

Guiding Principles on Management of Research Information and Data

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Introduction

Picture this:

- A postdoctoral student in marine biology is hired based on her impressive h-index and citation count;
- A university committee decides which NWO Gravity proposal to submit, based on a predictive analytics tool that utilise global trends in grant awards;
- a government panel for the Groeifonds makes its selection based on metrics provided by a commercial company
- A journal editor publishes controversial research, hoping to raise the impact factor of her journal

But what if not all publishing venues for marine biology are equally well covered by the underlying data sources? And what if the high scores resulted from choosing a large commercial publisher over an academic society to publish the work? Which biases did the algorithms include that were at the basis of the decision of the university committee? Did the metrics of the commercial company provide skewed support for particular thematic areas?

More fundamentally: do such approaches undermine critical values such as academic independence and communality? Can Mertonian norms for science be upheld if leadership decisions and the integrity of the global academic corpus rely on market mechanisms and related opaque technologies?

The corpus of science and scholarship is a common good, and access to it a universal right. As part of this corpus, the infrastructures for research (meta)data, such as mentioned in the examples above, should serve the community and be designed, used, and maintained according to scholarly values.

Such services and infrastructures should be community-owned, transparent, democratic, open, inclusive, and enabling. They should increase opportunity and choice for all stakeholders, rather than close down options. They should allow for inclusive innovation and allow others to build on the work of the academic community; and give others the rights to do so rather than restrict rights

and create scarcity. They should enable expansion of the knowledge commons.

In order for the academic community to uphold scholarly values for (meta)data infrastructures, sustained coordinated strategic action is vital. *A crucial first step is to establish principles that open up research (meta)data and data analytics, and to ensure the research community understands what is at stake and agrees on the principles.* These principles are outlined below. Adoption of these principles is essential if we are to cope with the increasing commercial development across the entire research life cycle without transparency or clarity on whether this supports the interests of the research community.

Secondly, we need policy adoption (by government, funders, academic institutions) for, as well as investments - at scale - in open infrastructures. The development of policy and direction of the necessary investments requires a clear, effective governance uniting the research performing organisations and funders.

The principles as formulated in this document aim to help guide

- I. academic institutions with decisions in information management of research in their organisations;
- II. form a collective frame in which academic institutions jointly formulate policy and steer investments in infrastructure;
- III. provide clear rules of engagement for collaborations involving publicly funded academic data and metadata.

Scope of the Principles

The principles focus on information about research; the metadata that describes research outputs in the broadest sense including publications, software and data sets. This also includes derived or enriched metadata, i.e. metadata that is created by collecting, analysing existing primary metadata (for example: title, abstracts and reference lists). We use the term (meta)data in recognition of the fact that a corpus of metadata is data in itself.

The principles are not about the data objects that are created by researchers as part of their research (commonly known as research data). While the values enshrined in the Mertonian norms should also apply to research data, there are additional challenges in embedding these values that require further thought. Therefore, the research output itself is out of scope of these principles.

A closer look - complimentary services & network effects

Research is increasingly data-driven. This not only holds true for research methods, but also for how research is managed, communicated and evaluated - partly in response to the need to account for public spending. Indeed, the area of *research intelligence* is fuelled by large-scale data collection, aggregation and analysis. It provides new prospects for assisted decision-making on funding opportunities, publishing venues and alternative metrics. Such types of analysis are based on products (such as articles, datasets and software) and by-products (such as metadata about funding and collaborations) of research. Of a total of €17.5 billion annual investment in Dutch research and development, 30% is funded and 34% performed by public institutions. It is

therefore essential that research intelligence undertaken in these institutions is done so in accordance with values central to science and the academy.

Third parties (whether non-commercial or commercially driven) develop new services that add a value within this ecosystem - as they have done in the past e.g. in the print publishing era. Some of these third parties enact gravitational effects on the market - significant additional value is accrued through complimentary services yielding network effects (Knowledge Exchange, 2019). This holds true for publishing platforms and related information services, as well as commercial cloud providers offering services to process and store research data.

