NWO PID Strategy

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Content

1   Introduction and Summary

In its strategic plan 2019-2022, "Connecting Science and Society"[1], NWO emphasizes its connecting role: "NWO connects researchers from various disciplines and across the entire knowledge chain and brings researchers and societal partners together". Persistent identifiers (PIDs) also act as connectors – between researchers, institutions, research outputs, and funders. We will show that PIDs hold promise in enabling NWO to deliver on its connecting role in ways that will result in reduced administrative overhead, improved flow of information and opportunities for collaboration.

What are Persistent Identifiers and why are they relevant?

Persistent identifiers can be defined as long-lasting references to a digital resource. They reliably point to and unambiguously and uniquely identify a digital entity. A digital object identifier (DOI) is an example of a PID that is widely used to reference journal articles and data sets. Although PIDs have been in use for decades (e.g. the DOI), they have taken a much more prominent role with increased digitization of research outputs and increased use of digital networks in research practice. In the contemporary scholarly context, PIDs are used to uniquely identify researchers, organizations, research grants and projects, and other contributions such as research software.

Persistent identifiers come with descriptive information (metadata) about the entity that they identify. These metadata can be used to connect PIDs to one another. For example, to link journal articles citing other journal articles, or more interestingly from a funder perspective, to link individual grants to researchers and their employers and to the outputs funded by those grants. At present, making these essential connections relies on manual labor, at great cost in time and effort[2], limiting the possibility to get an enhanced picture of the impact of funded research.

In addition, persistent identifiers are fundamental components of implementing Open Science ambitions. They are a key part of the requirements placed on publishers by Plan S[3] and central to the realization of a FAIR data ecosystem[4]. Indeed, without applying a persistent identifier, data simply can't be made FAIR[5] (*'findable'*).

Scope and purpose of this document

Research funding organisations, including NWO, collect a lot of information about research activities, but it is often difficult to re-use this information for strategic decision making. Challenges in collecting good quality, reusable data are multiple and intertwined. They include researchers failing to register their outputs on funders' systems, as well as name ambiguities of both people and institutions. Together, these information

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[1] NWO stratey 2019-2022 | Connecting Science and Society, edited and published by NWO (2018).

[2] Brown J., Demeranville T., & Meadows A. (2016). Open Access in Context: Connecting Authors, Publications and Workflows Using ORCID Identifiers. *Publications*, 4, 30; doi:10.3390/publications4040030

[3] Principles and Implementation | Plan S

[4] Turning FAIR into reality - European Commission (2018). Final report and action plan from the European Commission expert group on FAIR data.

[5] The FAIR Data Principles | FORCE11

challenges undermine funders' ability to systematically assess the outcomes of funded research projects and the overall performance of funding instruments.

We propose a persistent identifier strategy to improve NWO's capacity for analyzing the impact of research funding. The promise of incorporating PIDs into NWO's information architecture is increased fidelity of research information that leads to long-term improvements in analytical resources with reduced administrative overhead. Increasing the capacity to track research outcomes also enables a feedback loop from which to improve on earlier funding decisions.

A note on 'impact' assessment in relation to PIDs

Popular methods for calculating impact are being scrutinized for misuse and inherent limitations. A central critique of bibliometrics, for example, is the use of impact indicators out of context and apart from expert judgment[1]. This is one of the reasons NWO signed the San Francisco Declaration on Research Assessment (DORA)[2] last year. The meaning of 'impact' is itself an increasingly contested term. In addition to re-positioning traditional quantitative indicators to the role of informing qualitative expert judgment[3] (rather than standing alone), there is interest in other kinds of impact, such as societal impact or impact of increased openness. Nevertheless, whether quantitative or qualitative, research or societal, reliably linking research funding to research outputs is essential for the possibility of assessing project outcomes. Persistent identifiers provide a fundamental infrastructure layer that enables insight into the impact of funded research by increasing the capacity to track outcomes.

What are other funders and key stakeholders doing?

Funders worldwide are increasingly building PIDs into their grant workflows. The primary aim is to improve the quality and the reusability of the information funders collect. But there is also interest in saving researchers time and effort by streamlining the process of gathering that information.

