Knowledge Exchange

Openness Profile: Defining the Concepts

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Title: Openness Profile: Defining the Concepts

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Foreword

The interest of Knowledge Exchange is to help reap the benefits of open, more transparent and collaborative research approaches by using the opportunities that information technology has to offer. Since 2005, our activities have explored how Open Access and Open Science, (a movement which is also known as open scholarship or open research as its scope has reached beyond physical, natural and social sciences), can best deliver their promise.[1]

We've recently addressed Open Scholarship at conceptual level, resulting in the KE Open Scholarship Framework and the book 'The Economy of Open Scholarship and the Need for Collective Action'. In parallel we collected use cases of initiatives and services that aim to contribute to Open Scholarship, focusing primarily on the economic challenges they face in a rapidly changing digitised research landscape. Outcomes of this work are published in 'Insights into the Economy of Open Scholarship: A Collection of Interviews'.

This report documents an investigation into the need for and value of new evaluation approaches of people conducting open scholarship and their outputs. The report provides an extensive overview of strategies, barriers, and community needs regarding openness and explores what contributions an Openness Profile, as introduced in this report, can make to enable desired openness and fairer assessment in research. Examples are the recognition of contributions that traditionally have not been credited, appreciation of 'different' research outputs such as software, and actionable information on infrastructure requirements.

Activities to support the development of the Openness Profile will continue in the coming year. The objective is to bring stakeholders together to proof the concept of Openness Profile in various environments. The result we aim for is a body of knowledge, a mature concept, experiences, as well as a set of recommendations on how the Openness Profile could best be implemented in research practice.

We are aware there is still a long way to go. By sharing the rich findings of the first part of the work we hope to inspire and encourage you in your approaches towards improving openness in research.

Bas Cordewener
Knowledge Exchange coordinator

Footnotes

1 In this report, the terms 'Open Scholarship' and 'Open Research' are used interchangeably.

Contents

1. Background

Knowledge Exchange is a collaboration between six national research supporting organisations, DFG (Germany), Jisc (UK), DAFSHE (Denmark), SURF (The Netherlands), CSC (Finland) and CNRS (France), working together to support the use and development of ICT infrastructures for higher education and research.

There is a concern among the Open Scholarship movement that there is a discrepancy between open science policy and the practices of current researchers. This may be due in part to incentive issues, but it could also be due to a lack of - or the wrong sorts of - tools being available. There could be challenges in education, persistent cultural norms or a mix of all of the above.

The primary purpose of this study is to understand current practices in relation to Open Scholarship and to explore whether the development of an Openness Profile would reinforce early adopter behaviours and lead to wider understanding, take-up and uses. The overarching goal of Knowledge Exchange in this area is to encourage openness in scholarship as far as is ethically and legally practical. The guiding principle of 'Open as possible, closed as necessary' underlies the thinking of this research study and the openness profile project.

Fiona Murphy and Phill Jones have been engaged as consultants by Knowledge Exchange to investigate these questions in a project designed to run between April 2019 and May 2020. This document reports progress to date, preliminary findings from the interview and analysis phases, outlines an initial set of requirements for an Openness Profile, and looks forward to the next project activities: preparation and holding the Stakeholder Workshop, and the final report.

2. Openness profile concept

Figure 1: A workflow diagram showing one potential tool chain for an openness profile.

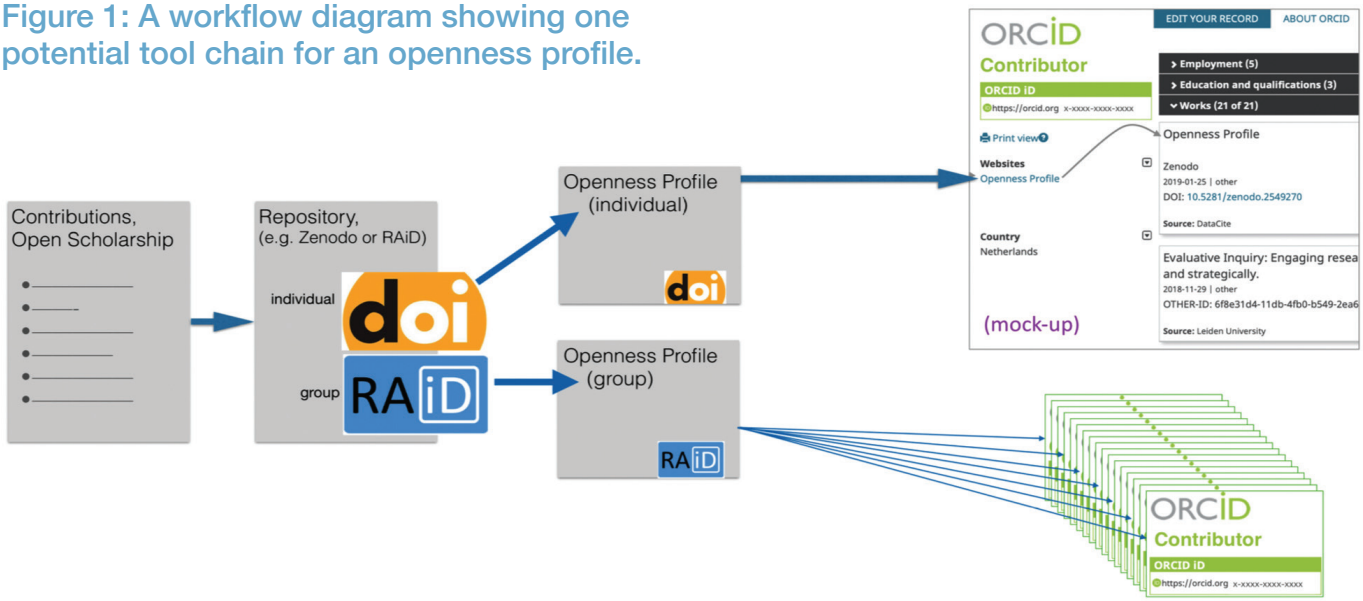

Figure 1 depicts the Openness Profile concept in the form of simple workflows. Starting from the left side of the diagram, individual or group contributions to Open research are documented and deposited into a DOI granting repository. In this case, we use Zenodo as an example. With the contributor's authorisation, metadata from the Openness Profile would then be automatically added to her ORCID record, for example, via automated updates from DataCite.

A group profile would show the contributions to Open research from a particular group. Here, we illustrate the Research Activity ID (RAiD) as one suitable means for collecting the aggregate contributions from members of a group or organisation. **Figure 1** depicts the group profile as a collection of individual Openness Profiles, linked to their respective ORCID records. There are other ways of presenting group contributions, such as aggregating the contents of individual profiles contained in the RAiD, or through the set of profiles associated with a particular Research Organisation ID (RoR).

Both individual and group scenarios are shown for the purpose of conveying the concept. Although the basic functionality described is possible, the Openness Profile is still in the concept phase. In the next stages of the project, details of the workflow and technical aspects will be refined based on interviews and feedback from the forthcoming stakeholder workshop.

3. Methodology

Between May and September 2019, the consultants conducted 19[2] in-depth, semi-structured interviews with research contributors (see Appendix A for key role definitions, including 'research contributors', who are in both research and roles that are traditionally thought of as research-supporting)[3].

Based upon discussions with the KE Task & Finish group the initial main areas of Open research interest included: strategies, mandates, skills, community norms, appraisals/evaluations, non-individual profiles, barriers, incentives, and feedback on the Openness Profile (OP) concept itself (see below for the schematic that was used to explain the OP during the interviews, and Appendix D for a snapshot of the coding taxonomy as at 24th September 2019).

Both consultants attended all the sessions, with one leading the conversation while the other checked topic coverage and took notes. All the interviews were recorded and the transcripts edited for accuracy. The transcripts were then imported into ATLAS.ti, a qualitative data analysis tool. The next phase was to develop a content coding schema for qualitative analysis of the interview transcripts. The consultants used the research questions to identify cardinal terms and text from the interviews and then expanded these terms into coding schemes. Using the Atlas.ti functionality, quotations from the interviews were categorised, the codes themselves were grouped into families, and their relative associations mapped. For example, there are 26 members of the 'usecases' category. One of the sub-categories is 'usecase-funder-track outputs', which is itself <associated with> 'usecase-researcher-prove openness'.

