Context:

The Global Open Research Commons International Model Working Group (GORC-WG) has been working to create a model describing commons* attributes* so that commons* developers can compare aspects across

This is the GORC WG commons* model version 1.1. It represents the work done by the GORC WG culminating in V1.0 of the model endorsed by RDA in October 2023, with slight revisions.

Note that additional versions* of this model, as well as implementations and applications of it, are under

You can also access and comment on this version of the model online in its Google Sheet format

What the model is:

This spreadsheet representation of the model includes a flat breakdown of the essential elements* of a commons* (from the GORC-IG definitions document, see below), categories* and subcategories* of these essential elements*, and the attributes* and features* that exist for each. Of note is the relationship between all aspects of the model as presented here: the entities of essential elements*, categories*, and subcategories*, and the characteristics (attributes* and features*) that belong to them. Subcategories* are child entities of categories*, and categories* are child entities of essential elements*. Attributes* are inherited from parent to child entities, but are not necessarily shared between sibling entities. Features* are more granular than attributes*. Categories* of essential elements* may be considered mandatory and not disjoint, in the way that any entity that is part of the essential element* must belong to a category* of the essential element and may belong to more than one category*. Subcategories* are optional and not disjoint, in the way that any entity that is part of a category* may or may not belong to a subcategory*, and belong to more than one subcategory*. Possible Key Performance Idicators* (KPIs*) and metrics* for consideration are listed in the last tab. A UML visual representation of these relationships is available in this conceptual model.

In addition to the statement of the model (i.e. the name of each essential element*, category*, subcategory*,

Any word throughout the model with an asterisk (*) has a specific definition captured in the glossary. In some cases, the same word may have different meanings depending on context, and so the same word may have an asterisk in one place and no asterisk when used in another part of the model as it means something different than our model-specific definition, especially within examples. Each essential element* in the model has its own tab. Blue coloured cells indicate categories* and their information, and purple cells indicate subcategories* and their information. Orange coloured cells indicate attributes* and their information, and yellow cells indicate features* and their information. Attributes* and features* at the top of each tab that are not within a category* or subcategory* belong to the essential element*, and are inherited by each category* and subcategory*.

How to use the model

Commons* developers may use this model as a guide for what to consider as they build, maintain, and expand their commons*. Not every commons* should include every item in this model, however we encourage commons* to consider having some representation in each essential element*. Commons* developers should review and consider each attribute* and feature* and the subcategories* and categories* they belong to in each essential element*, asking themselves if each is something their commons* has at a sufficient level, has but needs to improve or expand, does not have and needs immediately, does not have and needs eventually, or doesn't need at all. Developers may consider keeping explanatory notes for themselves on their decisions for each item in the model, and revisiting them over time as part of their strategic planning process. Developers may find the list of possible KPIs and metrics helpful as a starting point to determine their own success indicators and metrics. A first edition adoption tool , based on V1.0, is available for those interested in adopting the model.

Note that the access level on this sheet is set to "anyone can comment". Please do leave comments and suggestions on cells throughout the model. All parts of the model should be visible, but please contact CJ at c.joseph.woodford@gmail.com if you find you cannot see any area of the model clearly. We also have a

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Relevant Resources:

Global Open Research Commons International Model, version 1.1, Model documentation

The Global Open Research Commons International Model, version 1, supporting documentation;

GORC IG: Typology and Definitions : https://doi.org/10.15497/RDA00087

GORC International Model WG - Commons Model V1.0

Cite as:
Woodford, C. J., Treloar, A., Leggott, M., Payne, K.., Jones, S., Lopez Albacete, J., Madalli, D., Genova, F., Dharmawardena, K., Chibhira, N., Åkerström, W. N., Macneil, R., Nurnberger, A., Pfeiffenberger, H., Tanifuji, M., Zhang, Q., Jones, N., Sesink, L., & Wood-Charlson, E. (2024). *The Global Open Research Commons*

Acknowlegements and thanks are extended to all GORC-WG members, speakers, and RDA community members who provided input to and feedback on the model. In particular, we thank Corrie, B., Crawley, F.,

			Counts
Essential Element*	**Total items**	**Core Considerations**	**Desirable Considerations**
Governance & Leadership*	59	41	18
Rules of Participation & Access*	15	11	4
Sustainability*	12	5	5
Engagement*	17	11	5
Human Capacity*	27	22	5
ICT Infrastructure*	28	20	4

Interoperability*	21	9	11
Standards* & Conventions*	33	10	22
Services* & Tools*	74	28	36
Research Objects*	6	6	0
Subtotals	**292**	**163**	**110**
KPIs* & metrics*	104	49	34
Total Considerations:	396	212	144

Optional Considerations	Categories*	Subcategories*	Attributes* & Features
0	5	6	48
0	2	8	5
2	3	5	4
1	4	3	10
0	5	1	21
4	5	8	15

1	3	3	15
1	10	2	21
10	10	10	54
0	5	0	1
19	**52**	**46**	**194**
21			
40			

Glossary

Term
Attribute*
Block-based Storage*
Category*, Subcategory*
Collection* (of Research Objects*)
Commons*, Research commons*
Community*, Research commons community* or commons community*
Consideration Level*
Data space*
Development Stage*
Digital object*
EDII*
Engagement* (essential element*)

Essential Element*

Feature*

File based Storage*

Governance & Leadership*, Governance* (essential element*)

Human Capacity* (essential element*)

ICT Infrastructure*, ICT, Information Communication and Technology Infrastructure (essential element*)

Internal Capacity*, Internal Personnel*

Interoperability* (essential element*)

KPI*, Key Performance Indicator

Machine Actionable*

Members*

Metadata*

Metric*

Object based Storage*

PID*, Persistent Identifier*

PID* record*

Platform*, Research Platform*

Provenance*

Providers*

Publishers*

Publication*

Repository*, Repositories*, Repo*, Repos*

Research Compendium*

Research Data*

Research Object* (essential element*), Research Artefact*

Research Software*

Rules of Participation & Access* (RoP) (essential element*)

Semantic Artifacts, Semantic Objects*

Service* (essential element*)

Stakeholder*

Standards & Conventions*, Standards* (essential element*)

Sustainability* (essential element*)

Tool* (essential element*)

Users*

Version*, Versioning*

As much as possible, it is preferred we make definitions more inclusive rather than exclusive. This glossary is listed alphabetically.

Current definition
A standard, characteristic, functionality or point of reference from which information can be documented, or measurements or comparisons may be made. Attributes* are the top level characteristics of entities (essential elements*, categories*, subcategories*). e.g. "Metadata content" is an attribute of the category "Metadata standards" within the "Standards & Conventions" essential element*.
Block storage is an approach to data storage in which each storage volume acts as an individual hard drive that is configured by the storage administrator. In the block storage model, data is saved to the storage media in fixed-sized chunks called blocks. Each block is associated with a unique address, and the address is the only Metadata* assigned to each block.
A grouping or classification within an essential element* of items that share attributes* and features*. Categories* may be broken down further into subcategories*. Any attributes* and features* of the essential element* to which the category* belongs are inherited by that category*, and likewise by any subcategories*. For example, in the essential element* ICT Infrastructure*, the category* "Storage Infrastructure" has two subcategories*: "Direct attached storage [...]" and "Network based storage [...]". This category* has one attribute, "Knowledge and management of storage infrastructure", that is inherited by both of its subcategories*. Likewise, ICT Infrastructure* itself has two attributes, "Infrastructure is designed to scale with changing volume, complexity, and velocity of projects and expectations" and "A review and update of ICT infrastructure* happens on a regular basis". Both of these attributes, as well as the features in the latter, are inherited by the "Storage Infrastructure" category and its subcategories, such that any direct-attached, network-based, or other storage
A combination or bundle of Research Objects* that are of the same kind or different kinds that share a relationship, is treated as a digital object* which may bear a PID*, and consists of a finite number of digital object* identifiers and Metadata* associated with each referenced identifier.
A trusted ecosystem that provides seamless access to high quality, interoperable research outputs and Services*. While commons* may be focused on a specific discipline or geographic region, they should have the intent to be part of the global data ecosystem. The scope of this and related documents is intentionally restricted to digital information, and intentionally does not include the instruments that generate the data that may be made available through the commons*.
All human individuals and entities that could be considered stakeholders", Users", Providers", Members" and intermediaries of the commons* (i.e. those who do not interact directly with the commons, but use information about or provided by the commons, e.g. policy makers, journals, funders) in the past, present, and future as well as all research communities that the research commons* is a part of in a regional, national, and global context. Depending on the structure of the commons*, may include funding and government bodies as well as related commercial entities, such as through related Services* or associated with related research.
Consideration levels" indicate the priority or importance with which each item in the model should be considered. There are three levels, with 'Core' indicating items that are critical to consider for a commons* at any development stage* and in any discipline, 'Desirable' indicating items that should be considered by established commons* or those looking to expand, and 'Optional' indicating items that may be considered by commons* with particular interest in those areas.
Any digital location that incentivises the sharing of data and/or facilitates the use of data across any research discipline or field. Includes research data commons*, data Repositories*, data portals, research commons*, and any interlinked Service* such as HPC infrastructures or VRE platforms*. Note that data space*s may also be physical locations, but we are not concerned with physical data space*s in this model.
The stage that a commons* is in regarding its development. This speaks to the main goal of the commons* at present, spanning: Initial [getting building blocks in place, before development or implementation of external-facing services*], Developing [main foundation of commons* is in place and the commons* is starting to develop, trial, and open external facing services* and tools*], Established [recognized in research community with core services in place], Expanding [core services are well in place, looking to bolster current services and/or expand offerings/audience]. Note that "Established" may be the end goal for a commons*, as "Expanding" is specifically for growing beyond the original mission of the commons*. Additionally, development stage* is not the same as commons* age or maturity, since the time spent in any one stage will be context
A digital object* (DO*) is represented by a bitstream, is referenced and identified by a persistent identifier and has properties that are described by Metadata*.
EDII* is an acronym standing for Equity, Diversity, Inclusion, and Indigenization. The use of this particular acronym throughout the model can be taken as any similar acronym representing these overlaping concepts, such as EDIA (Equity, Diversity, Inclustion, and Accessibility) and DEI (Diversity, Equity, and Inclusion).
Methods, mechanisms, and means used to interact with the broad research commons* community* to involve them in activities. Specifically human engagement, as technical engagement is captured in Services* & Tools*

A top-level entity that captures the functionality, coverage, and/or characteristics of a commons*. Ex. Governance* structure, Services* and Tools*

Aspects or properties of attributes*, a further stage of granularity of the characteristics of essential elements*, categories*, and subcategories*. e.g. 'Development of relevant roadmaps' is a feature of the attribute 'Development of strategy within the "Governance & Leadership*" essential element*.

In file storage, data is stored in files, the files are organized under a hierarchy of directories and subdirectories. To locate a file, you need the path—from directory to subdirectory to file.

Stakeholders* that define the commons* purpose and the development of the strategies, objectives, values, and policies that frame how that purpose will be pursued.

The mechanisms of the commons* to create and maintain capacity for humans to interact with the commons* at all levels as well as the capacity of humans in regards to the commons*, or the role of humans within the commons*. This may be considered 1) the ability of the commons* to create a human-friendly environment for all stakeholders* and community* Members* in all aspects, specifically for Users*, Providers*, and internal personnel*, so that 2) the commons* can set and achieve objectives, perform functions, solve problems, and continue to develop the means and conditions required to enable this process.

Information and communications technology infrastructure, the physical components that a computer system requires to function and are necessary to conduct research.

Anyone who is working on behalf of the commons*, for the commons*, or representing the commons* or its subsidiaries in any capacity regardless of their specific contract details or lack thereof. Includes staff, partial contracts, external contracts, volunteers, co-op students, interns, visiting researchers, etc.

The ability of Research Objects* or Tools* from different resources to integrate or work together with minimal effort. e.g. A research data file can be used by two different commons* HPC infrastructure.

Legal Interoperability*: A category* of Interoperability*. The ability to combine Research Objects* from multiple sources without conflicts among restrictions imposed by the license of each Research Object*; Research Objects* should be reusable. Covers the broad environment of laws, policies, procedures, and cooperations agreements needed to allow the seamless exchange of information and reusability of Research Objects* between difference individuals, organizations, and across jurisdictions.

Organizational Interoperability*, Pragmatic Interoperability*: A category* of Interoperability*. How organizations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals; meeting the requirements of the shared commons community* by making Services* available, easily identifiable, accessible, and community* member-focused Considerations for Interoperability* with other commons*, repos, public research institutions, private research institutions, and commercial entities, among

Semantic Interoperability*: the ability of computer systems to transmit information with unambiguous, shared meaning; a requirement to enable machine computable logic, inference, knowledge discovery, and Research Object* federation between information systems; what is sent is what is understood by both humans and

Technical Interoperability*: the ability of different information technology systems and software applications to communicate and exchange Research Objects*, and specifically to accept Research Objects* from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention.

Qualitative and quantitative measures used within and by the commons* to measure the uptake, engagement or use of a category*, subcategory*, Attribute* or feature*. KPIs* are often used to measure success, adoption, and use specifically.

Machine Actionable* means that a formal statement is syntactically and semantically specified enabling computing systems to carry out automatic processing.

A human individual or entity, such as research institutions, that participate in the commons*. Participation may include but is not limited to being Providers*, granting access or creating pathways for Users* to engage with the commons*, and participating in the governance* structure of the commons*. Being a member of a commons* is the highest level of interaction without being an employee or hosting organization. Eg. a member is participating on the Data Management Plan task group of the commons*.

Information about the Research Object*, Service*, Tool*, or other entity being described. Often stated as "data about data". Metadata* typically contains descriptive, contextual and Provenance* assertions about the properties of a digital object*.

A metric* is a quantifiable measure that is used to track and assess the evolution or performance of specific processes

A stored object is a logical collection* of bytes that are of variable size and can be used to store entire data structures, such as files, database tables, medical images, or multimedia. Object-based storage offers the efficiency of block storage and the control of file storage.

A persistent identifier* is a long-lasting ID represented by a string that uniquely identifies a digital object* and that is intended to be persistently resolved to meaningful state information about the identified digital object. A PID may also be defined by it's characteristics, i.e. that PIDs: are uniquely identifying a specific Digital Object*; in general consist of a name space indicator (prefix) and a local identifier (suffix); are actionable on the web, by extending it to a fully defined URI, if required; can be persistently resolved to state information and/or a landing page; are associated with a persistent resolution system; are issued and managed by a clearly specified

A PID* record* or kernel is a minimal set of information about the digital object* communicated between machines. At minimum, it contains the pair between the PID* and the landing page or access URL for the Metadata*.

Research platforms and Services* (virtual science labs, VREs, science gateways) instantiate a collection* of Research Software* source code, including large software frameworks, discipline-specific Tools*, Services*, and glue code, and are deployed to support both the research workflows and the communities of practise engaged in collaborative research. Capabilities include: DAM, processing and visualisation, storage and preservation, sharing and discovery. EX: ERDR, Syzygy, RIMS, CWRC

Any and all information regarding the creation, curation, maintenance, context, rights and responsibility for a Research Object*.

An individual or entity, human or machine, that provides Services*, Tools*, and/or Research Objects* to the commons* or to Users* on behalf of the commons*. Providers* may also be Users* and Members*. Ex. a Provider* deposits a dataset into the commons*' Repository*, a third-party company provides digitization Services* for commons* Users*

An entity, human or machine, that prepares and issues a Research Object* for distribution or otherwise makes the Research Object* public, so that it may be shared and discovered. This includes but is not limited to peer-review and open access journals, data Repositories*, government bodies, pre-print Repositories*, blogs, and digital spaces owned and operated by research institutions and organizations, such as websites and news columns. Specific examples include websites such as Zenodo, an institutional or discipline Repository* such as

A text based scholarly Publication* or publishing channel that contains results of research. CRISs typically record Metadata* about scholarly Publications* from the scope of the CRIS (institutional CRIS for the institution, funder CRIS for the funding it distributed, etc.) in the context of the research projects, infrastructure, funding, organization units and authors/contributors. This entity typically represents the granularity level of a single published item for which attribution information is attached (usually in the form of a list of authors and contributors). This entity is also used to represent publishing channels and sources: journals and book series (incl. continuing conference proceedings series).

A system for Research Object* storage and management. Repositories* may aggregate Research Objects* from other Repositories*, and may be a part of or are harvested by commons*. Repositories* typically do not have Services* or Tools* beyond essential storage and management.

A bundle of all the research artifacts used and necessary to support a research claim, such that the claim is completely reproducible using only what is provided or referenced in the research compendium*.

An assembly of data that is identifiable and has the potential to be curated or published by a single actor and is the result or focus of research activities. Research data can digitally represent a group of observations, a data product from a specific version* of a processing algorithm based on observations, output of numerical model(s), or outcomes of laboratory experiments. Research data serve as the object(s) of an investigation, whether scientific, scholarly, literary or artistic, and are used to create more or other research data.

Any input to, or output of, any and all stages of the research process. For this version of the model (V1.0), we only consider Research Objects* that are Digital Objects*, as we have confined the model to digital and e-infrastructures.

Source code files, algorithms, scripts, computational workflows, and executables that were created during the research process or for a research purpose. Software components (e.g. operating systems, libraries, dependencies, packages, scripts, etc.) that are used for research but were not created during or with a clear research intent should be considered software in research and not Research Software*.

A set of policies defining a minimal set of rights, obligations, and accountability governing the activities of those participating in the commons*.

Semantic Objects* are a named grouping of descriptive elements that sufficiently describe a distinct identity. Semantic Objects* may be in the form of documentation, Research Software*, or research data*. They may also be referred to as Semantic Artefacts*, defined as groups of entities with unique identifiers where entities include subjects, predicates, and objects that can be linked together to form a network that describes a dataset. In this model, Semantic Objects*/Artefacts are not considered as collections, since collections are comprised of

Any commons* element that can be invoked by Users* to perform some action on their behalf.

Data Service*: any Service* that acts on at least one component of the 'holy trinity of data management': the bit sequence, the Metadata* and the PID* of a digital object*. This includes Services* that bind these components together (e.g. associating Metadata* with a bit sequence), Services* that deliver data to the User*, Services* that automatically analyze or transform data, Services* that aggregate and index Metadata*, Services* that store or replicate data, etc

Any human individual or entity that represent themself or a non-human (animal, plant, land, resource, or technology) entity or group that is associated with, is a member of, participates in, provides to, or uses the commons* past, present, and future.
e.g. Producers, Users*, and re-Users* of research data; Funders of research infrastructures and the production of research data; Policy developers for research data management
e.g. "Core": governance* bodies and committees, Members*, secretariat; Funders and influencers: national ministries and agencies, public science funders and councils, intergovernmental bodies and organizations, foundations and charities, industry; Users*, data controbiters, data Publishers*: individuals and organizations such as intergovernmental bodies and others, and projects; Discipline or otherwise related informatics: other infrastructures, IT departments at related institutions, standardization bodies, projects, and other initiatives

A standard* is a repeatable, harmonized, agreed and documented way of doing something. They are typically certified by an official endorsing body (e.g. ISO) and are formally recognized. A convention* is similar in that they define a way in which something is usually done, but will typically be informal and specific to the internal operations of the commons*. Conventions*, as used in this model, are considered at least repeatable and

Models and agreements made on how to fund or resource activities in a way that can be sustained over the long term.

Any commons* element that enables Users* to perform one or more operations, typically on data with data as the output.

Individuals, humans or machines, that use a Service* of the commons* or are the recipient or beneficiary of a Service*. Users* may also be Members* and Providers*, but in this role are not required to contribute anything to the commons*. E.x. a User* types keywords into a search bar to find relevant datasets

The saved state of a Research Object*, process, or configuration that is unique from previous states. Versioning* includes revisions (successive) and variants (parallel), as well as dedicated releases. Types of versioning* include storing modified copies in their entirety, storing deltas between states, offsets in append-only Research Objects*, versioning* individual records, and versioning* pipelines to recreate derived Research

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Notes / source

Adapted from the GORC-WG case statement

Adapted from https://www.techtarget.com/searchstorage/definition/block-storage,

Task Group 5 Phase 2 Evaluation (May - September 2023), https://joeyhoer.com/attributes-vs-categories-6f3c9bab

Research Data collections WG Recommendations, CURE-FAIR WG (10 things for curating reproducible and FAIR research), Speaker series (NII), Task Group 3 Phase 1 Evaluation (October 2022 - April 2023)

Adapted from the GORC-IG typology

GORC-WG Phase 1 Evaluation (October 2022 - April 2023)

GORC-WG Phase 2 Evaluation (May - September 2023)

Adapted from EOSC Monitoring Framework

Phase 2 Review (Literature Analysis, November 2022 - June 2023), adpated from Research Data Management Support Services by Libraries - A LIBER/ADBU Toolkit (https://zenodo.org/record/8101818)

Adapted from RDA data foundation and terminology - DFT: Results RFC

Phase 2 Review (Literature Analysis, November 2022 - June 2023)

Adapted from the GORC-IG typology, essential element*

Adapted from the GORC-IG typology

GORC-WG Phase 1 Evaluation (October 2022 - April 2023)

Adapted from https://www.ibm.com/topics/file-storage

Adapted from the GORC-IG typology, essential element*

Adapted from "Strategic Framework for Human Capacity* development in fisheries"

Adapted from the GORC-IG typology, essential element*

GORC-WG Phase 2 Evaluation (May - September 2023)

Adapted from the GORC-IG typology, from Wilkinson et al. 2016, essential element*

(EOSC FAIR-WG) EOSC Interoperability* framework - Publications Office of the EU [2021, https://data.europa.eu/doi/10.2777/620649]

Adapted from (EOSC FAIR-WG) EOSC Interoperability* framework - Publications Office of the EU [2021, https://data.europa.eu/doi/10.2777/620649]

(EOSC FAIR-WG) EOSC Interoperability* framework - Publications Office of the EU [2021, https://data.europa.eu/doi/10.2777/620649]

(EOSC FAIR-WG) EOSC Interoperability* framework - Publications Office of the EU [2021, https://data.europa.eu/doi/10.2777/620649]

Adapted from the GORC-WG case statement

(EOSC FAIR-WG) A Persistent Identifier (PID*) policy for the European Open Science Cloud (EOSC) - Publications Office of the EU [2020, https://data.europa.eu/doi/10.2777/926037]

GORC-WG Phase 1 Evaluation (October 2022 - April 2023)

GORC-WG Phase 1 Evaluation (October 2022 - April 2023)

A Set of Common Service Quality Assurance Baseline Criteria for Research Projects [2022] https://digital.csic.es/handle/10261/214441

Adapted from https://ieeexplore.ieee.org/document/1222722#citations

Adapted from Persistent Identifiers: Consolidated Assertions, from the RDA Data Fabric IG and RDA Data foundation and Terminology WG

Adapted from Persistent Identifiers: Consolidated Assertions, from the RDA Data Fabric IG and RDA Data foundation and Terminology WG
D2.4 2nd report on FAIR requirements for persistence

Research Software* Current State Assessment [2021] (https://alliancecan.ca/sites/default/files/2022-03/rs_current_state_report_1.pdf)