Over the last few years an increasing number of international funders have issued a policy or statement[4] relating to the use of the Open Researcher and Contributor ID (ORCID). ORCID is a globally unique and persistent digital identifier for researchers that automatically and unambiguously links researchers to their outputs. As noted by Meadows and Haak (2018)[5]: "Many researchers share the same or a similar name; they work or publish under different versions of their name; they change their name; and their name may get transliterated." ORCID IDs solve this name ambiguity problem by providing a long lasting identifier that remains the same across changes of name and institutional affiliation.

ORCID IDs can be used across multiple research information systems. "Enter once, re-use often" is ORCID's mantra. For funders, the ultimate goal is "to enable researchers to easily share information about their

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[1] Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., & Rafols, I. (2015). Bibliometrics: The Leiden Manifesto for Research Metrics. *Nature* 520, 429. https://doi.org/10.1038/520429a

[2] San Fransciso Declaration on Research Assessment

[3] For example, see: Wilsdon, J., et al. (2015). The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management. DOI:10.13140/RG.2.1.4929.1363

[4] Funders'ORCID policies

[5] Meadows, A., & Haak, L. (2018). How persistent identifiers can save scientists time. *FEMS Microbiology Letters* Volume 365, Issue 15, fny143. https://doi.org/10.1093/femsle/fny143

activities and affiliations with grant application systems, reducing the data entry burden for them and improving data quality for funders and the broader community."[1]

Wellcome has been collecting ORCID IDs from its applicants since 2015[2] and the Austrian Science Fund (FWF) has mandated the use of ORCID IDs in grant applications since 2016[3]. The Australian Research Council is using ORCID to enable applicants to build their application CVs[4], and the US National Institutes of Health (NIH), to streamline application processes and to track career outcomes of researchers funded through NIH training programs[5].

Research funders are not alone in committing to the use of ORCID IDs in their workflows. In January 2016, eight publishers and scholarly associations signed an open letter committing their organization to requiring ORCID IDs for authors. As of early February 2021, there were 112 signatories to the letter[6]. As a result, researchers are now most likely to encounter ORCID in publishing systems and to register one for themselves when they are asked to include it in new journal submissions.

Researchers are also increasingly encountering ORCID in their university systems. In the Netherlands, SURF facilitates the ORCID-NL consortium, wherein all fourteen research universities and the KNAW (Royal Netherlands Academy of Arts and Sciences) are members[7]. The consortium model[8] provides institutional access to the ORCID database, usually implemented in a local Current Research Information System (CRIS), at a substantially discounted subscription rate. In 2019, the UKB (the Dutch consortium of university libraries and the National Library of The Netherlands) initiated a national campaign to encourage researchers to register an ORCID ID and to promote the use of ORCID[9].

Another important, recent development in the field of persistent identifiers for research has been the emergence of the Crossref Grant ID, which Wellcome piloted in partnership with Crossref and several other research funders, including the NIH and the UK Medical Research Council. In September 2019, Wellcome became the first funder to register IDs for their grant awards with Crossref[10]. Most funders have local, internal grant identifiers, but these are not globally unique. A grant number, without further information and context, can in some cases refer to widely different projects from completely different funders. In the pilot initiated by Crossref and Wellcome, new grants are assigned an open, global, interoperable and unique grant identifier. In the words of Robert Kiley, the Head of Open Research at Wellcome:

"Ultimately we want to get to a situation where every grant has a unique ID, which can then be unambiguously linked to the all outputs – articles, data, code, materials, patents etc. – which arise from it. And, if every funder were to adopt such a system and expose their grant metadata in a consistent, machine-readable way, it would facilitate the development of applications to help funders get a greatly enhanced picture of the global funding landscape, which in turn would inform strategic planning and resource allocation."[11]

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[1] Reports and ORCID Recommendations from ORBIT Funder Working Group, Laure Haak, ORCID, 2019

[2] Open Researcher and Contributor ID (ORCID), Wellcome

[3] FWF mandates ORCID for applications as of 2016, FWF, 26 Nov. 2015

[4] ORCID integration into RMS | Australian Research Council, 12 Sep. 2018

[5] Linking ORCID Identifiers to eRA Profiles to Streamline Application Processes and to Enhance Tracking of Career Outcomes, 5 Aug. 2019

