functional prototypes. The stress on creating a visible, tangible referent to explain and concretize their idea is consequential not only in terms of outcome. In terms of process, the participants are encouraged to visually conceptualize their idea, the logic or process behind it, and write down all ideas and insights on Post-it notes. The creation of a shared, modifiable referent helps participant to bridge their separate knowledge domains, converge on a common view, and aid collaboration[2] as it makes conversations less conflictual and more focused on the creation of common ground [Mengis & Eppler 2006].

At the Helsinki FAIR Design Jam,[3] taking inspiration from previous Legal Design Jam workshops, we divided the participants in advance into multidisciplinary teams, making sure that different stakeholder types and their expertise would be represented in each of the 6 teams we formed (see Table 2).

[2] For a deeper discussion of these themes, see literature on boundary objects and knowledge visualization (e.g. Bresciani 2011, Bresciani & Eppler 2009, Ewenstein & Whyte 2009).

[3] The FAIR Design Jam was held in Helsinki on 23 November 2016 in connection with the Nordic Open Science and Research Forum 2016 (http://openscience.fi/aaltofair-workshop).

Category	Expertise and role
Researcher	*End-users.* Researchers need tools and support to manage, preserve, search and reuse data as part of their research work (from planning to publishing)
Librarian	*End-users.* Librarians acquire, organize, promote and disseminate various research resources to meet the diverse needs of the community. They also provide a variety of information and support services to access digital resources. Librarians are ICT-savvy.
Research policy and governance	*Experts*. Examines empirically and theoretically the interaction between innovation, technology or research, on the one hand, and economic, social, political and organizational processes, on the other.
Data infrastructure management	*Experts*. Works on the infrastructure solutions used to preserve different research resources, including centralized monitoring, management and intelligent capacity planning of a data infrastructure and centre's critical systems. Technical understanding.
Research administration	*Stakeholders*. Provides information, documents and tools to research teams across the university, supporting compliance with funders and university policies.

Table 2: Participant profiles.

The FAIR Design Jam started with a short talk to familiarize the participants with the concepts of user-centeredness, and provide several examples of user-centred communication and services. This was followed by a small warm-up exercise in which they had to create a simple to understand diagram to explain and simplify a short, yet unclear, text written in «bureaucratese».

After this, we assigned one challenge per team, choosing among three critical challenges that had emerged from preliminary research conducted by the Open Science and Research Initiative in Finland. The challenges were stated as follows:

1. *«In order to comply with FAIR principles, data needs to be assigned high-quality metadata. Design an easy-to-use, user-friendly solution to help researchers create FAIR metadata for their data.»*
2. *«Some researchers may not know much about FAIR data principles, and why/how they benefit them, and thus may be resistant to change the way they work. Create a «FAIR F.A.Q.» to address the key questions and concerns of «concerned researchers», so that they can be persuaded to share and use FAIR data.»*
3. *«Researchers go to the librarians of their university for help with choosing a good FAIR repository, suitable for their data. Create a solution to help both users make an appropriate choice easily.»*

While the teams remained in charge of ideating solutions to their challenge, one of the authors acted as facilitator and guided them through activities that would help them towards a meaningful result. For instance, early in the process, the participants utilized user personas – description of fictional characters, yet based on real users characteristics, typically used in service and interaction design [Nielsen 2014] – and empathy maps – a collaborative tool to investigate the tacit thoughts, feelings and perceptions of a user in a given situation [Gray et al. 2010] – as a way to «prime» themselves into generating ideas that would better take into consideration the real struggles and ambitions of potential users. After brainstorming and idea sorting, the teams engaged in two rounds of prototyping. The first, limited to just one hour, forced them to find ways to concretize their ideas. It was followed by peer-to-peer feedback among the teams on how to improve the concept forward. The second round allowed the participants to work out further details of their idea and prepare a brief presentation. During the wrap-up phase of the Jam, all teams had a chance to present their concept and comment on each other's work.