Influenced by https://ckaestne.medium.com/versioning-Provenance*-and-reproducibility-in-production-machine-learning-355e48665005

OpenAIRE Guidelines [2022] (https://guidelines.openaire.eu/en/latest/index.html)
Publication* Metadata* in CERIF: Inspiration by FRBR (https://doi.org/10.1016/j.procs.2014.06.008)

Adapted from RDA data foundation and terminology - DFT: Results RFC

CURE-FAIR WG, 10 things for curating reproducible and FAIR research

Global Community Guidelines for Documenting, Sharing, and Reusing Quality Information of Individual Digital Datasets
https://datascience.codata.org/articles/10.5334/dsj-2022-008/
Canadian Tri-Agency

Adapted from the GORC-IG typology, essential element*

Amsterdam Declaration on Funding Research Software* Sustainability [V0.3, 2023] (https://zenodo.org/record/7330542#.Y5ts83bMJdg)

Adapted from the GORC-IG typology, from EOSC, essential element*

Adapted from D2.1 Report on fair requirements for persistence and Interoperability [2019, FAIRsFAIR]

Adapted from the GORC-IG typology, from IVOA, essential element*

M2.7: Assessment report on 'FAIRness of Services*' [2020, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5470375)

Briefing Paper on EOSC: Federating Research Infrastructures in Europe for Fair Access to Data [2022] (https://www.scienceeurope.org/our-resources/briefing-paper-on-eosc/)
Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)

Adapted from the GORC-IG typology, from IRENA, essential element*, developed in Phase 2 Evaluation (May - September 2023)

Adapted from the GORC-IG typology, essential element*

Adapted from the GORC-IG typology, essential element*

Influenced by https://ckaestne.medium.com/versioning-Provenance-and-reproducibility-in-production-machine-learning-355c48665005

Essential Element*: Governance & Leadership*		Items in active view:	59
Category*	Subcategory*	Attribute*	Feature*
Commons* intent and definition			
		Statement of current commons* nature, mandate, and value proposition. Reference to any prior mandates and how the commons* has changed over time.	
		Identification and definition of the commons* community* and stakeholders, how their needs intersect with the commons*, and how the commons* engages with the community* to fulfill their needs	
		Development of mission and vision statements and making them accessible publicly	
		Development of values and/or guidance principles	
Commons* Strategic Planning			

		Development of strategy	Strategic planning influences and approaches
			Development of relevant roadmaps
			Development of organizational performance and capability metrics*
			A monitoring organizational design or organizational performance system to gather qualitative and quantitative metrics*
			Regular strategic review and alignment exercises
		Development and implementation of community* relations	
	Funding and Resourcing Frameworks	Identification of the financial and resource requirements for commons* activities	Environmental considerations
			Social considerations
			Governance* considerations
		Demonstration of added value	

Organizational structures, designs, ways of working, and capability maturity level for the aims and context of the commons*	Risk Management Frameworks	Identification of risks and issues	
		Development of risk management frameworks	Business continuity planning
			Technology and information governance* planning
			Health and safety governance* planning
			Human rights risk identification and management
		Implementation and operationalization of risk	
	Policy advocacy, and recommendations		
		Explicit decision making processes, specifying who makes decisions in what scenarios and when	
			Formal reporting framework
		Systems of accountability	
		Transparency of corporate activities	

Governance Structures appropriate for the specific characteristics of the commons*	Creation and maintenance of governance* structure	Characteristics of governance* structure composition, particularly on boards
		Mechanisms to maintain effective relationships between governance* elements, and management, stakeholders, and shareholders
		Development and regular review of constitution(s), terms of reference, and code(s) of conduct for all governance* and management structure elements and interactions
		Considerations for which committees to create on the board(s) as well as their composition, operating principles, and charter.
		Governance* components composition and performance reviews and evaluations
	Governance* operations and tasks regarding Management and Internal Personnel*	
Management structures appropriate to the specific characteristics of the commons*		

Internal Commons* Policy Development, implementation, and review		Development and regular maintenaince of policies, guidelines, and/or SOPs for resource	
		Development and regular maintenaince of policies, guidelines, and/or SOPs for commons* operations	Legal compliance
			Commons* records and information:
	Internal Code of Conduct, supplemented by ethical standards, recruitment, human resources practises, and communication of expectations		
Governance* rules, principles, and enforcement of quality for Research Object*s and Services* & Tools*		Existence of a statement on the level of commitment to having Research Objects*, Services* and Tools* as open as possible and as closed as necessary,	

Existence of a statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the FAIR principles.

Existence of a statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the CARE principles for Indigenous Data Governance*.

A statement on the level of commitment to equity, diversity, inclusion, and where appropriate, Indigenization (EDII*), for the commons* community

For commons* with any digital Repository* aspects, existence of a statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the TRUST principles for digital Repositories*.

Existence of a statement on the level of commitment to promoting, implementing,

Where appropriate, existence of a statement on the level of commitment to upholding any other frameworks relevant to the commons*.

	Ongoing review of community* rights and obligations Ongoing review of management of community* rights and obligations through accountability For Repositories* and Services* dealing with sensitive data, appropriate levels of commitment to legal and non-legal approaches that protect against sensitive information compromise

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Extended Description

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A vision statement is a statement of an organization’s overarching aspirations of what it hopes to achieve or to become. A mission statement describes what the organization needs to do now to achieve the vision. Mission and vision statements support each other, and neither list specific goals or actions. The mission statement however, is more actionable and leads to the creation of strategic goals.

The values statement defines what the organization believes in and how people in the organization are expected to behave. Principles may be defined for overarching conditions (e.g ethics and integrity, inclusiveness, respect to scientific freedom etc) and for guiding the mission/objectives of the commons* (openness, excellence, quality, impact etc).

i.e. including governance* structure, stakeholder* strategy, sustainable operational strategy, and a strategy for the future

addressing how it responds to customer segments and delivers value propositions and meet its mandate etc.

i.e. non-research or organization specific influences on how strategy is created or how strategic planning should progress. This speaks to strategic planning frameworks and methods.

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i.e. including evaluation of KPIs*, purpose and direction of the commons*, and all governance* aspects; policy feedback cycles; identification of strategic elements; linkage to international landscape / ecosystem through needs assessments, Considerations for growth, e.g. more rigorous separation of governance* and management, changes to strategic planning, Assess environment (landscape review) including: political, economic, social, technological, environmental, legal, conduct competitor/market analysis

i.e. Engagement* with stakeholders on matters that affect them and Shareholder relations (if applicable

i.e. ensuring ability to function and continue operations

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i.e. cost of implementing or not implementing environmentally conscious or damaging practises and infrastructure

i.e. cost of implementing appropriate social obligations for Internal Personnel* and the commons* community*

i.e. cost of governance* operations

Includes assessing cost (financial or otherwise) by stage or area of focus within the commons* and downstream costs.

May have different frameworks for different types and impacts of risk, such as for governance*, management, technical and operational, related to Sustainability* etc.

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If a full framework is untenable, a risk strategy with key considerations may suffice. The developmet of risk management frameworks considers the balance between the liklihood of the risk and the impact.

i.e. including how to manage identified risks, and disaster recovery plan (i.e. covering health and safety of workers, alternate premises, alternative technology platforms, key personnel strategy, plans that include customers or contractors on site, financial management including payroll systems, media management plan, infrastructure safety, essential Services*, communications, management of data and key documents)

i.e. considerations for cybersecurity, data protection and managing privacy breach risk, prevention of information leakage, malware risk, loss of information/data, management of capital-intensive projects, avoiding obsolescence and opportunity costs, data breach reporting, compliance with privacy and IP laws,

i.e. considerations for risk culture, setting policies, mental health and wellbeing

i.e. considering safe working conditions, fair wages, protection from forced labour, freedom from harassment and discrimination through protection, respect, remedies to breaches

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Advocacy towards policy makers and other stakeholders* (i.e. Governance and leadership* role in advocacy, aligned with mission and mandate) as well as the research community*

Including a clear definition of working relationships
between governance* and management

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i.e. reporting from Management to Governance*, Governance* reporting to funders, etc.

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Performed by Members* of governance* and/or supporting personnel

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i.e. appropriate support for the board depending on scale of the commons*, such as a company secretary, corporate officer, and/or secretariat, executive committee, etc.

i.e. May be considered for each part or level of the governance* structure together or separately, as appropriate. Includes explicit board processes, Workload plans for the board (setting calendars and agenda items, including setting a chair and chair responsibilities) legal mandate to the governance* structure

May be permanent or temporary, created and resolved over time.
e.g. audit, nomination [board succession planning], remuneration [people and human capital matters]

i.e. for board(s), committee(s), etc.

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May be in the form of polciies, guidelines, and/or standard operating procedures (SOP)

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i.e. Be aware of new legislation and changes in industry practise, Assess how these changes affect the organization, Assess how the changes affect the flow of data (collection, storage, security, access), Document and communicate changes in operating procedures., Consequences for breaches, General guidelines can be in the codes of ethics, codes of conduct, codes of practise documents.

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i.e. document management policy pertaining to commons* information and documentation (i.e. NOT ROs),

A Code of Conduct, among other goals, assists in bridging the gap between legal compliance and ethics, where often legislation lags behind true ethical compliance for technology.

i.e. Research Object* ethics, including data ethics

i.e. such that the commons* is demonstrating and implementing open access to the maximum extent possible while also being in compliance with all applicable laws and regulations applicable to it at all levels in addition to any frameworks and principles that are deemed required or desirable.

-Findable. Metadata* and data should be easy to find for both humans and computers.
-Accessible. Once the User* finds the required data, they need to know how they can be accessed, possibly including authentication and authorisation.
-Interoperable. The data usually need to be integrated with other data. In addition, the data need to interoperate with applications or workflows for analysis, storage, and processing.
-Reusable. To achieve this, Metadata* and data should be well-described so that they can be replicated and/or combined in different settings.

More information available at https://www.go-fair.org/fair-principles/

i.e. such that the commons* considers both people and purpose in their advocacy and pursuits. Specifically, considerations for:
- Collective Benefit. Data ecosystems shall be designed and function in ways that enable Indigenous Peoples to derive benefit from the data.
- Authority to Control. Indigenous Peoples' rights and interests in Indigenous data must be recognised and their authority to control such data be empowered.
- Responsibility. Those working with Indigenous data have a responsibility to share how those data are used to support Indigenous Peoples' self determination and collective benefit
- Ethics. Indigenous Peoples' rights and wellbeing should be the primary concern at all stages of the data life cycle and across the data ecosystem.

More information available at https://www.gida-global.org/care.

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-Transparency. To be transparent about specific Repository* Services* and data holdings that are verifiable by publicly accessible evidence.
- Responsibility. To be responsible for ensuring the authenticity and integrity of data holdings and for the reliability and persistence of its Service*.
- User* Focus. To ensure that the data management norms and expectations of target User* communities are met.
- Sustainability*. To sustain Services* and preserve data holdings for the long-term.
- Technology. To provide infrastructure and capabilities to support secure, persistent, and reliable Services*.

More information available at https://www.rd-alliance.org/rda-community*-effort-trust-principles-digital-Repositories*

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i.e. including legal and regulatory compliance, intellectual property and copyright requirements, and data ethics

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Examples	Consideration Level*
-	Core
e.g. type of authority (formally government mandated or informally community* driven), scope of Services* e.g. the commons* carefully considers actions to avoid scope creep, i.e. unplanned or unmanaged growth, that could cause issues with resources or impede on other organizations' area of work.	Core
e.g. through environmental scanning (landscape reviews, etc.) to find needs, wants, aspirations of stakeholders ; competitive advantage (i,e, gaps in current Services*), community*-aligned policies and operations; e.g. Identification and communication of value chains at varying levels (e.g. biosphere > biodiversity > impact on society, data > information > knowledge > impact on a sector of application) and usage of "success stories", where value chains and quantitative metrics* are combined to illustrate narratives to specific stakeholders (e.g. # of citations for science funder, monetary value for agency of economic development) e.g. Different value propositions for different stakeholder groups (e.g. researchers, citizen scientists, industry and enterprises, universities, standard development organizations, policy making organizations, specialized Service* Providers*, research funding agencies, research infrastructure and e-Infrastructure) e.g.There is a statement, listing, or set of collections* that illustrates the higher-level subject areas/disciplines that the commons** covers or includes, as well as cross-disciplinary domain	Core
EX. The vision of the ISC is science as a global public good. The mission of the ISC is to act as the global voice of and for science. The strategic goals are that the ISC: acts as the legitimate and effective voice of science all over the world, particularly to the many components of the international policy community* ; serves as a thought leader in the evolution of science and science systems ; stimulates and support the coordination of international scientific endeavours on major issues of global concern ; promotes the appropriate and effective use of science in policy making, societal decision making and diplomacy, including by increasing trust in science and by defending freedom and responsibility in science ; acts with assurance and professionalism on behalf of a diverse, strong, global constituency of scientists. Source: (https://council.science/about-us/)	Core
EX: In fulfilling its role, the values that the Council will uphold in its work, its governance* and its partnerships include: • Excellence and professionalism ; • Inclusivity and diversity ; • Transparency and integrity ;• Innovation and sustainability (https://council.science/wp-content/uploads/2020/06/ISC-Statutes-and-Rules-of-Procedure_02.2021.pdf) e.g. openness, transparency, honesty, equity, fair competition, objectivity, democratic participation	Core
-	Core
-	Core

e.g. Consideration for shareholder vs stakeholder prioritization in strategies and planning, where a hybridization is possible e.g. Balance between performance and conformance in setting strategic goals, expectations, and metrics* (Performance here means: setting and monitoring strategy, strategic risk management, long-term attraction and allocation of human, physical, and financial matters ; Conformance means controls, reporting, compliance)	Desirable
e.g. investment roadmap, platform* roadmap, technology roadmap	Core
e.g. Metrics* for 6 capitals: financial, manufactured, intellectual, human, social, relationship, natural e.g. Organizational design and capability/practise maturity, including both quantitative and qualitative KPIs*, goals, and milestones	Desirable
e.g. such as a task group or other governance* body that designs, decides on, gathers data for, and presents KPIs*	Desirable
e.g. through internal audits e.g. annual reviews as well as long-term reviews, such as decadal reviews	Core
e.g. Indigenous community* partnerships c.f. constitution, commercial relationship building	Core
-	Core
-	Core
e.g. climate change and carbon footprint, environmental protection, biodiversity, pollution and resource depletion, water use, waste management, energy, sustainable procurement	Desirable
e.g. health and safety, labour standards*, human rights, fair trade, harassment/discrimination, people management, diversity and equality, supply chain management, privacy and ethics, consumer responsibility	Desirable
e.g. board composition and diversity, leadership, remuneration, shareholder rights, ethics, whistle blowing, disclosure and transparency, risk management, anti-bribery and corruption, stakeholder engagement*	Desirable
e.g. Economic impact of reuse of ROs (feeds into value statement of commons*), open source software and Tool* development and use e.g. Cost-benefit analysis for Sustainability* options	Desirable
contingency plans to ensure Research Objects* are available and maintained during and after unforeseen events	Core

e.g. through considerations for crises (economic (strike, market crash), financial (unexpected loss of finances), informational (cyber-attacks or leaks), physical (loss or breakdown of equipment), health (pandemics), human resources (loss of personnel), reputation, as a result of human acts (sabotage, terrorism, workplace violence), natural disasters) e.g. risk perception and literal risk	Core
-	Core
-	Core
-	Core
-	Core
-	Core
e.g. Insurance and indemnities, including a set claims process	Core
setting or informing national policy, research discipline-specific policies	Desirable
-	Core
-	Desirable
e.g. Monitoring and reporting on Key performance indicators and trend data, Monitoring of Rules of Participation & Access* and compliance, reporting on the qualitative and quantitative compliance with the rules of participation, Management reports, Operational reports	Desirable
e.g. Governance* holds management to account through oversight of performance and conformance matters, such as operational monitoring and evaluation	Desirable
-	Desirable

e.g. steering groups or boards, including external advisors where possible e.g. board committees to target key areas of work, such as an Ethics committee - provides assurance about the commons* ethical position and monitors ethical policies and behaviours of the commons* in addition to relevant developments in the commons* community*. (e.g. staff are regularly trained in ethics, breaches of ethics are reported and investigated, liaison with stakeholders is engaged over ethical matters, ethical accountability frameworks exist and are regularly maintained)	Core
-	Core
e.g. balance of skills and experience, diversity, stability vs new Members*hip, size, balance between executive, non-executive, and independent directors, contributions from CEO and management, and tenure on the board including procedures for exiting the board (e.g. retirement, resignation, removal, disqualification) e.g. Community* representation in the governance* structure, such as through committees, task groups, review panels, etc.	Core
e.g. governance* reports to funders	Core
e.g. federated or multi-state commons* have the appropriate documentation for each level and component of governance* e.g. If non-profit, definition of trustees, trustee duties, and terms of trust (e.g. if reliant on volunteers, fundraising, sponsorship, grants, or member subscriptions) e.g. If state-sector, considerations for reporting to ministers and hosting departments e.g. If co-operative (stakeholders are also shareholders), compliance with local laws e.g. Code of conduct is geared for minimizing conflict and promoting debate, Board supports open debate, diversity, thoughtful challenge and constructure dissent e.g. governance* frameworks/ standards* e.g. Commitment to professional development for directors e.g. Considerations for eligibility for director appointment and their remuneration	Core
-	Desirable
e.g. Governance* accountability around policy approval and performance management	Desirable
Human capital considerations, including workforce strategy, culture and conduct, diversity and inclusion, remuneration and performance management, succession planning, learning and development	Desirable
Top level management or executive level roles, such as directors, CEOs, and presidents; middle management or strategic level roles, such as senior management teach or team leads	Core

-	Core
e.g. Solvency requirements (e.g. financial projections, budgets, revision of assets, value of assets, contingent liabilities)	Core
e.g. global Interoperability* policy influencing standards* and protocols	Core
e.g. Legal framework, addressing compliance with applicable laws at all levels (regional, national, pan-national, etc e.g. control frameworks (COBIT, COSO), client or subject privacy, data protection, data access	Desirable
e..g considerations for definition of “document”, retention period, access, User* definitions for documents, responsible individuals for documents, storage policy, storage protocols, e.g. share register e.g. Policies are versioned, indexed, and semantically annotated in a policy registry to enable broad reuse in addition to any resources mandated by policies (e.g. consent forms) e.g. implementing specific documentation framework such as https://diataxis.fr/	Core
e.g. Workplace interactions : health and safety, bullying and intimidation, employee and customer privacy, accurate reporting of information, protecting company assets, confidentiality, IP and trade secrets, computer and data security, industrial espionage, equal employment opportunities and non-discrimination, sexual harassment, conflicts of interest e.g. Financial interactions: investments, insider trading, expense account criteria and practises, gifts, entertainment, and gratuities, political contributions, compliance with local laws, global business practises e.g. Interactions with Third Parties: relationships with sellers, suppliers, contractors, joint ventures partners, etc., relationships with customers, product quality and safety, advertising and marketing practices, environmental protection, dealing with the media e.g. professional duties to the highest possible standard and carrying out duties in a legal and ethical manner are paramount.; Recognition of intellectual property rights and acknowledgement of sources; respecting privacy and confidentiality; overall concern for public health, safety, and the environment; duty to understand and comply with all relevant laws, regulations, and standards; duties to one’s superiors as well as to the public at large.	Core
-	Core
-	Core

-	Core
-	Core
e.g. Any statement or embodiment encompassing EDII* specified in public-facing documentation, events, actions, or other programming.	Desirable
-	Core
-	Core
e.g. Paris accorde.g. considering the Sendai Framework for Disaster Risk R	Desirable

-	Core
-	Core
-	Core

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Primary Source(s)
Phase 2 Review (Literature Analysis, November 2022 - June 2023)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
The four pillars of governance best practice for New Zealand Directors (https://www.iod.org.nz/resources-and-insights/4-pillars-landing-page/#) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97) D5.1 FAIRsFAIR Communication, Marketing and Engagement Plan [2019. FAIRsFAIR] (https://doi.org/10.5281/zenodo.6656060) RDA Fairsharing WG
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
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Task Group 1 Phase 1 Evaluation (October 2022 - April 2023)
Phase 2 Evaluation (May - September 2023)

The four pillars of governance best practice for New Zealand Directors (https://www.iod.org.nz/resources-and-insights/4-pillars-landing-page/#)

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GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)

Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/key-performance-indicators-KPIs-monitoring

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The four pillars of governance best practice for New Zealand Directors (https://www.iod.org.nz/resources-and-insights/4-pillars-landing-page/#)

GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
The four pillars of governance best practice for New Zealand Directors (https://www.iod.org.nz/resources-and-insights/4-pillars-landing-page/#)
NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

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GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf, National Data Services IG: https://www.rd-alliance.org/groups/national-data-Services.html

Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/key-performance-indicators-KPIs-monitoring, The four pillars of governance best practice for New Zealand Directors (https://www.iod.org.nz/resources-and-insights/4-pillars-landing-page/#)

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GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), Connolly, T., & Begg, C. (2015). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson Education Limited. ISBN: 978-1-292-06118-4

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Phase 2 Evaluation (May - September 2023)

Random Encounter (Library ethics), https://www.go-fair.org/fair-principles/

Random Encounter (Library ethics), https://www.gida-global.org/care

Random Encounter (Library ethics)

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Phase 1 Workshop (co-located with RDA P20, 24 March 2023)

Sendai Framework (https://www.preventionweb.net/files/resolutions/N1516716.pdf?_gl=1*d3kn33*_ga*MjAxNDQ1NTg0MC4xNjY2NjIwOTgw*_ga_D8G5WXP6YM*MTY2NjYzMTY4My4xLjEuMTY2NjYzMTk3OS4wLjAuMA..) [2015]

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Phase 1 Workshop (co-located with RDA P20, 24 March 2023)

Task Group 1 Phase 1 Evaluation (October 2022 - April 2023)

Essential Element*: Rules of Participation & Access*		Items in active view:	15
Category*	Subcategory*	Attribute*	Feature*
		Definition of community* of Users* and Providers*	
A set of policies defining a minimal set of rights and obligations for the commons* community	Access policy		
	Reuse Policy		
	Allocation of resources policy		
	Privacy policy		
	Retention policy		
	Attribution policy		

A set of policies defining minimal accountability for the commons* community

Acceptable Use Policy

Consequences of provided Research Objects* not meeting quality expectations

Liability of Providers* and Users* if policies not followed

Consequences for breach of contract
Consequences for misuse of Research Objects*, Services*, Tools*, or infrastructure

Code of Conduct

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Extended Description
i.e. any definitions or specifications on who can participate in the research commons* as a User* or Provider* with direct access and AAI rights, with reference to the audience defined in the commons* strategic plan. Depending on the policy and use, may be an operational definition.
May be a singular policy document with several sections addressing different aspects of rights and obligations, or several specific policies. May also be grouped with accountability in a larger rules of participation and access* document for the commons*.
A legal framework for access to Research Objects*, Services* and Tools* provided by or through the commons* (i.e. computing time, digitalisation Services*, data curation etc). and sharing of Research Objects*, in addition to a Guide or policy detailing how to share Research Objects*.
A guide or policy detailing how to reuse Research Objects*, addressing intellectual property rights, data licenses, and copyright requirements.
A plan for the distribution of human and technological resources in keeping with the Commons* mission or specific KPI*s
An openly available data and Research Object* privacy policy or policies, encompassing all Research Objects* hosted by the commons* and consistent for all users*.
i.e. for Research Objects* stored or listed within the commons*
i.e. attribution to owners and contributors on for Research Objects*, Services* and Tools*

May be a singular policy document with several sections addressing different aspects of accountability, or several specific policies. May also be grouped with rights and obligations in a larger rules of participation and access* document for the commons*.