[6] Requiring ORCID in Publication Workflows: Open Letter

[7] ORCID-NL consortium

[8] ORCID Premium consortium

[9] Get recognised. Get your ORCID-iD now! - ORCID-NL - SURF, 2 Dec. 2019

[10] Global grant IDs in Europe PMC, Europe PMC Blog, 4 June 2020

[11] Wellcome explains the benefits of developing an open and and global grant identifier, 16 Feb. 2018

Summary of the recommendations

In making the five recommendations that comprise this PID strategy (see Table 1), we were guided by two questions:

1. What's important for NWO to consider out of the broader PID landscape, in particular the ways in which the data/information position of NWO can be improved ?
2. What PIDs may be important for the broader national and international research landscape and can effectively be pushed by NWO?

NWO works with three fundamental kinds of information that form the basis for most workflows related to funded projects: information about researchers, about organizations, and about grants. Thus we recommend the implementation of three corresponding identifiers into NWO's information architecture (see Recommendations 1 - 3). Implementing these individual PIDs, and making explicit links between them, enables analysis of funded research at many levels of aggregation.

No stakeholder – be it funders, publishers, research performing organisations, or infrastructure providers – is able to cover the entire information spectrum on their own. Given its connecting ('nexus') role and ambition, NWO can play a crucial role in promoting the use of PIDs in the wider national and international research landscape by engaging with key stakeholders. We propose participation both nationally and internationally to help shape the PID ecosystem, within which funders are both beneficiaries and enablers of change (see Recommendations 4 - 5).

Recommendation 1	Implement ORCID ID for researchers into grant application, peer review, and project reporting workflows.
Recommendation 2	Implement Crossref Grant ID in grant application and project reporting workflows.
Recommendation 3	Implement research organization IDs in grant application and project reporting workflows.
Recommendation 4	Contribute to shaping the national PID landscape by participating in the ORCID-NL consortium and in a future PID Advisory Board.
Recommendation 5	Collaborate with other funders in the international PID landscape, for instance within the context of Science Europe.

Table 1. Summary of the recommendations that comprise this PID strategy.

If all the recommendations are adopted, NWO will be entering the PID domain with a cohesive strategy, whereas most other funders are implementing PIDs piecemeal. Such cohesive strategy will help maximise the benefits of implementing PIDs, not just for NWO, but also for other key partners in the national and international landscape. In this sense, the relative delay with which NWO will enter the PID domain can be seen as an advantage, in that it has provided the opportunity to consider PIDs in a more holistic way.

2   Persistent Identifiers, Fundamental Infrastructure

NWO works with three fundamental kinds of information that form the basis for most workflows related to funded projects: information about researchers, about organizations, and about grants. In this section, we recommend the implementation of three corresponding identifiers into NWO's information architecture. For each recommendation, we ground the rationale on the basis of NWO research initiatives and funding operations (See Annex 1), and the potential for improved capacity for assessment of funding outcomes.

Recommendation 1: ORCID ID for researchers

Implement ORCID into grant application, peer review, and project reporting workflows.

The first priority is ORCID, as it would provide the most immediate benefit. Researchers are central to NWO's interests and operations. Researchers apply for funding, their proposals are assessed by evaluation committees, and upon award, NWO enters a long-term relationship with each funded researcher. ORCID IDs unambiguously and uniquely identify researchers involved in the NWO (primary) grant process, and one of the advantages is that the researchers themselves control how information is added to the record. Researchers update their ORCID record directly or authorize trusted third parties – such as employers, repositories, or publishers – to provide automated updates. In any event, NWO retains ownership of its business information.

The ORCID ID, a digital identifier for researchers, is accompanied by an editable ORCID record that has the appearance and functionality of a CV webpage. Researchers can update their ORCID records with employment history, research outputs, and awarded research grants. Researchers can also authorize trusted third parties to update the ORCID record, which typically involves automated processes. For example, an employer can assert affiliation information to the ORCID record via their local CRIS (see Figure 1). Crossref and Datacite, among others, can be authorized to 'auto-update' new publications or deposited datasets. And funders can assert a grant award to the recipient's ORCID Record (see Recommendation 2). In this way, the ORCID ID contains metadata that describes relationships between the researcher and their outputs (works), affiliations, and awards.
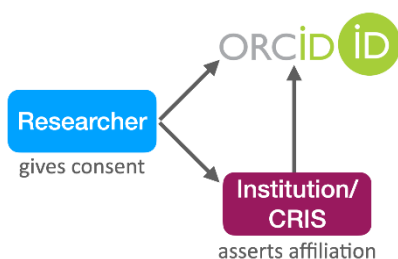

Figure 1. This diagram illustrates how an employer can assert affiliation information to the ORCID record via their local CRIS.