The consequences of some of these developments may be positive, resulting in new opportunities for research contributions and information use. On the other hand, as vital functions of the scholarly enterprise become increasingly dependent on such services, it is critical that knowledge institutions carefully consider risks involved in becoming too dependent on specific third parties and their tightly integrated solutions. Equally, such third parties must respect and commit to these academic values if they wish to collaborate.

These guiding principles are intended as clear rules of engagement for the research community in partnering with third parties in developing new infrastructures and services related to research intelligence and scholarly communication. They should provide clarity on what we expect, what we need, and what can and cannot be done with our (meta)data.

Wider context

This document has emerged in a specific context and at a particular moment in time. A context that still reflects mechanisms and options introduced over the past decades. Knowledge institutions should scrutinise this context if they are serious about reasserting core values and about its commitment to open science and scholarship. Of course innovation often comes from commercial parties. Some companies have worked for decades on building tightly integrated infrastructures with smooth interfaces that seemingly offer convenient solutions. But are academics still in the driving seat? Or do we now find ourselves in a situation in which short-termism and availability of commercial software suites leads to choices that are perhaps not aligned with community values?

This document does not exist in a vacuum:

- A. it expands on existing principles ([Principles of Open Scholarship](#); [SPARC](#), [Educopia Values and Principles](#)) in the context of research (meta)data;
- B. it aligns with the commitments made by the Dutch research community to reform research practice and support open science and scholarship. These commitments have already been embedded in a range of initiatives in the NL (e.g. the new [Strategy Evaluation Protocol](#), the Position Paper '[Room for Everyone's Talent](#)' published by VSNU, NFU, KNAW, NWO and ZonMw in 2019 and the [National Plan Open Science Netherlands](#)).

Implementation

A first iteration of these principles has been drafted under time pressure of specifying the Framework Agreement between the Dutch knowledge institutions and Elsevier. This resulted into

[an agreement, signed in May 2020](#) and lasting for five years, it is the first national framework to combine, access to journals, publications in journals and new services related to research meta(data). The principles have partially been embedded in the contract and the related governance. In particular, the governance allows the knowledge institutions to demand openness of new research meta(data) services created by Elsevier.

As well as helping guide the ongoing contract with Elsevier, this updated version of the principles now acts as provides a keystone to support two courses of action