Also referred to as "terms of use", "terms of Service*", addressing Users* and Providers* of Research Objects*, Services*, and Tools* including third party Service* Providers* and the commons* on the whole.

i.e. that supports and reflects the quality assurance process the commons* offers

i.e. For Providers* to provide Services* and Tools* and maintain appropriate behaviour in the provision of Services* and Tools*, and for Users* to use Research Objects*, Services* and Tools* appropriately for the purposes specified and within the parameters stated in the acceptable use policy. If individuals or entities in the commons community* are registered and identifiable, policies for misuse of the commons* (e.g. consequences)

i.e. consequences for the Provider* if they breach their contract with the commons* or with individual users*

i.e. consequences for misuse of Services*

Community* facing code of conduct applying to all individuals and entities in the commons* community*. Consider a people-oriented perspective for all commons* aspects and activities, such that local and global values for humans and their environment are prioritized.

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Examples	Consideration Level*
e.g. the commons* accepts Research Object* deposits from and provides Services* to anyone regardless of affiliation; the commons* accepts Research Object* deposits from and provides Services* to the hosting institution, region, country, etc. ; the commons* accepts research deposit from and provides Services* to specific entities other than the hosting entities; etc. e.g. anyone with this account type is a part of the commons by default (e.g. EGI account holders can access CSTCloud)	Core
-	Core
-	Core
-	Core
-	Core
-	Core
Research Objects* are assessed based on their use, impact, value, uniqueness, cost, provenance*, and legal and regulatory requirements relating to preservation, considerations for technical decisions (archiving), adminitrative or policy decisions, deaccessioning and end-of-life, legal documents, Recognition of removed data (tombstone)	Core
e.g. https://creativecommons.org/choose/; https://opendatacommons.org/	Core

-	Core
-	Core
e.g. Metadata* is incomplete, and Providers* have some set number of days to revise and resubmit e.g. required changes for Publication* or rejection. e.g. corrupted files or format is incorrect, Providers* have some set time limit to remedy and resubmit e.g. punitive action for repeated, deliberate unqualified or inappropriate submissions or usage of Services*, such as mining bitcoin	Desirable
-	Desirable
-	Desirable
e.g. providing HPC Services* for mining bitcoin instead of the commons* specified mandate	Desirable

minimizing harm and maximizing benefit in the commons* processes from individual research objects through large-scale activities; Ethical processes address imbalances in power, resources, and how these affect the expression of human rights and any specific population rights such as Indigenous rights; The potential future use and future harm based on ethical frameworks grounded in the values and principles of the relevant community* or communities are taken into account.	Core

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Primary Source(s)
Speaker Series (NII, KISTI, ARDC); re3data Data Quality Assurance Survey (Q01), Phase 2 Evaluation (May - September 2023)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) ; Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf)
Phase 2 Review (Literature Analysis, November 2022 - June 2023), https://data.research.cornell.edu/data-management/sharing/intellectual-property/
Phase 1 Workshop (co-located with RDA P20, 24 March 2023), Phase 2 Review (Literature Analysis, November 2022 - June 2023)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) ; GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf
Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)

GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)

Data Quality Assurance at Research Data Repositories (re3data quality assurance survey analysis : https://datascience.codata.org/article/10.5334/dsj-2022-018/)

Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf), Phase 2 Evaluation (May - September 2023)

Phase 2 Evaluation (May - September 2023)

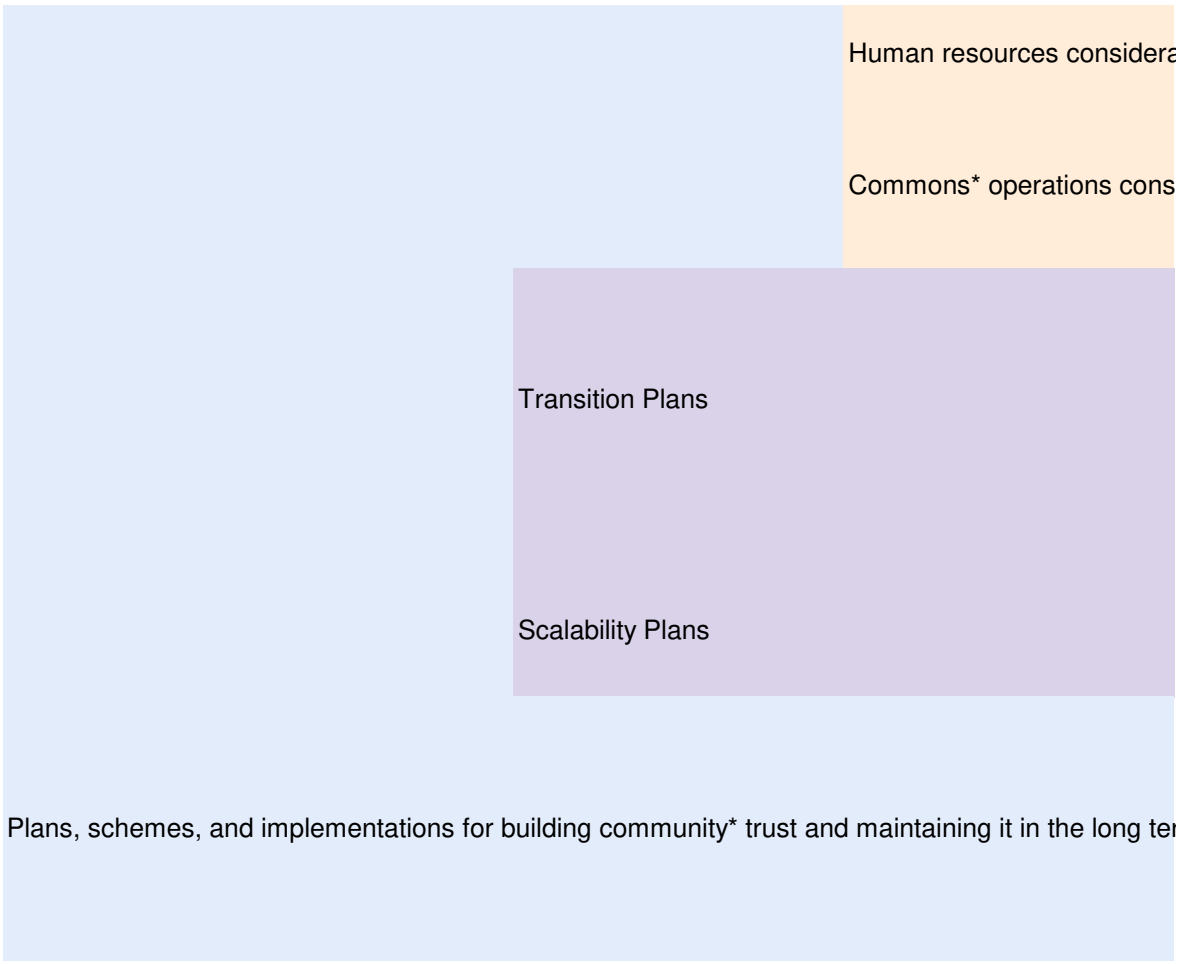
Phase 2 Evaluation (May - September 2023)

Speaker Series, found on investigation (IVOA, EOSC, ARDC, MOSP)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023), CARE principles

Essential Element*: Sustainability*

Items in active view:

Category*	Subcategory*	Attribute*
Plans, schemes, and implementations for resourcing and capacity building on the medium and long term	Plans, schemes, and implementations for a business mo medium and long term	
	Plans, schemes, and implementations for management the medium and long term, taking into consideration reta knowledge	
	Plans, schemes, and implementations for management resources on the medium and long term.	
Plans, schemes, and implementations for medium and long term stewardship, contextualization, usability, and accessibility of Research Objects*, Services* and Tools*		ICT infrastructure* considerations


Human resources considera
Commons* operations cons
Transition Plans
Scalability Plans
Plans, schemes, and implementations for building community* trust and maintaining it in the long ter

Feature*	Extended Description
	i.e. Suitable viable plans, schemes, and implementations matching the commons* ability to execute plans, tied to the maturity and state of the commons* such that a young commons* may start at a minimal viable plan through a mature commons* focusing on scalable plans and implementations, keeping adaptability and flexibility in mind in all stages
odel sustainable on the	-
of human resources on aining accumulated	i.e. business continuity practises for people, skills, expertise, documentation, etc. Relating to human capacity* and governance*
of any other types of	-
	i.e. Suitable viable plans, schemes, and implementations addressing research object*, services*, and tools* integrity, authenticity, availability, understandability, and reusability, acknowledging potential for a wide array of systems of knowledge and communities and interests "Contextualization" here means the context of the Research Objects*, Services* and Tools*, which may be done with descriptive metadata* and documentation
	i.e. the physical hardware and software supporting Tools* and Services* provided by or through the commons*, including relevant Standards & Conventions* and Interoperability* requirements for such changes
Need to balance open data and cost recovery concerns in keeping with commons goals, needs, and resources	i.e. Consideration for the balancing of openness (which the commons may need to support and develop themselves) and private support (from proprietary providers that may require restrictions on access) to match their goals, needs, and resourcing

ations	i.e. what happens to Internal Personnel* and human capacity*, governance* and management of the commons* during a scale up or scale down event(s)
iderations	i.e. what happens to commons* internal and external operations during a scale up or scale down event, relating to human capacity* and the Standards & Conventions* and Interoperability* requirements for such changes
	i.e. in case the commons* ceases operations entirely, or retires a specific Service*, Tool*, or infrastructure. The goals of transition plans should be defined in strategic planning, and may be for cessation of a Service* ot Tool*, continuation by another commons* or organization, changing Services* and Tools*, and for temporary unavailability due to maintenaince or upgrades. i.e. in case of overwhelming success in funding and demand, the commons* can scale up. Conversely, a failure or slowdown in need or ability can be accomodated by a scaling down.
rm.	i.e. Suitable viable plans, schemes, and implementations with a focus on social agency to operate, relating to governance* (strategy), rules of participation and access*, and engagement*; capturing values, co-design, equity of outcomes, and the overall mindset of the commons* as well as being showcased through appropriate and accessible KPIs* and metrics*.

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Examples	Consideration Level*
e.g. Capability mix, Financial forecast	Core
a funding model with explicit stream(s) of investment and cost recovery, such as subscriptions, Service* payment models, reuse of existing components, grant applications and calls for proposals, structural funds (i.e. dedicated funding pots through hosting institution, government agency), and in-kind contributions), partnerships with industry, Mixed streams of investment and cost recovery (i.e. more than one kind of mechanism and mechanisms of different types)	Core
strong and consistent internal documentation practises.covering team knowledge on ways of working, playbooks, practices, Tools*, documentation methods	Core
in-kind contributions with trust consensus, structures, buildings, physical locations	Optional
-	Core
e.g. Considerations for dealing with obsolete hardware e.g. Adaptation to emergent/disruptive technologies e.g. Maintenance/adaptation of old technologies	Desirable
e.g. A commitment to open source infrastructure development, such as the software backend for commons* Services* and Tools* being open software such that it may be easily mapped or modified to suit Interoperability* with other Services* and Tools*	Optional

-	Desirable
e.g. engagement* is increased or decreased in specific ways	Desirable
-	Desirable
-	Desirable
-	Core

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Primary Source(s)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023), Task Group 1 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97) Phase 1 Workshop (co-located with RDA P20, 24 March 2023) Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Phase 2 Evaluation (May - September 2023) Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

Phase 2 Evaluation (May - September 2023)

Phase 2 Evaluation (May - September 2023)

Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html), NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

Phase 2 Evaluation (May - September 2023)

Task Group 1 Phase 1 Evaluation (October 2022 - April 2023)

Essential Element*: Engagement*		Items in active view:	17	-	-	-	-
Category*	Subcategory*	Attribute*	Feature*	Extended Description	Examples	Consideration Level*	Primary Source(s)
				-	e.g. communications Tool*kit	Core	Phase 1 Workshop (co-located with RDA P20, 24 March 2023) ; GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), Task Group 2 Phase 1 Evaluation (October 2022 - April 2023) ; Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf) ; XSEDE final report (https://www.ideals.illinois.edu/items/124108) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf) D5.1 FAIRsFAIR Communication, Marketing and Engagement Plan [2019. FAIRsFAIR] (https://doi.org/10.5281/zenodo.6656060) D6.2 Initial Core Competence Centre Structures [2020, FAIRsFAIR] (https://doi.org/10.5281/zenodo.3732888)
		Structured, coordinated, and implemented communication and engagement* plans and mechanisms, media, or channels	Intent of communications or engagement*	i.e. the purpose	-	Core	Task Group 2 Phase 2 Evaluation (May - September 2023)
			Content of communications or engagement*	i.e. updates about the commons* structure, procedures, Services*, etc. are published and shared on a regular basis and are disseminated to Users*, or at least easily found by Users*; updates on the decision making process and what has been done with contributions, dissemination of Research Objects* hosted by the commons	e.g. considerations for using appropriate and balanced diction, and in particular reducing the use of jargon. EX. Using "data description" instead of "metadata" in research-focused communication.	Core	Task Group 2 Phase 2 Evaluation (May - September 2023), Phase 2 Review (Literature Analysis, November 2022 - June 2023)
			Audience for communications or engagement*	i.e. who the communications content is intended for, may influence mediums chosen for dissemination	-	Core	Task Group 2 Phase 2 Evaluation (May - September 2023)
			Media and frequency for communications or engagement*	i.e. how the communications material or engagement* content is shared on what platform and how often	e.g. social media, blog, newsletter, journal article, supplementary material, landing pages, commons-hosted community forum, Informative events, Community* building/networking events, Strategic planning events, hackathons, etc. e.g. yearly, quarterly, monthly, daily, bi-weekly, etc.	Core	Task Group 2 Phase 2 Evaluation (May - September 2023)
		Documented and public processes of the commons maintain a high level of transparency with stakeholders and the community*		Include culturally appropriate materials and translations.	e.g. open of training materials and resources	Desirable	Phase 2 Evaluation (May - September 2023), Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), Research Metadata* schemas WG, Guidelines for publishing structured Metadata on the web, Recommendation 8
Community* input and feedback				-	e.g. community* engagement* and input as part of setting expectations for governance* decision making processes, delivery and development of Services* and Tools*	Core	GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf
		Structured Feedback, to acquire input		-	e.g. User* feedback and community* surveys, mechanism for User* review and rating of Research Objects* (e.g. stars, text reviews, comments), Ability to report errors in the Research Object*, consultations with individuals from the research commons community* (i.e. for methodology development, benchmarking, testing), community*-driven needs assessment	Core	Phase 2 Evaluation (May - September 2023), Phase 1 Workshop (co-located with RDA P20, 24 March 2023), re3data Data Quality Assurance Survey, Random Encounter (Leah Wassler: https://nitter.net/LeahAWasser/status/1577730887818498049), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile, Data Quality Assurance at Research Data Repositories (re3data quality assurance survey analysis : https://datascience.codata.org/article/10.5334/dsj-2022-018/)
		Attribution and acknowledgement for contribution, once the input has been received Response to how feedback was used, once input has been actioned and feeding into creating another call for input through structured feedback		- -	-	Core	Phase 2 Evaluation (May - September 2023), Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
					e.g. through gathering exercises, usability testing	Core	Phase 2 Evaluation (May - September 2023), Phase 1 Workshop (co-located with RDA P20, 24 March 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Active promotion to intended audiences to participate in the commons*				-	e.g. Competitions and contests e.g. Facilitating community* and general population research engagement* (i.e. citizen science) e.g. Events and other outreach activities promoting standards* used and created by the commons* e.g. Encouraging data submission from recognized gaps in the commons* community, both in terms of demographic representation of Members*, Providers*, and Users* as well as topic, theme, and content-wise e.g. commons* representatives give presentations, posters, workshops, training sessions, etc. at discipline-based meetings and professional society meetings, including conference, to both promote and to empower researchers e.g. Ambassador and travelling ambassador programs, where advanced trainers "swap" (like a sabbatical) or travel to new locations to both gain experience and to introduce the commons*	Core	CURE-FAIR WG (https://www.rd-alliance.org/group/cure-fair-wg/outcomes/challenges-curating-reproducible-and-fair-research-output), Challenge #6 10 simple rules for improving research data discovery (https://doi.org/10.1371/journal.pcbi.1009768) Speaker Series: From KISTI, see cell GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing) Phase 2 Evaluation (May - September 2023), Speaker Series (IVOA) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
		Engagement with research institution librarians and information professionals		-	e.g. data stewards	Desirable	CURE-FAIR WG (https://www.rd-alliance.org/group/cure-fair-wg/outcomes/challenges-curating-reproducible-and-fair-research-output), Challenge #6
				i.e. includes both direct incentives for participation and mitigation of disincentives for participation	e.g. incentives for data publishing, deposit, research data* management e.g. remove or reduce barriers that limit data dissemination	Core	CURE-FAIR WG (https://www.rd-alliance.org/group/cure-fair-wg/outcomes/challenges-curating-reproducible-and-fair-research-output), Challenge #6 Phase 2 Evaluation (May - September 2023) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Incentivisation to intended audiences to participate in or with the Commons*		Consultations or events for navigating participation and access to any and all of the commons* and research domain aspects		-	e.g. Consultations, training, or events for navigating laws/legal structure; Training on researcher rights and responsibilities in research data* reuse and deposition into the commons* (e.g. RDM; storing, reusing, and analysing information; ethical issues about sharing data; legal and policy knowledge on open science; creating quality Metadata*) e.g. Co-creating and providing institutional processes, guidance, and incentive structures to motivate RDM best practice e.g. Encourage and enable use of commons* holdings for policy making and resource management decisions, for doing research e.g. consultations and training on meeting deposit expectations, specifically quality assurance expectations	Desirable	Phase 1 Workshop (co-located with RDA P20, 24 March 2023), RDA-CODATA Legal Interoperability IG Guidelines, Guideline 2D Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
		Funding competitions and/or opportunities hosted or supplied by the commons* intended for researchers (individuals, groups, organizations, etc.) to enable their research.		-	e.g. funding opportunities to partner with the commons* to build relevant search infrastructure e.g. Scholarship programs, to financially support graduate students and postdoctoral fellows researching the areas relevant to the commons* (e.g. scholarly Publication* and research dissemination)	Desirable	Speaker Series (ARDC, Alliance) Erudit 2021-2022 annual report, https://apropos.erudit.org/2021-2022-annual-report/?lang=en
Engagement* with other research commons*, research infrastructure hosts, research institutions, and research funders				i.e. universities, medical institutions, government agencies, etc.	e.g. Mentorship, Strategic alignments.partnership e.g. The commons* acts as a connector for community* individuals and organizations to help each other	Desirable	Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
		Partnering on active research projects, programs, and institutes		i.e. the commons partners with other organizations (committing time, funds, resournes, etc.) for discipline-specific research that may not directly address ICT or data needs.	e.g. space science research projects, from design, mission development, implementation, and any relevant applications	Optional	Speaker Series (NeIC, AOSP)

Essential Element*: Human Capacity*		Items in active view:	27
Category*	Subcategory*	Attribute*	Feature*
Internal Capacity*		Internal appointments preferred for all available Services*, with the intention to grow expertise for intended and future Services*	Capacity to manage administrative tasks Capacity to manage operations and Infrastructure Management Services* Commons* public record maintainer role
		Labour turnover/offboarding and succession/backfill plans in place	
		Mechanisms for enactment of EDII* commitment for Internal Personnel* and the commons community*	
		Documented and shared processes for every internal, personnel-facing process, maintaining a high level of transparency and documentation for and between Internal Personnel*.	
		Regular review of Internal Personnel* working conditions and requirements	
Skills for planning, managing and assessing Service* delivery		Development of use cases for Services* and platforms Prioritization of identified needs and derived requirements of Users*	
		Ongoing assessment of plans and deployments	

	Implementation of continuous improvement	
Skill requirements for the commons* community*	Documentation for easing skill requirement for the commons* community* and improving ease of use such that interacting with the commons* is an effective choice	Guides enabling understanding of the Rules of Participation & Access
		Data Policy
Ease of use for the commons* community	Effective user-centred designs employed and tested to enable ease of use of the commons*	
	Development of training and education programs	Considerations for content

Training and education hosted, provided, and/or contributed to by the commons* for individuals and groups in the commons* community*

Considerations for audience

Delivery of training and education programs

Evaluation and assessment of training and education programs

Ongoing program for training Internal Personnel*

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Extended Description
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i.e. such that an internal or external workforce skills inventory can be created and maintained.
i.e. all tasks and roles associated with internal administration and communication, tackling needs in governance* (especially management), rules of participation and access*, sustainability*, and engagement*. i.e. all critical Services*, Tools*, and their supporting infrastructure are supported adequately by Internal Personnel* i.e. contact person or organization for the record in a registry that describes the Repository* or other Services* operated by the commons*, the participation of the owner or maintainer of the repo* helps verify the information in the registry, such that there are Internal Personnel* who can represent the commons* and its subsidiaries
i.e. a decision making process or plan for when staff leave their position (offboarding and succession) or when someone moves up in the organization (e.g. promoted). i.e. EDII* = Equity, Diversity, Inclusivity, Indigenization Include culturally appropriate materials and translations. i.e. who can work for, volunteer with, or represent the commons* and under what conditions, such as credentials, experience, location, etc.
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Requirement of any and all groups in the commons* community*, and specifically providers* and users*, which may be expected upon first contact with the commons* and/or developed via engagement* with the commons*.

Include culturally appropriate materials and translations.

i.e. walkthroughs, statement of needed or expected skills, etc. for commons* community* groups, specifically users* and providers*

i.e. providing information about or action regarding: definition of the research data*, exceptions to policy, embargos, supplementary materials, data repos, data licensing, research/author support, data availability statements, data forms and standards*, mandatory data sharing (specific data types), mandatory data sharing (all papers), peer review of data, DMPs

Responsibility of the commons* to ensure that user interfaces and expectations are sufficiently easy to use and navigate.

i.e. UX design, usability are priorities in user-facing Services* & Tools* Note that this attribute specifies "user" as "end-user" which may encompass any and all commons* community* groups, and specifically providers* and users*.

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Consider open community driven approaches for the development of training resources, development of instructor capability, and the instruction and pedagogy principles, processes, and practices.

i.e. What is being covered.

i.e. who the training is for, who will participate in the training, how experienced they are as commons participants.