Footnotes

2 One more interview is scheduled to complete the corpus. This interview will be incorporated into the main body of data and its implications will form part of future phases of the project.

3 See also Appendix B, an information sheet provided in advance and Appendix C, the interview question set.

4. The interviews

The project has a keen interest in tracking, evaluating and crediting a range of research-related outputs and activities, from all contributors to research. This includes technicians, librarians, data stewards, project managers, and others. Hence, a typical conversation with a contributor not in a role traditionally thought of as doing primary research might begin with a variation on 'I don't know if I'm the right person to talk to'. However, other implications for the research ecosystem are still being teased out through this project. These include ramifications for ORCID usage levels, non-researcher career and incentives tracks, funding allocations, and metrics.

4.1 Ongoing observations

From the interim qualitative analysis presented here, we found ten significant code groups about interviewees' specific experiences in their own Open research journey. Those were: motivations, their organisation's strategy, barriers to openness, unmet community needs, research activities and outputs, skills needed for openness, tools that are available, evaluation of openness in a professional context, initiatives they are aware of, who they look to for information, and leadership around openness.

There was significant feedback on the OP concept itself, which was divided into two groups; initial feedback and possible use cases.

Looking across the codes from different groups and viewing the interviews as a whole, a picture begins to emerge of evolving community norms with a complex landscape of mandates and slowly shifting incentives.

High-level observations included:

1. Significant enthusiasm for open research among the people that we interviewed

2. Frustration with current incentive structures and cultural inertia was very common, which translated into a desire for systemic change in how contributions to scholarship are valued and who is credited

3. A number of emerging use cases - people could use the OP as part of either their annual review or to inform decision making or create incentives/metrics at their organisation

4. The lack of an established, open source institutional persistent identifier (PID) is sorely felt. There is already some use of Global Research Identifier Database (GRID) and awareness of the emerging Research Organisation Registry (ROR)

5. Those interviewees not identifying primarily as current researchers expressed the most frustration with the system, and with how their contributions to knowledge are viewed and credited

4.2 Specific findings on the open research journey

4.2.1 Motivations

Many of the interviewees were committed and enthusiastic about changing how research is done and communicated. They often talked about their reasons for participating in open research.

The two most frequent motivations, given by seven interviewees each, were to improve social impact and the overall quality of research itself. The latter was frequently connected to the idea that openness generates faster and more detailed feedback than is possible with the traditional publication and peer-review processes. In addition, a strand of thought emerged around responsibility, fairness (including the emerging FAIR Data[4] meaning of the term), diversity, and inclusion. Many interviewees felt that the current system of incentives and rewards in research favour a particular type of researcher, often in terms of intellectually conservative thought, geographic location, gender, and specific cognitive profile.

Group = Motivations (top 10)

Code	Mentioned by[5]
Better research	7
Social impact	7
Inclusion	5
Avoid commercial lock-in	4
Earlier feedback	4
Fairness	4
Help other researchers	4
Reproducibility	4
Accessibility	3
Dissemination	2

4.2.2 Organisational strategy

There is recognition that openness is emerging as a core scholarly principle that enhances the potential for scientific integrity. However, it remains unclear to many interviewees how best to operationalise it. Interviewees were generally unsure about how to include openness in institutional activities or relate it directly to their own work.

Interviewees were explicitly asked about their organisation's strategy around openness. Eight said that the strategy was positive towards openness, but only three were able to confirm knowledge of a formal declaration or documentation of a defined openness strategy up until this point in time.

One interviewee talked about their institution's open research energies being focused on data at this point in time. Another interviewee explicitly stated that openness was not part of their institution's strategy, suggesting that there was something of a 'wait and see' approach.

Group = Organisation strategy

Code	Mentioned by
Positive	8
Formal declaration	3
Focused on data	1
Negative	1

Footnotes

4 The FAIR Data Principles are a set of guiding principles in order to make data findable, accessible, interoperable and reusable (Wilkinson et al., 2016).

5 Throughout this report, 'mentions' are counted as 'the number of individual interviewees who mentioned this'.

4.2.3 Barriers to openness

Despite positive attitudes towards open research, many interviewees were frustrated by real and perceived barriers to being more open in their own work as well as the work of colleagues, and those they support.

The most frequently cited frustration related to systemic inertia; the sense that the system is hard to change due to ingrained incentives, outdated value structures, and network effects. Interviewees spoke of colleagues' reluctance to being more open, misaligned incentives, and a lack of driving force for change, where no one stakeholder group or entity is emerging to take responsibility.

There were also some more practical considerations around the need for a reliable infrastructure to support open data and open research more generally. The size of datasets and a lack of knowledge about how to structure and share them, were discussed.

Group = Barriers (top 10)

Code	Mentioned by
Inertia	12
Researcher burden	11
Misaligned incentives	8
Researcher reluctance	7
Doesn't apply to me	6
Lack of credit	6
Financial sustainability	5
Data too big	4
Displaced responsibility	4
Politics	4

4.2.4 Community needs

In order for open research infrastructures to develop in community-supportive directions, it is important to understand the needs of research contributors who are already practicing open research. Half of all interviewees cited a need for training. While training is vitally important, particularly from the perspective of open research to address the gaps in understanding as to how to operationalise openness, such training lies outside of the scope of this project.

Many interviewees (nine) wanted better alignment between desired outcomes and incentives. Several ideas emerged that seemed to address some of the barriers mentioned above. For instance, the researcher burden issue might be alleviated if there were more data stewards[6]. Incentives that explicitly encourage openness might help people get credit for their work and overcome some of the inertia.

The concept of minimizing researcher burden emerges here again. Several (six) interviewees spoke of the need to input metadata or upload outputs once and have them propagate automatically through whichever system they need to interact with. This idea is often positioned as an antidote to a task that usually falls to researchers of having to re-key information into multiple systems or websites. This observation underlines the importance of integrating with existing components of the scholarly communications infrastructure such as ORCID, DOI, etc.

A quarter of interviewees mentioned a need for better metadata. The lack of a generally accepted standard for institutional identifiers was a particular pain point. The

Footnotes

6 An emerging research data management support role often operating within discipline-specific teams. See, for instance: tudelft.nl/en/library/current-topics/research-data-management/research-data-management/data-stewardship, accessed 25 September 2019.

related concept of standards around research objects, particularly datasets, was also raised by five interviewees. Concepts of culture change and awareness were also flagged. Interestingly, while the concept of cultural inertia as a barrier was raised by the majority of interviewees, the idea of culture change as a need was less frequent, at only four interviewees.

Group = Needs (top 10)

Code	Mentioned by
Training	10
Incentives	9
Data stewards	6
Input once use many	6
Metadata	5
Object standards	5
Awareness	4
Culture change	4
Data storage capacity	4
Funder support	3

4.2.5 Outputs

Building on the topic of general community needs, there is a need to understand the types of outputs and activities that researchers and other stakeholders engage in as they contribute to open research.

The most popular forms of output are research articles and software or computer code, mentioned by half of all interviewees. This contrasted with certain preconceptions of what might be articulated, as research data was only mentioned directly by five interviewees.

The portfolio of activities and outputs represented in the interview sample was extremely broad, ranging from teaching, to peer-review, to data management plans and beyond. Mention of internal reports and grey literature is accompanied by disappointment or frustration as interviewees had created valuable information that, a short time later, was undiscoverable and uncreditable.

Group = Outputs (top 10)

Code	Mentioned by
Research articles	10
Software	10
Data management plans	7
Peer-review	7
Public engagement	6
Research data	5
Teaching	5
Conference talks	4
Grey literature	4
Protocols	4

4.2.6 Skills

The practices that support open research are still emerging. As a result, many practitioners are finding that they need to adopt new workflows and learn new skills, for example in order to make their data interoperable or to utilise new channels for communication. The issue of attaining new knowledge and skills is particularly pertinent given the importance of training mentioned above.

During the interviews, there was a sense of disconnect between various components of the research ecosystem, with generally poor levels of comprehension of the roles of other contributors. Several interviewees also felt that they needed a better understanding of what constitutes an output or activity. Taken together, these observations point to a need for training not just on specific skills but also on how the research ecosystem functions - both now and in the near future when open research has hopefully become more ‘normalised’.