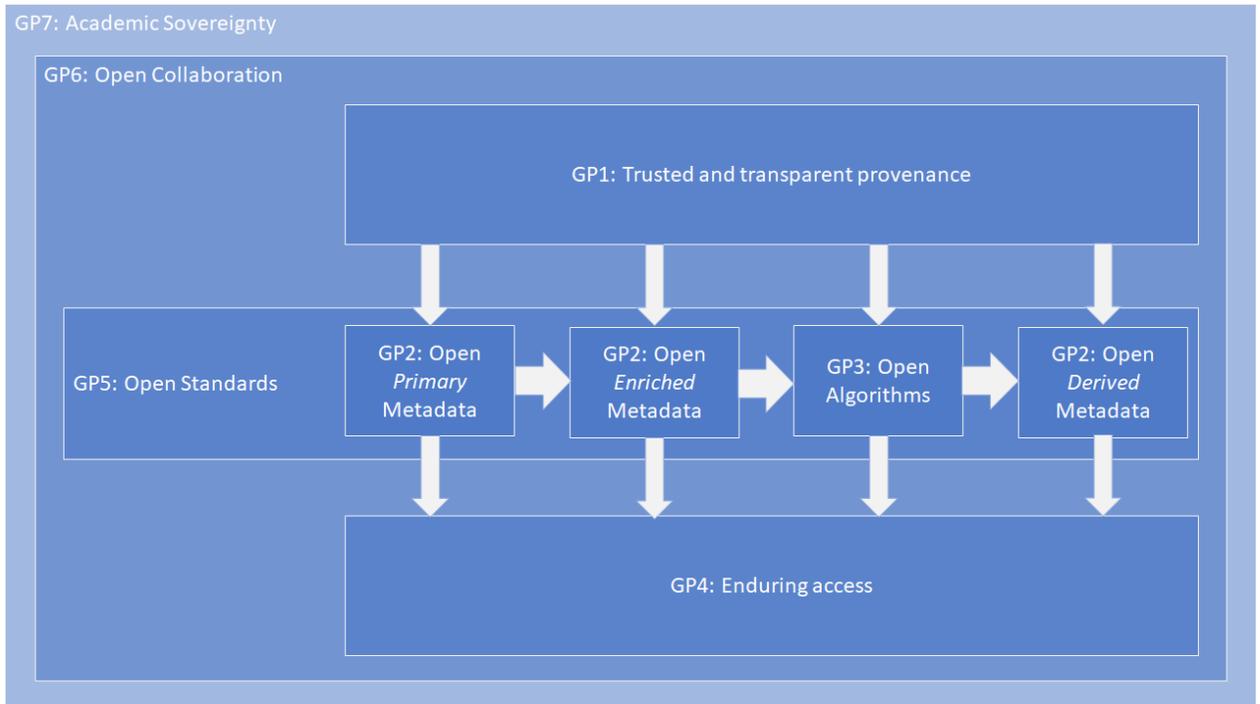
- 1) The first is the possible development of an Open Knowledge Base (OKB). Development of the OKB requires applying to the principles to existing and new research meta(data). Building both a technical solution to manage that metadata and a dedicated governance structure to deal with the specific challenges as outlined in the feasibility study.
- 2) Secondly, it is envisioned that any collaboration involving research (meta)data by Dutch universities is framed by these principles and embedded in the governance. This not only includes contracts with publishers, but also service contracts with cloud providers that process research (meta)data or public private partnerships in which research metadata is created and /or managed.

Agreeing and implementing these principles at an institutional level is not a straightforward task. There are both strategic (in terms of relationship to existing strategies and policies) and practical implications (for instance in current contractual arrangements with third parties) implied by the principles. It is likely to take 3 to 5 years before the principles are properly embedded.

Principles

Definitions:

- **Keywords:** The words "Must", "Must Not", "Required", "Shall", "Shall Not", "Should", "Should Not", "Recommended", "May", And "Optional" in this document are to be interpreted as [described in RFC 2119](#).
- **Research Output:** articles, research data, software, standards, protocols, etc. and related metadata (eg.title, abstract, keywords, references, roles, affiliations, etc)
- **Research Information:** Information about Research Output; this includes the (primary, enriched and derived) metadata.
- **Research Analytics / Intelligence:** Analysis with Research Information.
- **Data and Metadata:** structured information related to research output. This can be descriptive data (= metadata), usage data, APC costs, etc. When the term data is used we mean collections of (meta)data records related to research output.
- **Primary (meta)data:** metadata (eg. title, keywords, abstracts, reference lists, etc) that is born from an intellectual creative process, or facts that are assembled in a distinct structure.
- **Enriched (meta)data:** Data referring to or about Research Output or Primary Metadata that is obtained from an external source and is added or linked to (enriches) the primary records.
- **Algorithm:** a recipe / method / mathematical representation that demonstrates the workings and mathematical integrity behind the (re)creation of derived (meta)data.
- **Derived (meta)data:** (meta)data that is derived from Primary (meta)data, adding value to the prime record or aggregation. (eg. citation graphs, topic clustering, etc.)
- **Knowledge Institutions:** Dutch universities, academic medical centres, academy of arts and sciences and other institutes for fundamental and applied research.
- **Proxy institutions:** Organisations that act on behalf of the Dutch Knowledge Institutions, such as VSNU, NFU, SURF.
- **Third Parties:** not-for-profit organisations, commercial organisations, knowledge institutions, proxy institutions, individuals, etc who contribute and extract primary and derived (meta)data to the common resource pool.
- **Stakeholders:** Knowledge Institutions, Proxy Institutions and Third-parties.
- **Ecosystem:** Scholarly communication and Research Analytics services that are connected in terms of using input data from the output data of another service.



