# Efficiency and insight

## A cost-benefit analysis for a central service to support persistent identifier implementation in Ireland

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# Executive Summary

Persistent identifiers (PIDs) are foundational elements of research infrastructure. As well as uniquely identifying people (researchers), places (research organisations and institutions), and things (research outputs, grants, etc.), they also enable reliable connections between these entities. They make the research process more efficient and transparent, they increase the discoverability and reach of the research itself, and they support information exchange between organisations, across sectors, and internationally.

Widespread adoption of PIDs benefits both researchers and organisations, including through: cost savings (time and money); support for Open Research and research integrity; improved understanding of the research landscape; better management of research data; evidence and analysis of research impact; competitive advantages for institutions through improved benchmarking and strategic insights; and more.

PIDs are a critical component of the Irish National Action Plan for Open Research, which includes four named priority PIDs: DOIs, ORCIDs, RAiDs, and ROR identifiers. A national PID strategy for Ireland is therefore being developed and, as part of this, MoreBrains Cooperative was commissioned by NORF to develop a national roadmap for PID adoption.

The roadmap includes a cost-benefit analysis, developed in consultation with NORF and a wider PID Task Force, and conducted by MoreBrains. It is based on our established methodology and estimates the time and financial savings that could be generated in the Irish research community by automatically re-using the information associated with PIDs in common research processes and systems.

The creation of a central support service comprising three full-time equivalent staff, would accelerate PID implementations and adoption, resulting in an earlier and higher return on investment. This proposed service would support 25 institutions, including 16 publicly funded higher education institutions (HEIs) along with a number of other institutions and bodies that receive exchequer funding in the Republic of Ireland.

A conservative estimate of the potential savings from an 85% PID adoption level after five years (feasible if the support service is established) equates to more than 4,000 days of staff time each year, equivalent to nearly €1.8M. This would more than cover the costs of both implementing the four priority PIDs at all of the supported institutions as well as the central support service. Financial breakeven would be achieved in under three years, and a total five-year projected financial benefit to the nation of over €1.6M.

# List of Acronyms

| | |
|---|---|
| **AAF** | Australian Access Federation |
| **ARC** | Australian Research Council |
| **ARDC** | Australian Research Data Commons |
| **APC** | Article Processing Charge |
| **CRIS** | Current Research Information Systems |
| **DMP** | Data Management Plan |
| **DOI** | Digital Object Identifier |
| **EU** | European Union |
| **FAIR** | Findable, Accessible, Interoperable and Reusable |
| **FTE** | Full-Time Equivalent |
| **GBR** | Great Britain |
| **HEI** | Higher Education Institution |
| **IRL** | Ireland |
| **JISC** | Joint Information Systems Committee |
| **MP** | Member of Parliament |
| **NORF** | Ireland's National Open Research Forum |
| **NWO** | Nederlandse Organisatie voor Wetenschappelijk Onderzoek [Dutch national research funder] |
| **OA** | Open Access |
| **OECD** | Organisation for Economic Cooperation and Development |
| **ORCID** | Open Researcher and Contributor ID |
| **PID** | Persistent Identifier |
| **RAiD** | Research Activity Identifier |
| **RDA** | Research Data Alliance |
| **ROR** | Research Organization Registry |
| **RPO** | Research Performing Organisation |
| **TD** | Teachta Dála [Deputy to the Dáil] |

# 1 Introduction

A persistent identifier (PID) is both a unique label for, and a long-lasting link to, a person (e.g., a researcher), a place (e.g., an organisation), or a thing (e.g., a grant or a research output). PIDs are associated with additional descriptive information known as metadata, which can point directly to online resources, including PIDs for other entities[1], If widely adopted, PIDs have the potential to help make the entire research lifecycle more efficient and effective, benefitting researchers and research organisations alike[2].

Like research, most PIDs operate globally, but (also like research) are often managed at the national level, for example, through national consortia[3]. In recent years, momentum has been growing for national-level strategies to ensure that PIDs are used effectively, equitably, and for the benefit of all the nation's researchers. Countries in the Americas, Asia Pacific, and Europe are at various stages of developing and implementing national PID strategies[4]. Many, like Ireland, have already negotiated national access to one or more PID systems via consortia, so they have direct experience of the benefits of expanded PID adoption for their researchers and research organisations.