The most frequently mentioned skill was coding. In keeping with the observation that computer code is an increasingly important research output, four interviewees cited coding as the key skill needed to ensure that outputs can be transformed into interoperable objects. To take a specific example, the use of open source coding languages like Python and R were mentioned as key tools for wrangling data into standard structures.

Group = Skills (top 10)

Code	Mentioned by
Coding	4
Data formats	1
Data services	1
Data wrangling	1
Grant writing	1
Knowledge of open standards	1
Open as part of daily work	1
People skills	1
Web development	1
Where to put data	1

4.2.7 Tools

A taxonomy of tools used by practitioners of open research is an area of interest for the Openness Profile initiative. The creation of such a framework would enable contributions to be curated and categorised.

Many interviewees referred to classes of tools, rather than specific ones. Institutional repositories, eLab notebooks, and CRIS systems were all mentioned as tools that aid collaboration and knowledge sharing. Of the specific tools that were cited, the most frequent was Github. This observation underpins the theme that computer code is an increasingly important scholarly output.

Of data sharing tools/facilities, the most frequently mentioned were Zenodo, with a quarter of interviewees talking about it, and Figshare, which was cited by two interviewees.

Group = Tools (top 10)

Code	Mentioned by
Github	7
Zenodo	5
Institutional repository	4
eLab books	3
ResearchGate	3
CRIS system	2
Figshare	2
GitLab	2
Google Scholar	2
LinkedIn	2

4.2.8 Evaluation

During the interviews, the subject of how people are evaluated in their roles was discussed. This included the possibility of augmenting existing evaluation processes to include a discussion of an individual's OP as a way to enable incentivisation.

It was frequently found that openness is either not currently discussed in detail in interviewees' personal evaluations, or that interviewees had only informal evaluations or none at all. In some cases (five), however, the interviewees stated that openness was an important part of their annual appraisal or evaluation.

Some of the barriers to incorporating openness as part of evaluations were administrative, for example, the lack of a section in the evaluation process/form to discuss openness in a standard form.

Group = Evaluation

Code	Mentioned by
No openness conversation	7
Not formal	5
Openness matters	5
Bibliometric	1
Formal	1
Quality of research	1

4.3 Specific findings on the open research landscape

4.3.1 Initiatives

During the interviews, many participants discussed initiatives they were aware of or involved in. Almost 60 initiatives were mentioned. While many were global in scope (such as the most frequently mentioned ones, ORCID, DORA, and FAIR), others, for instance Hyper Articles en Ligne (HAL) are national level initiatives.

Group = Initiatives (top 10)

Code	Mentioned by
ORCID	7
DORA	4
FAIR	4
ESOC	3
HAL	3
PlanS	3
BioArxiv	2
coko	2
DataCite	2
FORCE11	2

4.3.2 Thought leaders

Interviewees were asked where they look for information and innovation in the open research space. Comparatively few mentioned individuals, but around 60 organisations were collected. The spread of those mentions was fairly thin among interviewees, with the most frequent being Jisc and the Wellcome Trust, which were cited by three people each. The European Open Science Cloud (EOSC), eLife, Gates Foundation, the GO-FAIR Foundation and the National Institutes of Health (NIH) were each mentioned by two interviewees.

A complete list of thought leaders mentioned can be found as in the codes in **Appendix D**.

Group = Thought leaders (top 10)

Code	Mentioned by
Jisc	3
Wellcome Tust	3
Crossref	2
elife	2
EOSC	2
Gates foundation	2
GOFAIR	2
NIH	2
Anne Cambon-Thomson	1
BMC	1

5. Feedback on the Openness Profile itself

During the interviews, participants were shown a brief presentation about the Openness Profile concept and asked for feedback.

5.1 Initial feedback

Interviewees were overall highly positive about the Openness Profile. All but one of the interviewees had specific feedback on the project.

The most frequent piece of feedback (15 out of 19 interviewees) was to consider the use cases of the OP when designing what goes into it, and the user journeys of the different stakeholders. A second strong piece of feedback was to make sure that the OP is easy to use, particularly that participants should not be burdened by extra work as a result of it. As noted in the needs section, several interviewees felt that being able to enter data once without rekeying it multiple times was an important need for anyone practicing open research. Likewise, those wanting to access the information in the Profile (such as funders and evaluators), prioritised enabling the exposure of information and metadata in the tools that they already use.

There was a split in opinion among interviewees as to whether quantifying the OP would be a good idea. While some (eight) encouraged the generation of metrics to drive competition and enable evaluation, a similar number (six) urged the avoidance of quantification and advised that the focus should be on narratives, to avoid gamesmanship.

Other feedback included suggestions to make a taxonomy of activities and outputs and for the governance process for the Openness Profile to be broad, to ensure it serves as many stakeholders as possible.

Group = Feedback (top 10)

Code	Mentioned by
Consider use cases	15
Ease of use	10
Quantification	8
Narrative	6
Interoperable	5
Taxonomy	5
Consider the workflow	4
Governance scale	4
Groups are good	4
Next steps	4

5.2 Use cases

Building on the feedback given above, the idea of use cases for an OP was directly explored.

Many interviewees talked about the need to provide evidence of openness. Over half of the interviewees (twelve) thought that the OP would enable people to get credit for work that is currently not credited. A number of people (seven) also stated that entries to an OP could be used to certify an individual's ability to perform a specific underlying task, such as creating a high-quality dataset. Beyond personal credit, a number of interviewees also suggested that organisations could prove their openness through the use of a group or institutional level OP. This extends to funders, publishers and private companies, as well as to academic institutions.

A picture emerged of a system that might provide information to institutions and funders about who they wish to hire or fund, as well as to individuals about where they might choose to work or whom to collaborate with.

Group = Use cases (top 10)

Code	Mentioned by
Enable credit	12
Organisation-prove openness	8
Show capability	7
Create incentives	4
Funder-decision making	4
Researcher-prove openness	4
Standardised CV	4
Evaluations	3
Map collaborations	3
Discoverability	2

6. Themes emerging from the interviews

The following section contains some comparatively strong assertions. The authors are aware that these are based upon a numerically small – though rigorously recorded - interview cohort. Ideally, further research will be conducted that can strengthen the evidence base in the future.

6.1 Evolving community norms

Despite strong inertial forces (see section **4.2.3 Barriers to openness**) there is evidence of cultural shift. Interviewees expressed widespread awareness of national and international initiatives aimed at driving the open agenda, but participation is piecemeal because of the perceived gap between policy and concrete actions/directives.

In **section 4.2.1 Motivations**, there is evidence of key drivers of cultural change such as a desire to include earlier, better feedback as part of the research process and to improve the social impact of research. It is important to note that funders and funder documentation would also need to be involved in order to build the social impact dimension.

Interviewees often connected an improved research process with better incentives that should be inherently more egalitarian, with openness acting as a catalyst for greater inclusion and diversity in research. Lack of diversity in terms of both demographics and skill sets is increasingly seen as an impediment to research progress. For example, limited recognition for technical skills such as data science can lead to a lack of opportunities for individuals with those skills, who are consequently likely to leave their research careers.[7] The resultant lack of resource in that area may then lead to poor data management at the institutional level. The argument goes that if research were more open, it would be possible for a wider range of stakeholders to receive credit for a greater range of activities, thus broadening the types of skills and backgrounds that are perceived as valuable. In addition, data management tasks tend to be allocated to post-doctoral students. If they become proficient and enjoy the work then they eventually leave academia because of career development difficulties. If they manage to progress their academic career, they will in turn delegate such tasks to more junior colleagues in order to free up time for more prestigious endeavours.

There was also some recognition of the distinction between open source, community governed tools and projects, and proprietary solutions. Use of the latter may entail the risk of consumer lock-in (such as not being able to exercise free choice of how to use tools and which products to use) or lock-out (such as the loss of data if choosing to change tools).

6.2 Mandates - who decides what to share and when

Although there was wide recognition of the existence of funder and institutional mandates around sharing and opening research outputs, such as data, this was accompanied by an acceptance that governance and day-to-day decisions are being taken by principal investigators. Well-established communities of practice within our interviewee cohort are rare - except within specific domain groups that grapple with peculiar issues such as ultra-large datasets (eg astronomy, high energy

Footnotes

7 Although none of the interviewees had experienced this chain of events first-hand, it emerged anecdotally on several occasions.

physics). Decisions are therefore left ad-hoc to experienced researchers who are not necessarily in the best position to take them (invariably when asked 'who decides on the data sharing', the interviewees responded that it was ultimately the decision of the researchers, or more specifically the project's Principal Investigator). Short of time, and often further removed from the coalface work and skills required to manage data than their junior colleagues, senior researchers emerge initially as obstacles, but with the potential to become levers for cultural and procedural change if open research can be made sufficiently fit for purpose.