A diagram indicating how the seven principles relate to one another

GP1. Trusted and transparent provenance

Statement

Within any infrastructure or service for research meta(data), the provenance of the metadata, and the related algorithms, must be clear.

Rationale

Research meta(data) underpins decision-making processes in many aspects of university life. To ensure fair and accountable decision-making, the provenance of that scholarly information needs to be public. This provides accountability to all stakeholders affected by such decision-making processes

Implications

Knowledge institutions:

- will not make use of research meta(data) services or infrastructures that do not display clear provenance
- will ensure agreements with Third Parties contain terms that allow for trusted and transparent access to scholarly information:
 - Provenance information should include information on how metadata has been created and modified over time
 - Processes used by the Third Party to create metadata should be replicable by others

Examples

- [Digital Preservation requires an Open Provenance Model](#)
- [Provenance explained by Dutch Linked Data community](#)
- [Wikidata requests references to each data statement made](#)

GP2. Openness of (Meta)data

Statement

Knowledge institutions must release metadata related to research output as openly as possible, ideally as CC0.

Rationale

Open metadata is essential for the smooth flow of scholarly information. Without open metadata, the findability, transparency, and trust of research outputs (articles, research data, software, standards, protocols, etc.) is severely hindered.

Implications

- Knowledge institutions use third-party services to store or process (meta)data related to research output. Within contractual agreements with third parties, the institution, or its proxy must ensure agreements concerning the openness of metadata, including any post-publication enrichments, are put in place.
- By applying CC0, knowledge institutions ensure (meta)data stored in services related to research intelligence and scholarly communication is available for re-usage by others. The curation of the metadata can be outsourced, if the conditions for openness are safeguarded.

Examples

- Metadata on cultural heritage released as CC0 - [Europeana releases 20 million records into the public domain using CC0](#)
- The [Initiative for Open Citations](#) assembles and promote the unrestricted availability of scholarly citation data

GP3. Openness of Algorithms

Statement

Algorithms and other techniques and methodology used to analyse and report on scholarly outputs must be available for public inspection.

Rationale

'Black-box' algorithms inhibit transparent, fair decision-making, for instance in choices relating to scholarly evaluation and recognition. Equally, the deployment of closed algorithms creates dependencies (ie vendor lock-in) on third-party services. Consequently, both the data used and produced and the mathematical rules / recipes of algorithms used, should be open as well.

Implications

- Knowledge institutions contract third-party services to analyse (meta)data related to research output. Within contractual agreements with third parties, the institution, or its proxy (eg. SURF, VSNU, NFU, etc) must ensure agreements concerning the openness of algorithms are put in place.
- All stakeholders should explore best practices and standards for ensuring the results algorithms are reproducible.

Examples

- Within the Elsevier / VSNU Open Science contract for 2020-2024, a framework has been established to guide the open science projects. This framework requires Elsevier to publish the 'recipes' behind any algorithm they make use of (add link when published)

GP4. Enduring access and availability

Statement

Knowledge institutes and third-party services that collect, interact with or use research output in any shape or form must facilitate complete, non-discriminatory and enduring access to primary metadata and enriched metadata without functional, technical, legal or financial limitations.

Rationale

Scholarly communication is constantly producing new outputs and interactions. Research (meta)data are created on an ongoing basis, through manual data entry but also through enrichment via algorithms. Without the open availability of this data, transparency and accountability are impaired.

To support this aim, research data and metadata should be considered as a public resource that can be accessed immediately and is available enduringly. When cancelling a licensed service the knowledge institutions must be allowed to transfer derived data to ensure enduring access to that data and the associated decisions.