In a PID-optimised world, metadata about researchers, their organisations, and their outputs would be captured as early as possible and would then flow seamlessly between the systems used throughout the research ecosystem, minimising the manual entry of information and maximising the opportunities for it to be reused[5]. This results in a number of benefits, including cost savings (time and money); support for Open Research and research integrity; improved understanding of the research landscape; better management of research data; evidence and analysis of research impact; and more. However, while PIDs and their metadata are already being used in many Irish research organisations, they are not yet ubiquitous and have not been adopted or implemented consistently (see section 3.2). Their full benefits are, therefore, yet to be realised.

Responses to a community survey (section 3.2) show that barriers to PID implementations include the costs of the integration of PIDs into local systems, the lack of technical capacity and knowledge to deliver those implementations, and a lack of senior leadership buy-in to unlock the investments needed. Staff at the existing Irish PID consortia are already fully occupied in providing support for their members. After extensive discussions with the National Open Research Forum (NORF) and a PID Task Force of key stakeholder representatives, it was agreed that the benefits of PID adoption in Ireland should be set against the costs of providing a central PID support service. This is initially intended to last for five years and would comprise three full-time equivalent staff: a coordinator, a technical community manager, and a community and outreach manager, as described in section 4.3 below.

**A central PID support service to lower the costs of PID implementation and increase technical capacity across organisations, in order to accelerate the realisation of the benefits of PIDs and offer a faster 'break even' on Ireland's investment in PID adoption and community support.**

Two recent cost-benefit analyses for Australia[6] and the UK[7] show that the widespread use (>80% adoption) of five key PIDs (for researchers, grants, outputs, organisations, and projects) will deliver significant benefits by enabling the automation of metadata entry in research systems. These savings are associated solely with the re-entry of grant, project, and article metadata. There will be significant additional benefits, due to improved automation and more timely and complete availability of information. Such aggregation and analysis are increasingly important, for example, for monitoring compliance with current or future Open Access mandates[8], [9] ,or to inform strategic policy making at the institutional or national levels[10].

As part of a wider initiative to design and launch a national PID strategy for Ireland[11], MoreBrains Cooperative was commissioned by NORF to develop a cost-benefit analysis which would demonstrate the specifc benefits and savings to Irish researchers and organisations.. This report presents the detailed findings of this analysis, setting out the time and consequent financial savings that could be generated by automatically re-using the information associated with PIDs in common research processes and systems.

Based on our discussions with key stakeholders across the global research community — funders, institutions, publishers, and more — we have identified several problems that could be addressed by the widespread adoption and implementation of PIDs at the national level.

They go beyond the readily quantifiable benefits used in the analysis, and include:

- **Researchers spend too much time on administrative tasks and too little on their research:** Estimates suggest that researchers can spend as little as 17% of their time doing research[12]. In our analysis, we found that a total of 4,054 person days are wasted every year repeatedly entering the same information into various university computer systems. By enabling data to be entered once and reused across multiple systems, PIDs reduce the administrative burden on researchers, freeing up more of their time for actual research as well as minimising the risk of errors.
- **"You can't be FAIR without PIDs**": PIDs are integral to the FAIR principles[13] which, in turn, are an essential component of Open Research, underpinning the National Action Plan for Open Research 2022-2030[14] and the national Open Data Strategy[15]. National PID adoption will contribute to making Irish research data Findable, Accessible, Interoperable, and Reusable.
- **The research evaluation process, for grants and for recruitment/promotion, is a huge administrative burden**: Data gathered from multiple sources and manually re-entered several times is often rife with errors or incomplete. PIDs can help, for example, by storing and maintaining the data used for evaluation in ORCID records, from where it can be pulled directly when needed, reducing the need for manual data entry.