6.3 Incentives

Incentives emerge in a largely negative context - as misaligned, or not open-friendly. Substantial change to incentives does emerge as a requirement but not in detail. In general, as might be expected, interviewees were more able to articulate what was not working as opposed to what might be installed in its place. There was more detail in the 'motivations' code group.

6.4 Underserved output types

The processes, tools and resources needed to handle both large numbers of different types of data and large data sets (frequently terabytes, and occasionally petabytes, of data) was an emerging theme. In particular, the subset of interviewees who work in data management and stewardship talked about this question being frequently raised by researchers. In addition, there was a lack of clarity on how to make data FAIR.

In the section on outputs more interviewees cited computer code as an output than data, with the skill of writing computer code emerging as the most important new skill for contributors to become more open. Data management plans were also mentioned in a number of instances. Finally, Github was the most frequently cited tool for open research. Taken together, these observations suggest that computer code is becoming increasingly important as a research activity and output as we move towards a more open environment. This may in part be related to the fact that making data FAIR – or more precisely, wrangling it into appropriate forms and community-standard structures for interoperability and reusability - often requires data wrangling techniques that are accomplished using languages such as Ruby, R and Python.

7. Key identifiers

There is a need to integrate into existing components of scholarly infrastructure. A key area of focus in this area will be persistent identifiers. As noted in **section 5.1**, researchers and stakeholders see the need for interoperability, to prevent rekeying of information, as crucial for adoption. The key identifiers currently potentially involved with developing a workable prototype OP are Open Researcher and Contributor IDentifier (ORCID) and the Research Activity Identifier (RAiD).

7.1 ORCID

ORCID has become accepted as the established unique identifier for researchers. It has strong support with a robust community that appears likely to remain in place for the foreseeable future. The consultants had a preliminary, informal conversation with ORCID about the OP. It emerged that ORCID investigated contributor roles around five years ago. At the time, it felt the community wasn't sufficiently mature for further action.

ORCID is keen to recognise a range of research contributions through structured metadata. However, they still struggle to get people to provide information about these 'additional research outputs' such as data curation and book chapters.

Further culture change seems to be required for widespread uptake, although some disciplines are further along than others (For instance, during the interviews, it was noticeable that those working in the humanities had less familiarity with open research than their contemporaries working in the sciences.) Currently ORCID is concentrating on journal articles, datasets and software.

Further discussions with ORCID, as well as Crossref, DataCite and other infrastructural organisations, will be required during the next phase of the project. See '7. Some preliminary Openness Profile requirements'.

7.2 RAiD

RAID is an emergent research object identifier that works at the grant and funded project level. It tracks the PIDs that are associated and date stamps them, and is being built as a GroupID. They are working with **Australian Access Federation (AAF)** (**https://aaf.edu.au/about**) to build a group service.

Whereas ORCID situates the person as the central entity, RAiD does the same with the project. It is seeking to expose relationships between institutions, infrastructures, instruments, grants, and other research activities and outputs.

8. Some preliminary Openness Profile requirements

The Openness Profile project has not yet collected sufficient information to be able to develop a fully-fledged set of requirements for a pilot or minimum viable product. However, some preliminary recommendations are emerging and should be tested for further feedback.

Table 1. Preliminary recommendations

1.	The collation process should be as automated as possible
2.	Entries should be subject to validation by third parties wherever possible
3.	The people holding the OPs need to feel in control of how the entries are added
4.	The profile should be flexible enough to enable reuse of information, with an API that enables integration into existing systems such as the relevant CRIS
5.	It should be closely allied with ORCID in some way, although whether that would entail integration into ORCID, or as a linked-out separate object is not yet clear
6.	With research contributors joining the cohort of people holding research profiles, this has implications for the scalability of ORCID and for research evaluation systems more generally that need to be considered

9. Next steps

As noted in **Section 4.1** Ongoing Observations, we are already able to draw some high-level initial observations from our preliminary analysis that we will continue to shape into suggested actionable solutions that will form the basis of the Openness Profile. There are significant and entrenched obstacles and systemic inertia that make progress towards openness a challenge, but there is evidence that strong desire for change exists.

This interim report is presented to stimulate discussion and feedback amongst the KE partners and their wider collaborators, including participants at the FORCE2019 workshop that will include this project as one of several topics for exploration.

Prompted by these inputs and by initial feedback to this report, it is expected that hypotheses will be posed to drive further data analysis. Alongside these activities, there will be additional, and increasingly focused conversations with potential partners, such as ORCID, RAiD, DataCite, Crossref, Scholix, and possible pilot groups, including institutions, researchers/research contributors, and funders.

These exercises will run in parallel with planning for the Stakeholder Workshop, to be held at the end of the first quarter in 2020 at the University of Leiden. Invitees to the workshop may include but won't be limited to representatives of the groups mentioned above as well as experts in metrics, funders, librarians, and funders.

Outputs will include a final report, due in 2020. It is also envisaged that some recommendations could be developed for both researchers/research contributors and their evaluators to base their profile compilations and appraisal discussions upon.

Further research questions for future enquiries may begin to emerge, as well as a closer understanding of the conflicts currently besetting would-be open research practitioners. Ideally, these activities and enquiries will continue to contribute to the body of concrete evidence that can be used to overcome the various loci of inertia that have already been identified.

The group profile also emerges as a potentially important branch of investigation that relates to other initiatives (such as the Curtin Open Knowledge Initiative, or COKI)[8].

Footnotes

8 See weblink: **https://ccat.curtin.edu.au/programs/innovation-knowledge-communication/curtin-open-knowledge-initiative-coki** accessed 26 September 2019.

Appendix A: Definitions

Openness Profile

This is a bottom-up initiative that seeks to enable open research practitioners to compile a diverse range of contributions and make those contributions accessible in order to get credit for them. It is hoped that this functionality will be amenable both to current open research practices as well as enabling future policy advances.

Roles definitions

Contributor	An individual who contributes to research or scholarship. This includes people who are traditionally viewed as researchers as well as roles that have traditionally been seen as supportive of research. Such roles include data management and stewardship, technology and infrastructure creation, research evaluation, and policy setting. **All interviewees in this study were defined as contributors to scholarship.**
Early career researcher	Academic researcher that does not hold a faculty appointment. These would generally be postdocs or PhD students in the sciences. In the Humanities, postdocs are less common, so we'd normally look for somebody < five years out of their PhD.
Mid career researcher	Academic researcher that holds a faculty appointment. In the sciences, they would not hold tenure but will probably have been awarded at least one major research grant. In the humanities, they may or may not hold tenure but would not be a professor. They would probably have published at least one book or monograph.
Senior researcher	Academic researcher that is well respected as a global leader in their field. They would be a full professor irrespective of their field and have a strong publication track record. In the sciences, they will have been awarded multiple research grants, generally from national-level governmental funders and run their own research group that pays other researchers' salaries. In the humanities, they would have a strong publication track record. They may be, or have been, a department chair or hold other senior strategic administrative roles at their institutions.
Data manager	Academic support staff that would generally be associated with an institutions, library, department or individual research group. Their role includes the curation and maintenance of research data output. They work closely with academic researchers to help meet data archiving and sharing needs.
Technologist	Non-academic staff that works for a library, or consortia, or commercial company in the scholarly communication space or start-up. May or may not write computer code as part of their role, but would be involved in the creation of technologies that support open research. They may be a project manager, solutions architect, technical manager, or entrepreneur.