Implications

- All third-party services used by knowledge institutes to store or process (meta)data, need to have agreements in place that ensure enduring access and accessibility.
- Access to scholarly output may be separate from access to software or user interfaces.
- Public organisations may collectively provide a platform to bring together the data obtained from multiple third parties

Examples

- The Dutch Digital Cultural Heritage Strategy includes a data repository, a well-documented API that is open for access and options for data export: <https://netwerkdigitaalerfgoed.nl/en/>
- The CLOCKSS initiative is a community governed and supported digital preservation archive for scholarly content : <https://clockss.org/>

GP5. Open Standards & Interoperability

Statement

All stakeholders must agree to work towards common definitions and open standards for exchanging and describing both (meta)data and algorithms.

Rationale

Open Standards are a precondition for realising a trusted, transparent infrastructure for scholarly communications. Because continuous innovation of information services and technology makes for an ever-changing data landscape, Open Standards are essential to ensure the usability of meta(data) now and in the future. Standardised scholarly metadata that is accessible and separated from associated services and tools allows for competition without platform or vendor lock-ins.

Implications

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- An open, inclusive dialogue between all relevant parties is needed to establish open standards, involving both public knowledge institutes as well as any third-party that delivers a service dealing with scholarly output or (meta)data. Decisions shall be documented; specific decision-making processes that are context-dependent will be developed, documented and communicated to all relevant stakeholders;
- Once established, all parties must commit to implement open standards for exchanging, harbouring and describing (meta)data. By engaging in this dialogue, parties must commit themselves to implement agreements and sharing in the costs that invariably come with making and maintaining infrastructures interoperable.
- Knowledge institutions are responsible for adherence to the open standards and definitions and, where needed, make the investments necessary to improve metadata quality up to the required level.

Examples

- The OpenAIRE Guidelines for sharing publications, datasets and CRIS metadata so these can be accessed through the OpenAIRE infrastructure.
<https://guidelines.openaire.eu/en/latest/>
- The Edustandaard initiative describes open standards that allow portability of electronic educational resources and student metrics across teaching platforms:
<https://www.edustandaard.nl/>
- The W3C defines what an Open Standard entails; transparent, relevant, open, impartial, available, maintained.
<https://www.w3.org/2005/09/dd-osd.html>

GP6. Open collaboration with Third parties

Statement

Knowledge institutions and third parties must engage in open collaboration where innovation, competition and public value are recognised and respected cornerstones.

Rationale

Within scholarly communications, there is an increasing tendency of certain third parties to become de facto monopolies. The accumulation of services provides such parties with unassailable advantages in creating value. To avoid further entrenchment of this situation, open collaboration is required. This will restore healthy competition, lower the barrier for entry to newcomers, facilitate network effects between third parties to spark innovation.

Implications

For knowledge institutions:

- Must critically assess their existing services and contracts and identify where open collaboration is possible
- Must work collectively, identifying common interests and thereby enabling open collaboration (e.g., the development of an Open Knowledge Base).
- Must not invest in mega-applications that contain multiple bundled services. Rather create smaller procurement lots and work towards a sustainable overarching technical architecture of services that are connected and communicate with each other based on open standards. This permits multiple third parties to operate in a flexible ecosystem that is adaptable for future change and innovation.
- Create tender conditions in the procurement process that allows smaller third parties and start-ups to be on a level-playing field when offering services to the research analytics and scholarly communication ecosystem.
- Must avoid vendor lock in by defining exit strategies and ensuring the means to enact those strategies are in place

Examples

- [OCRE | Open Clouds for Research Environments](#) is an open collaboration platform, where procurement lots of cloud services are defined, called for tender, and offered in a catalogue.
- [Edustandaard](#): The Edustandaard initiative facilitates open collaboration between public and private parties on conventions on the usability of open standards.

GP7. Academic sovereignty through governance

Statement

Because no single party should have absolute control over the shared ecosystem, a governance structure must exist that permits sharing of information between stakeholders and enables inclusive sustainable decision making.

Rationale

Research meta(data) is a common good. To accommodate sovereignty of this common good, we need to manage information between stakeholders, deal with conflict and steer new developments. The steering and monitoring of evolving principles, standards and collaborations underpinning Dutch scholarly capital must be governed principally by knowledge institutes representing the academic community. The governance will be open to third parties. The model will adopt the subsidiarity principle and include arrangements for collective choice, monitoring and enforcement of agreements and conflict resolution mechanisms.

