DCC

Digital Curation Centre

Using RISE

the Research Infrastructure Self-Evaluation Framework

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Introduction

Delivering effective institutional support for research data management (RDM) is a challenge for any HE institution, regardless of size or research intensity. Typically, support should include both technical and human infrastructure, with ownership of individual service elements distributed across the institution. Ensuring that RDM service development takes as comprehensive a view as possible and engages effectively with relevant stakeholders is key to successful research data support.

The Research Infrastructure Self-Evaluation (RISE) framework is a benchmarking tool designed to facilitate RDM service planning and development at the institutional level. The tool provides a framework for discussion, enabling relevant stakeholders to contribute their experience to all aspects of a holistically envisioned service. It distils the DCC's experience working with the HE sector through the Institutional Engagement programme and builds on existing tools such as the DCC's CARDIO.[i]

RISE was created primarily for higher education institutions to help them to take stock of their current RDM support provision and identify areas of focus for future development. This process is typically administered by someone from within the institution with significant experience of the local research support infrastructure, and a good understanding of the wider issues associated with supporting data management. Regardless of who manages the service review, input is likely to come from representatives of the Library, Research Office and IT, and may include input from other areas. One of the advantages of using RISE is that it provides a means of engaging these stakeholders in productive discussion about service development and allows them to reach a shared vision of where the RDM service aims to be.

Addressing issues with service development

When planning or refreshing institutional support services, there are a number of common issues that the RISE model aims to address:

Firstly, there is a need to adopt a holistic approach to service design, as delivering effective RDM support typically requires people and processes to work together across professional service units. This coordinated result is very difficult to achieve when individual RDM service elements are developed in isolation.

Secondly, it can be difficult to foster discussion across services to ensure that all stakeholders contribute to relevant discussions. Although there should be a clear institutional owner for any distinct service that is part of RDM support, there will be several stakeholders who have a useful contribution to make to service planning and implementation. Free-form discussion can be unproductive where people have varying levels of experience with systems or underlying issues.

Thirdly, organisations can develop their capabilities through different combinations of technologies and products, which evolve rapidly. Using a capability model enables stakeholders to take a step back and consider the question 'what do we need to provide?', informed by current practice and developments in skills and technology. This helps keep more detailed discussion of requirements on track, by avoiding the risk that discussion of service development drills down into specific technologies and products too far and too soon. This can prove isolating for those who are not familiar with the technical details of implementation but have valuable views and experience to contribute to the discussion.

Using capability models for self-assessment and planning

Self-assessment is an essential early step towards constructing a service development plan which responds to the individual needs of an institution. It is a key concept in service management that implemented services should be continually reviewed, and there are a variety of capability and maturity models that provide a framework to facilitate these processes. Capability models offer different perspectives from which to systematically review key RDM process areas and activities (capabilities), and assess their level on a scale such as 'maturity' or 'organizational readiness'. It is most important to choose a capability model that matches the aims of the assessment, offers a relevant set of processes, and a useful scale to rate them on.

A common feature of capability models is a list of process areas, representing a domain such as digital preservation, software development, or open access service provision. These are used to construct a rubric, in tabular form, whose rows list the relevant capabilities. A number of columns (e.g. 3 to 5) are labelled to describe a scale of attainment, and each cell provides a statement describing a level for each capability.

Probably the most widely established model for service development is the *Capability Maturity Model (CMM)* developed at the Software Engineering Institute (SEI) at Carnegie Mellon University (Paulk et al., 1993)[ii]. In the CMM approach, the scale represents maturity, i.e. the level of organizational capability to reliably perform the process. This maturation reflects the extent to which each process is institutionalized and managed, ideally with quantified measures enabling continuous process improvement.

An influential example of a capability model focusing on the preservation context is the 'Five Organizational Stages of Digital Preservation' developed at Cornell University (known as the 'Cornell model'). This evaluates five stages of 'preservation readiness' for institutions, drawing on the OAIS standard. The Cornell Model has influenced a number of recent capability models, including:

- CARDIO (Collaborative Assessment of Research Data Infrastructure and Objectives) developed by the Digital Curation Centre as a tool for institutional stakeholders to self-assess service elements.
- AOR (Assessing Organisational Readiness) developed by University of London Computing Centre as a tool for organisations to measure their readiness for managing digital content.