Includes format considerations

More specific expertise needed than general community* feedback assessment

i.e. to ensure Sustainability* and development of internal capacity*, such as keeping up to date with current technology and Tools* as well as building skills as the commons* Services* evolve, building internal human capacity with the support of institutional HR where applicable

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Examples	Consideration Level*
e.g. staff, volunteers, 3rd party contractors, etc.	Core
e.g. qualitative and quantitative data science on feedback, surveys, etc e.g. internal staff conduct their own research and/or research on behalf of the commons*, such as working on ML applications for commons* data, conducting research using commons* data e.g. Internal staff are strategically proactive in working with Providers* to address gaps in commons* holdings	Core
e.g. report writing, utilities, coordination, billing, order management, transportation, etc e.g. communications specialist, administrative assistants, secretariat, trainers, education officer, human resources staff, finance officer, etc. e.g. helpdesk Services*, monitoring, analysis, configuration, etc. e.g. technicians, resident researchers, developers, engineers, etc.	Core Core
-	Desirable
e.g. handover document, exit interviews	Desirable
e.g. anti-discrimination processes in the recruitment process, such as evaluating anonymized resumes in the first stage of hiring e.g. detailed DMPs or roadmaps for: Administrative Data, Data Collection*, Documentation and Metadata*, Ethics and Legal Compliance, Storage and Backup, Selection and Preservation, Data Sharing, and Responsibilities and Resources e.g. linkage of DMPs to administrative records (e.g. agreements, transactions, etc.) e.g. Process flow for internal document management e.g. following https://diataxis.fr/ framework e.g. following The Turing Way (https://the-turing-way.netlify.app/index.html) e.g. Careful considerations for internal staff to work onsite and be physically in one location or to have regional, pan-national, or global spread of staff.	Core Desirable Core
-	Core
-	Core
e.g. participation across integration, deployment, operations, researchers, Service* Providers*	Core
e.g. review processes are conducted to ensure relevance to Users* and Providers*	Core

-	Core
-	Core
e.g. following https://diataxis.fr/ framework	Core
e.g. Describe how Research Object*, Services* & Tools* Providers* choose the level of access to their Research Objects*, Services* & Tools* e.g. Easy to use ingest process with few barriers to participation (e.g. data deposit guidelines are supplied) e.g. How to create special collection* views or digital exhibitions e.g. Provide both single and batch ingest paths e.g. The commons* creates, maintains, and provides Metadata* crosswalks and vocabulary crosswalks e.g. Documentation about data quality and quality assurance measures performed by the commons* are available and transparent to Users* and stakeholders, preferably available in a machine-readable format.	Core
-	Desirable
-	Core
e.g. showcase Research Object*, Service* & Tool* accessibility (available for download, behind a paywall or login) e.g. Construct and publish a sitemap; split up large sitemaps into a sitemap index e.g. UAT (User acceptance testing) / application testing / end-user testing	Core
-	Core
-	Core
e.g. preparedness for new and advancing technology, the adoption of open science practises, implementation of of FAIR principles, researcher rights and responsibilities (e.g. Research Object* structure) e.g. onboarding for commons* services* and tools*, platforms, mechanisms, etc.	Core

e.g. Training for trainers, focusing on more advanced concepts, new methods, and training method; graduate students; data stewards, users, providers, etc.	Core
e.g. Summer schools and/or winter schools, online courses, in-person courses, single day training, one-off training, open registration courses (open to public), graduate courses, graduate program e.g. summer school sample: D6.7 Report on schools run through franchising with local organisers [2022, FAIRsFAIR] (https://doi.org/10.5281/zenodo.6701167) e.g. higher education example: D7.3 FAIR Competence Framework for Higher Education (Data Stewardship Professional Competence Framework [2021, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5361917)	Core
-	Desirable
e.g. Product management practice and skills e.g. new and advanced technologies e.g. data management training	Core

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Primary Source(s)
Phase 1 Evaluation (October 2022 - April 2023)
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf) Section 6.11 Table 15 on pg 096, FAIRsharing WG: https://zenodo.org/record/4683794#.Yv5y13bMLIW and the National Data Services IG (https://docs.google.com/document/d/17iUyJ2icY0gFzMZGPWJyY5E0tUoukAtI4BFeRonefv4/edit?usp=sharing) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
Phase 2 Review (Literature Analysis, November 2022 - June 2023), e-Infra: Resource Category https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile e-Infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile FAIRsharing WG: https://zenodo.org/record/4683794#.Yv5y13bMLIW , Phase 2 Evaluation (May - September 2023)
Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf) Random Encounters (Library ethics) Research Metadata* schemas WG, Guidelines for publishing structured Metadata on the web, Recommendation 8 NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf) Speaker Series (IBICT) Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)
Phase 2 Evaluation (May - September 2023)
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, XSEDE/ACCESS) Random Encounter (SMD Data and Computing Architecture Study Workshop Series, XSEDE/ACCESS) Random Encounter (SMD Data and Computing Architecture Study Workshop Series, XSEDE/ACCESS)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing) D3.1 FAIR policy landscape analysis [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5537032)
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023) RPRD-IG matrix, GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), Phase 2 Evaluation (May - September 2023) Speaker Series: ARDC (mentioned during the GOSC DataIO WG update meeting in May 2022), EOSC (mentioned in GOSC DataIO webinar in July 2022) Data Quality Assurance at Research Data Repositories (re3data quality assurance survey analysis : https://datascience.codata.org/article/10.5334/dsj-2022-018/)
D3.1 FAIR policy landscape analysis [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5537032)
Phase 2 Review (Literature Analysis, November 2022 - June 2023)
Phase 2 Evaluation (May - September 2023), Phase 1 Workshop (co-located with RDA P20, 24 March 2023) Data Discovery Paradigms: https://datascience.codata.org/articles/10.5334/dsj-2019-003/, Recommendation 3 Research Metadata schema WG (output 2, https://docs.google.com/document/d/1VTA-rFhSn6dceNZpp0Nq3mRRUoAjYMPaqQtEW-ls9Qs/edit)
Task Group 2 phase 2
Task Group 2 phase 2
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), NIST RDaF: https://www.nist.gov/system/files/documents/2021/05/12/RDaF%20Preliminary%20Framework%20Core%2005-12-21_0.pdf, from https://www.nist.gov/programs-projects/research-data-framework-rdaf, GOSC (https://codata.org/initiatives/decadal-programme2/global-open-science-cloud/), RDA-CODATA Legal Interoperability IG Guidelines, Guideline 2D Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)

Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), NIST RDaF: https://www.nist.gov/system/files/documents/2021/05/12/RDaF%20Preliminary%20Framework%20Core%2005-12-21_0.pdf, from https://www.nist.gov/programs-projects/research-data-framework-rdaf, GOSC (https://codata.org/initiatives/decadal-programme2/global-open-science-cloud/), RDA-CODATA Legal Interoperability IG Guidelines, Guideline 2D
Twenty-Year Review of GBIF (https://doi.org/10.35035/ctzm-hz97)

Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
Speaker Series (IBICT)

Phase 2 Evaluation (May - September 2023)

Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf)
NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

Essential Element*: Interoperability*		Items in active view: 21	
Category*	Subcategory*	Attribute*	Feature*
		Where appropriate and possible, addressing the need for multilingualism of commons* documentation, Services*, Tools*, engagement*, etc.	
Technical Interoperability*	Syntactic Interoperability*	Existence of plans and mechanisms to create and maintain Interoperability* and compatibility at the syntactic level over time	
		File/data formats that support Syntactic Interoperability*	
		APIs that support Syntactic Interoperability*	
	Semantic Interoperability*	Existence of plans and mechanisms to create and maintain Interoperability* and compatibility at the semantic level over time	
		Metadata*, data, and other Research Objects* use standardized community*-endorsed vocabularies, and FAIR-compliant community*-endorsed vocabularies where possible.	
	Other Technical Interoperability* plans, infrastructure, and	API s follow search standards*	

	infrastructure, and mechanisms	A security framework is shared between Services* and Tools*, from backend to frontend.
Organizational Interoperability*		
		Plans and mechanisms exist to create and maintain organizational Interoperability* and compatibility over time For non-domain specific commons*, domain-specific needs are addressed and considered so that the commons* is interoperable with other domain-specific commons* and Services*
Legal Interoperability*		Access to and reuse of Research Objects* is open and unrestricted as a default rule, or otherwise granted with the fewest limitations possible A licence for reuse is required for all Research Objects* and Tools* in the commons* Licenses used are enumerated and harmonised to allow seamless exchange between actors within the commons* and outside of the commons*. Who or what entities with rights to Research Objects* is/are specified appropriately via licenses and Research Object* documentation and identified before dissemination.

	Legal aspects are encoded in a Machine Actionable* format that enable automated provision of Services* and data

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Extended Description
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i.e. Plans, infrastructure, and mechanisms for technical Interoperability*
Plans, infrastructure, and mechanisms for syntactic Interoperability*
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APIs and File/data formats are both necessary for syntactic Interoperability*, and are in a M:N relationship. One API might work with multiple file formats and one file format might be capable of processing using multiple APIs. This is why we have split them
Plans, infrastructure, and mechanisms for semantic Interoperability*
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"FAIR-compliant" here means standardized with easily findable documentation. e.g. COAR vocabularies. "Community*" here encompasses research discipline and geographic location.
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i.e. ROs and other commons* assets need to be findable by data Repository* and other relevant aggregators and applications.

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i.e. Mechanisms, infrastructure, and plans in place for organizational interoperability. Agreements between organizations, also called "pragmatic Interoperability*, how organizations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals; meeting the requirements of the shared commons* community* by making Services* available, easily identifiable, accessible, and community* member-focused (https://data.europa.eu/doi/10.2777/620649), Considerations for Interoperability* with other commons**, repos, public research institutions, private research institutions, and commercial entities, among other entities in the community*, are included.

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i.e. including both provision of specific Services* and Tools* as well as a mechanism to allow for User* or Provider*-given domain-specific extensions

i.e. Mechanisms, infrastructure, and plans in place for legal Interoperability*. Definition: ability to combine Research Objects* from multiple sources without conflicts among restrictions imposed by the license of each Research Object*; Research Objects* should be reusable. Covers the broad environment of laws, policies, procedures, and cooperations agreements needed to allow the seamless exchange of information and reusability of Research Objects* between difference individuals, organizations, and across jurisdictions. (https://data.europa.eu/doi/10.2777/620649)

i.e. such that by default, intellectual property rights are waived as far as possible and the objects distributed/made accessible in the least restrictive manner

i.e. the commons* requires licenses to be specified for all of its holdings, likely in the Metadata* for each Research Object* at least.

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Examples	Consideration Level*
-	Desirable
e.g. artifact exchange, including semantic and syntactic Interoperability* considerations, Definition: Creation and maintenance of mechanisms and plans the ability of different information technology systems and software applications to communicate and exchange Research Objects*, and specifically to accept Research Objects* from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention. (https://data.europa.eu/doi/10.2777/620649)	Core
-	Core
e.g. updating APIs as file formats change and evolve	Core
e.g. interoperable Research Object* formats E.g. enumeration of file/data formats used to encode the information represented by the digital objects* E.g. specifications on how to encode and decode the information	Desirable
-	Desirable
-	Core
Includes creation of Semantic Objects* if necessary. e.g. The commons* develops, provides, and iteratively revises crosswalks that map the schemas that describe Research Objects* to standard markup vocabularies e.g. The commons provides definitions of a set of core types of Research Objects* and Services* provided by the commons*. E.g. Creating Semantic Artefact* that can be used to infer and map relationships between concepts and the related terms within and across vocabularies used to when encoding research information as digital objects*.	Core
-	Desirable
-	Desirable
e.g. using community* adopted vocabularies for Interoperability*	Desirable

Includes common encryption standards*, data exchange protocols, through User*-facing AAI interfaces such a common SSO	Desirable
e.g. ARDC MOU with KISTI, KISTI agreements with OpenAire and ARDC. NII has tied collaboration with CERN, MERAL, KISTI, Wacren and OpenAIRE for Interoperability*."	Core
-	Core
e.g. domain specific standards* informed by community*, domain specific Services* and Tools*, offer mappings to cross-domain vocabularies and exchange formats	Desirable
-	Core
-	Core
e.g. distributive and permissive licenses for software and software components e.g., to make terms and conditions clear for Users* distributed across legal jurisdictions	Desirable
-	Desirable
-	Optional

-	Desirable

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Primary Source(s)
D2.1 Report on fair requirements for persistence and Interoperability [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5535719)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Speaker Series, originally from IVOA docs (https://www.ivoa.net/documents/index.html), Task Group 4 Phase 1 Evaluation (October 2022 - April 2023)
Speaker Series, originally from IVOA docs (https://www.ivoa.net/documents/index.html), Task Group 4 Phase 1 Evaluation (October 2022 - April 2023)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Phase 2 Evaluation (May - September 2023), Research Metadata schema WG - Guidelines for publishing structured Metadata on the web (Rec 3), FAIR digital object Fabric IG: https://www.rd-alliance.org/sites/default/files/recommendation-jan-2017-v8_0.pdf, Component 5
Phase 2 Evaluation (May - September 2023) Research Metadata schema WG - Guidelines for publishing structured Metadata on the web (Rec 3) FAIR digital object Fabric IG: https://www.rd-alliance.org/sites/default/files/recommendation-jan-2017-v8_0.pdf, Component 5
FAIR Data Maturity Model: https://www.rd-alliance.org/system/files/FAIR%20Data%20Maturity%20Model_%20specification%20and%20guidelines_v1.00.pdf, RDA-I2-01M and 01D
Phase 2 Evaluation (May - September 2023)
Data discovery paradigms (Rec 10), FAIR4RS (I1)

Speaker Series, from the single-sign on for NII Services*.
GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Phase 2 Evaluation (May - September 2023) CURE-FAIR WG (https://www.rd-alliance.org/group/cure-fair-wg/outcomes/challenges-curating-reproducible-and-fair-research-output), Challenge #6, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023)
RDA-CODATA Legal Interoperability IG Guidelines
RDA-CODATA Legal Interoperability IG Guidelines, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Phase 2 Evaluation (May - September 2023) RDA-CODATA Legal Interoperability IG Guidelines, Phase 2 Evaluation (May - September 2023) SMD Policy Document SPD-41 (https://science.nasa.gov/science-red/s3fs-public/atoms/files/Scientific%20Information%20policy%20SPD-41.pdf) RDA-CODATA Legal Interoperability IG Guidelines, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Phase 2 Evaluation (May - September 2023) RDA-CODATA Legal Interoperability IG Guidelines, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Phase 2 Evaluation (May - September 2023)

RDA-CODATA Legal Interoperability IG Guidelines, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Phase 2 Evaluation (May - September 2023)

Essential Element*: Standards & Conventions*		Items in active view:	33
Category*	Subcategory*	Attribute*	Feature*
		Sustainability* of standards*, conventions, and guidelines	
Community* supported Research Object* standards and conventions			
		Research Object* Content	
		Research Object* Format	
		Research Object* Access Method	
Community* supported Metadata* standards			

and conventions	
	Metadata* content
	Metadata* format
	Metadata* access method

Community supported Semantic Object* standards and conventions, in addition to applicable Research Object* and Metadata* standards	Semantic Object* Content Semantic Object* Format Semantic Object* Access Method The Semantic Objects* are mapped to foundational ontologies.
Applications, Software, Services* & Tools* standards and conventions, in addition to applicable Research Object* and Metadata* standards	Applications and software have demonstrated, reproducible build and distributed procedures Relevant conventions for computational workflows
Quality standards*, conventions, and/or	

Quality standards*, conventions, and/or guidelines	Well-defined triggers for appraisal decisions Clarity on who has the responsibility to appraise the Research Object*(s) Standards and conventions* on how validation and certification of compliance towards all the other standards is done
	PIDs* are associated with all Research Objects*, and where available, other objects or aspects associated with the research project
Standards and conventions* for adding and maintaining PIDs* for managed assets	Widely used and documented PID* standards* / Services* are used for assigning PID*s and for managing complex life cycles of Research Objects*. Documented approaches are used for PID* resolution

Authentication and Authorization protocols	Research Object* Authorization and Authentication, ability to implement authentication and authorization in its resolution protocol as part of the access process Metadata* Authorization and Authentication, ability to implement authentication and authorization in its resolution protocol
Standards and conventions* for the commons* catalogues of digital objects*, including Research Objects*, Services*, and Tools*	
Standards and conventions* for regulatory and ethical compliance	Standards and conventions* for equitable access to information, resources, Services*, and Tools* A response convention for detected data breaches.
Standards and conventions* supporting and describing mechanisms, infrastructure and plans for specific workflows, use cases, and types of interexchange within the commons*	

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Extended Description
i.e. Maintenance of all commons* standards and conventions*, including updates and depreciation and to check obsolescence
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i.e. required information in the Research Object*. Does not specify research-related information such as data, text, images, etc. Informs research quality assessments as part of Services* and Tools* (content or formal reviews). May have different standards* & conversions for different types of staged content, such as submission states that are raw, processed, curated, and published,
i.e. how the information in the Research Object* is structured and represented. Can specify requirements for specific types of Research Objects*, informing research object quality assessment in Services* and Tools* (technical reviews)
i.e. how the Research Object* is accessed
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i.e. what information is contained in the Metadata*, with the aim to make the associated digital object* discoverable,
accessible and usable/interpretable.
Considerations for descriptive, structural, and administrative Metadata*

i.e. how information is contained and represented in the Metadata*

i.e. how the Metadata* is accessed

i.e. standards and conventions* for Semantic Objects* used by the commons* as well as those hosted through the commons* as Research Objects*

i.e. what information is contained in the Semantic Object*

i.e. the container for the Semantic Object*, how the content is represented

i.e. how the Semantic Object* is accessed

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i.e. standards and conventions* for applications and software that are both Research Objects* held by the commons* as well as those that are implemented as Services* and Tools* by the commons*

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i.e. Guidelines that provide sufficient information to allow all Users* to readily evaluate the degree of “fitness for purpose” of their Research Objects*, Services* and Tools* before and during deposit/integration, as well as to guide internal personal on conducting quality assurance reviews of all commons* holdings as well as Services* and Tools*.These should cover all quality control and assurance criteria enacted in quality control and assurance Services* provided by and through the commons*, such as completeness, accuracy, integrity, consistency, and timeliness

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i.e. Some identifiable objects may not be ROs, such as digital twins of physical instruments that were not created by or for the specific research project but were used in the research project (e.g. electron microscope, spectrometer)

i.e. such that standard expected functions are available, even for dynamic ROs* where the information content represented in the RO* is changing for some period of time or even for an indefinite duration.

i.e. enabling PID* resolvers to be used

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i.e. different access levels implemented, if applicable

i.e. if applicable

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In terms of equitable accessibility for individuals and groups, relating to the inclusivity of the commons*

if needed by the commons* or required by local legislation (for instance, GDPR in Europe). May be more than one convention, as appropriate.

Standards* and conventions* relevant for the commons* that are not captured by other categories*.

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Examples

e.g. community* standards* versions are monitored and adopted upon release
e.g. new standards* and conventions are chosen when the current standard or convention becomes obsolete

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e.g. Research Objects* include references to other Research Objects*
e.g. Collection* content considerations, such as: collections* may contain sub-collections*, but not recursively. It should be possible to restrict this rule for individual collections*; A single collection* may contain objects stored at, and sourced from, different places; If possible, record the role of an object within a specific collection*, independent from the role it has in the context of other collections*.
e.g. DMPs: Contains 'contact' information, including at least an identifier for a contact person, an email address, and a name. ; Contains 'dataset' information such as dataset ID(s) such as PIDs* or URIs, if personal data is included in the dataset, if sensitive data is included in the dataset, and the title of the dataset ; Contains 'created' information, such as the date and time of the first version* that is not changed in subsequent versions*. ; Contains an identifier for the DMP itself. ; Contains an indicator on whether ethical issues exist related to the data in the DMP. ; Contains 'language' information ; Contains 'modified' information, indicating the DMP version* and the date and time of the modification ; Contains a title; Data summary (What is the purpose of the data collection/generation?, What is the relation to the objectives of the project?, What types and formats of data will the project generate/collect?, Will you re-use any existing data and how?, What is the origin of the data?, What is the expected size of the data?, To whom might the data be useful ('data utility')?); Considerations for making data findable (Are the data produced and/or used in the project discoverable with Metadata*? Are the data identifiable and locatable by means of a standard identification mechanism (e.g. persistent and unique identifiers such as digital object* Identifiers)? What naming conventions do you follow? Will search keywords be provided that optimize possibilities for re-use? What is the approach for clear versioning? What Metadata* will be created? In case Metadata* standards* do not exist in your discipline, please outline what type of Metadata* will be created and how.); Considerations for making data accessible (Which data produced and/or used in the project will be made openly available as the default? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from voluntary restrictions. If there are restrictions on use, how will access be provided? Is there a need for a data access committee? Are there well described conditions for access (i.e. a machine readable license)? How will the identity of the person accessing the data be ascertained? How will the data be made available (e.g. by deposition in a Repository*)? What methods or software Tools* are needed to access the data? Is documentation about the software needed to access the data included? Is it possible to include the relevant software (e.g. in open source code)? Where will the data and associated Metadata*, documentation and code be deposited? Have you explored appropriate arrangements with the identified Repository*?); Considerations for making data interoperable (Are the data produced in the project interoperable, that is allowing data exchange and re-use between researchers, institutions, organisations, countries, etc. (i.e. adhering to standards* for formats, as much as possible compliant with available (open) software applications

e.g. Research Object* formats shall be machine-readable, such that Research Objects* are reasonably structured to allow automated processing
e.g. Files need to be converted into the most accessible formats: use of proprietary and legacy types are possible, but may be reviewed on a case by case basis
e.g. Research Object* format complies with a community* standard
e.g. Collection* format considerations, such as: Objects may belong to more than one collection*.
e.g. DMPs are represented in a machine-actionable way

e.g. Research Objects* are accessed through standardised protocols, preferably open and free
e.g. Research Objects* can be accessed manually (i.e, with human intervention)
e.g. Research Objects* can be accessed automatically (i.e. by a computer program)
e.g. Variables/column names/file elements are described in both human and Machine Actionable* formats
e.g. Collection* access method, such as collections* must offer well-defined actions (such as create, read, update, delete) that can be executed by software agents with minimal additional context required.
e.g. the DMP can be accessed by humans or machines, automatically (without human interference) and manually (with human interference)