Implications

- All stakeholders (knowledge institutions, proxy institutions and third-parties) shall be represented in the governance model;
- The governance will be underpinned by a coherent set of guiding principles and decision-making processes with defined roles and responsibilities;
- A clear mandate shall be defined describing mutual rights from, changes to and enforcement of these principles;
- An agreed decision-making model will detail the distribution of votes (e.g. consensus, veto-model or through a qualified majority-rule).
- Public parties from the Dutch academic knowledge institutions maintain the casting vote;
- The governance will include an arbitration agreement to resolve disputes in compliance to principles, agreed upon standards and collaborations.
- Decisions in the collective interest may not always yield a Pareto improvement , and requires the commitment from knowledge institutes to make concessions on individual interest .

Examples

- The ORCID researcher identifier is governed by a Board of representatives from a broad cross-section of stakeholders, the majority of whom are non-profit. The ORCID Board is responsible for ensuring the organization is acting in the best interests of ORCID stakeholders. <https://orcid.org/>
- Edustandaard has a governance structure with different boards and working groups, to preserve the interests of parties involved and to oversee the implementation implications of migration to new versions of a standard. <https://www.edustandaard.nl/onze-werkwijze/>
- Data governance maturity; The Dutch government offers a self-assessment tool to indicate the maturity of the data governance of an organisation or collective. <https://www.digitaleoverheid.nl/document/data-governance-self-assessment-tool/>

Towards an Implementation of guiding principles

Process until March 2021

Knowledge about the output and operation of scientific research is of vital importance to the development of research policy and research enterprise at large. The way in which data related to publications and other scholarly output is handled and analysed has a crucial impact on judgements about research success of scientists, institutions and countries. This (meta)data related to scholarly communications has been managed in discrete, unconnected and sometimes closed, commercial systems. In this context the board of Association of Universities in the Netherlands (VSNU), The Netherlands Federation of University Medical Centres (NFU) and The Dutch Research Council (NWO) installed an expert taskforce on Responsible Management of Research Information and Data.

This Taskforce first developed a set of guiding principles (V1.0, March 2020) and handed them over to the negotiating team with Elsevier. These GP1.0 were implemented in the contract with Elsevier (transformed into collaboration principles) and approved by VSNU, NWO and NFU early May 2020. During the summer of 2020 the Guiding Principles V1.0 were opened for public consultation and revised end 2020/early 2021.

Required decisions for the board of knowledge institutions

In principle three kinds of decisions are needed:

1. Each knowledge institution endorses (or ratifies) the guiding principles and agrees to proactively apply these into their own systems and systems of third parties.
2. Decide on the collective actions securing a sustainable implementation of the guiding principles (related for example towards realisation Open Knowledge Base)
3. As such the knowledge institutions should agree towards implementing the governance structure needed (to further develop Guiding Principles, promote their implementation and monitor their uptake).

These decisions are needed to ensure the next steps in securing the quality of research information and academic sovereignty, to prevent (too) strong vendor lock-in to services of commercial parties and provide conditions for new contract with third parties (as initiated with contract Elsevier), increasing the return on investments in research data, amongst others.

Recommended governance model

The implementation of the Guiding Principles requires collective action from all stakeholders. We consider the research information landscape a common-pool-resource, not because of the rivalrous nature of data-usage, but given the finite available funds to support the infrastructure, which are either tied up in contracts or in development and operational costs (resource dependency).