6. Results

Even though none of the participants was familiar with design and prototyping, all managed to create a rough first prototype of their idea by the end of the day. The participants managed to take a step forward in figuring out what communication about (and implementation of) the FAIR Data Principles could be, look like and feel. Prototypes, as artifacts, allowed participants to discuss the future and its challenges in a more effective way,

and show to each other their vision for it. Prototyping, as a process, helped them reveal the challenges and opportunities ahead, as the teams «rehearsed» problem solving in a safe sandbox for exploration.

Visualization was instrumental in concretizing all teams' ideas, adapting well to different concepts (websites, brochures, service processes). Participants enjoyed putting their visualization skills to test, and discovering that visual conceptualization considerably eased the effort of working with complex, abstract issues. Some participants underlined how sketching made thinking easier, as the interdependencies between different aspects of an issue became more easy to grasp, and felt confident that they would start sketching more at work. As an example, the metadata team, which ideated an information website including a wizard system to support metadata creation in practice, used their paper prototype to envision the possible information architecture and content of the solution (Figure 1). For instance, they argued that a less motivated user would need to be convinced and enticed to create metadata and thus created a «novice path» for such users comprising videos and sections explaining what metadata is and why it matters. Similarly, they created an «expert layer» for users who already decided to create metadata, so that they could simply skip to use practical tools and instructions for metadata creation.

Figure 1: Detail of a paper prototype for a metadata planning and creation tool[4]

It is to be noted that this type of explorative, creative work can be done only iteratively, one improvement at a time: no team had fixed on a clear concept from the start and simply implemented it. The need to produce something concrete and answer to open questions forced them to make design decisions which in return helped them explore, question and iteratively redefine what the «right» solution may be. Despite the constant open-endedness of the process, participants' feedback on the Jam suggests that co-design inspired working methods could be of great value to policymaking and policy implementation work.

Feedback suggests that participants from different institutions were able to have valuable discussions, learn from each other and their different experiences. The pressure of coming up with a solution and building a prototype together was more conductive to meaningful discussions, common ground creation and knowledge exchange than more traditional discussion roundtables – which instead explicitly aim at fostering discussion. A participant who holds a key position in an international policy steering group was rather impressed with the quality of ideas and progress he was able to achieve with his team in one day. In comparison, he felt that the traditional policymaking often did not proceed with sufficient efficiency and effectiveness, getting mired in discussions of principle over matter. This participant expressed interest in bringing Jam-like methods to the organizations he was involved with.

Other participants appreciated the opportunity to work as a team with other knowledgeable persons who brought different perspectives to the table. Many pointed out that this type of «real» teamwork was a very

[4] For more examples, go to FAIR Design Jam workshop results available at http://openscience.fi/aaltofair-workshop.

rare occurrence in their own institutions, and unfortunately so, because they felt that more collaborative practices could benefit the quality of their work. Others exchanged contacts to follow-up on ideas and possibilities of collaboration between their respective organizations.

7. Conclusion

The goal of a Design Jam is to let participants experience how design thinking and visual communication can be brought into practice and applied through, for example, checklists, infographics, plain language instructions, process maps, etc. We had a chance to apply the approach to a complex communication challenge – and it worked, as it provided a structure, timing and tools that facilitate tacit knowledge exchange and externalization. It seems that Design Jams create the conditions that enable interactions conductive to innovative thinking, as participants are empowered to concretize their ideas and make use of their knowledge in an effective fashion. While our primary goal was to promote the objectives of the Open Science and Research Initiative led by the Finnish Ministry of Education and Culture and to encourage as wide of an adoption as possible of the FAIR Data Principles in Finland, we believe that our user-centred, co-creative approach can work in many other contexts and countries as well – whenever experts work with people unfamiliar with their topic, seeking to communicate their knowledge or the «why» and «how» of their work product to end-users in an engaging way that resonates with the intended audience.

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