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Metadata* content may include (dependent on discipline, aim of the commons*, etc.):
e.g. Metadata* includes information about the licence under which the Research Object* can be reused, and where possible, Metadata* refers to a standard, machine-actionable reuse licence ;
e.g. A Metadata* description contains the PID* of the corresponding object;
e.g. Metadata* contain qualified outward references to third party resources. This might include links to associated software, Publications*, other data sets, the author's online presence, the project's online presence, etc. instead of only listing names or titles.
e.g. Metadata* contain a descriptive title beyond the title of the Research Object* filename, i.e. specifying the type of Research Object*, where the data was collected, timeframe of the data, subject of the research, and approximate size of the Research Object*.
e.g. Metadata* contain a list of contributors, including those involved with curation, methodology, resources, and software (if the Research Object* is data that has been simulated or processed).
e.g. Metadata* contain a rich description, including the number of files, important variables, and other available documentation.
e.g. Metadata* specifies the Research Object* subtype, such as Publication* -> preprint, peer reviewed, conference proceeding, etc.
e.g. Metadata* contain affiliated organizations of the authors or organizations participating in the project
e.g. Metadata* contain the countries of the organization or project
e.g. Metadata* contain information about the funder
e.g. Metadata* contain information about the context, such as the related research community*, initiative, or infrastructure
e.g. Metadata* contain the Publisher* of the Research Object*
e.g. Metadata* contain information about the location of this instance of the Research Object*, such as specifying the repo, OA Publisher* or journal, aggregator, entity registries, journal aggregators, Current Research information system or CRIS
e.g. Metadata* contain links to related research products, such as article and dataset, dataset and software, software and article, such that the Research Object* is part of a larger research graph
e.g. Metadata* contains links or provides information for dynamic linking to related research products, such as objects by the same author, in the same context or theme focus
e.g. Metadata* contain method of data production
e.g. Metadata* contain information to enable the User* to get access to the data
e.g. Metadata* includes references to other Metadata*, preferably qualified references

e.g. Metadata* terms are in a resolvable namespace (so-called Grounded Metadata*), where resolution leads to a definition of the meaning of the term such as JSON-LD, embedded schema, or any form of RDF.
e.g. Metadata* uses machine-understandable community* knowledge representations and standards*
e.g. Metadata* uses controlled vocabularies

e.g. Metadata* may be retrieved by an open and free protocol.
e.g. Metadata* is offered in such a way that it can be harvested and indexed
e.g. Metadata* can be accessed both by humans and by machines
e.g. Metadata* is accessed through standardized protocol

e.g. vocabulary and ontology standards*
E.g., establishing a consensus on what information must be explicitly represented in the digital objects* themselves and to what extent the implicitly understood information should be represented elsewhere
E.g., establishing a collection* of Semantic Objects* that must be referenced when representing research information as new digital objects
E.g., each value and structural element used to represent a digital object* is mapped to a corresponding Semantic Object* that makes its meaning explicit and unambiguous (definitions of algorithms, procedures, scales/quantities, etc.)
E.g., creating a semantic model of the commons* and its Services*, defining relationships between Services*, Semantic Objects*, Research Objects* and how they map to top-level concepts that should be understood by all participants in the commons*
E.g., creating top-level Semantic Objects* that map commons* specific concepts to ubiquitous standards* and conventions beyond the commons*

e.g. The variables description should enable data reuse with minimum reliance on externally held free-text documentation

e.g. machine-readable

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e.g. Test suites are included for each application and software package, i.e. the presence and quality of automated tests and the versions* of coding languages those tests are run against

e.g. Where computational workflows are used or referenced in Provenance* information, these should be captured in a standards*-based way (i.e. is script or work-flow based so that the workflow can be re-executed using minimal actions)

e.g. Repositories* have a successfully undergone a community*-endorsed certification process (such as CoreTrustSeal)

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e.g. identity management (for people), as well as for organizations, projects, funders, etc.
e.g. for workflows, such as the Research Object* crate and Research Activity Identifier (RAiD)

e.g. The PID* records contains the Metadata* PID*, The PID* records contains the Metadata* PID*, Research Objects* are identified by a globally unique identifier, Metadata* identifier resolves to a Metadata* record, Research identifier resolves to a DO*, etc.
e.g. When two or more DOs* are merged, the resulting new DO* should have a new identifier and information about the merging action should be provided in the Metadata* as provenance* Metadata*
e.g. When a DO* is being split into two or more units, new identifiers should be assigned to the new entries, and some history information is made.
e.g. If a DO* has been removed or deprecated, the original PID* must still be resolvable and point to tombstone information including basic Metadata*, reasons for deletion, and if available, any succeeding versions.
e.g. Different versions* of Research Objects* are assigned distinct identifiers
e.g. Manage replicas of Research Objects* and Research Objects* merged, split, replicated or derived from other research ("master") objects
e.g. PIDs* should be human and Machine Actionable*
e.g. Multiple PIDs* can point to the same Research Objects*, but not vice versa
e.g. PIDs* are technology independent
e.g. PID* Services* interoperate with each other
e.g. PID* policy accommodates mature and established PID* practise, schemes, technologies, and Providers*
e.g. Long term maintenance and Sustainability* of PID* infrastructure
e.g. PIDs* used controlled syntax
e.g. For sensitive data, ability to set access control and/or encryption on the kernel information
e.g. Options for Providers* to have shallow FAIR (PIDs* assigned at the dataset or database level) through deep FAIR (PIDs* assigned to individual elements e.g. data points, lines) options
e.g. Extrinsic identifiers for the Metadata* and intrinsic identifiers for the artifact are included for software to assist with different layers of granularity (e.g. software granularity: project, project version, modules, sub modules, snapshots, releases, commits, directories, files, fragments)

e.g. PIDs* are assigned to data types, resolving to human and machine accessible internal or external data type standards*. If internal, data types follow the Metadata* and data format requirements applied to Research Objects*
e.g. Close to 24/7 availability of all PID* Services*

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e.g., acceptable forms of identification
e.g., specifications for Tools* and Services* to issue, validate and revoke permissions

e.g., exchange format to encode information about what roles and permissions have been granted to a User* for a specific catalogue, Service* or Research Object*

e.g. standards* for access to information, resources, Services*, and Tools* through the commons* catalogue, such as defined Service* endpoints between any combination of humans and machines

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Commons* Repositories*, platforms*, Services*, and Tools* shall comply with local and international standards* for accessibility for all electronic and information technology to people with disabilities.; Commons* Repositories*, platforms*, Services*, and Tools* shall comply with a principle of non-discriminatory access so that all Users*, Providers*, staff, and other stakeholders* are treated equally. Any variation in accessibility will result solely from the capability, equipment, and connectivity of the individual."

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e.g. Conventions describing a proven workflow to connect multiple different Research Artefact* types. Such a convention may specify that this workflow is built on a Persistent Identifier* infrastructure designed for Interoperability* ("i.e. connect related Research Objects* through their PID*. This can be done through entries in the Metadata* and/or connected platforms* (e.g. KISTI connecting DataON and AcessON with links between Research Objects* that live in DataON with articles that live on AccessON)
e.g. A convention describing a process for developing, updating and promoting standards*
e.g. data storage procedure, such as keeping and maintaining multiple copies
e.g. standards* and conventions for commons* policies (i.e. what information to include
e.g. Identify what resources and Research Objects* are to be marked up with structured Metadata*

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Consideration Level*
Core
Desirable
Desirable
Desirable
Desirable
Core

Core

Core

Core

Desirable
Desirable
Desirable
Desirable
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Desirable
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Desirable

Desirable
Desirable
Desirable
Core
Desirable
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Core
Core

Desirable

Desirable

Desirable

Desirable

Desirable

Optional

Desirable

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Primary Source(s)
FAIRsFAIR D6.5, adapted from the idea of training material sustainability to enhance reuse
Phase 2 Evaluation (May - September 2023)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) FAIR data maturity model (RDA-I3-01D - useful) Research Data collections WG Recommendations (rec 5, 7, 12) DMP common standard WG (DMP common standard for machine-actionable data management plans) D1.2 Data Management Plan [2022, FAIRsFAIR] (https://doi.org/10.5281/zenodo.6656144) RPRD-IG matrix
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) SMD Policy Document SPD-41 (https://science.nasa.gov/science-red/s3fs-public/atoms/files/Scientific%20Information%20policy%20SPD-41.pdf) RPRD-IG matrix FAIR data maturity model (RDA-R1.3-01D - essential), FAIR4RS (I1, R3), NIST RDaF Research Data collections WG Recommendations (rec 6) DMP common standard WG (DMP common standard for machine-actionable data management plans)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023), FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/) FAIR data maturity model (RDA-A1-02D - essential), Persistent Identifiers: Consolidated Assertions (2.4), FAIR4RS (A), IADOPT-WG (Rec 1), Data Type Registry WG (Problem addressed by the working group) FAIR data maturity model (RDA-A1-05D), Persistent Identifiers: Consolidated Assertions (2.4) IADOPT-WG Framework (Rec 1) Research Data collections WG Recommendations (rec 10)
Phase 2 Evaluation (May - September 2023)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf ;
FAIR Data Maturity Model: https://www.rd-alliance.org/system/files/FAIR%20Data%20Maturity%20Model_%20specification%20and%20guidelines_v1.00.pdf, RDA-R1.1-01M, RDA-I3-01M - important, RDA-A1-01M
FAIR digital object Fabric IG, Persistent Identifier: Consolidated Assertions - https://www.rd-alliance.org/group/fair-digital-object-fabric-ig/outcomes/persistent-identifiers-consolidated-assertions
FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)
10 simple rules for improving research data discovery (https://doi.org/10.1371/journal.pcbi.1009768)
OpenAire Monitor Methodology (https://monitor.openaire.eu/methodology/terminology)
Task Group 4 Phase 1 Evaluation (October 2022 - April 2023)
OpenAire Research Graph (https://graph.openaire.eu/)
Speaker Series (ARDC)
Data Discovery Paradigms (Rec 3), CURE-FAIR WG 10 things for curating reproducible and FAIR research (Transparency), RDAS/TDWG Attribution Metadata working group: Final recommendations
FAIR4RS (F3), FAIR4RS Adoption Support (AGU: Metadata: access conditions), RDA/WDS Data publishing workflows (Data Repository entry),
The FAIRsharing registry and related services (Citable, discoverable resources)
Data Type Registry WG Data Type Registry Requirements
Research Data collections WG Recommendations (Collection Capability 9, 10, 11, 12, 13, 14, 15)
Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf)
NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)
FAIR Data maturity model (RDA-I1-02M - important), CURE-FAIR WG 10 things for curating reproducible and FAIR research (Metadata*), FAIR4RS (F), IADOPT-WG (Rec 1)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
FAIR Data Maturity Model: https://www.rd-alliance.org/system/files/FAIR%20Data%20Maturity%20Model_%20specification%20and%20guidelines_v1.00.pdf, RDA-F4-01M, RDA-A1-04M - essential
Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), FAIR Data Maturity Model: https://www.rd-alliance.org/system/files/FAIR%20Data%20Maturity%20Model_%20specification%20and%20guidelines_v1.00.pdf, RDA-A1-02M
FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)
FAIR4RS Principles (A)

Phase 2 Evaluation (May - September 2023), CODATA GOSC (DataIO webinar in Nov 2022, Australia), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)

Phase 2 Evaluation (May - September 2023)
IADOPT-WG framework (Rec 2)

Phase 2 Evaluation (May - September 2023)

Phase 2 Evaluation (May - September 2023)

D2.8 FAIR Semantics Recommendations Third Iteration [2022, FAIRsFAIR] (https://zenodo.org/record/6675295#.ZEGtUHbMLIU), P-Rec. 10

Phase 2 Evaluation (May - September 2023)

Random Encounter (Leah Wassler https://nitter.net/LeahAWasser/status/1577730887818498049)

Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), CURE-FAIR WG, 10 things for curating reproducible and FAIR research

NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Turning FAIR into reality - Publications Office of the EU [2018, https://data.europa.eu/doi/10.2777/1524]

NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

Turning FAIR into reality - Publications Office of the EU [2018, https://data.europa.eu/doi/10.2777/1524]

Phase 2 Evaluation (May - September 2023)

Phase 2 Evaluation (May - September 2023), Persistent Identifiers: Consolidated Assertions (PID-26, PID-30), Research Data collections WG Recommendations (Rec 1), RDA/WDS Data publishing workflows WG recommendations (research data publishing definition)
NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
D2.1 Report on fair requirements for persistence and Interoperability [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5535719)

Persistent Identifiers: Consolidated Assertions (PID-9, PID-10, PID-31, PID-32, PID-33, PID-35 through PID-43, 2.4, PID-24))
FAIR digital object Fabric IG
FAIR Data maturity model (RDA-F1-02D), FAIR4RS Principles (F1), FAIR4RS Adoption support (ESMAValTool), RDA/TDWG Attribution Metadata working group: Final recommendations, Research data collections WG recommendations (Rec 2), RDA/WDS Data publishing workflows WG recommendations (research data publishing definition)
FAIR4RS Principles (F1.2), FAIR4RS Adoption support (ESMAValTool*), PID information types WG (Provenance tracing: Versioning: modifying Metadata)
PID information types WG (Data replication)
D2.4 2nd report on FAIR requirements for persistence and Interoperability [2020, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5356517)
M2.15 Assessment report on 'FAIRness of software' [2020, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5472911)

Phase 2 Evaluation (May - September 2023), Data type registry WG (problem addressed by the working group)

Phase 1 Evaluation (October 2022 - April 2023), FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)

FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)

FAIR Maturity Indicators List (https://fairdata.Services:7171/FAIR_Evaluator/metrics) / FAIR metrics (http://www.fairmetrics.org/)

Phase 2 Evaluation (May - September 2023)
Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)
Phase 2 Evaluation (May - September 2023)

Phase 2 Evaluation (May - September 2023), SMD Policy Document SPD-41 (https://science.nasa.gov/science-red/s3fs-public/atoms/files/Scientific%20Information%20policy%20SPD-41.pdf)

Supplemental Information to the NIH Policy for Data Management and Sharing: Selecting a Repository for Data Resulting from NIH-Supported Research (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-016.html)

Phase 2 Evaluation (May - September 2023), GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf, Task Group 4 Phase 1 Evaluation (October 2022 - April 2023)
Speaker Series, IVOA: https://www.ivoa.net/documents/index.html
D3.1 FAIR policy landscape analysis [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5537032)
(Research Metadata schema WG - Guidelines for publishing structured Metadata on the web (Rec 2), Metadata Principles (#2)

Essential Element*: ICT Infrastructure*		Items in active view:	28
Category*	Subcategory*	Attribute*	Feature*
		Web interfaces for commons* ICT infrastructure	
		Infrastructure that is designed to scale with changing volume, complexity, and velocity of projects and expectations while ensuring baseline operations and necessary redundancy	
		A review and update of ICT infrastructure* happens on a regular basis	Considerations for Environmental Sustainability* Considerations for hardware maintenance, upgrades, and replacement Considerations for software maintenance, upgrades, and replacement

Network Infrastructure		Knowledge and management of Network infrastructure
	Internal network infrastructure	
	External network infrastructure	
Compute Infrastructure		Knowledge and management of Compute Infrastructure
		Federated Computing Infrastructure
	Base Computing Infrastructure	
	Add on Computing Infrastructure	
Storage Infrastructure		Knowledge and management of Storage Infrastructure
		Federated Storage Infrastructure
	Direct-attached storage, maintained and provided by the commons*, that supports different information containers as appropriate.	
	Network-based storage, that supports different information containers as appropriate.	

Foundational Operating System (OS)		Knowledge and management of foundational operating system	Infrastructure deployment and computer resource provisioning can be automated Infrastructure configurations are versioned controlled and are performed through code and data pipelines
		Federated Authentication and Authorization infrastructure	
Authentication and Authorization Infrastructure (AAI)	Base AAI Infrastructure		
	Add on AAI infrastructure		

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Extended Description

The ability to access Services*, Tools*, and Research Objects* in a secure manner. i.e. Data and vendor independent connectivity to allow freedom of choice in the selection of the DBMS now and in the future; The ability to interface to the database independent of any proprietary Web browser or Web server; A connectivity solution that takes advantage of all the features of an organization's DBMS; An open-architecture approach to allow interoperability with a variety of systems and technologies; A cost-effective solution that allows for scalability,growth,and changes in strategic directions, and helps reduce the costs of developing and maintaining applications; Support for transactions that span multiple HTTP requests; Acceptable performance; Minimal administration overhead; A set of high-level productivity tools to allow applications to be developed, maintained, and deployed with relative ease and speed.

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i.e. ICT Infrastructure* is implemented and continuously improved to ensure reception of next generation components and mechanisms as well as to meet principles identified from higher level strategies, rules, models, and guidelines implemented by the commons*

For all ICT infrastructure* purposes, including network, compute, storage, and cybersecurity/AAI

For all ICT infrastructure* purposes, including network, compute, storage, and cybersecurity/AAI

For all ICT infrastructure* purposes, including network, compute, storage, and cybersecurity/AAI

i.e. Ultra-fast connectivity and ubiquitous access to eInfrastructures' resources and Services*; infrastructure that enables or supports a network Service* that connects resources with stakeholders*

-

i.e. passing messages between connected computing and storage, Interoperability* between the endpoints for commons* computing and storage

i.e. Appropriate for the context of the commons*, considering national, regional, pan-national, and discipline/domain research community* needs and incorporating interconnect and intraconnect network

High-performance computing resources and scalable cloud compute capacity for demanding job processes

-

i.e. distributed computing infrastructures that are interconnected and appear as one infrastructure to the user.

i.e. Essential components required for stable and robust minimum viable operation

i.e. Components that enable advanced or specialzed operations

i.e. Reliable, secure and scalable storage for scientific data, apps and workloads.

-

i.e. distributed storage infrastructure that are interconnected and appear to be one storage infrastructure to the user.

i.e. Appropriate direct-attached Storage types (e.g. disk, tape, etc.) for appropriate information containers (e.g. object*, block*, file*)

i.e. Cloud based storage for appropriate information containers (e.g. object*, block*, file*)

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i.e. provisioning may be done manually or automated, depending on preference, need, or context

Parts of technical systems should be listed, issues with technical systems and responses to issues should be listed (e.g. bug fixes, change requests)

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i.e. shared AAI infrastructure with partners (e.g. with universities, research institutes, etc.)

i.e. Essential components required for minimum viable operation

i.e. Components that enable advanced or specialzed operations

-	-
Examples	Consideration Level*
e.g. through using appropriate APIs, scripting languages, servers, third party services, etc.	Core
e.g. ability to add more memory, compute power, physical components, etc. e.g. with existing hardware, ability to offload certain computing tasks to specialized hardware components within the system, enabling greater performance and efficiency e.g. implementing RAID technology, i.e. Redundant array of independent Disks. Fault tolerant, meaning the system continues running if one of the hardware components fails, specifically disk drives, disk controllers, CPU, power supplies, cooling fans. RAID levels range from 0-6	Core
e.g. energy consumption of the infrastructure is considered	Core
-	Core
-	Core
e.g. Any security issues and responses to issues are listed	Core
-	Core

e.g. Following IEEE generic standards*, interoperable protocols	Core
Queue, load balancer	Core
direct connection, virtual networks, exchange connectivity, content delivery network, traffic manager Services*, and DNS	Desirable
-	Core
-	Core
-	Optional
job execution, workload management, orchestration, etc.	Core
virtual machine management, container management, serverless applications Repository* (i.e. cloud computing), quantum computing infrastructure, edge computing, exascale computing, etc.	Optional
-	Core
-	Core
-	Optional
-	Core
-	Desirable
-	Core
-	Core

-	Desirable
-	Core
-	Core
-	Optional
User* login, encrypted password storage and data	Core
: VPN Gateway (i.e. providing secure connectivity between multiple sites. Typically a physical router device, but can also be a server, firewall, or any device with internetworking and data transmission capabilities), Multi-factor authentication, Blockchain technology, etc.	Desirable

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Primary Source(s)
Connolly, T., & Begg, C. (2015). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson Education Limited. ISBN: 978-1-292-06118-4
Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf) Connolly, T., & Begg, C. (2015). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson Education Limited. ISBN: 978-1-292-06118-4
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)
Phase 2 Evaluation (May - September 2023)
Phase 2 Evaluation (May - September 2023)
Phase 2 Evaluation (May - September 2023) Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Random Encounter (Leah Wassler https://nitter.net/LeahAWasser/status/1577730887818498049) Report on a maturity model towards FAIR data in FAIR Repositories (D4.6) [2022, FAIRsFAIR] (https://zenodo.org/record/6699520)
e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
Phase 2 Evaluation (May - September 2023)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023), Phase 2 Evaluation (May - September 2023)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Speaker Series (NeIC)

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

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Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Speaker Series (NeIC)

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

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Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Phase 2 Review (Literature Analysis, November 2022 - June 2023)

Phase 2 Review (Literature Analysis, November 2022 - June 2023)

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf)

Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Big Data Maturity Matrix (https://unstats.un.org/bigdata/task-teams/training/Big%20Data%20Maturity%20Matrix%20v1.0.pdf)
Report on a maturity model towards FAIR data in FAIR Repositories (D4.6) [2022, FAIRsFAIR] (https://zenodo.org/record/6699520)

Phase 1 Evaluation (October 2022 - April 2023)

GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf

GORC-IG Typology (https://docs.google.com/document/d/19222GItDg3tcrLsDUqg9Z7GLwPELaS-XHEbN6796Tvc/edit?usp=sharing)

e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

Essential Element*: Services* & Tools*		Items in active view: 74	
Category*	Subcategory*	Attribute*	Feature*
		Service* and Tool* maintenance and Sustainability*	Services* and Tools* undergo periodic testing and maintenance
			FAIR assessment
		API exists for automated execution of standard Repository* tasks and to interoperate with external Services* and Tools* useful to the stakeholders*	
		Deposit Services* and Tools*	A system to register types of Research Objects*, including Metadata* schemas, that may not already be present in the commons*.
		Research Object* validation Tool*	
		Research Object* FAIR self-assessment Tool*	

Research Object* Repositories*	Integrity and quality control mechanisms for Metadata*, including immutability	Technical
		Completeness
		Content Quality
		FAIR compliance
		QA/QC are implemented with several methods or mechanisms, including assessment of Publications*, research data*, and Research Software*
		Formal criteria are applied to ensure technical quality of Research Objects*, conducted internally by the commons*.

	Integrity and quality control mechanisms for Research Objects*	
		A review is conducted to ensure content quality of the Research Object*
		Relevance of the Research Object* to the commons* is determined
		Research Objects* are FAIR compliant to the maximum degree possible
	Storage Services* and Tools*	
	Digital badges for Research Objects*, with features for online sharing, verification, portability, and trustworthiness with associated Metadata*	

	Research data* Repository*	
	Publication* and research documentation Repository*	
	Research Software* Repository*	
	Semantic Object* Repository*	
Discovery Services*	Harvesting, or aggregating, Metadata* from external Repositories* and commons*, including Members* and Providers*	
	Provide a harvestable Metadata* Service* so that others can harvest Metadata* hosted by the commons* that describe Research Objects*, Services*, and Tools*	
	Consultation Services* offered to the commons* community* to improve or facilitate research.	
	Platform* as a Service* (PaaS)	Developer Tools*
		Software Development Kits
		Software Libraries
		APIs Repository*/ Gateway

Training platform* and Tools*

Services* and Tools* for direct research tasks

Data acquisition Services* and Tools*

Analysis, processing, and visualization Services* and Tools*

Data collection and Research Object* Management Services* and Tools*

Services* and Tools* that enable workflows and middleware

Persistent Identifier* Services*	Use of a global PID* Service* that ensures continuous resolvability of PIDs*	Persistence of the identifier
		Persistence of the binding between identifier and object
		Persistence of the Services* to resolve from the identifier to the object
		Persistence of Service* to allow for updating of the binding between identifier and object
	Capacity to discover PIDs* from Metadata* and vice versa	
Vocabulary and Semantic Object* Services*		
Data* management services* and tools*		
	A process to create and add to an open, searchable commons* catalogue that will include pointers to other types of catalogues or collections* and Services*	
	A marketplace or API for external Service* Providers* to access and add their Services*, such that an interoperable interface is available to third party Services* from the perspective of Users* and creates a Service* catalogue	
		API testing
		Integration testing

Commons* catalogues of all Services* and Tools*, including those hosting Research Objects*

Integrity and quality control mechanisms for Services* and Tools* offered through the commons* by a third party

- Functional testing
- Performance testing
- Service* and Policy documentation is available
- Service* security is assured
- Support for the Service* is available
- FAIRness of Service*

A system to register types of Services* and Tools* that may not already be present in the commons*.