At present, there is no hierarchical governance model in place to steer a top-down implementation, nor is it deemed feasible to establish such a structure. Instead, we propose a framework of networked governance to further develop Guiding Principles, promote their implementation and monitor their uptake. This framework is based on the principles of a clear separation of powers while limiting the proliferation of new bodies. We propose a governance arrangement that separates between:

1. Governance of principles

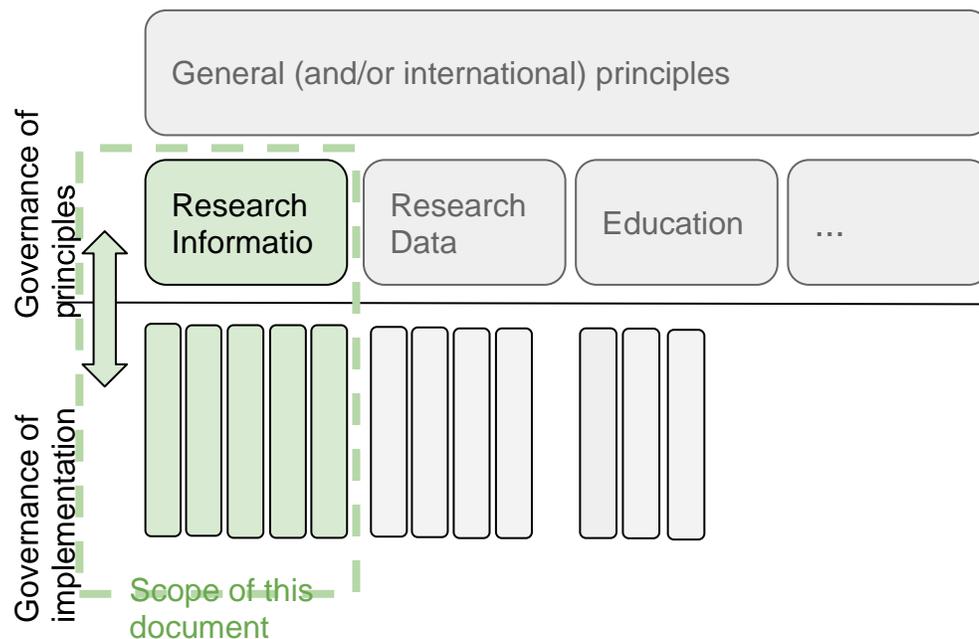
The governance of the principles is concerned with the discourse, advocacy and management of the development of the principles themselves, preferably in an international context. It has characteristics of both a standards body as well as a strategic forum to discuss the effectiveness of the current principles. Through opinions it may give clarity on the interpretation of the principles and publish revisions or annotation where needed. It presents collective choice arrangements for their implementation. It does however not govern the implementation itself.

2. Governance of implementation

This refers to the implementation of principles as a framework directive for contracts and (infrastructure) innovation programmes and projects dealing with research information, e.g. information services, read and publish deals, and CRISs. It is responsible for applying the principles in contract negotiations or infrastructure design, but not is not responsible for the principles and the development thereof.

3. Monitoring of the landscape

Between the governance and implementation of the principles, we propose monitoring the uptake of the principles in the implementation as a critical function to inform decision-making. Furthermore, it is important to scout new developments, to provide independent advice on where principles should apply and how they have been applied. These findings should be evidence-based and reported on a regular basis to the governance of principles.



These functions are layered to the principle of subsidiarity, to allow for effective organisation while minimising central overhead and recognising autonomy of knowledge institutions: individual institutions may have hundreds of small contracts in the research information domain, for which it may not be necessary to be managed collectively. Rather, decisions on scope and applicability are part of the collective choice arrangement informed by monitoring functions, discussed as part of the governance of principles and implemented through a fit-for-purpose organisation. Overtime, the network may evolve and be coalesced with parallel or serial developments in other information domains, e.g. research data, education or clinical data, as well as at the international

level. Especially the latter should be considered critical in order to establish sufficient critical mass in a globalised market of information services.