In many capability models, the scale represents maturity, i.e. the level of organizational capability to reliably perform the process. This maturation reflects the extent to which each process is institutionalized and managed, ideally with quantified measures enabling continuous process improvement.

The DCC's RISE model adopts a different approach, in that the maturity of capabilities are not explicitly assessed. Instead, the model uses an everyday concept of 'capability' as 'the ability to generate an outcome', in this case the ability to provide service value. RISE describes three levels of capability that correspond with different levels of service value in each area of capability. Broadly speaking, the focus for level one is compliance, for level two is providing locally-tailored services and for level three is sector-leading activity. The model does not include a level corresponding to a complete lack of support activity, in those cases capability is described as being at level zero.

Figure 1. DCC Research Data Service Model

The RISE framework describes 21 capabilities, distributed across ten research data support service areas shown in Figure 1. These were identified through the DCC's institutional engagement programme and applications of the CARDIO tool, and were the basis for a generic RDM service model.iii The current version updates that model in keeping with the increasing maturity of RDM support. It draws on DCC surveys of institutional RDM services in the UK, and trends reported in surveys of academic libraries in the UK, US and Europe. iv,v,vi A DCC workshop in which RDM service practitioners tested an earlier draft of RISE was also extremely useful in validating the model.

The model reflects the high level of diversity among UK research institutions, ranging from the highly research-intensive to those conducting little research, or which specialise in certain disciplines. This is not unique to the UK. Institutions worldwide are addressing funder and community expectations of broader research data sharing, but the appropriate level of response is largely defined by the institutional context. It would be unrealistic to expect every institution to provide the same level of service capability across every element of RDM support. RISE aims to help institutions identify which capabilities are appropriate for them and therefore which areas to prioritise in their service improvement planning.

The level of service capability that it is feasible or desirable to deliver will depend on the institutional context. Where it might be considered essential that a large research intensive institution provide an in-house data publishing platform, an institution with a modest research capacity may be better to consider outsourcing or sharing aspects of the service, including the repository platform itself, with other institutions or an external provider. The RISE capability model aims to recognise this contextual difference by providing three possible levels of service capability, using compliance with the main policy expectations of research funders, and legal requirements as a starting point. It should be noted that while the levels offer a progression in terms of service capability, RISE does not assume that more is better. The level of capability offered should be proportionate to costs that are justifiable, considering local research strategy, available resources, and likely demand for the relevant services.

Using the RISE framework in service planning

Aiming to ensure that institutions could use RISE in a variety of contexts, the DCC engaged with 16 UK HE institutions to test its relevance and utility. Applications ranged from using the tool as a framework for a semi-structured interview with RDM service managers and selected central support staff, to using it in a group workshop session to discuss data publication needs. The RISE outputs from this session informed a more detailed assessment of shortlisted platforms, based on capabilities set out in ReCap, a sister DCC model for evaluating data repositories. [vii]

Working through the RISE model is relatively straightforward, though achieving consensus across the institution may add layers of complexity. Broadly speaking, there are four stages to using the RISE model:

1. Setting the scope and identifying context
2. Classifying current RDM support provision
3. Identifying feasible levels of service provision based on what is desirable
4. Reporting and recommendations

We describe these steps in more detail below.

1. Setting the scope and identifying context

It is important when starting a RISE assessment to have a clear goal in mind, this helps to define the scope of the assessment and identify the relevant stakeholders to engage in discussions. Generally speaking, this phase will involve quite a small subset of institutional stakeholders, often those with overall responsibility for providing institutional RDM support. Examples of requirements that have been addressed using the RISE framework are:

- ensuring that RDM infrastructure meets RCUK funder requirements
- providing a clear overview of current provision
- helping establish a roadmap for further development.

2. Classifying current support provision

In this phase, engagement is widened to include a range of institutional stakeholders. RISE should be tailored to suit the number of people that need to be involved at this point. If only one or two stakeholders need to be involved in the assessment, RISE can be used as a basis for a discussion. If more, then a service or project manager can use RISE as a basis for preparing semi-structured interviews or a workshop.

Whichever approach is adopted, relevant stakeholders should work through the tool to identify which statement for each capability best suits the current institutional support provision. This phase can usefully draw on relevant contextual information such as user surveys or consultations. This information can subsequently be summarised during the reporting phase of the assessment to frame and qualify implementation decisions.