Publisher/librarian	Non- or semi-academic staff that works for a research institution, university press, learned society, commercial publisher or similar organisation. Has an interest in scholarly communication, particularly in the publication of research and its future. This individual would generally not be in the commercial, marketing, or sales part of a commercial organisation, but sit more on the journal or publishing policy side.
Research funder	Non-academic staff that occupies a strategic role at a research funding organisation. Does not generally become involved in the individual assessment of research proposals but is involved in the setting of funding strategy.
Infrastructure developer/manager	Non-academic staff that is involved in a collaborative organisation that creates infrastructure (eg PIDs) for scholarly communication. Crossref, ORCID, etc. are examples of such organisations. Their role may or may not be technical or on the product development side.
Policy promoter (eg OS advocate)	Non-academic, or academic that works in the field of research communication policy not as their main function. May not be associated with an organisation in this role.
Research evaluator	Non-academic staff. This person is not a peer-reviewer. They may have a role in an institution or funder that is directly involved in the assessment of research. For example, they may translate and contextualise grant peer-reviews for funders, or they could be involved in research evaluation exercises like the REF in the UK or the SEP in the Netherlands.

Appendix B: Information sheet for participants

What is the research project about?

Description and purpose of the Openness Profile

Knowledge Exchange (KE) is a collaboration between six national research supporting organisations, DFG (Germany), Jisc (UK), DEFF (Denmark), SURF (The Netherlands), CSC (Finland) and CNRS (France), working together to support the use and development of ICT infrastructures for higher education and research.

Each organisation is active in Open Scholarship and supports open access to research and learning. As part of this work, KE has developed its Openness Profile concept. This is a bottom-up initiative that seeks to enable open research practitioners to compile a diverse range of contributions and make those contributions accessible in order to get credit for them. It is hoped that this functionality will be amenable both to current open research practices as well as to enable future policy advances.

Description and purpose of the research project

There is a concern among the open research movement that there is a discrepancy between open science policy and the practices of current researchers. Partly, that may be due to incentive issues, but it could also be due to a lack of or the wrong sorts of tools being available. There could be challenges in education, persistent cultural norms or a mix of all of the above.

The primary purpose of this study is to understand current practice in relation to open research. We would also like to generate ideas about what could be done to make research more open generally. Specifically, we'll show you the prototype of the openness profile during this interview and we'll ask you for your thoughts and ideas on that.

What will be the set-up of the interviews?

The interviews will be of a semi-structured format, meaning that it may be closer to a conversation than a question and answer session. You will be asked to recall and describe certain things and further questions/ clarifications may well be sought at certain points in the interview. The interviews will be recorded.

What will I be asked to talk about?

Semi-structured interviews are designed to be free-flowing, meaning it is quite possible that the sessions will cover a diverse range of issues. Examples of what you may be asked to describe include the ways in which research data that you generate or interact with are used and/or shared and your role with regard to such data.

How long will the sessions last?

Typically, we deem one hour a sufficient amount of time to cover a broad range of topics, although we recommend booking a 90-minute slot to avoid a hard stop mid-sentence. If you need to stop the interview at any stage, please say so.

What will happen to the interviews?

Once recorded, the interviews will be transcribed, coded and analysed. Where appropriate, quotes from the conversation may be included when outcomes from the project are published in the form of original research. If we do this, we will ask specific permission from you for each individual quote. The recorded interviews will be kept on a password protected computer or on an encrypted cloud storage account, and will not be made available to anyone outside of the core research team working on the project.

We will make all reasonable efforts to keep the interview and other research data secure.

- All computers that are used to analyse the data will have a password
- All cloud storage will use AES-128 bit encryption, which is commonly used for this use case

- Data will be encrypted with AES-256 bit encryption when communicated between members of the research team, which again is a commonly used standard for this use case

- Copies of data will not be kept on computers or in accounts when no longer necessary

Will I be made anonymous?

With any activity in which data is stored or transmitted electronically, anonymity can never be fully guaranteed. We will, however, take all reasonable steps to protect your data.

The data that you create during your interview will be pseudonymised, which means that identifying information such as your name and institution will be removed from the dataset for analysis.

You may wish to have your contribution to the study explicitly attributed - through direct quotes and opinions, or you may wish to have your contribution highlighted in the acknowledgements sections of our own research outputs. Please let us know if you would like this to be that case. We may also ask you for permission to do so during your interview if we believe a particular quote will be of interest to readers of the report that we will write.

We will always ask explicit permission for each specific data use with which your identity is associated.

What potentially identifying information will be kept with the data?

Unless you give us explicit permission, we will not record your name as part of the research data. We will, however, record and store the following data:

- Job function

- Career stage (in the case of academic researchers)

- Research discipline if applicable

- Country in which you work

Data protection

You will have the opportunity to request to view any of the comments you have made before they are submitted into any research output. Should you feel uncomfortable about the comments at a later date, but have not specified this on the consent form, then please contact us as soon as you can.

During the course of this research study, some data will be generated about you, as listed above. Under GDPR legislation, you have a number of rights as a consequence of the recording of such data.

- You have the right to request a copy of all data that we hold on you as an individual

- You have the right to request that any incorrect information held by us is updated without undue delay

- You have the right to request that all data relating to you is erased by us

- You have the right to receive a copy of your data

- You have the right to withdraw your consent for the data that we gather or hold pertaining to you to be further processed or analysed at any time

If you wish to exercise any of the above rights, please contact XXXX XXXX at xxxx.xxxx@jisc.ac.uk.

Consent

By agreeing to be interviewed and participate in this study, you acknowledge that you have read the above information sheet and consent to the collection and use of data as described above.

Appendix C: Question guides

Description and purpose of the Openness Profile

We sent an introductory email, as reminder:

- Knowledge Exchange (KE) is a collaboration between six national research funding organisations, that supports the use and development of ICT infrastructures for higher education and research
- As part of this work, KE has developed its Openness Profile concept
- This is a bottom-up initiative which means it's aimed at enabling and incentivising open behaviours, this is as opposed to a top-down initiative, which would typically be an official policy change
- The profile seeks to enable open research practitioners to compile a diverse range of contributions and make those contributions accessible in order to get credit for them
- The profile is intended to be compatible with current research practice as well as support predicted future policy advancements

Description and purpose of the research project

- We want to build a more complete picture of current research practice
- Obtain recommendations from the community as to how to enable and incentivise open research
- Obtain feedback on the openness profile itself

Why we are talking with you

Depends on individual. Include brief overview of the interviewee's activities/role. This might help save time and trigger quicker engagement.

Housekeeping. In the introductory email that we sent you, there was some information regarding GDPR and data protection. Are you happy with that?

Early career researchers

Link to Tag sheet (https://bit.ly/32xqP2Z)

1. At this point, I'd like to talk about your specific work. Would you mind giving us an overview of your research
2. Can you give us a very high level idea of the types of methods and processes that you employ?
3. During the course of your work, you must generate various research outputs, can you describe those?
4. Who decides how you share those outputs? Is that your own decision, do you take advice from mentors or supervisors, or are there perhaps set protocols established in your institution or by your supervisor?
5. At what point do you share research outputs?
6. What tools do you use to share research outputs?
7. Beyond sharing research outputs, what other types of activities do you engage in, in order to be more open in your research?
8. Thinking about the ways in which you share outputs and practice open research, have you had to learn specific skills to enable you to do that? Are there skills that you'd like to or need to learn in order to be more open?
    a. Do you encounter obstacles or resistance when trying to share?
    b. What types of resources would help you share resources better?
9. Is there any support available for openness skills? This could be from your institution, but it could be available elsewhere, perhaps from a funder, publisher, or other stakeholder?
10. Are you encouraged by your funder or institution to share outputs? For example, is open research advocated for? If so, in what ways?
11. Could you tell me a little about how you're evaluated professionally? Is there an annual assessment, for example? What sort of things are considered?
12. Do you get credit for the ways in which you are open, does it form part of how you're assessed as an academic, either by your funders or your institution?
13. Do you include openness activities and sharing in your CV?
14. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For researchers that are pro-open

15. What do you think could be done to help researchers like yourself be more open?
16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For researchers that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open scholarship. What do you think would have to change to make open scholarship more of a viable option for researchers like you?
16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be more useful for you?

Mid career researchers

1. At this point, I'd like to talk about your specific work. Would you mind giving us an overview of your research

2. Can you give us a very high level idea of the types of methods and processes that you employ?

3. During the course of your work, and the work of people that you supervise, you must generate various research outputs, can you describe those?

4. Who decides how you share those outputs? Is that your own decision, do you take advice from mentors or supervisors, or are there perhaps set protocols established in your institution or by your supervisor?