The ORCID ID can provide a good first step in reducing the burden for researchers when completing a grant application and would reduce administrative burden at NWO, for the often labor-intensive need to deduplicate records and manually 'correct' data. This problem arises e.g. when exchanging data with universities, when exchanging data between internal information systems at NWO, or when maintaining the frequency that a researcher may submit an application (in cases where a maximum number of applications needs to be enforced).

Implementing ORCIDs in funding workflows would likely need to be assessed among other NWO considerations, such as platform capabilities, which takes time and effort. However, there is sufficient benefit in requesting applicants' ORCID IDs in the grant application process or end of project report – even without yet adding a datafield to the ISAAC platform (e.g. by creating an ORCID field in NWO's .docx application templates or end of project report forms). ORCIDs can then be used sooner as a 'data key' when exchanging project information with university CRISs. It is worth noting that funding applicants have already been asking NWO to accept their ORCID in funding applications.

NWO Data Exchange Pilot

Researchers funded by NWO are required to register their publication output in NWO's grant management system ISAAC. However, there are concerns about the quality and completeness of this data, as researchers do not always comply with the registration requirement. Even when they do, the information is provided through manual entry in NWO-specific databases, which adds the risk of it being inaccurate, incomplete, or out of date. This makes it very difficult to make use of the data for analyses. Indeed, a recent study, looking at the extent to which research funded by NWO is made openly accessible, had to rely on data from Web of Science[1]. This study recommended NWO to consider adopting grant IDs such as the Crossref Grant ID.

To improve its publication output registration data, NWO is running a data exchange pilot with three universities. The idea is to streamline the process of obtaining information about publications resulting from NWO funded projects by automatically harvesting it from the information systems of the universities. One of the most important challenges in this pilot has been establishing a link between project numbers and their publication outputs, partly because universities in the pilot keep these two pieces of information in two separate systems and there is no link between the two. The use of persistent identifiers, particularly the adoption of ORCID and the Crossref Grant ID, would facilitate this exchange of information and would make it easier to keep track of the publications and/or other outputs funded by NWO.

Recommendation 2: Crossref Grant ID for NWO awards

Implement Grant IDs in grant application and project reporting workflows.

Incorporating the Grant ID serves two strategic purposes for NWO. First, it increases NWO's control of, and long-term access to, information about funded projects. And second, it facilitates the propagation of automated linking of information about funded projects, especially by third party stakeholders.

In the first instance, NWO benefits from their own efforts in creating and disseminating funding information to relevant stakeholders. In the Crossref grants system, each grant gets assigned a DOI. Information (metadata) about the funded project is included through the normal course of registering a Grant ID with Crossref. Information such as the research topic, lead investigator (and respective ORCID ID), award dates, and funding type and amount are included in the metadata[2]. Disseminating this specific project information via the Grant ID thereby seeds the future potential to enact routine information exchanges. For example, linking the award to the investigator in this way increases the likelihood of successful information exchanges between NWO and institutional databases, such as university CRISs. While the record of the relationship between the researcher and the award will remain in the Crossref database, the university CRIS at present will generally have better information about project outcomes.

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[1] NWO and ZonMw, Heading for 100% Open access: on the right track, but further steps are needed, 2 Jun. 2020

[2] For the full list of metadata for Crossref grant IDs, see: https://github.com/CrossRef/grantID-schema

As collecting project information from a variety of university CRISs is an important but challenging ambition, adding the investigator's ORCID in the Grant ID metadata increases findability of project outputs. For example, by querying a database for ORCID ID + Grant ID, the ORCID lD helps find the person and the Grant ID helps locate relevant activities and outputs within that person's oeuvre. This serves the initial interest in assessing a funded project. But it also creates the possibility of systematically collecting and saving research outcomes for all NWO funded projects. Thus, having used the ORCID ID and Grant ID to collect project information, locally storing this information (in a database), enables analysis across funded projects.