Registry of Repositories*

Cyber Security Implementations

Security and Identification Services*, Authentication and Authorization (AAI)		User* authentication (i.e. of each User*)
		Identity access and management
		Authorization
		Assess identity verification and assign levels of assurance
		Group Creation and Management
	Access protocol translation	
	Remote access	

Helpdesk Service*

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Extended Description
i.e. considerations for the improvement and consistent availability of the Service* or Tool*, such that it remains meaningful and relevant for stakeholders and viable for the commons*
Regular maintenance and testing is planned along a reasonable timeline, services* undergo periodic testing through monitoring
i.e. Perform a self-assessment on how the functions of the Service* enable, respect or reduce each of the FAIR principles for the data it operates on. Make the results of the self-assessment publicly available, together with an outlook on the desired state for the Service* (including a cost/benefit analysis).
i.e. a Repository* for each kind of Research Object* supported by the commons*.
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-
i.e. during deposit, if a Research Object* type or appropriate Metadata* schema is not available already for the Research Object*, the Provider* may add the Research Object* type and appropriate Metadata* schema. This new type and Metadata* schema are then available for all future deposits from all Providers*. RO types should be based on community* standards* with the following referenced by PIDs*: - how the various dimensions represented as variables in datasets of the form w1, d2, temp, etc., correspond to real world notions of weight, distance, temperature, etc. - what are the measurement units associated with each of those dimensions, e.g., Kelvin, Celsius, or Fahrenheit in the case of temperature. - how those dimensions are grouped or packed together in datasets.
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i.e. all necessary Metadata* fields are sufficiently filled

-

FAIR compliance to the maximum degree possible

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Can be automatic.

May be conducted externally by expert reviewers

i.e. does it follow the theme of the commons*

i.e. the FAIRness of the object is assessed. May be automated) (e.g. Quality control for PIDs* to check if they are at an appropriate FAIRness depth and do not duplicate existing PIDs*

i.e. management of storage infrastructure to meet needs of Users*, ideally with capacity for temporary, campaign/project, community*, and long-term storage, or hot, warm, and cold storage options

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Vast range of datasets and other research data* objects to facilitate research and scientific activities that have been provided by the commons* community*. Different kinds of data Repositories* may need different types of management.

i.e. Research findings available to the wider academic community* and beyond.) that have been provided by the commons* community*

i.e. Research Software* that has been provided by the commons* community* ; a catelogue of software items, including platforms*, packages, notebooks and libraries , included documentation and links for dependencies required to deploy but not all dependent libraries will be required to be part of the software Repository*. The software repo* can either have Metadata* for items held within the repo* or can point to dos in external platforms* (e.g. github))

i.e. catalogue of vocabulary and ontology schemas, where Users* and Providers* can search, find, and use these schemas as well as add, register, and maintain concept vocabularies not already present

i.e. a platform* or portal to discover Research Objects*, passive interaction

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i.e. May be automated, in a "ticket" or "chat" format with personnel, or through meetings with personnel. May be offered on an individual and/or group basis.

i.e. space(s) to deploy, develop and use software packages and libraries, where ideally both graphical and code interfaces to platforms* are available

i.e. to develop your own research Service* or Tool*, e.g. simulation Tools*

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i.e. focused on developing more complete or complex software that Services* a direct research purpose

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i.e. a portal, interface, etc. where individuals in the commons* community* can access training materials, modules, courses, etc. and complete asynchronously or synchronously

i.e. for the collection and ingest of data

i.e. Processes for Research Objects* with the goal of discovering useful information, informing conclusions, and supporting decision-making.

i.e. active data management' Tools*, active Research Object* management Tools*, such as an RDM platform

-

i.e. assigning of PIDs*, mediating external PID* Services* such as DOI, ORCID, RAiD, etc.

-

i.e. uniqueness

-

i.e. resolvability

-

-

i.e. a standalone or integrated vocabulary Service*. Depending on the commons*, these Services* may be used without using other Services* and Tools*, or it may be integrated with other Services* and Tools*, such as Repositories*.

For all forms of data* and information that is used and passes through the commons, such as ancillary data.

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i.e. Ensure functional suitability of the Service* by promoting and using testing techniques that check the compliance with the User* requirement

i.e. such that the testing covers the validation of features, an assessment of the security-related criteria, and use test doubles such as mock servers or stubs

i.e. the evaluation of the interactions among coupled Services* or parts of a system that cooperate to achieve a given functionality, Integration testing should include ensuring previously working interactions with external Services* still work when a new functionality is added and is automated

i.e. the verification of the Service* identified functionality. Functional testing should cover the full scope (positive, negative, edge cases) for the set functionality that the Service* claims to provide, include the web interface of the Service*, are checked automatically, and are provided by the developers of the underlying software.
i.e. verifying the Service* meets the specified performance requirements and assess performance characteristics, such as capacity and response time. Stress or load testing, scalability testing

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i.e. such as a tracker or helpdesk for operational User* issues, a tracker for underlying software issues, an operational level agreement with the integrated infrastructure, and a Service* level agreement with the User* communities

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i.e. if applicable, the commons* provides a registry of Repositories* that it is and/or is not affiliated with, where Users* can go to discover and deposit Research Objects*. This might include a set of approved repos for use by the commons*.

A Service* that mediates access to digital objects* and other Services* and Tools* according to specified conditions; underpins all Services* and Tools* provided through or performed by the commons*

i.e. Services* and Tools*, carried out internally or provided to Users*, that serve the commons* cyber security strategy which targets vulnerabilities of the systems and/or holdings and threats to the system.

i.e. Services* for the identification and authentication of Users*, including Security Assertion markup language identity Providers*, certification authorities, OpenID Connect or OAuth2 Providers*

i.e. User* identity is editable and can be updated by appropriate parties. May also include access granting and revoking privileges to projects, research objects*, etc. controlled by the users* account

i.e. authz, controlling access to the end Services* layer. Provide different access rights for groups and Users* (roles) on Research Objects*, their versions*, and Services*, and allow the import of such concepts.
The granting of a right or privilege that enables a subject to have legitimate access to a system or a system's object. Involves authentication of subjects requesting access to objects

i.e. the level that the Service* Provider* can be assured that the identity being verified is genuine and of a high standard

i.e. Members* and access permissions of group; group components related to managing and providing information about Users*, including community* group Members*hips and roles

i.e. SP-IdP-Proxy (integration point), token translation Services* (translate identity tokens between different technologies), discovery Service* (selection of User*'s authentication IdP), User* notice (allows Users* to be informed regarding the processing of their personal data)

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i.e. provide a Service* to take in User* questions and requests and connect them with the appropriate Internal Personnel* for response.

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Examples	Consideration Level*
-	Core
e,g. tests including for functional-related criteria (public-endpoints, public APIs, web interface), security-related criteria (public endpoint and APIs are secured with strong ciphers for encryption), and infrastructure-related criteria.	Desirable
-	Desirable
-	Core
e.g. to ingest data or to integrate data analysis Services* and Tools*	Desirable
e.g. registration, Metadata* capture, assigning of PIDs*, publishing, annotation, digitization	Core
-	Optional
e.g. for data, for Research Software*, etc. e.g. should allow Users* to capture and store the evaluation as provenance* data.	Desirable
e.g. for data, for Research Software*, etc. e.g. may include a scale of FAIRness or a scale for each aspect. e.g. should allow Users* to capture and store the evaluation as provenance* data.	Desirable

-	Desirable
e.g. format and vocabulary quality and control mechanisms for Metadata*, compliant with an appropriate Metadata* schema, Metadata* application is consistent with other Metadata* records in the collection*)	Desirable
e.g. copyrights and usage rights are clarified, information on data provenance*)	Desirable
e.g. checking function of outgoing links, appropriateness	Optional
-	Optional
-	Desirable
e.g. a combination of curators, peer review, User* feedback or machine, etc	Desirable
e.g. file format such as open data format, licence such as open data licence physical integrity, # of datasets is correct, size of datasets is >0, datasets and Metadata* are accessible, data sizes are controlled and correct, Metadata* is consistent to the data, data and descriptions are consistent), administrative (e.g. openness, described in open documentation, consent forms from study subjects are available, conflicts of interest are declared, the title, PID*, version, data producer, Publication* or update date, Publisher*, date accessed, and usage licence are included, data with commercial value have a filed patent), and access-related quality of the Research Object* (e.g. availability), testing and validation Tools* for software, including reproducibility and uncertainty quantification and system resilience and adaptability	Desirable

e.g. data accuracy, appropriate and correct use of methods, completeness, compliance with legal and ethical norms, consistency, plausibility/correctness, novelty, reproducibility, significance, data logic and organization, suitability, temporal and spatial coverage where appropriate, reuse potential, pass statistical tests, documentation quality and appropriateness, software executability, structure, interpretability, objectivity, traceability, understandability, error documentation, precision, trustworthiness (origin, methods of collecting and processing, authenticity, acceptability, applicability, understandability, subject, discipline, reputation of creators, biases of the evaluators, Users*' confidence, lack of deception, independent review, reuse), ease of use, e.g. for software specifically, Continuous integration and continuous delivery pipelines (CI/CD), encompassing both verification and validation processes for functional (behaviour-driven) and non-functional (usability-oriented) requirements as well as automation.	Optional
-	Desirable
-	Optional
E.G. backups, synchronization between copies, replication, recovery ability, long-term digital preservation / cold storage, archive storage e.g. Policy-based storage Services*, including access control and higher security measures where necessary e.g. Direct management and curation: Flexible methods to track usage and to specify and enforce limits (e.g. User* quotas, tree quotes, etc.); Methods to quickly walk the storage resource namespace (distribution of file or object sizes, access frequencies, etc.); Ability to manage hardware that has different characteristics (e..g bandwidth, capacity)	Core
e.g. expose Research Object* usage statistics so that they are publicly viewable on the Research Object* landing page, spanning access and downloads (E.G. Metadata* viewed, object viewed, object downloaded, object cited, map view of geographic distribution, cumulative views, citations, number and distribution of linked objects, etc.) e.g. Make the quality of individual datasets visible so that they are publicly viewable on the Research Object* landing page e.g. to allow filtering of raw data by quality check issue and provide statistics and metrics* on the selected records to find gross anomalies and guide selection	Optional

Metadata*, government and agency data, statistical data, scientific and research data*, online Service* data, clinical trial data, epidemiological data, etc	Core
workflow Repository*, peer-reviewed article Repository*, reports and notes Repository*	Core
-	Core
-	Core
E.G. sharing and discovery Services* including enabling sharing and downloading of bibliographic references where applicable, providing a range of query interfaces and access points such as simple search box, advanced search, subject search, and faceted browser/filtering	Core
e.g. from institutional Repositories*, from commons* with whom a MOU is shared	Desirable
-	Desirable
e.g. Aggregation Tools*, surveying Tools*, statistical Tools*, calculation and analysis Tools*, APIs, Database management Tools*, testing and validation Tools*	Core
e.g. Audit and Assessment, Application porting, application scaling, Application optimization, Software development, Software improvement, Modeling and simulation, Prototype development, Testing, Certification, Calibration, Benchmarking, Technology Transfer, Methodology Development e.g. The commons* works with Providers* if consistent data quality issues are found over time such that direct, individualized support for Research Object* Providers* is available	Desirable
-	Desirable
-	Optional
-	Optional
-	Desirable
-	Desirable

-	Optional
-	Core
artificial intelligence and machine learning Services* and Tool*ls, forecasting, visualization, data extrapolation, image analysis, iterative model fitting. data analysis (e.g. transformation, calibration, normalization, plausibility checks), data cleaning, etc., Different forms and formats of Analysis (i.e. manual, exploratory, descriptive, diagnostic, evaluative, predictive, prescriptive, correlational, statistical, automated or autonomous) e.g. workflows (i.e. Services* enabling the building and implementation of workflows), A collaborative platform* with AAI for groups")	Core
Access, transfer, interlinking, anonymisation, preservation, brokering; creation, maintenance and curation of objects and their versions, Identify and aggregate Metadata* records that describe the same Research Object*, record audit trails, transfer ownership, setting and automation of policies on Research Objects*, updates are permitted by the Provider* (e.g. software updates, automatic or asynchronous updates), collections management, automatically generated Metadata*, LIMS, ELNS, Tools* dealing with specialist types of data such as colony management systems for animal data e.g. DMP platform*, DMP Repository*, DMP development Services* and Tools*, Software Management Plan capacity such as Tool* or platform*	Core
e.g. Communication (such as a reporting Service*, to assist Users*, Providers*, and other stakeholders* in creating necessary reports that use or include the commons* (e.g. impact of commons* on dissemination of the Provider*'s data), collaboration, productivity, business, education, social/networking, utilities e.g. automated Metadata* capture, anomaly detection and correction Tools*, collaboration Tools*, process monitoring and evaluation tracking Tools*, containerization Tools*, workflow component reuse Tool*, microServices*, Tools* enabling distributed workflows, comprehensive report generation Tool*	Desirable
-	Core

-	Core
-	Core
-	Core
-	Core
e.g. if the object is not longer available, the binding between PID* and object can be updated so that the PID* points to tombstone information	Desirable
-	Core
e.g. Semantic data annotation Service*, such that Users* have the ability to link datasets or elements of datasets together with existing concepts/terms coming from ontologies/vocabularies without changing the underlying model of the repo	Desirable
-	Core
-	Core
-	Core
-	Desirable
-	Desirable
-	Desirable
-	Desirable

-	Desirable
-	Desirable
e.g. Policy documents which describe the User*'s expected behaviour while using a Service*, how they can access it, and what they can expect regarding privacy of their data. Policies should include an acceptable use policy (i.e. rules applied by owner, creator, administrator that restrict the ways in which the Service* may be used and how it should be used, acceptable use policy or Fair use policy), access policy or terms of use (i.e. binding legal contract between the Users* and Provider* of the Service*), and a privacy policy (i.e. privacy statement informing Users* about which personal data is collected and processed when they use and interact with the Service*, states User* rights).; e.g. Service* documentation must be available online, easily findable and accessible, have a PID*, version controlled, updated on new Service* versions involving any change in the installation, configuration, or behaviour of the Service*, updated whenever reported as inaccurate or unclear, have a non-software licence, and produced according to the target audience	Desirable
-	Desirable
-	Desirable
-	Optional
-	Desirable
-	Desirable
-	Core
e.g. threat protection, coordination, firewall	Core

e.g. Single Sign-on	Core
e.g. Discretionary access control (DAC)- Managing privileges through SQL through the GRANT and REVOKE commands. e.g. Mandatory access control (MAC)-System-wide policies that cannot be changed by individual users. Each object is assigned a security class, each user a clearance for a security class, and rules imposed on reading and writing. SQL standard does not have support for MAC. Bell-LaPadula model: objects, subjects, security classes, clearances. Classes are ordered. Two base restrictions: Simple security property(subject S is allowed to read object O only if class (S) >= class (O).), *_Property(Subject S is allowed to write object O only if class (S) <= class(O).) Multilevel Relations and polyinstantiation- When records or tuples within a relation each have their own security class. Polyinstantiation = presence of data objects that appear to have different values to users with different clearances.	Core
e.g. from identity management systems	Core
e.g. Entity validation, including ensuring member;s right to: use particular domain names in relation to protocol endpoints, User*-facing URL endpoints, entityID attributes and for Identity Provider* entities, any scope elements; use URN namespaces; ensuring all required information is present in Metadata* provided; ensuring protocol endpoint provide correct information and are properly provided with TLS/SSL certificates, ensure User* facing URL endpoints are available, ensure technical, administrative, and security contact information is periodically validated	Desirable
-	Desirable
-	Desirable
-	Desirable

e.g. technical help, domain-specific expertise requests	Core

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National Data Services IG: https://docs.google.com/document/d/17iUyJ2icY0gFzMZGPWJyY5E0tUoukAtI4BFeRonefv4/edit?usp=sharing, e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile Task Group 5 Phase 1 Evaluation (October 2022 - April 2023)
RPRD-IG matrix
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Research Platforms for Research Data IG: https://www.rd-alliance.org/group/repository-platforms-research-data-ig/outcomes/matrix-use-cases-and-functional-requirements, Task Group 5 Phase 1 Review (Literature Analysis, August - October 2022)

re3data Data Quality Assurance Survey (Q05), e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile (Validation), Task Group 5 Phase 1 Review (Literature Analysis, August - October 2022)
NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

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National Data Services IG: https://docs.google.com/document/d/17iUyJ2icY0gFzMZGPWJyY5E0tUoukAtI4BFeRonefv4/edit?usp=sharing, Speaker Series: presentations and analysis ((NII, ARDC, EOSC, KISTI, MOSP))

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D2.1 Report on fair requirements for persistence and Interoperability [2019, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5535719)

Phase 2 Review (Literature Analysis, November 2022 - June 2023)

Phase 2 Evaluation (May - September 2023), NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

GORC-WG Case Statement: https://www.rd-alliance.org/sites/default/files/GORC%20International%20Model%20WG_%20Case%20Statement%20V4%20July%202021.pdf

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)

A Set of Common Service Quality Assurance Baseline Criteria for Research Projects
Turning FAIR into reality - Publications Office of the EU [2018, https://data.europa.eu/doi/10.2777/1524]
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Turning FAIR into reality - Publications Office of the EU [2018, https://data.europa.eu/doi/10.2777/1524]

FAIR digital object Fabric IG: https://www.rd-alliance.org/sites/default/files/recommendation-jan-2017-v8_0.pdf, Component 4

NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf)

FAIR Implementation Profile (FIP) Ontology [2023] (https://peta-pico.github.io/FAIR-nanopubs/fip/index-en.html)

Speaker Series, NII in questionnaire and presentation, e-infra: Resource Category, https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile

e-infra: Resource Category,
https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

e-infra: Resource Category,
https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
Connolly, T., & Begg, C. (2015). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson Education Limited. ISBN: 978-1-292-06118-4

RPRD-IG matrix
EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

Federated identity management for research collaborations IG
EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

e-infra: Resource Category,
https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

EOSC Authentication and Authorization Infrastructure (AAI) - Publications Office of the EU [2021] (https://op.europa.eu/en/Publication*-detail/-/Publication*/d1bc3702-61e5-11eb-aeb5-01aa75ed71a1/language-en)

e-infra: Resource Category,
https://wiki.eoscfuture.eu/display/PUBLIC/B.+v4.00+EOSC+Resource+Profile
D6.1 Overview of needs for competence centres [2019, FAIRsFAIR]
(https://doi.org/10.5281/zenodo.5361524)
D6.2 Initial Core Competence Centre Structures [2020, FAIRsFAIR]
(https://doi.org/10.5281/zenodo.3732888)

Essential Element*: Research Objects*		Items in active view:	6
Category*	Subcategory*	Attribute*	Feature*
		Considerations for the displayed, User*-facing accessibility and reusability of Research Objects* held by and discoverable through the research commons*.	
Publications* and Research Documentation			
Research Data*			
Research Software*			

Semantic Objects*

Collections*

-

Extended Description
i.e. in addition to any Research Object*-level specific standards* and quality assurance checks that occur at acquisition
Any digital, textual, visual, audio, or tactile representations that describe or discuss any aspect of the research project and activities in human or machine readable formats.
A collection* of data that is identifiable and has the potential to be curated or published and is the result or focus of research activities. Research data* can digitally represent a group of observations, a data product from a specific version* of a processing algorithm based on observations, output of numerical model(s), or outcomes of laboratory experiments.
Any software component created during the research process or for a research purpose that is implementable or executable by a computer or machine. Does not include software components that are used for research but were not created during or with a clear research intent

i.e. any format and representation of Semantic Objects*. Semantic Objects* are a named grouping of descriptive elements that sufficiently describe a distinct identity. Semantic Objects* may be in the form of documentation, Research Software*, or research data*. They may also be referred to as Semantic Artefacts*, defined as groups of entities with unique identifiers where entities include subjects, predicates, and objects that can be linked together to form a network that describes a dataset. In this model, Semantic Objects*/Artefacts are not considered as collections, since collections are comprised of Research Objects* and not entities.

A combination or bundle of Research Objects* of the same kind or different kinds that share a relationship, that is treated as a digital object* which may bear a PID*, and consists of a finite number of digital object* identifiers and Metadata* associated with each referenced identifier.