5. At what point do you or the people who report to you tend to share research outputs?

6. Beyond sharing research outputs, what other types of activities do you engage in, in order to be more open in your research?

7. What tools do you use to share research outputs?

8. Thinking about the ways in which you share outputs and practice open research, have you had to learn specific skills to enable you to do that? Are there skills that you'd like to or need to learn in order to be more open?

    a. Do you encounter obstacles or resistance when trying to share?

    b. What types of resources would help you share resources better?

9. Is there any support available for openness skills? This could be from your institution, but it could be available elsewhere, perhaps from a funder, publisher, or other stakeholder?

10. Are you encouraged by your funder or institution to share outputs? For example, is open research advocated for? If so, in what ways?

11. Could you tell me a little about how you're evaluated professionally? Is there an annual assessment, for example? What sort of things are considered?

12. Do you get credit for the ways in which you are open, does it form part of how you're assessed as an academic, either by your funders or your institution?

13. Do you include openness activities and sharing in your CV?

14. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For researchers that are pro-open

15. What do you think could be done to help researchers like yourself be more open

16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research

For researchers that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option for researchers like you?

16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be more useful for you?

Senior researchers

1. At this point, I'd like to talk about your specific work. Would you mind giving us an overview of your research?

2. Can you give us a very high level idea of the types of methods and processes that you employ?

3. During the course of your work, and the work of people that you supervise, you must generate various research outputs, can you describe those?

4. Who decides how you share those outputs? Is that your own decision, do you take advice from mentors or supervisors, or are there perhaps set protocols established in your institution or by your supervisor?

5. At what point do you or the people who report to you tend to share research outputs?

6. Beyond sharing research outputs, what other types of activities do you engage in, in order to be more open in your research?

7. What tools do you use to share research outputs?

8. Thinking about the ways in which you share outputs and practice open research, have you had to learn specific skills to enable you to do that? Are there skills that you'd like to or need to learn in order to be more open?

    a. Do you encounter obstacles or resistance when trying to share?

    b. What types of resources would help you share resources better?

9. Is there any support available for openness skills? This could be from your institution, but it could be available elsewhere, perhaps from a funder, publisher, or other stakeholder?

10. Are you encouraged by your funder or institution to share outputs? For example, is open research advocated for? If so, in what ways?

11. Could you tell me a little about how you're evaluated professionally? Is there an annual assessment, for example? What sort of things are considered?

12. Do you get credit for the ways in which you are open, does it form part of how you're assessed as an academic, either by your funders or your institution?

13. Do you include openness activities and sharing in your CV?

14. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For researchers that are pro-open

15. What do you think could be done to help researchers like yourself be more open?

16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For researchers that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option for researchers like you?

16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be more useful for you?

Data managers

1. Can you also describe your role as a data manager and how you interact with colleagues with others in your organisation?

2. How is open research as a whole of interest to you in your role as a data manager? What sort of outputs or practices do you support or are interested in?

3. Would you mind giving us an overview of the area or areas of research you support

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. Are you involved in those decisions and what can you tell us about whose decision that is?

6. At what point are research outputs shared as a general rule?

7. Beyond sharing research outputs, what other types of activities do you engage in, in order support open research?

8. What obstacles do you encounter when you try to share outputs or practice open research?

9. Is any support or training available to you to help you be more open?

10. What sort of support would help you be more open?

11. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

12. Do you support others in open research activities? If so, what type and how

13. What tools are used to share research outputs?

14. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

For individuals that are pro-open

15. Given your role, we shouldn't be surprised that you're broadly in favour of open research. Assuming that it's a good thing, what do you think could be done to help research be more open

16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research

For individuals that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Technologists (providers of software that serve open scholarship needs)

1. Can you also describe the function of the organisation that you work for and your role within it?

2. Could you tell us about the technology that you're developing and how it'll support research or scholarship?

    a. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

3. Would you mind giving us an overview of the area or areas of research you support?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. You must have spoken with a range of researchers and stakeholders while developing the technology or software. In the workflow that you support, who would make the decision about when the research outputs that you support should be shared

6. This is a similar question about timing. When would research be shared in the workflow that your software supports?

7. Does your technology support other types of open research activities? If so, what type and how?

8. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

9. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

For individuals that are pro-open

10. Given your role, we shouldn't be surprised that you're broadly in favour of open research. Assuming that it's a good thing, what do you think could be done to help research be more open?

11. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

10. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

11. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Publisher

1. Could you tell us about the organisation that you work for, and your role in it?

2. Which research disciplines do you personally interact with?

3. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

6. During the course of your work, you must come into contact with a lot of research and researchers, which by extension means lots of research outputs? In the disciplines and types of research that you publish, what sorts of research outputs are people producing?

7. When assessing articles or research outputs for publication, can you tell us a little about what the criteria on which work is assessed?

8. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. As a publisher, are you involved in that decision?

9. When considering what to publish, does your organisation have a policy regarding assessing the level of openness that researchers engage in?

10. Do you encourage sharing of research outputs? In ways other than through mandates?

11. When do you think research outputs should be shared?

12. Beyond sharing research outputs, are there other types of open research behaviour that you encourage researchers to engage in? If so, how?

For individuals that are pro-open

13. Assuming that open research is a good thing, what do you think could be done to help research be more open?

14. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

13. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

14. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Librarian

1. At this point, I'd like to talk about your specific work. Could you tell us about the organisation that you work for, and your role in it?

2. Which research disciplines do you personally interact with?

3. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

4. Thinking about your institution, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

6. During the course of your work, you must come into contact with a lot of research and researchers, which by extension means lots of research outputs? What sorts of research outputs are people producing?

7. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. As a librarian, are you involved in that decision?

8. When do research outputs tend to be shared as a general rule?

9. When do you think research outputs should be shared as a general rule?

10. Do you encourage the sharing of research outputs as part of your role? If so, how do you do that?

11. Beyond sharing research outputs, do you encourage other types of open research activities? Could you tell us about those?

12. What tools are used to share research outputs?

13. What activities do you personally engage in that might support open research and sharing?

14. What obstacles do you encounter in doing so?

15. Is any support or training available to you to help you be more open?

16. What sort of support would help you be more open?

17. Could you tell us how your work is assessed as a librarian? Do you have an annual review or something similar?

18. What are the criteria that you are assessed on?

19. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

20. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For individuals that are pro-open

21. Assuming that open research is a good thing, what do you think could be done to help research be more open?

22. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

21. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

22. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Research funder / evaluator

1. Can you also describe the function of the organisation that you work for and your role within it?

2. Would you mind giving us an overview of the area or areas of research you support?

3. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

6. During the course of your work, you must come into contact with a lot of research and researchers, which by extension means lots of research outputs? In the disciplines and types of research that you fund, what sorts of research outputs are people producing?

7. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. To what extent do you as a funder have influence over those decisions?

8. When you conduct research evaluations, do you assess the level of openness that researchers engage in?

9. When do research outputs tend to be shared as a general rule?

10. When do you think research outputs should be shared as a general rule?

11. Beyond sharing research outputs, what other types of activities do you encourage do you consider when evaluating research, in order to be more open in your research?

12. What tools are used to share research outputs?

13. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

14. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For individuals that are pro-open

15. What do you think could be done to help research be more open?

16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Infrastructure development / manager

1. Can you describe the function of the organisation that you work for and your role within it?

2. Could you tell us about the technology (or resources) that you're developing (or managing) and how it'll support research or scholarship?

    a. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

3. Would you mind giving us an overview of the area or areas of research you support?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. You must have spoken with a range of researchers and stakeholders while developing the technology or software. In the workflow that you support, who would make the decision about when the research outputs that you support should be shared?

6. This is a similar question about timing. When would research be shared in the workflow that your software supports?

7. Does your technology support other types of open research activities? If so, what type and how?

8. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

9. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

For individuals that are pro-open

10. What do you think could be done to help research be more open?

11. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

10. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

11. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Policy promoter

1. Can you also describe the function of the organisation that you work for and your role within it?

2. Would you mind giving us an overview of the area or areas of research you support?

3. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

6. During the course of your work, you must come into contact with a lot of research and researchers, which by extension means lots of research outputs? In the disciplines and types of research that you fund, what sorts of research outputs are people producing?

7. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. To what extent do you as a funder have influence over those decisions?