Long-term retention of project information enables analysis of project outcomes at different levels of aggregation while also insulating NWO from dependence on third party data services. Holding project information data does not preclude the use of third parties to conduct the analysis. For example, NWO would supply the data to the third party. In any event, a local database for project information would increase NWO's independence in choosing who to enlist for analytics services and would potentially increase the reliability of analyses from different third parties (by using the same core dataset).

In the second instance, NWO benefits from enabling trusted third parties (such as universities and publishers) to routinely enrich information about funded projects. For example, once funding is awarded, NWO can assert the Grant ID to the recipient's ORCID record. Establishing a relationship between a researcher and an award, in the researcher's ORCID record, enables other authorized third parties to act on this information.

An illustrative example is the automated placement of funding information in journal publications, which addresses a well known problem with funding acknowledgements[1]. By asserting the Grant ID to the investigator's ORCID early in the manuscript submission and review process, publishers can detect the Grant ID/ORCID relationship, see that it's validated by the funder, and automatically add the Grant ID to the publication metadata. It is also possible to include specific acknowledgement text in the metadata, whereby publishers could automatically add the prewritten acknowledgement to articles associated with the Grant ID. This has the potential to automate funding acknowledgments in research publications.

Figure 2. This diagram illustrates two possible linking actions initiated by NWO. When registering the Grant ID (top arrow), NWO adds the investigator's ORCID ID to the Grant ID metadata. This links the ORCID to the Grant ID, which can facilitate more reliable information exchange with university CRISs. Using ORCID's delegated authority technology, NWO can also assert the Grant ID to the investigator's ORCID record. This links the Grant ID to the ORCID records, which enables third parties to act on this information. A key point here is that NWO is noted as the source, thereby establishing a 'validated' link between the award and the recipient.

More generally, assigning an open, global, interoperable and unique grant identifier enables not only the ability to create enduring links between the award and project outcomes (see Figure 2), but in doing so it also enables longer term assessment of funding priorities. NWO is the producer and only authoritative source for information about their grants. Only NWO is capable of establishing this information and of contributing to the national and international research information landscape. To track the relation between funding and output, the Grant ID is the central node that pulls it all together.

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[1] See e.g. Van Honk, J., C. Calero-Medina, & R. Costas. (2016). Funding Acknowledgements in the Web of Science: Inconsistencies in Data Collection and Standardization of Funding Organizations. In 21st International Conference on Science and Technology Indicators - STI 2016. Book of Proceedings, 90–96, DOI: 10.4995/STI2016.2016.4543

Following are a few practical examples of a global Grant ID serving in this central role: (a) the exchange of project information between funder, university, publisher, and back to funder, (b) analysis based on award dates or the involvement of specific investigators, (c) analysing collaborations associated with funded research at different levels, such as researchers, institutions, and countries, and (d) analysis of organizations and authors in relation to publication behavior (e.g. to investigate local research cultures in relation to open access).

Recommendation 3: Organization IDs

Implement research organization IDs in grant application and project reporting workflows.

As discussed, the combination of ORCID ID and Grant ID provides considerable potential for finding and assessing the outcomes of funded research. And while the capacity of the ORCID/Grant ID duo can be used to capture additional information, review of NWO policies and priorities suggests that the addition of research organization IDs would extend the analytical reach across a wider range of NWO interests.

For example, clear identification of a funded researcher's affiliation(s), during the defined award dates, would facilitate Plan S administration and APC payments more generally. It would also improve the visibility of open access publications deposited in institutional repositories and project related research information captured by local CRISs (see Figure 3). Incorporating research organization IDs in NWO grant application and award workflows – in addition to ORCID and Grant IDs – further increases visibility of collaboration networks directly or indirectly related to the funded research.

Figure 3. Incorporating researcher organization IDs, such as ROR, in NWO grant application and award workflows – in addition to ORCID and Grant IDs – would facilitate data exchange with institutional CRIS.