3. Designing the future service

The next stage in the process is to identify, for each relevant capability in the RISE model, what level is considered feasible and desirable. This decision should take into account institutional philosophy, the resourcing outlook, and the benefits and risks associated with moving to a higher level of capability. In practise, phases two and three can be performed concurrently.

4. Reporting and recommendations

Producing a formal report as part of the RISE process is optional; some users of the tool have simply found it a useful tool for initiating conversations between RDM stakeholders to reach a consensus about the service. For others, RISE has proved a useful tool for identifying gaps in support provision and aiding prioritisation decisions, contributing to the development of roadmap documents. Working through the RISE framework uncovers useful information about the case for service development that can be incorporated into business plans. Use of the RISE framework alongside its sister model ReCap can also help scope high-level requirements for data repository platforms to help progress to more detailed discussions around platform selection.

Lessons from using RISE

A number of lessons can be drawn from working through the RISE framework with HE institutions:

- Have a fixed goal in mind, and communicate this clearly to all participants
- Allow sufficient time to work through the model, the amount of time taken will depend on:
    - Number of participants (ideally no more than eight at once)
    - The level of engagement in the organisation with RDM issues
    - The scope of the assessment – will all or part of the framework be used?
    - The level of detail required – in addition to the main capabilities, RISE offers suggestions of associated questions to consider during discussion
    - The extent to which current and/or future service provision is already defined
- Stakeholders should familiarise themselves with the framework individually before coming together to discuss collectively.
    - This is particularly true for the individual administering the process, who will need to guide discussion and potentially resolve situations in which participants' interpretation of capabilities differs.
- Ensure discussion is captured to allow useful information to be summarised and fed back

By and large, the length of time needed to complete a RISE assessment depends on the level of detail required from discussion. As an indication, a full assessment in a workshop group of 6-8 people would take half a day, assuming participants are familiar with the framework.

Future development of the RISE framework

Development of the RISE framework to date has drawn on the Digital Curation Centre's experience of working with the RDM community. It was conceived as an outcome of the DCC programme of engagement with UK universities, and with the input of RDM professionals from a range of Higher Education institutions, who provided feedback and validation. We aim to keep developing it, and future iterations will respond to user feedback and advances in sector best practice.

A more detailed version of this guide will include more discussion about applying the framework. We aim to publish selected case-studies from institutions that use RISE with or without DCC support. These case studies will discuss the pros and cons of different approaches, present lessons learned and, where possible, include examples of outputs from the process.

Further guidance is intended on how to use the outputs of RISE with ReCap, its companion model. The models are intended to be compatible, so that broad service development discussions can extend to more in-depth consideration of data repository platform options. This should better enable non-technical services staff to help shape requirements, and address difficulties in getting researchers' input. ReCap is the first of a two-part guide, the second part of which describes data repository workflows and contexts that inform the model.[7]

Further work is also intended in a number of areas, including community consultation on specific benefits to the organisation and to service users that may be realised as a service increases in capability from one level to the next.   Over the next few years we aim to integrate RISE with career development frameworks. Like ReCap and other capability models, RISE is focused on improvements at the level of the service and its host organisation. Delivering these improvements means having the right skills in place for individuals in RDM service provider roles. The uptake of new services also depends on researchers having the right skills to use the services offered to them.

It makes sense therefore to use capability models in conjunction with competence frameworks. Competence (or 'competency') frameworks define what people with specific roles should be able to do. These frameworks are typically used by human resource professionals to analyse training needs, and manage career development and performance review/reward.[viii] They have also been used by the European Commission to support its 'new skills agenda', for example through DigiComp, a common reference framework for public authorities to implement digital skills development for citizens, [ix] and the European e-Competence Framework, which addresses the education of IT professionals to meet workplace competence needs.[x] The EDISON project takes a similar approach to develop a competence framework for Data Science.[xi]

In the European Open Science Cloud (EOSC) pilot project, DCC is working with partners to develop an integrated competence and capability framework, informed by shared experience in supporting service development and validating EOSC services. Joining up competence frameworks in data science and data management,[xii,xiii] the EOSC framework will help organisations ensure the right training is included in service development roadmaps, and in the career development plans for relevant staff.

There is also scope for further work to better integrate RISE with other capability models, such as the Community Capability Model for Data Intensive Research (CCM-DIR)[xiv] and the Capability Maturity Model for RDM (CMM-RDM).[xv] Integration could make it easier for individuals and organisations to apply a model best suited to their needs.