- **Conducting research analysis — especially over time — is difficult**: Keeping track of alumni and awardees' career paths, outputs, and collaborations is currently very challenging for institutions, funders, and other research organisations. Widespread PID adoption will facilitate this, by making reliable and persistent connections between researchers, their organisations, grants, and outputs — past, present, and future.Understanding policy impacts: Demonstrating that the requirements of policies, such as those around data management plans or Open Research, have been met can be time-consuming and costly. PIDs can help by providing a reliable link to information about outputs and activities, including licensing, related documents, policies, and funding acknowledgements.
- **Strategic policy insight is often challenging:** Understanding the effectiveness of policies and programmes is currently time-consuming and expensive. More timely, accurate, and open information about research inputs, activities, outcomes, and impact enables better policy-making and evaluation of policy effectiveness.

Our cost-benefit analysis for Ireland sets the cost of national PID implementation, including the option of creating and operating a centralised, time-limited PID support team, against the quantifiable savings in time and money that could be generated by automated metadata re-use. It shows that the return on this investment would be significant, even without taking into account the additional opportunities to increase return on research investment and thereby accelerate innovation[16], and to make critical policy agendas more effective and achievable.

# 2 Context

PIDs are a fundamental component of digital research. They enable insights and support the discovery of resources in a complex and global-scale research information landscape. PIDs enable the identification, description, and discovery of research inputs (grants, equipment), activities (projects, data collection), actors (researchers, technicians), and outputs (articles, books, datasets, software, etc.).

The comprehensive use of PIDs and their associated metadata brings efficiency and transparency to the research process and increases the discoverability and reach of the research itself. PID infrastructures support the exchange of information about research throughout the lifecycle, between organisations, across sectors, and internationally.

These features mean that PIDs, while global in their reach, are of enormous value at the national level. In a competitive landscape, institutions will benefit from better insights into their own research portfolio, trends in research activities, and understanding their national and global position, supporting more robust strategic decisions and informed benchmarking. They are critical to the successful realisation of national ambitions, the delivery of key priorities, and the tackling of core national challenges for the Irish research sector, such as those set out in section 2.1 below. Internationally, Ireland has a highly collaborative and extensive network of research connections which can be better mapped and tracked using PIDs. Irish infrastructures and services are key players in such as the European Open Science Cloud[17], which include PIDs as foundational components.

Unlocking these benefits requires investment, both to support the widespread adoption of PIDs and to enable their integration into research information systems. The national goals highlighted below will be quicker to achieve and more effective if they are underpinned with support for the community to maximise their investment in PIDs.

## 2.1 National priorities and policy context

### 2.1.1 Positioning Ireland as a desirable research destination, and a leading research power

The Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris TD, observes in his introduction to the Government's Impact 2030 Research and Innovation Strategy[18] that "As the attraction and retention of talent becomes increasingly competitive on a global level, Ireland needs to be a location of choice in order to realise our ambitions."

As shown in section 3, Irish research is highly international and collaborative. Understanding these global patterns of activity and mapping them to the local context and contributions requires robust integration into international information systems. For this reason, "All-island, EU, and Global connectivity" is a pillar of the Impact 2030 strategy. PIDs help to deliver this, both by mapping Ireland's collaborations, participation, and reach, and by embedding Irish research activities, outputs, and outcomes in global discovery and analysis systems. The resulting insights are key to successful global participation and to the understanding of its impact; by evidencing and articulating the value and breadth of Irish research networks, Ireland's research contributions and strengths can be leveraged to recruit, retain, and reward talent.

### 2.1.2 Digitalisation of research and infrastructure

As the digital landscape grows and increases in complexity, bridges between systems and contexts become ever more important. Research outputs are increasingly 'born digital', and the management of research is increasingly underpinned by digital platforms. As a consequence, Impact 2030 recognises that, "How we define research infrastructure has also evolved over time, with a much stronger emphasis

now, for example, on digital infrastructure."[1]

PIDs are a valuable tool for connecting information from different infrastructures, both digital and physical. They enable persistent digital references, and the sharing of descriptive metadata between systems. Open PID systems are a foundational infrastructure, which enable the creation and exchange of information about research inputs, activities, and outputs. Without them, we risk creating digital silos and losing both the insights and efficiency gains promised by the digital revolution.