8. When do research outputs tend to be shared as a general rule?

9. When do you think research outputs should be shared as a general rule?

10. Beyond sharing research outputs, what other types of activities do you encourage do you consider when evaluating research, in order to be more open in your research?

11. What tools are used to share research outputs?

12. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

13. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For individuals that are pro-open

14. What do you think could be done to help research be more open?

15. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

14. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

15. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Research evaluator

1. Can you also describe the function of the organisation that you work for and your role within it?

2. Would you mind giving us an overview of the area or areas of research you support?

3. How is open research as a whole of interest to you in your role? What sort of outputs or practices do you support or are interested in?

4. Thinking about your organisation, is open research a part of the strategy, either in a formal, defined sense just even implicitly?

5. Are there people in your broader community, not necessarily at your organisation but they could be, that advocate or advance open research?

6. During the course of your work, you must come into contact with a lot of research and researchers, which by extension means lots of research outputs? In the disciplines and types of research that you fund, what sorts of research outputs are people producing?

7. We're talking about open research, so one of the things that we're interested in is who decides when and how research outputs are shared. To what extent do you as a funder have influence over those decisions?

8. When you conduct research evaluations, do you assess the level of openness that researchers engage in?

9. When do research outputs tend to be shared as a general rule?

10. When do you think research outputs should be shared as a general rule?

11. Beyond sharing research outputs, what other types of activities do you encourage do you consider when evaluating research, in order to be more open in your research?

12. What tools are used to share research outputs?

13. In what ways are open research activities encouraged in your role. For example, are they part of you performance reviews?

14. We've talked about the ways in which you practice open research as well as policies, mandates and incentives. Communities can develop open research practices independently. Are there examples of open practices in your community that have developed organically?

For individuals that are pro-open

15. What do you think could be done to help research be more open?

16. Taking a look at the openness profile now. How do you think it should be evolved to be a more powerful tool to enable open research?

For individuals that have reservations around open research

15. Based on our conversation so far, I'd be interested to learn a bit more about your thoughts on open research. What do you think would have to change to make open research more of a viable option?

16. Looking at the openness profile, do you have any specific suggestions about how this might be made to be a more powerful tool?

Reserve questions on general understanding

These questions can be used towards the end of the interview if there appears to be differences between the interviewees' perception of open research and the commonly used definition.

Definition:

- **Analytically:** we can operationalise in the form of practices. eg sharing and reuse of outputs
- **Conceptually:** if possible, more interesting for interviewee to define in own terms and in relation to local practices

1. As I mentioned above, the openness profile is being developed as a mechanism to facilitate recognition of open research from the bottom up. Of course, in order to talk about open research, it's important that we all share the same notion of what open research is. Could you tell me what, in your opinion open research means?

2. Are you familiar with the FAIR data principles? Is FAIR use in, relevant for your work?

NB: If the interviewee has a significantly different understanding about Open research; address those differences.

3. In a moment, we'll talk about whether you think open research is good for your career personally. First, let's talk in general terms. Do you think open research is good for society as a whole and for the academy?

    a. Tags:

        i. (society-excellent) Very good for society

        ii. (society-good) Moderately good for society

        iii. (society-neutral) Neither good nor bad for society

        iv. (society-bad) Moderately bad for society

        v. (society-vbad) Very bad for society

        vi. Can you explain your reasons for saying that?

4. Now, from a personal perspective, can you explain you think the movement towards open science will be good for you personally?

5. Can you explain your reasons for saying that?

Appendix D: Codes

Group: Barriers
barrier-academic freedom
barrier-bureaucracy
barrier-competitive culture
barrier-data not accepted
barrier-data not valuable
barrier-data too big
barrier-disincentives
barrier-displaced responsibility
barrier-doesn't apply to me
barrier-don't know where to put data
barrier-ECR vulnerability
barrier-fear of judgement
barrier-financial sustainability
barrier-inertia
barrier-lack of credit
barrier-lack of knowledge
barrier-lack of political support
barrier-laws
barrier-misaligned incentives
barrier-never discussed
barrier-no evidence of work
barrier-no high impact OA journals
barrier-no publisher policy
barrier-not a scholar
barrier-politics
barrier-poor metadata
barrier-researcher burden
barrier-researcher reluctance
barrier-risk of scoop
barrier-some outputs need to be closed
barrier-some things have no digital presence
barrier-UX

Community Norms
COPNorm-121Collab
COPNorm-collab across departments
COPNorm-data format
COPNorm-data policy
COPNorm-data scientists help researchers
COPNorm-Discipline is open
COPNorm-documentation attached to datasets
COPNorm-institutional repository
COPNorm-preprints
COPNorm-protocol sharing
COPNorm-python
COPNorm-shared data after publication
COPNorm-shared after 1 year
COPNorm-shared elab books
COPNorm-subject specific repository
COPNorm-supercomputer cluster
COPNorm-walled garden sharing

Decision (Who's choice to share)
decision-author
decision-influenced by mandates
decision-input-legal
decision-negotiation between researchers
decision-principal investigator
decision-researchers(general)
Evaluation
evaluation-bibliometric
evaluation-formal
evaluation-no openness conversation
evaluation-not formal
evaluation-openness matters
evaluation-quality of researcher support

Feedback on the OP
OPFeedback-autopopulate
OPFeedback-consider the workflow
OPFeedback-consider use cases
OPFeedback-dashboard
OPFeedback-ease of use
OPFeedback-get senior researchers involved
OPFeedback-governance/scale
OPFeedback-groups are good
OPFeedback-Interoperable
OPFeedback-name
OPFeedback-narrative
OPFeedback-neutral
OPFeedback-next steps
OPFeedback-Only the highlights
OPFeedback-positive
OPFeedback-quantification
OPFeedback-researcher control
OPFeedback-security and privacy
OPFeedback-taxonomy
OPFeedback-validation
OPFeedback-version control
OPFeedback-which artefacts?

Fields of research
FoR-02 Physics
FoR-06 Biology
FoR-09 Engineering
FoR-0206 Quantum mechanics
FoR-0401 atmospheric sciences
FoR-0601 Biochemistry and Cell Biology
FoR-0604 Genetics
FoR-1103 Medical Sciences
FoR-1109 Neuroscience
FoR-1202 architecture
FoR-1204 Engineering Design
FoR-1608 Sociology
FoR-2001 Communication and media studies
FoR-2103 Historical studies
FoR-2203 Philosophy
FoR-020102 Astronomical and Space Instrumentation
FoR-020108 Planetary Science (excl. Extraterrestrial Geology)
FoR-029901 Biological Physics
FoR-040105 climate modelling
FoR-060603-Animal Physiology - Systems
FoR-100402 Medical Biotechnology Diagnostics
FoR-110904 Neurology and Neuromuscular Diseases
FoR-190408 Music Therapy
FoR-200401 Applied Linguistics
FoR-200402 Computational Linguistics
FoR-200403 Discourse and Pragmatics
FoR-200405 Sociolinguistics

General needs
needs-accessibility
needs-awareness
needs-CoPNorms
needs-culture change
needs-data audits
needs-data stewards
needs-data storage capacity
needs-easy tools
needs-evaluation change
needs-funder support
needs-incentives
needs-input once use many
needs-interoperability
needs-IT support
needs-journals to flip
needs-machine readable outputs
needs-metadata

needs-non profit ownership
needs-object standards
needs-open documents
needs-open source software
needs-organisational identifier
needs-PIDs
needs-plain language
needs-political support
needs-preregistration
needs-publisher involvement
needs-research data structures
needs-researcher behaviour
needs-resources
needs-respect for openness / engagement
needs-supercomputers
needs-training
needs-version control
usecase-funder-decision making