Contribute to the development of RISE

RISE has been tried and tested through practical application with the RDM community. We would welcome any feedback on the model to contribute to its continued improvement. Equally, we would be really interested to hear any accounts of how it has been used to shape service development. Please contact Jonathan Rans (j.rans@ed.ac.uk) or Angus Whyte (a.whyte@ed.ac.uk)

RISE capability model

RDM policy and strategy

This area of activity covers the development and maintenance of RDM policy and associated documents and processes that enable its implementation. Facets to consider:

- scope of the policy
- consultation on roles and responsibilities identified in the policy
- how policy is communicated to stakeholders
- mechanisms to monitor and review content

Policy implementation will encompass the design of processes to realise policy goals. This will include elements of policy development, stakeholder engagement and project management.

Policy development

Level One	Level Two	Level Three
Institutional policy articulates roles & responsibilities for researchers, other staff and students to comply with legal & regulatory obligations and external funders' RDM policy expectations.	Institutional policy articulates the value of good RDM practice to the institution and its rationale for retaining data of long-term value. Policy is subject to a regular, scheduled review process.	Institutional policies with a bearing on RDM (e.g. FOI, ethics, research conduct, etc.) are joined up and complementary. Policies are externally promoted, aiming to push the sector forward.

Awareness raising and stakeholder engagement

Level One	Level Two	Level Three
Research data policies are promoted to all relevant staff, students and researchers	Guidance on how to apply all relevant policies to the institutional context is provided and promoted to all relevant staff, students and researchers.	Policies are promoted by the institution through channels designed to engage with staff, student and researcher groups' specific interests.

RDM implementation roadmap

Level One	Level Two	Level Three
RDM roadmap is compliance-focussed and defined by funder requirements	Roadmap is informed by the institution's strategies and its researchers' priorities.	Roadmap/strategy seeks to derive competitive advantage from RDM support. It aims to be sector-leading and innovative.

Business plans and sustainability

This area of activity focuses on the institution's approach to securing the sustainability of RDM services. Facets to consider:

- making the business case for the service, considering its value proposition to service customers
- committee processes and timelines for securing resources for improved technical and human infrastructure
- costs and benefits associated with RDM support provision
- cost recovery models and research funder rules that govern what direct or indirect costs may be charged to research grants

Staff Investment

Level One	Level Two	Level Three
RDM service is delivered by dividing responsibilities among existing staff.	RDM service is delivered through significant redesign of staff roles including investment in staff development.	The RDM service is delivered by major redesign of staff roles, consistent with the establishment of an RDM service.

Technology Investment

Level One	Level Two	Level Three
A base level of investment in technical infrastructure, with commitment to supporting recurring costs, ensures that researchers can make their data findable and accessible in the long-term.	The institution coordinates investment in the central technical services it deems a strategic priority for research data life-cycle support.	The institution invests in technical infrastructure for all aspects of the research data life cycle, interoperating with tools and workflows at research group level.

Cost modelling

Level One	Level Two	Level Three
All RDM service costs are covered by overheads on grants.	Standard RDM services are funded through grant overheads. Where support exceeds the norm mechanisms allow for direct charging of grants.	Cost modelling enables specialist, stand-alone RDM services to be offered alongside standard support provision. (e.g. statistical modelling service or data visualisation service).

Advisory services

This area covers the provision of online and face-to-face advice for researchers who need support with a particular aspect of their research data management. Facets to consider:

- which staff deliver support to researchers across relevant professional service units, and what scope is there to join this up

- on which topics is the advice provision strongest and weakest

- which channels are used to connect researchers to any support already available, and what scope is there for using online more efficiently

Level One	Level Two	Level Three
Generic, online guidance is offered that addresses key areas of RDM. Content may be externally sourced, with little relating to the specific institutional context. Pages include a helpdesk email address.	Guidance offers relevant advice on how to use services that comply with institutional policies, and the benefits to researchers of doing so	Guidance is significantly tailored to support the specific needs of the institution's researchers and support staff. Guidance content is externally referenced as sector best practice

Topics	Level One	Level Two	Level Three

Typically, advisory service provision will vary in capability depending on institutional context and strategic priorities. So it may help to note under the table which topics the service is cable of providing at each level. Topics for advice include the following:

- Grant costing
- Curation
- Consent and Open Data
- Data reuse
- Data analysis

- Data selection
- Data preservation
- Metadata
- Text and data mining
- Visualisation