### 2.1.3 Open Research

PIDs underpin transparency, sharing, and collaboration and help to capture and record research processes. For this reason, PIDs are a critical component of the Irish National Action Plan for Open Research, which includes four named priority PIDs: DOIs, ORCIDs, RAiDs, and ROR identifiers:

> *"A4.4 Invest in Persistent Identifier infrastructure to enable consistent monitoring and improve interoperability.*
>
> *A4.4.1 Support the Irish ORCID Consortium and encourage further development and adoption of ORCID according to international best practice by researchers and within the systems and processes of publishers, research performing organisations, research funding organisations, and infrastructures.*
>
> *A4.4.2 Develop a national roadmap for the adoption of a range of Persistent Identifiers according to international best practice, such as ORCID, DOIs, RAiDs and ROR identifiers. Implement this roadmap to consolidate national coordination and accelerate the uptake and integration of priority identifiers."*[2]

The PID systems mentioned in the Action Plan for Open Research are themselves open infrastructures, with open data, governance, software, policies, etc. in place. Leveraging these open infrastructures in support of Open Research is an important element of supporting the transition to open. PIDs are also internationally recognised as essential for the effective monitoring of changing Open Research practice and the impact of Open Access policies including, for example, in the Plan S technical requirements[19].

### 2.1.4 Impact

Understanding and maximising research impact is central to the Irish government's ambitions for the Irish research and innovation community, serving a range of priorities (as set out extensively in Impact 2030), including, "the twin transition challenges of climate change and digitalisation and the many other national priorities such as competitiveness, health, food security, biodiversity, equality and inclusion."[3]

PIDs are a valuable tool for increasing the evidence base for impact, and for understanding the connections between impacts and research inputs and activities. Emerging developments in the PID landscape, such as the Research Activity Identifier (RAiD),[4] also mentioned in the National Action Plan for Open Research, show great promise for capturing information about relationships between research activities and a wider range of outputs, offering hope of reliable data on downstream impacts in future.

### 2.1.5 Reducing administrative burden

Reducing the administrative burden facing researchers through the widespread adoption of PIDs is at the heart of our analysis, which concentrates on time and effort savings that translate into direct financial costs. In Australia, a study comparing allocated workloads with actual hours spent on tasks found that time allocated on paper to research was being used disproportionately for administrative tasks instead[20].

1 Section 2.4, page 28 of Impact 2030 [18]
2 Section 4, page 16 of the National Action Plan for Open Research [14]
3 Introduction, page 2 of Impact 2030 [18]
4 More details can be found on the RAiD website - https://raid.org/

In addition, there is growing evidence that the crisis of burden is having effects on researchers' wellbeing and motivation and harming the effectiveness of the research and innovation enterprise as a whole. A Young Academy of Europe survey of early-career researchers found that high levels of stress, long working hours, and unmanageably high workloads are common[21].

Governments around the world are, therefore, now acting to prioritise the reduction of bureaucratic burden and the creation of efficiencies in research administration.

For example, in the United States, the American Innovation and Competitiveness Act states that, "it is a matter of critical importance to United States competitiveness that administrative costs of federally funded research be streamlined so that a higher proportion of federal funding is applied to direct research activities."[22] In his 2022 Statement of Expectations to the Australian Research Council (ARC), the incoming Australian Minister for Education, the Honourable Jason Clare MP, said that he wanted them to "identify ways to minimise administrative burden on researchers"[23]. In the UK, an independent review of research bureaucracy, conducted by Professor Adam Tickell in 2022[24], (recommendation 19) endorsed a proposal for a national multi-PID support consortium, recognising the benefits it could bring in terms of efficiencies, and the value of a centralised approach in providing equitable access to these systems and services.

At the personal level, in an interview with the Australian Access Federation (AAF), published on their website in 2021, Professor Joe Shapter, Pro-Vice-Chancellor for Research Infrastructure at the University of Queensland, shared his experience of using his ORCID ID when publishing and connecting his ARC profile to his ORCID record[25]. This means that his publication record is automatically added to his grant applications, saving three or four days per submission — as he put it, "a mountainous saving of work".

## 2.2 International comparisons

The Irish focus on PIDs as part of the solution for delivering on national policy priorities is not unusual; the potential for comprehensive PID adoption to deliver significant efficiencies and reductions in bureaucratic overhead has led to increased interest in PIDs globally, as a means to simplify and automate the exchange of information.