Initiatives
initiative-101innovations
initiative-AGUFair
initiative-altmetric
initiative-ANDS
initiative-ATTX
initiative-Beyond Library
initiative-BioArxiv
initiative-BODC
initiative-casrai
initiative-CEDA
initiative-citex
initiative-CODATA
initiative-coko
initiative-committee for open science (France)
initiative-CORLI
initiative-credit
initiative-DataCite
initiative-DOAJ
initiative-DORA
initiative-DSpace
initiative-EDMUND
initiative-ELRC
initiative-EOSC
initiative-FAIR
initiative-FAIR trust seals
initiative-FLA
initiative-folio
initiative-FORCE11
initiative-HAL
initiative-impact story
initiative-LeidenManifesto
initiative-Matilda
initiative-metadata2020
initiative-MUST
initiative-national open access initiative (Finland)
initiative-national open access initiative (Portugal)
initiative-national open science committee (France)
initiative-NESLI
initiative-OJS
initiative-open citations
initiative-Open Research Data Services for Researchers
initiative-open research hub
initiative-open science research assessment (France)
initiative-open science roadmap (France)
initiative-OpenAIRE
initiative-ORCID
initiative-patterns
initiative-PlanS
initiative-PROSPERO
initiative-PT-CRIS
initiative-RDA
initiative-REF
initiative-REPEC

initiative-ResearchGate
initiative-SCORM
initiative-WHEAT
initiative-XAPI
initiative-Zenodo

Levels
level-European
level-institutional
level-international
level-National

Mandates
mandate-consortia
mandate-deFacto Community Obligation
mandate-funder
mandate-institutional
mandate-publisher

Motivation
motivation-accessibility
motivation-avoid commercial lock-in
motivation-avoid subscription costs
motivation-become leader
motivation-better business
motivation-better research
motivation-dissemination
motivation-earlier feedback
motivation-ECR needs
motivation-enable credit
motivation-evidence based policy
motivation-facilitate collaboration
motivation-fairness
motivation-fraud
motivation-funder incentive
motivation-help other researchers
motivation-inclusion
motivation-interoperability
motivation-persistence
motivation-public access
motivation-reproducibility
motivation-researcher interest
motivation-self-evident
motivation-social impact
motivation-transparency
motivation-trust
motivation-win funding

Output formats
formats-BABCCSV
formats-CSV
formats-IIIN
formats-NetCDF
formats-proprietary image formats
formats-RDF
formats-TMX
formats-XML

Outputs
outputs-analysis pipelines
outputs-analyzed data
outputs-annotated texts
outputs-article metadata
outputs-behavioural assays
outputs-bibliography
outputs-blog posts
outputs-book chapters
outputs-citations
outputs-conference talks
outputs-corpora
outputs-data collection
outputs-data management plans

outputs-data mining
outputs-data processing
outputs-data strategy advice
outputs-data wrangling
outputs-database
outputs-datasets
outputs-domain expertise
outputs-downloadable corpus
outputs-email list
outputs-ethics advice
outputs-excel files
outputs-experimental design
outputs-flash cards
outputs-grant metadata
outputs-grant proposals
outputs-grants awarded
outputs-grey literature
outputs-immunohistochemistry
outputs-infrastructure
outputs-interviews
outputs-manage repository
outputs-microscopy images
outputs-model organisms
outputs-non-academic articles
outputs-open reports
outputs-Openness in APC pricing
outputs-openness research
outputs-pdf
outputs-peer-review
outputs-posters
outputs-practice guidelines
outputs-projects delivered successfully
outputs-proteomics profiles
outputs-protocols
outputs-prototypes
outputs-public engagement
outputs-public engagement management
outputs-Qpcr
outputs-qualitative surveys
outputs-questionnaires
outputs-raw data
outputs-research articles
outputs-research data
outputs-researcher education material
outputs-RNA transcripts
outputs-slide decks
outputs-software
outputs-statistics
outputs-students trained
outputs-survey
outputs-taxonomy of contributions
outputs-teaching
outputs-teaching awards
outputs-teaching management
outputs-teaching materials
outputs-user interaction data
outputs-video abstracts
outputs-website
outputs-workshops
outputs-written reports

Policy

policy-institutional
policy-no open research
policy-open data

Reaction to the Openness Profile

OPusefulCommunity-Positive
OPUsefulOrganisation-Positive
OPUSefulPersonal-demonstrate new product development
OPUsefulPersonal-Negative
OPUsefulPersonal-neutral-positive
OPUsefulPersonal-Positive

Role (that interviewees fulfil)
role-advise
role-community management
role-data manager
role-developing assessment framework
role-enterprise architecture
role-grants management
role-information hub
role-infrastructure
role-IT support
role-lean coach
role-oa expert
role-policy advisor
role-project manager
role-publisher
role-publishing policy
role-research management
role-researcher
role-researcher support
role-service provider
role-standards creation
role-teacher
role-technology architect
role-workshop facilitator
role-IT support
role-lean coach
skills-coding
skills-data formats
skills-data services
skills-data wrangling
skills-grant writing
skills-knowledge of open standards
skills-open as part of daily work
skills-people skills
skills-web development
skills-where to put data

Strategy
strategy-focused on data
strategy-formal declaration
strategy-negative
strategy-positive

Thought Leader (orgs and people)
leader-Anne Cambon-Thomson
leader-BMC
leader-British Library
leader-CASRAI UK
leader-CDL
leader-CERN
leader-Cherifa Boukacem-Zeghmouri
leader-crossref
leader-CWTSLeiden
leader-DARIAH
leader-DKRZ
leader-DORA
leader-elife
leader-Elsevier
leader-EMBL
leader-EOSC
leader-ESGF
leader-F1000
leader-Francoise Genova
leader-French National History Museum
leader-Gates foundation
leader-Goettingen University Library
leader-GOFAIR
leader-HEFCE
leader-Hypothesis
leader-IPCC
leader-IPSL
leader-jisc
leader-Kathrin Beck

leader-Laurent Romary
leader-Linus Torvalds
leader-Max Planck digital library
leader-MBO (Dutch funder)
leader-Michael Eisen
leader-Mozilla
leader-national data service (Australia)
leader-Nature
leader-NIH
leader-NSF
leader-OJS
leader-ORCID
leader-plos
leader-princeton
leader-publons
leader-Richard Stallman
leader-Robert Kiley
leader-Scottish insights institute
leader-stuff from twitter
leader-Sue Fletcher-Watson
leader-Tara Spires-Jones
leader-Ted Fon
leader-UKRI
leader-wellcome trust
leader-Zenodo

Tools

tool-annotation tools
tool-CEDA
tool-cloud storage
tool-collection management systems
tool-CRIS system
tool-database
tool-DataCite
tool-dataverse
tool-decision
tool-DMP tool
tool-DOI
tool-eLab books
tool-email
tool-experiment
tool-facebook
tool-figshare
tool-front end dev
tool-Github
tool-GitLab
tool-Google Reconcile
tool-google scholar
tool-GRID
tool-HAL
tool-ImpactStory
tool-IMS Corpus Workbench
tool-institutional repository
tool-ISNI
tool-LinkedIn
tool-LINUX
tool-listservs
tool-MSword
tool-OpenRefine
tool-protocol.io
tool-publons
tool-pubmed central
tool-PURE
tool-python
tool-questionnaire and interviewing tools
tool-R
tool-researchGate
tool-Ringold
tool-ROR
tool-scopus
tool-SketchEngine
tool-slideshare
tool-social media

tool-stylo
tool-supercomputer
tool-supplementary information
tool-Twitter
tool-Vivo
tool-WeTransfer
tool-workflow systems
tool-zenodo
tool-zotero
tools-file based archive
tools-OSF

Use cases
usecase-choose employer
usecase-create incentives
usecase-disaggregation of article
usecase-discoverability
usecase-enablecredit
usecase-evaluations
usecase-evaluate labs
usecase-front end for CREDIT
usecase-funder-decision making
usecase-funder-track outputs
usecase-interactive website
usecase-learning norms
usecase-map collaborations
usecase-negative results
usecase-organisation-prove openness
usecase-raise awareness
usecase-recruitment
usecase-researcher-prove openness
usecase-share more outputs
usecase-show capability
usecase-stakeholder-prove openness
usecase-standardized CV
usecase-trace outcomes
usecase-track impact of data
usecase-transparency
usecase-write grants

No code group
beyond open
careerBenefit-neutral
careerLibrarian-biomedical
creating narratives
CV-includes openness
CV-not includes openness
Epiphany
FAIRdata
formats-jpg
FranceEngineers
Good quote
hasORCID-Yes
list best outputs
Open Science Definition
open source software
open/functional dilemma
OPEthics
orgType-funder
orgType-private company
orgType-research institute
OSUnderstanding-High
OSUnderstanding-Moderate
problem oriented research
Repositories
researcher reputation
solution consultancy network
university press
whosupports-data sharing initiatives
whosupports-institution
whosupports-library

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