While the new Research Organization Registry (RoR) is the long-anticipated not-for-profit PID registry for research organizations, they are presently running a prototype system while building up staff, sorting out a suitable business model, and mobilizing a community-based governance framework. We use the term research organization IDs here to represent all identifiers presently in use for research organizations The RoR system operates on the basis of GRiD data, such that RoR and GRiD systems presently have one-to-one correspondence of top-level organization IDs[1]. Other relevant organization IDs could include Ringgold, ISNI, and Crossref Funder registry. Regarding the latter, Crossref has indicated they will in the future convert Funder IDs to RoRs at an appropriate time. Both Funder ID and RoR are registered as DOIs.

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[1] While RoR is focused on the specific use case of top-level organizations, many have voiced interest in organization identifiers for sub-units within institutional hierarchies (faculties, departments, institutes). An international collaboration (The Path to Departmental level PIDs) is presently working to extend the RoR scheme to include departmental level organizations. Although an external project among two US universities, a European funder (SNSF), and the ID Fuse organization based in the Netherlands, the project is coordinating with RoR and plans to develop a tool to integrate hierarchical relationships in the existing RoR schema.

At present, many early adopters are implementing RoR into their internal workflows, often as a pilot project. Prominent examples include Crossref, ORCID, Datacite and DMPonline[1]. It is also worth noting that NWO[2] and all dutch universities have RoR IDs. At this point, it would be sensible to recommend to implement RoR in NWO grant application and project reporting workflows.

A note on the governance of PID infrastructures

As community governed organizations, ORCID, Crossref, and RoR[3] generally align with principles that demonstrate increased attention to transparency, trustworthiness, and sustainability as not-for-profit organizations. Several governance features set these PID systems apart from commercial suppliers. For example, they serve defined communities, they are funded by membership fees, and their governance boards are elected by their members. The recommended PID systems tend to concern themselves with long term sustainability, including transition plans in the event that the PID system needs to shut down. ORCID in particular has structured their organization as "exclusively charitable, scientific, literary and educationational"[4], and enforces a governance structure that defends against potential commercial takeover.

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[1] RoR integrations: https://ror.org/integrations/ (DMPonline is the European partner of DMPtool.)

[2] RoR for NWO: https://ror.org/search?query=NWO

[3] The RoR governance plan is consistent with the community based approach, but is still in development

[4] ORCID Certificate of Incorporation

3 Funders as Stakeholders and Influential Actors

Making research information useful and meaningful across the often global platforms and services that enable modern digital research, including the systems which underpin the provision and management of the PIDs we recommend, is a collective endeavour. These systems operate across communities and rely on common standards (for metadata, for example), which demand collaboration between stakeholders in the PID domain[1]. No stakeholder – be it funders, publishers, research performing organisations, or infrastructure providers – is able to cover the entire information spectrum on their own.

In section 2, we made recommendations on how NWO can benefit from PIDs for its own primary procedures and the tracking of the research it funds. While NWO can play a crucial role in promoting the use of PIDs in the wider national and international research landscape[2], there is also much to gain by engaging with key stakeholders. Participating at the national level provides a fitting venue for coordinating the NWO PID strategy with relevant research performing organizations. Engaging internationally with other research funders provides a forum for sharing and learning, while also remaining current in a rapidly evolving PID domain. With this in mind, we propose participating both nationally and internationally to help shape the PID ecosystem, within which funders are both beneficiaries and enablers of change.

Recommendation 4: Contribute to shaping the national PID landscape

Participate in the ORCID-NL consortium and in a future PID advisory board.

We suggest that NWO becomes a member of the ORCID-NL consortium, wherein all fourteen research universities and the KNAW are members. Organized as a working group, its aims are to provide a venue for raising issues and sharing solutions about implementing ORCID and about research information more broadly. NWO's membership would be welcomed by the current members, as this would help establish ORCID more fully in the Netherlands. It would also provide an opportunity to coordinate information exchange with the universities and a platform for the exchange of experience. This would be particularly productive for NWO should it decide to implement PID's as proposed in this strategy, as there is considerable implementation and operational experience among ORCID-NL consortium members.

At the time of writing, SURF is working on a project plan to facilitate coordination of a national PID strategy. Although there are a variety of PID initiatives throughout the Netherlands, there is at present very little coordination among them. A key aspect of the SURF project is to establish a small PID advisory board to provide strategic guidance on the contours of a national PID roadmap. This approach will broaden the scope to consider three interrelated loci of PID activity: (a) existing PID system use cases in the Netherlands (e.g. EPIC, DANS Easy, and the Dutch Digital Heritage Network), (b) implications of a Dutch Open Knowledge Base (OKB), and (c) international developments associated with e.g. EOSC and OPENAire.