For example, in 2021, the Dutch national research funder, the Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) established "a persistent identifier strategy to improve NWO's capacity for analysing the impact of research funding."[26] The first French Plan for Open Science refers to PIDs including DOIs and ORCIDs as "building blocks of open science."[27]

Today, countries around the world are developing national PID strategies, and prioritising investment in these fundamental information infrastructures. In the UK, work on one such strategy led to a cost-benefit analysis of PID integration[7]. The study found that metadata re-used by members of the UK ORCID consortium had already saved £4M in staff time, and that significant additional cost savings would be realised by investing in a suite of PID integrations, justifying the provision of a national support network to reduce barriers to participation. The resulting improvements in research efficiency could free up 55,000 researcher days a year, leading to as much as £420M of annual benefit to the UK economy.

A recent Research Data Alliance (RDA) working group looked specifically at national PID strategies, and identified nine case studies of national approaches that were either under development or being implemented[4]. These case studies are highly informative and ongoing engagement with the initiatives described, and with the newly-formed RDA National PID Strategy Interest Group, is recommended to help to shape the evolving Irish National PID strategy.

## 2.3 PID-enabled workflows

In November 2023, we conducted a survey of key stakeholder groups from across the Irish research ecosystem, including some overseas organisations that serve the community (section 3.2). One of the questions asked respondents to rate several potential current or future benefits of using PIDs for their organisation. The four top benefits were improved reporting, interoperability with external systems, reduction in errors, and interoperability with internal systems (rated one or two by 80%+ of respondents, on a scale where one is the highest potential benefit and five the lowest).

As an illustration of the ways that PIDs could deliver the benefits identified in the survey, it is worth examining how they could be used in real-world activities. To help with this, MoreBrains generated PID-enabled workflows, which identify the touchpoints at which information about people, places, projects, works, etc. are entered into systems or retrieved from them. Figure 1, gives an overview of how PIDs can be used to facilitate information exchange through central metadata registries.

This diagram is based on research conducted in the UK, commissioned by Jisc[5] and sponsored by Research England. In this work, five priority PIDs for research entities were identified:

- DOIs for funding grants
- DOIs for outputs (e.g. publications, datasets, etc.)
- ORCIDs for people
- RAiDs for projects
- ROR for research performing organisations.

Between 2020 and 2022, MoreBrains led a series of community consultation activities involving 75 researchers, funders, research managers, and librarians from around the world. This consultation led to the creation of more detailed views of four specific workflows: institutional research management, funding, research data, and publications. These workflows are intended to aid all those working to support research and innovation to consider how they could use these existing powerful, global, open research information infrastructures in new ways to improve the efficiency and resilience of the Irish research ecosystem.

5 Jisc is a not-for-profit, membership organisation that provides network, IT and digital resources in support of research, further and higher education institutions, as well as for not-for-profits and the public sector https://www.jisc.ac.uk/