To support the network interactions for research information, we propose the following initial actions:

I. Set up a development forum

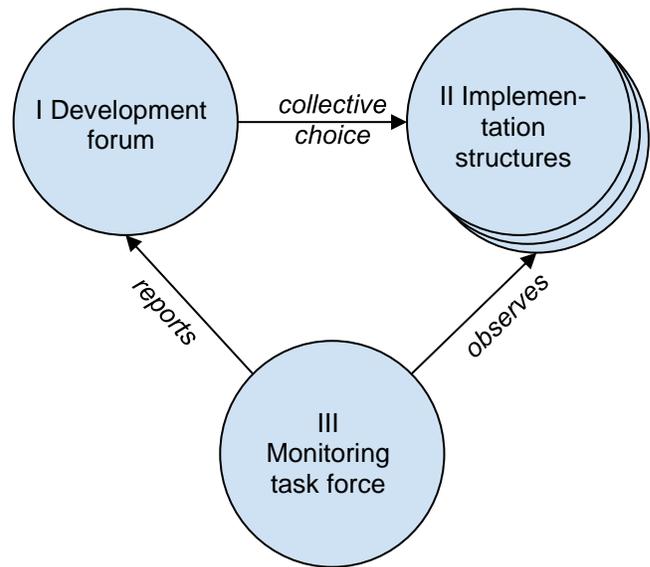
For the scope of research information - encompassing research policy, information policy and financial implications - this forum should at least have representation from the VSNU SOO, SSPG and SBF and the NFU O&O and S&F steering boards.

II. Enumerate implementation structures

These refer to the existing structures, e.g. contract-specific arrangements, programme and project boards overseeing the development of infrastructures and institutional specific bodies. This should be an exhaustive list, in order to provide clarity on scope and applicability of the Guiding Principles.

III. Assign the monitoring task

It is proposed that this is coordinated by the VSNU, further assisted by centres of expertise such as SURF, CWTS etc. Its first task is to take stock and enumerate structures and contracts of which is desirable to apply the principles as a framework directive.



From the perspective of a participatory, inclusive governance, it may be argued that the governance should be open and also include private entities or, indeed, representatives of the market, such is the case in the European Open Science Cloud.

While the proposed forum could indeed evolve to such a state, the inclusion of other interests also makes for a more pluriform constellation and places stronger requirements on effective conflict resolution mechanisms. To simplify dynamics during the initial stages, it is therefore recommended to start with the initial coalition of VSNU, NFU and NWO, and adopt an evolutionary path along the dimensions of other information domains, public sectors, international boundaries, and finally, private sector.

Meanwhile, the existing implementation structures typically already include a form of representation from the supplier side, e.g. the governance of the Elsevier Contract.

	Short term (<6 mths)	Medium term (1-3 yr)	Long term (>3 yr)
I Forum	<p>Ratify/endorse the guiding principles in at least the VSNU, NWO and NFU boards.</p> <p>Establish a new body with representation from the existing VSNU, NWO and NFU boards to manage the principles for the Research Information domain</p> <p>Formulate shared goals and desired level of accountability</p> <p>Connect and align with adjacent national initiatives e.g. NPOS</p>	<p>Communicate opinions on interpretations and publish revisions of the guiding principles</p> <p>Explore an effective way to connect and expand methods for the research information domain to other domains such as research data, education, and clinical data</p> <p>Explore ways to scale up to other sectors, i.e. research institutes and universities of applied sciences.</p> <p>Connect and align international institutions, e.g. EOSC, LERU etc.</p> <p>Present collective choice arrangement on desired scope and applicability in an implementation agenda</p>	<p>Evaluate shared goals and accountability</p> <p>Review effectiveness of governance model</p> <p>Consider the position of private entities and/or market parties</p>
II Implementation structures	<p>Implement in upcoming contracts at institutional level</p> <p>Implement in upcoming contracts at collective level (SURF, UKB publish and read deals, OKB development)</p>	<p>Based on the agenda, review contracts renewals and projects for the adaptation of principles.</p>	
III Monitor	<p>Take stock of projects, contracts and infrastructures that ideally should be governed by the guiding principles.</p>	<p>Evaluate contracts, make suggestions for improvement</p> <p>Annual report to forum on progress of implementation and new developments</p> <p>Public report on progress and practices.</p>	