Training

This area covers online and face-to-face delivery of learning materials on RDM principles and practice that are designed to meet the needs of both researchers and support staff. Facets to consider:

- what objectives does the training programme aim to address, e.g. which capabilities of the service will be improved

- whose skills or competencies need to be developed, and what are they

- what channels are used to connect staff and researchers with training opportunities

- how can RDM be aligned with other learning approaches

Online training

Level One	Level Two	Level Three
Externally sourced online courses are linked to from RDM pages.	Externally sourced online courses are supplemented with some materials which support local needs and services.	The institution produces a significant amount of online training material which meets the needs of its researchers and staff.. Materials are reused by others in the sector.

Face to face training

Level One	Level Two	Level Three
Face to face training in basic RDM principles is available on request. Course content is regularly updated and responsive to feedback.	Regular, structured face to face RDM courses are available to all. Training objectives are aligned with the objectives of the institution's RDM strategy.	Competencies for relevant researchers and professional support staff are defined in standard role descriptions. Training is provided which facilitates this development.

Data management planning

This area covers online and face-to-face support for researchers to effectively plan the data component of their research and produce associated documentation. This should enable them to meet their funders' requirements and allow the institution to monitor future support needs. Facets to consider:

- to what extent professional service units need to be joined up to deliver effective support

- how can the information gathered in data management plans be best used to the advantage of the researcher and the institution

Level One	Level Two	Level Three
Institution provides guidance to researchers on completing funder-mandated DMPs as part of grant bids.	Institution mandates DMP production at bid stage for all researchers. Guidance and templates are provided. Research Office connects to relevant stakeholders to appraise DMP content and notify them of relevant resource implications.	Institution promotes best practice in data management planning and facilitates good research design in relation to data generation and preservation. Automated systems flag researcher requirements to the relevant institutional support services (e.g. exceptionally large projected data volumes)

Active data management

This covers central services, particularly file storage and synchronisation. This will also encompass managed back-up, provision for storage expansion, and collaboration. Facets to consider:

- how could data management support be enhanced by integrating storage with other relevant systems

- how do researchers use third-party cloud services, and should in-house services compete and/or integrate with these

- how may researchers be supported to share in-house storage with collaborators in other organisations

Scaleability and synchronisation

Level One	Level Two	Level Three
The service provides researchers with managed access to networked storage, from multiple devices, of sufficient capacity and performance to satisfy most of the organisation's projects.	The service can provide additional storage on request to satisfy exceptional storage capacity, device networking, or performance demands.	The service provides automated access to additional storage to satisfy exceptional capacity or performance demands.

Collaboration support

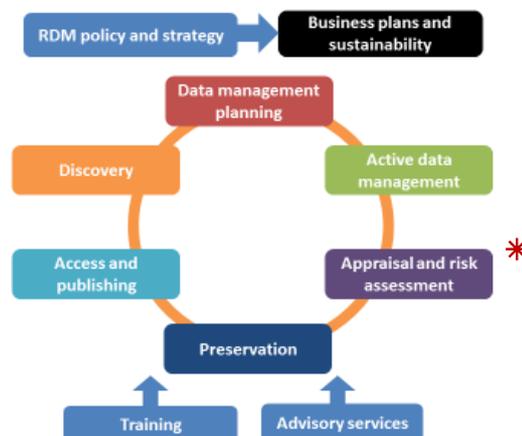| Level One	Level Two	Level Three
The service enables access to data for external collaborators by providing them with local access rights to institutional storage systems.	The service provides managed access to tools that enable researchers to share data with external collaborators.	The service provides managed access to virtual research environments that enable researchers to work on data with external collaborators.

Security management

Level One	Level Two	Level Three
The service provides authenticated access to storage that is protected from unauthorised data access, and researchers are made aware of procedures for data protection and de-identification.	The service provides tools/environments that enable researchers to de-identify, encrypt or control access to data as required.	The service provides researchers from across the institution with access to ISO 27001/2 or equivalently accredited facilities for analysis of shared sensitive data.