## PID-optimised research cycle

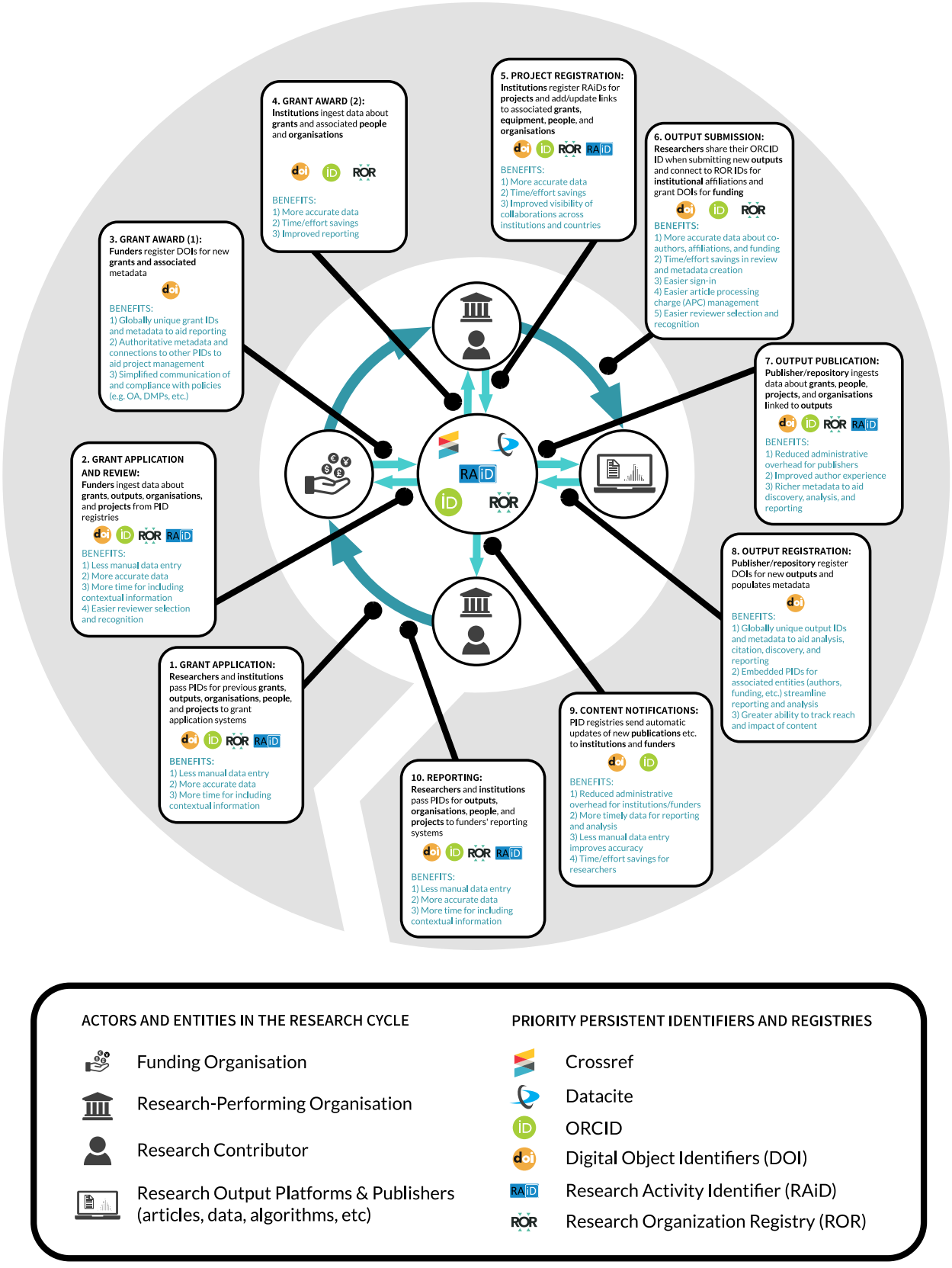


**Figure 1: The PID-enabled research lifecycle, developed by MoreBrains, gives a general view of how PID registries can facilitate the transfer of metadata automatically, thereby reducing time and expense https://resources.morebrains.coop/pidcycle/ (DOI: 10.5281/zenodo.4991733)**

# 3 The Irish landscape

## 3.1 Scale of research activity

As described in section 2, the value of PIDs is derived from multiple use cases, including the reduction of administrative burden; improved automation; and better, more timely and more complete data and metadata, for decision support at the national, organisational, and individual levels[28]. In this analysis, we focus on the immediate direct cost and time savings associated with reducing researcher and research administrative burden, specifically, the manual re-entry of metadata into multiple information systems for the publication, management, and reporting of research activity. The cost of unnecessary manual data re-entry and the subsequent cost savings are dependent on the scale of activity and the number of entities, including:

- Researchers
- Research performing institutions
- Funders
- Funded grants
- Research publications
- Research projects

In consultation with NORF and the PID Task Force, we identified various sources from which we combined the data to create a reasonable estimate for the number of each entity including Digital Science Dimensions[6][29], OpenAlex[30] public records, and direct communications with funders. We used those sources, as well as a survey, to estimate current levels of PID coverage and adoption wherever data was available.

We estimated the number of academic university researchers in Ireland based on the Higher Education Research & Development Survey 2020-2021[31]. We combined the number of researchers (including privately funded researchers) with the number of technicians to arrive at a total number of 23,540.