More generally, the aim of the PID advisory board will be to maintain a current account of Dutch PID priorities, focused on PID initiatives in the Netherlands, while remaining agile in the face of national and international developments. Participation in the PID advisory board would thus enable NWO to stay informed about a dynamic and evolving domain while developing and executing the NWO PID strategy.

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[1] Developing a persistent identifier roadmap for open access to UK research, Report by Josh Brown. Submitted to Jisc July 2019, revised April 2020.

[2] Future of Scholarly Publishing and Scholarly Communication, Report of the Expert Group to the European Commission, EC 2019

It would also serve both communication and coordination purposes. It's expected the other board members will represent key partners associated with NWO-funded research. In this context, NWO brings a unique perspective to the table. Not just as a research funder. Rather, as a stakeholder with a clear use case that covers the full life cycle of well-defined, temporarily and financially bounded research projects. Bringing this clarity of purpose, from which to advance the state of the art, to the advisory board would help to overcome ambiguity in the midst of too many options and among less well-defined use cases. While the NWO PID strategy will likely take years to implement, it would already suggest a way forward for the broader research community.

Recommendation 5: Collaborate with other funders in the international PID landscape

Participate for instance within the context of Science Europe.

A well-coordinated national strategy will help maximise the benefits of implementing PIDs, not just for NWO, but also for other key partners in the national landscape. However, given the international nature of research and associated infrastructures, it is important to ensure that national efforts are also well coordinated internationally.

NWO is a member of Science Europe and has had great success in helping bring coordination and alignment around other topics of common interest to Science Europe's member organizations. An example of this is "The International Alignment of Research Data Management"[1] that NWO championed and coordinated. NWO could propose to the Science Europe Governing Board to initiate an (ad hoc) Working Group on PIDs within Science Europe to collectively address common challenges (e.g. PID integration in rigid grant management systems) and ambitions (e.g. use of PIDs to facilitate Open Science). Another forum for international alignment of PID strategies is the Crossref Funder Advisory group to which NWO was already invited.

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[1] Practical Guide to the International Alignment of Research Data Management, Science Europe, November 2018

4   Concluding Remarks

Implementing the three recommended PIDs would provide NWO with an information backbone for substantially increased capacity to simplify the grant application process, monitor funded projects, and analyze funded research at many levels of aggregation. Implementing the individual PIDs, and making explicit links between them, enables analysis of individual projects, individual investigators, funded projects associated with a particular university, and at the national level within different time periods. Importantly, this capacity also enables analysis on the basis of specific funding instruments, thereby providing feedback on the effects of funding ambitions.

On the importance of linking PIDs

The proposed PID strategy is focused on NWO's fundamental information entities (researchers, organizations, and grants). Persistent identifiers used to identify digital objects (e.g. publications, datasets, software) are also important for NWO if the goal is to track project outcomes. At the appropriate time, a project ID such as the RAiD[1] is a promising approach for organizing project outcomes, as it provides a digital method of collecting all project information (including all the outputs) in one place. This sets up the possibility of providing explicit links among project related PIDs because all project related information associated with a RAiD is by association interlinked. This interlinking practice is also aligned with the proposed Dutch Open Knowledge Base (OKB)[2].

Implications for implementation

A detailed discussion of strategies for implementation is out of our scope. However, it would be remiss to not mention it. Implementation can take many forms depending on NWO's priorities around in-house versus external operations and local platforms versus third party services. Engagement with national and international stakeholders, as recommended in this strategy, will undoubtedly help inform implementation choices. However, we would say that at the very least, NWO needs to have a grant management system that has the ability to interact with the three recommended PID systems via an Application Program Interface (API). The primary activities in this regard include import of PIDs associated with project outputs, receiving updates to information in existing PIDs, and, in the case of Grant ID, registration of the award with a DOI.