-	-
Examples	Consideration Level*
-	Core
e.g. pre-print articles, peer-reviewed articles, reports (part, internal, memorandum, progress, policy, project deliverable, technical research), books and/or book chapters, dissertations, nanoPublications*, data management plans, lab notebooks, codebooks, blog entries, presentation slides, presentation videos, patents, miscellaneous text-based works (monographs, bulletins, legislative documents), standards*, technical specifications, teaching materials, conference objects (proceedings, papers, posters, etc), letter, DMPs, research proposal, reviews, technical documentation, working paper, thesis (bachelors, masters, doctoral), musical notation e.g actionable research documentation (i.e. representations that describe or assign an actionable sequence or process associated with any aspect of a research project) such as SOPs, protocols, workflows, analytical pipelines and algorithms e.g. research hardware related Publications* and documentation, such as User* manuals	Core
e.g. creative research data* (e.g. design), digitized or digital text material (e.g. digital editions), databases (e.g. protein structures), language data (e.g. spoken language corpora), model and simulation data, geo data (e.g. GIS), measured values (e.g. measurement data form specific instruments), data from analyzed sample material, devices / sensor Metadata*, survey data (e.g. household surveys, microdata), images, audio files, video files (with or without audio), Metadata* of physical objects and samples, Metadata* of physical research instruments and equipment, etc. e.g. Generated experimental data; generated computation data; qualitative data; acquired data, critically evaluated data (numerical that's undergone rigorous review), etc. e,g, Different formats, such as tables, spreadsheets; charts, graphs; maps, vectors, images; instrument outputs; dynamic data; datasets from models and simulations; structured data e.g. research hardware related research data*, such as calibration data	Core
E.g. software executables, source code, scripts, computational workflows, packages, containers, virtual machine images, Services*, platform* and infrastructure, Tools*, libraries, research hardware software endpoints such as LabView and IgorPro programs, etc that are created for an explicit or specific research purpose E.G. Not operating systems, libraries, dependencies, packages, scripts that have not been created for an explicit research purpose	Core

e.g, any form of taxonomy or taxonomic classification (a scheme of classification, especially a hierarchical classification, in which things are organized into groups or types), vocabulary (a list or collection* of words or of words and phrases usually alphabetically arranged and explained or defined), ontology (a set of concepts and categories in a subject area or domain that shows their properties and the relations between them.) e.g. glossary, controlled vocabulary, thesaurus, data models, taxonomies, ontologies	Core
e.g. collections* may include projects (i.e. items containing researchers, institution, funder, time period, synopsis, etc.) and research compendium*s (i.e. A bundle of all the research artifacts used and necessary to support a research claim, such that the claim is completely reproducible using only what is provided or referenced in the research compendium*.).	Core

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Primary Source(s)
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
GORC-IG Typology, SMD Policy Document SPD-41, NIST RDaF, Speaker series, re3data Data Quality Assurance Survey, IIIF, The landscape of open science in Malaysia, 2022 OpenAIRE Guidelines [2022] (https://guidelines.openaire.eu/en/latest/index.html) FAIR Principles for Research Hardware IG (https://www.rd-alliance.org/sites/default/files/case_statement/FAIR4RH-Charter%20_v2.pdf, https://www.rd-alliance.org/groups/fair-principles-research-hardware)
GORC-IG Typology, re3data Data Quality Assurance Survey NIST Research Data Framework (RDaF) V1.5 (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1500-18r1.pdf) FAIR Principles for Research Hardware IG (https://www.rd-alliance.org/sites/default/files/case_statement/FAIR4RH-Charter%20_v2.pdf, https://www.rd-alliance.org/groups/fair-principles-research-hardware)\
GORC-IG Typology, FAIR for Research Software* WG, Task Group 3 Phase 1 Evaluation (October 2022 - April 2023) FAIR Principles for Research Hardware IG (https://www.rd-alliance.org/sites/default/files/case_statement/FAIR4RH-Charter%20_v2.pdf, https://www.rd-alliance.org/groups/fair-principles-research-hardware)

Phase 1 Workshop (co-located with RDA P20, 24 March 2023)
D2.1 Report on fair requirements for persistence and Interoperability [2019, FAIRsFAIR]

Research Data collections WG Recommendations, CURE-FAIR WG (10 things for curating reproducible and FAIR research), Speaker series (NII), Task Group 3 Phase 1 Evaluation (October 2022 - April 2023)

KPIs* & Metrics*	Items in View:	109
Theme	Type (KPI* or Metric*)	KPIs* & Metrics* Statement
Commons* Governance* and Policy		
	KPIs*	The commons* complies with all applicable legal and ethical guidelines, in a transparent and auditable way.
		Compliance to international and domain-specific (where applicable) standards has resulted in the commons*, or a Service* or platform* of the commons* e.g. a subsidiary, obtaining an internationally recognized Repository* certification
		The commons* enables FAIR data by elevating the FAIRness of digital objects* and/or supporting the FAIRification process.
		The commons* enables CARE data by elevating the rights of Indigenous communities and their control over and benefit from Indigenous digital objects*
		The commons* enables TRUST infrastructure, services* and tools*
		The commons* enables environmental sustainability in all operations.
		Commons* staff have or are spending time as researchers to better understand the challenges they have making data available in a way that supports findability

	The commons* is managed so that it serves the (possibly evolving) goals of the User* community* and maximises usability while minimizing burden.
	A measure for the commons* adherence to and compliance with relevant policies
	% of implemented recommended practises for all commons* projects, programming, and Services*
	# of operational standards, schemas, APIs, and Metadata* frameworks adopted by the commons* that support FAIR DOs* and their automated processing
	# of inter and cross-disciplinary use cases conducted on data sharing practises
	# of landscape reviews conducted/completed
	# of internal positions filled
Metrics*	# of training events dedicated for Internal Personnel* regarding commons* processes and procedures
	% of Internal Personnel* trained on commons* processes and procedures
	# of research areas, disciplines or domains served by the commons*
	# of research disciplines world-wide that commons* representatives (e.g. Members*, Providers*, staff) provide recommendations on standards and open research best practises

		# of commons* created or co-created standards prepared and published
		Commons* budget year over year or quarter over quarter
		A measure for cost-efficiency in commons* operations
		Mean time to help or issue ticket resolution and/or mean time to issue resolution within support Services*
Commons* Engagement* with stakeholders*		
	KPIs*	The commons* communicates with its stakeholders in a transparent manner.
		# of partnerships with other research commons, research infrastructure hosts, research institutes, and research funders to build (pan)national research assets
		# of connections with commons* outside targeted geographical audience
		A measure for stakeholder* contributions to commons* projects
		Distinction between % or numbers of access and Engagement* interactions with regular (human) Users* and machine Users*
		# of individual User* accounts
		# of institutional accounts

Metrics*

# of Users*, Providers*, and Members*

# of Users*, Providers*, and Members* from outside targeted geographical audience

Types and geographic spread of Members*, Users*, and Providers*

# of sustained community* Members* using the commons* resources and Services*

# of new Users*, Providers*, and Members*

# of Users*/Providers* trained

# of participants in live training delivered by the commons*

# of students (grade school, undergraduate, graduate) benefiting from commons* resources and Services* through training, projects, or meeting attendance (conferences, gathering exercises, etc.)

# of skills, workforce development, and Engagement* events annually

	# of community* member requirements and requests responded to and resolved per month
	Frequency of commons*-wide fora
	# of regional and international communities of practise and interest groups supported by the commons*
	# of assets being developed with commons* co-investment at a regional, national, and international level
	# of guidelines and policies created for the research community*
	# of funding opportunities offered to researchers
	$ awarded in total in each funding opportunity and overall to researchers
	# of social media impressions over time
	# of commons*-related media hits
	Content production per time period, appropriate for the commons* communications channels and audiences
Feedback from and satisfaction of stakeholders*	Net Promoter Score (NPS) of the commons*, absolute target or a % increase over time.

	Metrics*	Aggregate mean User* rating of commons* Research Objects* and Services* & Tools*
		Aggregate mean rating of Provider* satisfaction with commons* software, ICT* capabilities, and Research Objects*.
		Aggregate mean rating of User* satisfaction with commons* software, ICT* capabilities, and Research Objects*
		Mean rating of User* satisfaction with tickets closed by the commons* support team
		% of recommendations addressed by relevant project areas within 90 days
		Aggregate mean rating of impact for attendees from post training event surveys
		Aggregate mean of stakeholder* and community* satisfaction regarding content and accessibility of external documentation
		Aggregate mean of internal staff satisfaction regarding content and accessibility of internal documentation
		Aggregate mean of internal staff awareness of inclusion and equity within the commons*
Commons* infrastructure and technology		
		The commons* services* are delivered in a reliable, secure, high-quality way, consistent with its specifications.

KPIs*	The commons* is operated in a low-barrier and inclusive way, seeking integrations and connections with other Services* and championing principles of openness consistent with Open Science and Open Research.
	The commons* designs services* with a timeframe for the swift implementation, maintenance and sustainability of the Service* in mind and implements measures accordingly, considering the researchers' need for reproducible research.
	# of data spaces* that implement FAIR data management principles
	% of repos and Services* with a certification
	# of interconnected repos and commons*
	A measure or measures for software/application maintenance
	# of workstations acquired
	% of equipment connected and operational
Metrics*	
	Completion or success rates for maintenance on ICT Infrastructure*
	# of operational and discoverable Services* (federated or non-federated) dedicated to end Users*

	# of Services* and Tools* that the commons* has determined are essential are available or implemented.
	# of new Services* added per year.
	A measure or measures for business benefit realization of projects, spanning ICT infrastructure*, services*, and tools*
	Hours or % of downtime with direct User* impacts from unplanned incidents
	# of security incidents
	Total downtime # of hours or % of total time
Stakeholder* Engagement* with technology and infrastructure	
	Geographic coverage of ICT Infrastructure*, Services*, and Tools*
	% of research requests successful (i.e. not rejected), by Service*
	# of Service* units delivered through commons* ICT*infrastructure
	Average utilization of commons* computing infrastructure
	# of Compute jobs delivered, successfully delivered, and successfully completed

or % of compute cycles spent on large jobs

of jobs at half to full compute system scale

% of compute jobs that are flex or used for backfill

% of compute Service* units delivered that are flex or backfill jobs

% of compute jobs that are small jobs

% of compute cycles delivered that are for small jobs

# of projects used in the computing cloud platform*/infrastructure

Service*-specific metrics*

Total volume/size (e.g. GB. TB) of data uploaded or available

	Increase in research outputs over time per project
	# of registered DOIs
Metrics*	
	Rates (%) of preprint posting, in any preprint server before formal Publication*
	# of datasets investigated in unique User*-sessions
	# and data volume (e.g. in GB) of Datasets requested in unique-User* sessions.
	Average # of Research Object* download by year, theme, project, etc.
	# of Research Objects* which are cited by their PID*
	Rates (%) of Research Object* sharing over time

# of file uploads or total number of Research Objects* by type and trends over time.

Citation impact of individual Research Objects*, tailored to the type of Research Object* it is

or % in each level of open access for Research Objects* and associated Metadata*

Total Research Object* investigations and requests

# of Research Objects* of national significance supported by the commons*

# of cross-referenced Research Objects*

% or # of datasets deposited in FAIR and open repos

-	-
Extended Description and Examples	Consideration Level*
Encapsulating KPIs*and metrics*related to governance* & Leadership, Rules of Participation & Access*, Sustainability*, Engagement*, and Human Capacity*.	-
Has 4 distinct parts, in order of likely priority: legal and transparent, legal and auditable, ethical and transparent, ethical and auditable	Core
e.g. CoreTrustSeal, Data Seal of Approval	Core
FAIR enablement is actively driven through the implementation of community*-supported standards and Interoperability* frameworks.	Desirable
CARE enablement is actively driven through the implementation of community*-supported standards and Interoperability* frameworks.	Desirable
TRUST enablement is actively driven through the implementation of community*-supported standards and Interoperability* frameworks.	Desirable
e.g. the commons aims for carbon neutrality for infrastructure operations	Desirable
-	Desirable

-	Core
May be a % increase over time or an absolute #.	Core
e.g. contracting, management, etc.. may be split by area	Desirable
identifying in particular those that are or enable cross-disciplinary research and cross-connecting commons*	Core
-	Desirable
-	Desirable
Could be extended to staff hours to include full and part time, as well as third party contracts.	Core
-	Optional
may be split by area	Core
some may be measured by proxies such as number of research infrastructures, instruments or data Services*	Core
identifying in particular recommendations on cross-disciplinary recommendations	Desirable

-	Optional
possibly represented as a % increase	Core
May be done per project or work area. e.g. % spending of total project budget, accumulated partner commitments	Core
-	Core
KPIs*and metrics* related to commons* interactions and Engagement* with stakeholders*, including for training, communications, partnerships, Services* and tools*, and participating in regional, national, and international groups.	-
-	Core
e.g. universities, medical research institutes, (pan)national facilities, and government agencies	Optional
-	Optional
e.g. resources pledged (80% of experiment requirements), at least one partner representative on each project steering board, staff time commitments to working on the project (90% of required hours committed by partners)	Desirable
This could be represented as a ratio (e.g. one our of every five accesses of data are machines) , percentages (e.g. 20% of data access events are by machines), or raw numbers.	Desirable
-	Optional
-	Optional

if feasible identifying those from underrepresented groups and from non-target disciplines. This number is likely larger than the number of user accounts.	Core
if feasible identifying those from underrepresented groups and from non-target disciplines	Core
A breakdown of the total number of individuals associated with the commons.	Desirable
i.e. User* retention, identify # from underrepresented groups if feasible (i.e. User* retention from underrepresented groups) and from non-target disciplines (i.e. User* retention from disciplines outside the commons* main scope)	Core
if feasible identifying from underrepresented groups an	Core
possibly divided by training type or Engagement* activity type	Core
if possible differentiating between online and in-person. Likely a larger number than the number of users and providers (i.e. identified participants in the commons) who have been trained or participate in training, and therefore Could be considered a subset of the above metric*, but keeping separate since it's possible that Users* and Providers* are a subset of the total community*, and therefore participants, for some commons*.	Desirable
identify those from underrepresented groups if feasible	Desirable
-	Core

regardless of the request being granted or denied	Core
-	Core
-	Optional
-	Optional
-	Optional
-	Core
may break down into # of projects funded, # of applications, etc.	Core
# social media views (e.g. youtube views per month), # social media subscriptions (e.g. per month)	Desirable
-	Desirable
e.g.# articles per year (published by commons*, per journal and per topic), # of newsletter Publications* per year (per newsletter source), # press releases per year, # quotes from, partners on website and social media posts, # surveys with published results, # flyers (by topic), # infographics (by topic) and other graphical, materials (e.g. roll-ups), # informational videos, # video interviews (by topic and group, e.g. partners, stakeholders), # social media connections (tweets or retweets/week, posts per month), # webinars with min attendance (e..g at least 40 attendees)	Core
-	-
In a community* survey asking "On a scale of 0-10, how likely are you to recommend the commons* to a friend or colleague?", NPS Score = % promoters (9-10/10) - % detractors (0-6/10).	Desirable

either their importance, impact or satisfaction. Could differentiate between types of Users* (e.g. principal investigators, undergraduate students, etc).	Core
Specifically the overall capabilities of the commons.	Core
Specifically the overall capabilities of the commons	Core
-	Desirable
(i.e. reviewed, assessed --> rejected, enacted)	Desirable
-	Desirable
(e.g. User* guides)	Core
(e.g. wiki)	Desirable
-	Desirable
Encapsulating KPIs*and metrics* related to the performance of Services* & Tools*, ICT Infrastructure*, and Research Objects*	-
-	Core

-	Core
-	Desirable
-	Desirable
-	Core
-	Core
e.g. Date of latest software commit/update (e.g. on average) by external software developers; # of software commits/updates per month; Spread of software commits/updates over time (i.e. consistency); # of software/applications that have regular releases (>1-2 updates per year) from the software Providers*)	Core
-	Optional
-	Core
such as # or % of development issues resolved, # or % of use issues addressed or responded to, # or % of use issues resolved, etc	Core
-	Core

May be extended to two measurements: # of publicly available Services*, # of internal Services*	Core
May be extended to two measurements: # of new publicly available Services*, # of new internal Services*	Core
i.e. Benefit realisation is the work that is carried out in order to ensure that the expected benefit is really achieved after the project deliveries have taken place. The result of the expected benefit consists of benefit objects, which make the expected benefit measurable. Benefit objects can be money, time or quality. e.g. % of benefits realised on time	Desirable
e.g. security incidents, network failing, framework failing	Core
i.e. failing or breach of AAI framework, e.g. theft of data, credentials, etc.	Core
from both unplanned and planned incidents	Core
Encapsulating KPIs*and metrics* related to stakeholder* Engagement* with Services* & Tools*, ICT Infrastructure*, and Research Objects*	-
e.g. # of provinces, states, counties, countries; # of universities and research institutions, by infrastructure and Service* type e.g. discovery, deposit, access to compute	Core
-	Desirable
e.g. a single core used for 1 hour	Core
-	Core
-	Core

e.g. >25,000 cores	Optional
-	Optional
-	Optional
1 Service* unit = 1 compute node used for 1 hour of wallclock time	Optional
e.g. <2 nodes	Optional
e.g. < 2 nodes	Optional
-	Optional
i.e. per service and tool, typically breakdowns of higher level metrics*such as # of registered Users*, # of active Users* over a given period of time, amount of computing researchers per User* or per group, amount of storage resources per User* or per group	Desirable
-	Core

i.e. Research Object* trends for each project or top performing projects by number of Publications*, datasets, software. Could be an absolute number or %	Optional
If commons* provides the DOI registration service on deposit of research objects, this metric* should be considered as a performance metric* instead of engagement.	Desirable
-	Optional
-	Desirable
-	Desirable
-	Core
-	Core
may be split by type (e.g. rates of data sharing over time, rates of code sharing over time, etc.)	Desirable

-	Core
(e.g. I10 index for Publications*, # of citations and references per Research Object*	Optional
-	Desirable
i.e. the total number of times a Research Objects* or information related to the Research Object* was accessed or downloaded and the volume (e.g. MB) that was transferred.	Core
-	Optional
e.g. data and Publications*, data and software, software and Publications*). Could expand to measure # of connections between Research Objects* and # of Research Object* connection types (data to pub, pub to software etc	Desirable
-	Desirable

-	Consideration Level*	ions to consider	
Source(s)	-	oment	Internal vs External information needed
-	Core		-
	Desirable		
	Optional		
2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)		Developing	Internal
RDA/WDS Data Publication* workflows WG recommendations (https://zenodo.org/record/1406045#.YJJjoKFlBPb)		Established	Internal
2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)		Developing	Internal
Operationalizing the CARE and FAIR Principles for Indigenous data futures (2021) https://doi.org/10.1038/s41597-021-00892- 0		Initial	Internal
Phase 2 Review (Literature Analysis, November 2022 - June 2023)		Developing	Internal
Phase 2 Review (Literature Analysis, November 2022 - June 2023)		Initial	Internal
M4.7 Improved Description of Data Repositories* [2020, FAIRsFAIR] (https://doi.org/10.5281/zenodo.5471811)		Initial	Internal

2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)	Initial	Internal
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Established	Internal
Speaker Series (IBICT)	Established	Internal
Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Speaker Series - EOSC: https://eosc.eu/wp-content/uploads/2023/08/Monitoring-Framework.pdf (2022), from https://eosc.eu/monitoring-reporting/	Established	Internal
Speaker Series - EOSC: https://eosc.eu/wp-content/uploads/2023/08/Monitoring-Framework.pdf (2022), from https://eosc.eu/monitoring-reporting/	Expanding	Internal
Speaker series (MOSP)	Initial	Internal
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Developing	Internal
Speaker Series (IBICT)	Initial	Internal
Speaker Series (IBICT)	Initial	Internal
Task Group 5 Phase 1 Evaluation (October 2022 - April 2023); Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Developing	Internal
Task Group 4 Phase 1 Evaluation (October 2022 - April 2023), Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Developing	Internal

Phase 2 Evaluation (May - September 2023)	Initial	Internal
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Initial	Internal
Speaker Series (NeIC)	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
-	-	-
2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)	Initial	Internal
Random Encounter (ICRI2022 presentation by Rosie Hicks, Speaker Series - ARDC)	Initial	Internal
Speaker Series: specifically stated by KISTII during presentation and in slides (https://www.rd-alliance.org/system/files/documents/KRDC_Introduction%28GORC%29%2820220728%2C09%2CSa-kwang%20Song%29.pdf)	Expanding	Internal
Speaker Series (NeIC)	Initial	Internal
Random encounters	Initial	Internal
Speaker Series (Alliance)	Initial	Internal
Speaker Series (Alliance)	Initial	Internal

Speaker Series: specifically stated by KISTII during presentation and in slides (https://www.rd-alliance.org/system/files/documents/KRDC_Introduction%28GORC%29%2820220728%2C09%2CSa-kwang%20Song%29.pdf)	Initial	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Initial	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Established	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
Speaker series (MOSP)	Developing	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
Random Encounter (ICRI2022 presentation by Rosie Hicks, Speaker Series - ARDC)	Initial	Internal

XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Initial	Internal
Random Encounter (ICRI2022 presentation by Rosie Hicks, Speaker Series - ARDC)	Initial	Internal
Random Encounter (ICRI2022 presentation by Rosie Hicks, Speaker series)	Initial	Internal
Speaker series (MOSP)	Initial	Internal
Speaker Series (Alliance)	Initial	Internal
Speaker Series (Alliance)	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	External
D5.1 FAIRsFAIR Communication, Marketing and Engagement* Plan [2019. FAIRsFAIR] (https://doi.org/10.5281/zenodo.6656060)	Initial	Internal
-	-	-
Phase 1 Workshop (co-located with RDA P20, 24 March 2023) (definition)	Initial	External

XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	External
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	External
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023)	Developing	External
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	Internal
-	-	-
2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)	Developing	Internal

2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU)	Developing	Internal
2.7 Framework for assessing FAIR Services [2021, FAIRsFAIR] (https://zenodo.org/record/6656431#.ZEGmHnbMLIU) Speaker Series (NeIC)	Initial	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Developing	External
Task Group 5 Phase 1 Evaluation (October 2022 - April 2023), Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Established	Internal
Speaker Series: specifically stated by KISTII during presentation and in slides (https://www.rd-alliance.org/system/files/documents/KRDC_Introduction%28GORC%29%2820220728%2C09%2CSa-kwang%20Song%29.pdf)	Developing	Internal
Random Encounter (Leah Wassler https://nitter.net/LeahAWasser/status/1577730887818498049), Task Group 2 Phase 1 Evaluation (October 2022 - April 2023)	Developing	Internal
Speaker Series (IBICT)	Initial	Internal
Speaker Series (IBICT)	Initial	Internal
Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Random Encounter (Leah Wassler https://nitter.net/LeahAWasser/status/1577730887818498049)	Initial	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/, XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal

Task Group 5 Phase 1 Evaluation (October 2022 - April 2023), Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Developing	Internal
Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Developing	Internal
Speaker Series (NeIC)	Established	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Initial	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Initial	Internal
Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC). Speaker Series (NeIC)	Initial	Internal
-	-	-
Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Initial	Internal
XSEDE final report (https://www.ideals.illinois.edu/items/124108)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal

Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (SMD Data and Computing Architecture Study Workshop Series, TACC)	Developing	Internal
Random Encounter (ICRI2022 presentation by Rosie Hicks, Speaker Series - ARDC)	Developing	Internal
A Set of Common Service Quality Assurance Baseline Criteria for Research Projects (https://digital.csic.es/handle/10261/214441)	Developing	Internal
Speaker Series - KISTI: during presentation, stated in the slides (https://www.rd-alliance.org/system/files/documents/KRDC_Introduction%28GORC%29%2820220728%2C09%2CSa-kwang%20Song%29.pdf --> pg 2)	Developing	Internal

Task Group 2 Phase 1 Evaluation (October 2022 - April 2023), OpenAire monitoring indicators (https://monitor.openaire.eu/indicators/funder)	Developing	Internal
Speaker Series (Alliance)	Established	External
PLOS partners with DataSeer to develop Open Science Indicators [2022] (https://theplosblog.plos.org/2022/09/plos-partners-with-dataseer-to-develop-open-science-indicators/), Trends in preprint, data, and code sharing, 2019-2022 - The Official PLOS Blog [2023] (https://theplosblog.plos.org/2023/04/open-science-indicators/)	Developing	External
COUNTER Code of Practise: https://www.projectcounter.org/code-of-practice-rd-sections/3-technical-specifications-reports/	Initial	Internal
COUNTER Code of Practise: https://www.projectcounter.org/code-of-practice-rd-sections/3-technical-specifications-reports/	Initial	Internal
OpenAire monitoring indicators (https://monitor.openaire.eu/indicators/funder)	Initial	Internal
Task Group 2 Phase 1 Evaluation (October 2022 - April 2023)	Established	External
PLOS partners with DataSeer to develop Open Science Indicators [2022] (https://theplosblog.plos.org/2022/09/plos-partners-with-dataseer-to-develop-open-science-indicators/), Trends in preprint, data, and code sharing, 2019-2022 - The Official PLOS Blog [2023] (https://theplosblog.plos.org/2023/04/open-science-indicators/)	Established	External