Appraisal and risk assessment

This area concerns processes to identify research outputs with value to the organisation. These should also identify potential risk factors associated with the materials and inform the appropriate preservation and publishing strategies. Facets to consider:

- what will the service offer researchers to persuade them to hand over data and metadata

- how will researchers be helped to identify relevant third-party repositories

- how will the RDM service interface with active research data platforms

- how may RDM support integrate with existing ethics approval and confidential data handling processes

Data collection policy

Level One	Level Two	Level Three
Service primarily supports data deposit to third-party repositories, and holds datasets in-house when legal/ regulatory compliance requires	Service defines criteria for retention of datasets of long-term value to the institution	Service defines criteria for developing datasets as special collections and ensures these meet specialist depositor and user needs

Security, legal and ethical risk assessment

Level One	Level Two	Level Three
Service seeks confirmation that data was collected or created in accordance with legal and ethical criteria prevailing in the data producer's geographical location or discipline	Service commits to proactively manage legal and ethical risks relevant to its depositors and users, and to relevant professional and technical development for researchers and support staff	Service offers data producers tailored guidance on risk assessment, and on solutions that offer an appropriate level of risk control for the data they manage

Metadata collection to inform decision-making

Level One	Level Two	Level Three
Information is gathered from research projects to enable the identification of research data that must be kept for compliance purposes	Metadata is routinely recorded to relate research activity to data and other outputs, and enable better informed decisions on the preservation costs, risks and value to the institution	Metadata on data and related research outputs is sufficiently well-structured and interoperable to enable added value to be extracted for service users' needs

Preservation

This area addresses the need to ensure data integrity and access, and address the risks that dependent technology may pose. Facets to consider:

- how feasible is it for the RDM service to commit to preserve 'more than the bits' e.g. file formats, or software needed to read data

- what policy and guidance needs to be in place to capture the contextual information others will need if they are to reuse the data

- how may archivists or special collections units contribute their expertise

Preservation planning and action

Level One	Level Two	Level Three
Service demonstrates it can ensure continued bit-level integrity of the data collections it holds, its metadata, and its links to any related information submitted with it	Service enables preservation plans e.g. file migration or normalisation to be enacted at time of ingest or dissemination, and records all actions, migrations and administrative processes it performs	Service commits to deploy tools and expertise to maintain the significant properties of data, metadata and related information for required retention periods and identified user groups (full preservation)

Continuity Support

Level One	Level Two	Level Three
Service enables retained data to be stored with a copy automatically held in another location	Service enables retained data to be stored with copies automatically held in two separate locations, at least one off-site	Service enables data & metadata to be automatically distributed across multiple locations according to specific policy criteria

Access and publishing

This area covers the support for depositing and publishing open access data of long-term value. This may be using in-house or externally provided infrastructure.

Facets to consider:

- does the institutional context warrant the development of an institutional data repository

- how should an institutional repository integrate with other institutional and external systems

- how can systems enhance the value of selected data collections (NB: Value-added services are unlikely to apply to all data assets)

Monitoring locally produced datasets

Level One	Level Two	Level Three
Information is gathered from research projects to enable compliance with funders' requirements for research data discoverability.	Metadata is routinely recorded on locally produced data, and its links to research activity or related outputs, enhancing the quality of the institution's research information.	Metadata on locally produced research data, and its links to other activities or outputs, is sufficiently structured and organised to inform institutional strategy.

Data publishing mandate

Level One	Level Two	Level Three
Service supports minimum external requirements for metadata and publicly accessible data.	Service supports community best practice standards for data access, citation and metadata exchange.	Service supports bespoke content discoverability, access and quality review needs for user groups or organisations.

Level of data curation

Level One	Level Two	Level Three
Service commits to brief oversight of submitted data and metadata e.g. for compliance purposes.	Service commits to maintain or enhance value through routine action across data collections.	Service commits to maintain or enhance value through bespoke action on individual collections.

Discovery

This area concerns processes and mechanisms for gathering and exposing the metadata needed for others, within and beyond the institution, to find out what data its researchers produce, whether it is accessible, and where it is held.

Facets to consider:

- What metadata for research data does the institution define as 'essential' and how does this relate to relevant standards for other research outputs

- How well a data catalogue integrates with other systems for metadata management and discovery

Metadata cataloguing scope

Level One	Level Two	Level Three
Service catalogues metadata for the organisation's publicly funded datasets according to funder expectations that they are discoverable, citable, and linked to related content	Service catalogues metadata to enhance value of the institutions data assets in accordance with recognised best practice standards	Service catalogues metadata to enhance potential dataset reuse according to sector-leading standards, or fulfil domain-specific purposes

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