Cohesive strategy vs piecemeal

If all the recommendations are adopted, NWO will be entering the PID domain with a cohesive strategy, whereas most other funders are implementing PIDs piecemeal. NWO has not been in a position so far to implement PIDs, partly because the ISAAC platform, NWO's grant management system, is not very flexible. In a positive sense, this delay provided the opportunity to consider PIDs in a more holistic way. The PID strategy as laid out in this document would put NWO in a leading position to help shape the PID ecosystem both nationally and internationally. NWO would also be in a position to benefit from several emerging initiatives that use PIDs (see Annex 2) and turn its relatively late entrance into the PID domain into an advantage.

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[1] Research Activity Identifier

[2] What is an Open Knowledge Base anyway?, 29 May 2020. See also https://docs.google.com/document/d/1TBhmPvUVWANqK3QIat-nm-rLuuqxlckvn5zcCDizXso/edit#.

5   Annexes

Annex 1. Consulted NWO policies, initiatives, and ambition

Open science: https://www.nwo.nl/en/open-science
International collaboration: https://www.nwo.nl/en/international-collaboration
Measures to reduce application pressure: https://www.nwo.nl/en/measures-reduce-application-pressure
Knowledge Utilization: https://www.nwo.nl/en/knowledge-utilisation
New approach to recognising and rewarding academics: https://www.nwo.nl/en/news/knowledge-sector-takes-major-step-forward-new-approach-recognising-and-rewarding-academics
Scientific Integrity: https://www.nwo.nl/en/scientific-integrity

How the PID strategy relates to relevant NWO's interests, policies and operations:

- Increased openness of funding information and of the funded project.
- Visibility of research data in cases where data is not (or not yet) shareable. The ID for a dataset can be linked to the project even when the dataset is not open. A description of the dataset, when privacy or licensing issues prevent access, would make the project record more complete.
- Monitoring Open Access status of publication (Green, Gold, etc.)
- Improved quality and consistency of funding acknowledgements in published works (articles, data, software, etc.)
- NWO Plan S policy / compliance: operational aspects will likely be facilitated by universities: NWO guidance on PlanS (https://www.nwo.nl/en/implementation-guidelines-plan-s).
- A grantee's ORCID ID can serve as the 'data key' for (meta)data exchange with university CRISs.
- Analysis of international collaboration is improved if RoRs are included in bibliographic records.
- Increased automation in preparing grant application reduces application pressure.
- Increased accuracy when importing data from ORCID API (instead of manual typing).
- Facilitates GDPR compliance (researchers explicitly consent to sharing ORCID record).
- Name disambiguation (of persons and organizations).
- Facilitates scientific integrity, e.g. increased transparency and especially related to enabling replicability.
- Impact assessment, scientific, societal, openness, etc.
- Applicants must be affiliated with an NWO-approved knowledge institution (universities, institutes, etc.): for example, see the full list in the Veni 2020 call for proposals (pdf).

Annex 2. Emerging initiatives that use PIDs

PID implementation enables NWO to take advantage of the following emerging new initiatives.

1. **Recognizing and rewarding open science**: The Openness Profile is a portfolio approach for organizing and presenting contributions to open scholarship, which is linked to and embedded in one's ORCID record.
2. **Infra ID**: The SURF infrastructure ID concept uses three linked IDs: ORCID, Crossref's Grant ID, and ARDC's Research Activity ID (RAiD)." *In this approach, we leverage the unique features of each of these three ID systems, and show how they interact to provide a flexible, scalable solution for Dutch national supercomputer resources.*"
3. **Machine actionable DMPs**, in the horizon for DMPonline. Registering DOIs for public DMPs is on the development roadmap for DMPonline for Winter 2020/1 (https://github.com/DMPRoadmap/roadmap/wiki/Development-roadmap).
4. **ORCID Reviewer Recognition:** There is increased recognition of the work of peer review. ORCID reviewer recognition, implemented by e.g. UKRI, provides reviewers with an option to get formal recognition for their review contribution displayed in their ORCID profiles.
5. **PID Graph, Datacite's new PID mapping platform**: Still in early prototype phase, the PID Graph queries large PID databases, such as Crossref (publications), Datacite (datasets), and ORCID (researchers) to establish relationships among these entities. The GraphQL queries return a visualization, which makes it easier to explore complex relationships. Based on available PIDs, test cases include researcher profiles, co-author graphs, or a variety of citation graphs.
   - https://blog.datacite.org/introducing-the-pid-graph/
   - https://blog.datacite.org/powering-the-pid-graph/