Speaker Series - IVOA: https://wiki.ivoa.net/twiki/bin/view/IVOA/WebStatistics, stated in slides for KISTI (https://www.rd-alliance.org/system/files/documents/KRDC_Introduction%28GORC%29%2820220728%2C09%2CSa-kwang%20Song%29.pdf) and NII	Initial	Internal
NIST RDaF: https://www.nist.gov/system/files/documents/2021/05/12/RDaF%20Preliminary%20Framework%20Core%2005-12-21_0.pdf, from https://www.nist.gov/programs-projects/research-data-framework-rdaf	Established	External
Task Group 3 Phase 1 Evaluation (October 2022 - April 2023), Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Developing	Internal
COUNTER Code of Practise: https://www.projectcounter.org/code-of-practice-rd-sections/3-technical-specifications-reports/	Initial	Internal
Speaker series (ARDC), Random Encounters (ICRI2022 presentation by Rosie Hicks)	Established	Internal
OpenAire monitoring indicators (https://monitor.openaire.eu/indicators/funder), Phase 1 Workshop (co-located with RDA P20, 24 March 2023)	Developing	Internal
Speaker Series - EOSC: https://eosc.eu/sites/default/files/2022-05/Monitoring%20Framework.pdf, from https://eosc.eu/monitoring-reporting/	Developing	External

Relationship to the model

Measurement of	Indicator of	Affiliated Category* or Attribute*
-	-	-
Governance* & Management	Governance* & Management	Governance* & Leadership* > Internal Commons* Policy Development, implementation, and review > Development of policies and guidelines for commons* operations
Standards* & Conventions	Governance* & Management	Governance* & Leadership* > Internal Commons* Policy Development, implementation, and review > Development of policies and guidelines for commons* operations
Interoperability* / Standards* * Conventions	Governance* & Management	Governance* & Leadership* > Research Object* and Services* & Tools* governance* rules, principles, and enforcement of quality. > A statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the FAIR principles
Interoperability* / Standards* * Conventions	Governance* & Management	Governance* & Leadership* > Research Object* and Services* & Tools* governance* rules, principles, and enforcement of quality. > A statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the CARE principles
ICT / Services* & Tools*	Governance* & Management	Governance* & Leadership* > Research Object* and Services* & Tools* governance* rules, principles, and enforcement of quality. > A statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing the TRUST principles
Standards* & Conventions	Governance* & Management	Governance* & Leadership* > Research Object* and Services* & Tools* governance* rules, principles, and enforcement of quality. > A statement on the level of commitment to promoting, implementing, endorsing, and/or enforcing environmental sustainability
Human Capacity*	Human Capacity*	Human Capacity* > Internal Capacity*

Governance* & Management	Governance* & Management	governance* & Leadership > commons* strategic planning > Development of strategy
Governance* & Management	Governance* & Management	Governance* & Leadership* > Internal Commons* Policy Development, implementation, and review > Development of policies and guidelines for commons* operations
Interoperability* / Standards* * Conventions	Human Capacity*	Human Capacity* > Internal Capacity*
Standards* & Conventions	Governance* & Management	Governance* & Leadership* > Internal Commons* Policy Development, implementation, and review > Development of policies and guidelines for commons* operations
Human Capacity*	Interoperability* / Standards* * Conventions	Interoperability* > Technical Interoperability* ; Standards* & Conventions* > Community* supported Research Object* standards and conventions
Human Capacity*	Governance* & Management	Governance* > Regular review and alignment of strategic planning, organizational structure
Human Capacity*	Human Capacity*	Human Capacity* > Internal Capacity
Engagement*	Human Capacity*	Human Capacity > Internal Capacity*
Engagement*	Human Capacity*	Human Capacity > Internal Capacity*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Governance* & Management	Governance* > Commons* Strategic Planning > Policy advocacy and recommendations

Standards* & Conventions	Governance* & Management	Governance* > Commons* Strategic Planning > Policy advocacy and recommendations
Sustainability*	Sustainability*	Sustainability > Suitable viable plan, schemes, and implementations for resourcing and capacity building on the medium and long term
Sustainability*	Sustainability*	Sustainability > Suitable viable plan, schemes, and implementations for resourcing and capacity building on the medium and long term
Human Capacity*	Human Capacity*	Human Capacity* > Operations and Infrastructure management Services*
-	-	-
Engagement*	Engagement*	Engagement* > Structured and coordinated communication plan and mechanism, medium, or channels
Engagement*	Engagement*	Engagement* > Engagement* with other research commons, research infrastructure hosts, research institutions, and research funders
Engagement*	Engagement*	Engagement* > Engagement* with other research commons, research infrastructure hosts, research institutions, and research funders
Engagement*	Engagement*	Engagement* > Engagement* with other research commons, research infrastructure hosts, research institutions, and research funders
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*

Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Engagement*	Engagement* > Training and education hosted, provided, and/or contributed to by the commons* for individuals and groups in the commons* community*
Engagement*	Engagement*	Engagement* > Training and education hosted, provided, and/or contributed to by the commons* for individuals and groups in the commons* community*
Engagement*	Engagement*	Engagement* > Training and education hosted, provided, and/or contributed to by the commons* for individuals and groups in the commons* community* ; Structured, coordinated, and implemented communication and engagement* plan and mechanism, medium, or channels ; Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Engagement*	Human Capacity*	Human Capacity* > Internal Capacity*.

Human Capacity*	Human Capacity*	Human Capacity* > Skills for planning, managing and assessing Service* delivery > Prioritization of identified needs and derived requirements of Users*
Engagement*	Engagement*	Engagement* > community* input and feedback
Engagement*	Human Capacity*	Human Capacity* > Internal Capacity*.
Engagement*	Engagement*	Engagement* > Engagement* with other research commons*, research infrastructure hosts, research institutions, and research funders ; Incentivisation to intended audiences to participate in or with the Commons* > Funding competitions
Engagement*	Human Capacity*	Human Capacity* > Internal Capacity* > Internal positions for...
Engagement*	Engagement*	Engagement* > Funding competitions
Engagement*	Engagement*	Engagement* > Funding competitions
Engagement*	Engagement*	Engagement* > Structured, coordinated, and implemented communication and engagement* plan and mechanism, medium, or channels
Engagement*	Engagement*	Engagement* > Structured, coordinated, and implemented communication and engagement* plan and mechanism, medium, or channels
Engagement*	Human Capacity*	Human Capacity* > Internal Capacity*
-	-	-
Engagement*	Governance* & Management	Governance* > Development of Strategy

Services* & Tools* / Research Objects*	Human Capacity*	Human Capacity* > Ease of use for Users*
ICT* / Research Objects*	Human Capacity*	Human Capacity* > Ease of use for Users*
ICT* / Research Objects*	Human Capacity*	Human Capacity* > Ease of use for Users*
Human Capacity*	Human Capacity*	Human Capacity* > Internal Capacity
Human Capacity*	Human Capacity*	Human Capacity* > Skills for planning, managing and assessing Service* delivery > Assessing plans and deployments
Engagement*	Engagement*	Engagement* > Training
Human Capacity*	Human Capacity*	Human Capacity* > Skill requirement for Users*, ease of use for Users* > Document and make public the whole process for every process where feasible, maintain a high level of transparency and documentation with stakeholders* and the community*
Human Capacity*	Human Capacity*	Human Capacity* > Internal Capacity >Document and share the whole process for every internal, personnel-facing process, maintaining a high level of transparency and documentation for and between Internal Personnel*.
Human Capacity*	Human Capacity*	Human Capacity* > Internal Capacity > Mechanisms for enactment of EDII* commitment for Internal Personnel* and the commons* community*
-	-	-
Services* & Tools*	Standards* & Conventions	Standards > Standards and conventions supporting and describing mechanisms, infrastructure and plans for specific workflows, use cases, and types of interexchange within the commons

Services* & Tools*	Standards* & Conventions	Standards > Standards and conventions* for regulatory and ethical compliance > Standards* for equitable access to information, resources, Services*, and Tools*
Services* & Tools*	Services* & Tools*	Services*& Tools* > Service* and Tool* maintenance and Sustainability*.
Services* & Tools*	Interoperability*	Interoperability* > Technical Interoperability*
Services* & Tools*	Governance* & Management	Governance* & Leadership* > Internal Commons* Policy Development, implementation, and review > Development of policies and guidelines for commons* operations
Services* & Tools*	Engagement*	Engagement* > Engagement* with other research commons*, research infrastructure hosts, research institutions, and research funders
Services* & Tools* / Research Objects*	Standards* & Conventions	Standards* & Conventions* > Applications, Software, Services* & Tools* standards and conventions, in addition to applicable Research Object* and Metadata* standards
ICT Infrastructure*	Human Capacity*	Human Capacity* > Internal Capacity*
ICT Infrastructure*	ICT Infrastructure*	ICT* > Network, Compute, Storage
Human Capacity*	ICT Infrastructure*	ICT* > A review and update of ICT infrastructure* happens on a regular basis
Services* & Tools*	Services* & Tools*	Services* and Tools* > All

Services* & Tools*	Services* & Tools*	Services* and Tools* > All
Services* & Tools*	Services* & Tools*	Services* and Tools* > All
ICT / Services* & Tools*	ICT / Services* & Tools*	Services* and Tools* > All ; ICT* > All
ICT Infrastructure*	ICT Infrastructure*	ICT* > AAI, Network, Compute, Storage
ICT Infrastructure*	ICT / Services* & Tools*	ICT* > AAI; Services* and Tools* > AAI
ICT Infrastructure*	ICT Infrastructure*	ICT* > Network, Compute, Storage
-	-	-
ICT / Services* & Tools*	Engagement* / Services* & Tools*	Services* and Tools* > All; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
Services* & Tools*	Engagement* / Services* & Tools*	Services* and Tools* > all ; Engagement* > Incentivisation to intended audiences to participate in or with the Commons* ; Training and education hosted, provided, and/or contributed to by the commons* for individuals and groups in the commons* community*
ICT / Services* & Tools*	Engagement* / Services* & Tools*	Services* & Tools* > All ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*

ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
ICT Infrastructure*	Engagement* / Services* & Tools*	Services* & Tools* > Services* and Tools* for direct research tasks ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
Services* & Tools*	Engagement* / Services* & Tools*	Services* and Tools* > All ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories* ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*

Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories* ; Engagement* > Active promotion to intended audiences to participate in the commons*, Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories* ;Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > Publications* and documentation; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > research data*; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > research data*; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > research data*; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories* (anything with a PID*) ; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories*; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*

Research Objects*	Engagement* / Research Objects*	Research Objects* > all categories*; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Research Objects*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*; Research Objects* > all categories
Research Objects*	Engagement* / Research Objects*	Engagement* > Training > content (open science and open access) ; Research Objects* > all categories
Engagement* / Research Objects*	Engagement* / Research Objects*	Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons* ; Research Objects* > all
Research Objects*	Engagement* / Research Objects*	Engagement* > Engagement* with other research commons*, research infrastructure hosts, research institutions, and research funders ; Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons* ; Research Objects* > all
Research Objects*	Engagement* / Services* & Tools*	Services* and Tools* > Services* and Tools* for direct research tasks > Data collection and Research Object* Management Services* and Tools* ; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*
Research Objects*	Engagement* / Services* & Tools*	Services* & Tools* > Research Object* Repositories* ; Engagement* > Active promotion to intended audiences to participate in the commons* ; Incentivisation to intended audiences to participate in or with the Commons*

Reasoning

-

This KPI* is multi-level indicator of success that will likely be achieved over time and in stages. The commitment to legal compliance, ethical compliance, and doing so in a transparent and auditable way is set by the governance* structure and showcases management's ability to orchestrate that compliance

A goal for the commons* to achieve in regards to the implementation of community standards in it's Services* and platforms.

Enabling FAIRness is largely within Interoperability and Standards & Conventions, which are then applied to other essential elements and individual items of the model in turn. The success of these implementations is an indicator of successful governance* target setting and management implementation.

Enabling CARE is largely within Interoperability and Standards & Conventions, which are then applied to other essential elements and individual items of the model in turn. The success of these implementations is an indicator of successful governance* target setting and management implementation.

Enabling TRUST is largely within ICT Infrastructure* and Services* and Tools*. The success of these implementations is an indicator of successful governance* target setting and management implementation.

Enabling environmental sustainability is largely within Standards & Conventions, which are then applied to other essential elements and individual items of the model in turn. The success of these implementations is an indicator of successful governance* target setting and management implementation.

A goal for internal staff experience, speaking to their ability to empathize with researchers and therefore enable better interactions and support to researchers.

A dynamic goal for the management and strategic planning process of the commons. How well the strategic plan is implemented, and an indicator of how well that strategic plan addresses and can adapt to evolving needs of the user community.

MEASUREMENT of policy compliance, INDICATOR of how well the policy goals set by governance are met by management's implementations

MEASUREMENT of compliance with recommended standards and conventions as well as actionable interoperability items, which is an INDICATOR of the internal personnel capacity to do this work

MEASUREMENT of compliance with FAIR DO enabling standards, which is an INDICATOR of the commons* delivering on its stated level of commitment to FAIR.

MEASUREMENT of number specific use cases, INDICATOR of commons* commitment to interoperability through standards and conventions of data sharing practises.

MEASUREMENT of how much time and people the commons* can dedicate to landscape reviews, and ultimately being well versed in what is happening in the commons* community*. INDICATOR of priority placed on being knowledgeable about the commons* community* as an input into Governance* and decision making processes

Direct MEASUREMENT of staff roles or hours, INDICATOR of the internal staff capacity

MEASUREMENT of dedicated Engagement* through training with internal personnel and INDICATOR of human capacity increase through events
MEASUREMENT of Engagement* with internal personnel through professional development training, INDICATOR of human capacity increase.due to said training

MEASUREMENT and INDICATOR of Engagement* and uptake within disciplines

MEASUREMENT of commons* Engagement* with the global research community* through standards interaction, INDICATOR of success of policy advocacy through standards and recommendations developments.

MEASUREMENT of commons* contribution to standards, INDICATOR of success of policy advocacy through standards development and setting.

MEASUREMENT and INDICATOR of financial sustainability over time.

MEASUREMENT and INDICATOR of financial sustainability of commons operations.

Direct measurement of internal staff ability to respond to User* requests, the ease of use and responsiveness of the help desk, and the ease of use for Users*

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A goal for the communications plan and resulting engagements the commons* has with stakeholders of all kinds.

Direct MEASUREMENT and INDICATOR of commons* community* engagement

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Direct MEASUREMENT and INDICATOR of commons* engagement with stakeholders*, specifically partners such as research institutions and other commons.

MEASUREMENT of User* Engagement* based on type of User*, INDICATOR of successful promotion and incentivization to use the commons* Services*, Tools*, collection*

MEASUREMENT and INDICATOR of Engagement* with intended user community

MEASUREMENT and INDICATOR of Engagement* with intended user community

Direct MEASUREMENT and INDICATOR of engagement, resulting from commons* promotion and adoption in the community*.

Direct MEASUREMENT and INDICATOR of engagement, resulting from commons* promotion and adoption in the community*. Could also be an indicator of how successful the communications strategy is

Direct MEASUREMENT and INDICATOR of engagement, resulting from commons* promotion and adoption in the community*. Could also be an indicator of how successful the communications strategy is

Direct MEASUREMENT of User* engagement. Could also be used as an INDICATOR for the success of an EDII* statement or commitment in RoP.A, the sustainability of the commons* to continue providing attractive Services* and tools, as well as human capacity for ease of use for users.

Direct MEASUREMENT of User* engagement. Could also be used as an INDICATOR for the success of human capacity and attractiveness of the commons.

Direct MEASUREMENT and INDICATOR of User* engagement.

Direct MEASUREMENT and INDICATOR of engagement.

Direct measurement and indicator of Engagement* through a variety of channels for a specific commons* community* subset.

MEASUREMENT of the level of Engagement* opportunities with the community*, INDICATOR of the Internal Capacity* to organize and run these events

Direct MEASUREMENT of internal staff ability to respond to these requests, recommendations, and requirements, INDICATOR of both the ease of user for users and of internal capacity to address gaps.

Direct MEASUREMENT of community* engagement, INDICATOR of opportunities for commons* community* to meet, interact, and ideally, provide feedback.

MEASUREMENT of the level of Engagement* opportunities with the broader community*, INDICATOR of the Internal Capacity* to participate and contribute to CoPs and IGs

MEASUREMENT of community investment by the commons, possibly through funding competitions, INDICATOR of Engagement* with related infrastructures and groups in the commons* community* and likewise possibly the success of funding competitions.

MEASUREMENT of the level of Engagement* with the research community*, both in terms of knowing what to propose to them and identifying gaps as well as knowing how and where to share the material. INDICATOR of the commons* human capacity* to do the work.
MEASUREMENT and INDICATOR of Engagement* through funding competitions
MEASUREMENT and INDICATOR of Engagement* through funding competitions

Direct MEASUREMENT and INDICATOR of community Engagement* through a specific channel (social media)

Direct MEASUREMENT and INDICATOR of community Engagement* through a specific channel (news sites)

MEASUREMENT of Engagement* items that have gone out, INDICATOR of human capacity* to create the content

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MEASUREMENT of community* member satisfaction across all outward aspects of the commons* and an INDICATOR of the commons* fulfilling its value proposition.

MEASUREMENT of findability and availability of Services* & Tools* and Research Objects*, INDICATOR of ease of use for Users* to then find and interact with them

MEASUREMENT of satisfaction with ICT* and Research Objects*, INDICATOR of ease of use for providers (those who use the Service* and contribute research outputs to the commons*). Could also be an indicator of governance* and delivery on value proposition and mission.
MEASUREMENT of satisfaction with ICT* and Research Objects*, INDICATOR of ease of use for users. Could also be an indicator of governance* and delivery on value proposition and mission.
Indirect MEASUREMENT of ease of use for Users* (i.e. more tickets = less ease of use in some contexts), INDICATOR of human capacity to address tickets successfully.
Direct MEASUREMENT of internal staff ability to respond to these requests, recommendations, and requirement, INDICATOR of success of assessment and upgrades of projects as well as internal personnel capacity to address them.
MEASUREMENT and INDICATOR of success of training engagement.

MEASUREMENT ease of use for users and INDICATOR of success of user-facing documentation

MEASUREMENT of internal staff satisfaction with internal communication and ease of accessing information related to their duties, which is an INDICATOR of the development process for documentation and its accessibility to internal staff

Direct MEASUREMENT of internal awareness of commons* EDII* policy, INDICATING the success of the implementation of the policy.

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A moving target for consistently high value Services* being offered to the commons* community.

A goal for the commons* to deliver on implementation of their standards, especially those regarding open research, expand their partnerships and therefore Services* available, and ensure accessibility of their services.

Goal to plan for the sustainability of a service, also related to Sustainability > Suitable viable plan, schemes, and implementations for medium and long term stewardship, contextualization, usability, and accessibility of Research Objects*, Services* and Tools*

MEASUREMENT of interconnected spaces that have all agreed to an Interoperability* commitment, INDICATOR of likely technical interoperability basis between spaces

MEASUREMENT of characteristic of Services* and Tools*, INDICATOR of uptake in certifications and potentially the quality of Services* and Tools* offered by or through the commons* and therefore fulling commons* operations specifications set by governance

MEASUREMENT of interconnected Services* and tools, INDICATOR of Engagement* with resource Providers* and the uptake of partnership with the commons*

MEASUREMENT of User*/Provider* Engagement* with their software in the commons* collection* and/or measure of performance of commons* maintained software, INDICATOR of commons* community* and/or personnel adherence to standards for applications and software. Specifically for commons* supported software, could also be an indicator of Services* & Tools* > Service* and Tool* maintenance and Sustainability*
MEASUREMENT of ICT infrastructure* (i.e the physical workstations), INDICATOR of human capacity (workstations enable Internal Personnel* to do their tasks)

MEASUREMENT of ICT infrastructure* (i.e equipment), INDICATOR of ICT Infrastructure*

MEASUREMENT of internal staff ability to respond to and implement action plan to ICT* needs and issues, INDICATOR of improvements and development in ICT* infrastructure

Direct MEASUREMENT and INDICATOR of services* & Tools*.

MEASUREMENT and INDICATOR of progression towards implementing all Services* and Tools* in the plan for a
MEASUREMENT and INDICATOR of progression towards implementing all Services* and Tools* in the plan for a commons*

MEASUREMENT of benefit outcomes from ICT*, services* and tools* and INDICATOR of their success

MEASUREMENT and INDICATOR of AAI implementation and success
MEASUREMENT and INDICATOR of AAI implementation and success

Direct MEASUREMENT and INDICATOR of success of ICT Infrastructure*

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MEASUREMENT of availability of ICT Infrastructure* and Services* and Tools* geographically, INDICATOR of successful Engagement* with commons* community* for geographic uptake

MEASUREMENT of successful instances of Services* and Tools*, INDICATOR of overall success of Services* and Tools* and engagement* with the commons* community* to use them as well as submitting appropriate requests, likely as a result of good training.

MEASUREMENT of activity through ICT infrastructure via Services* and tools, INDICATOR of successful Engagement* with commons* community* to lead to those requests and overall value fulfillment of Services* and Tools*.

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MEASUREMENT of interactions with or characteristics of services* and tools*, INDICATOR of the Service* and/or successful Engagement* with the service depending on the situation.

MEASUREMENT of Research Objects*, INDICATOR of total volume of Research Objects* the commons* is responsible for and possible an indirect indicator of successful Engagement* with commons* community.

Direct MEASUREMENT of submissions to the commons* collections*, which is an INDICATOR of commons* holdings as well as Engagement* with the commons*.

MEASUREMENT of Research Objects*, INDICATOR of uptake of DOI registration for Research Objects*. If commons* provides the DOI registration service on deposit of research objects, this metric* should be considered as a performance metric* instead of engagement.

MEASUREMENT of Research Objects*, INDICATOR of community* Engagement* with the commons*, success of promoting sharing of pre-prints as a form of open research

MEASUREMENT of dataset usage, could be an INDICATOR of the findability, accessibility, quality, etc. of datasets in the commons* and/or the successful Engagement* with the commons* community.

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MEASUREMENT of research object citation, INDICATOR of Engagement* with commons* community* to use Research Objects* and/or of proliferation of Research Objects*.

MEASUREMENT of Research Objects*, INDICATOR of community* Engagement* with the commons*, ease to share and success in promoting sharing of ROs

MEASUREMENT of Research Objects*, INDICATOR of community* Engagement* with the commons*, how appealing it is to register or store Research Objects* within the commons*

MEASUREMENT of overall Research Object* citation impact, INDICATOR of how useful the Research Objects* themselves are within the commons* and the success of Engagement* with the commons* community* to encourage the citation of Research Objects*.

MEASUREMENT of open access levels across Research Objects*, INDICATOR of User* and community* uptake in open access practises which may be a result, especially over time, of commons* training programs, and simultaneously of the openness of the commons* holdings

MEASUREMENT of interaction with Research Objects*,INDICATOR of Engagement* with Research Objects* through the commons* platforms* and interface, how useful the commons* is in presenting the Research Objects*

MEASUREMENT of an aspect of the Research Objects*, INDICATOR of Engagement* with community* such that the holdings of the commons* are of high use and impact, active promotion to and incentivization of commons* community* to engage with the commons, as well as of the Research Objects* themselves.

MEASUREMENT of linking between directly related Research Objects*,INDICATOR the success of the interlinking Research Object* management Service* and provider Engagement* with that service

MEASUREMENT of a Research Object* characteristic (i.e. which repos they are in), INDICATOR of Engagement* with commons-supported research object repos which are FAIR and open, or of Engagement* with commons* community* to user FAIR and open repos even if not provided by the commons