While a wide range of organisation types can adopt PIDs — including funders, private companies, charities, non-governmental organisations, the cultural sector, etc. — in consultation with NORF and the PID Task Force, we defined a core group of institutions most relevant to PID adoption efforts, for the purposes of our analysis. There are there are 16 publicly funded higher education institutions along with a number of other institutions and bodies that receive exchequer funding in Ireland. When combined, there are a total of 25 such institutions in Ireland according to Department of Further and Higher Education, Research, Innovation and Science (DFHERIS)[7]. We will refer to this group as simply as 'institutions' throughout the report.

### 3.1.1 Research publications

To estimate the time and financial cost of article metadata re-entry, we considered both the number of publications and the number of authors affiliated with Irish institutions. Data derived from the OpenAlex database[30] shows that the average number of articles with at least one Irish author, over the three-year period 2020-2022, was 23,696 per year. There was a total of 210,144 authors — an average of about 8.9 authors per paper, which is higher than the co-authorship analysis provided by Fanelli et al[32], suggesting that Irish research is particularly collaborative. Filtering for researchers with affiliations with Institutions in Ireland (figure 2), we find an average of 72,317 Irish authorships per year.

As part of our analysis, we looked at patterns of collaboration between authors at Irish institutions and those elsewhere in the world. Again, based on OpenAlex data, figure 3 shows how globally diverse Irish research collaborations are through the lens of co-authorships. Between 2020 and 2023, Irish researchers collaborated with authors from almost every country.

6 Digital Science. (2018-) Dimensions available from https://app.dimensions.ai Accessed on January 29th, 2024, under licence agreement

7 The list of relevant institutions is available from gov.ie and is supplied by DEFHERIS. https://www.gov.ie/en/publication/5088c-list-of-publicly-funded-higher-education-institutions/

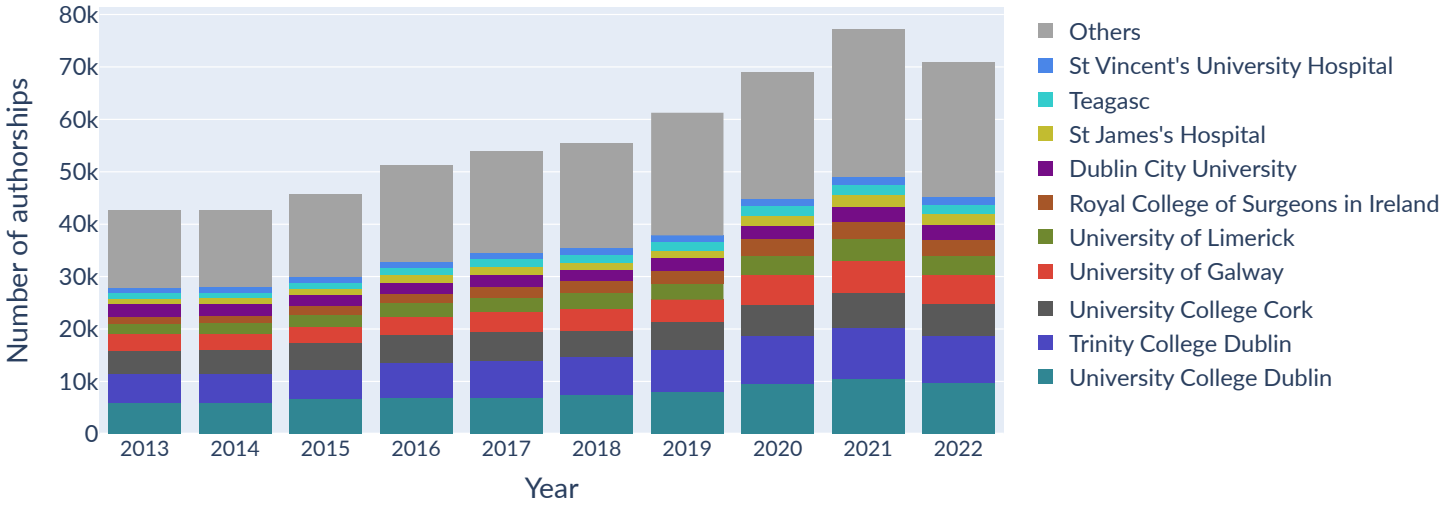


**Figure 2: The number of publication authorships by researchers with institutional affiliations in Ireland**

## Global co-authorships of publications with Irish researchers by country

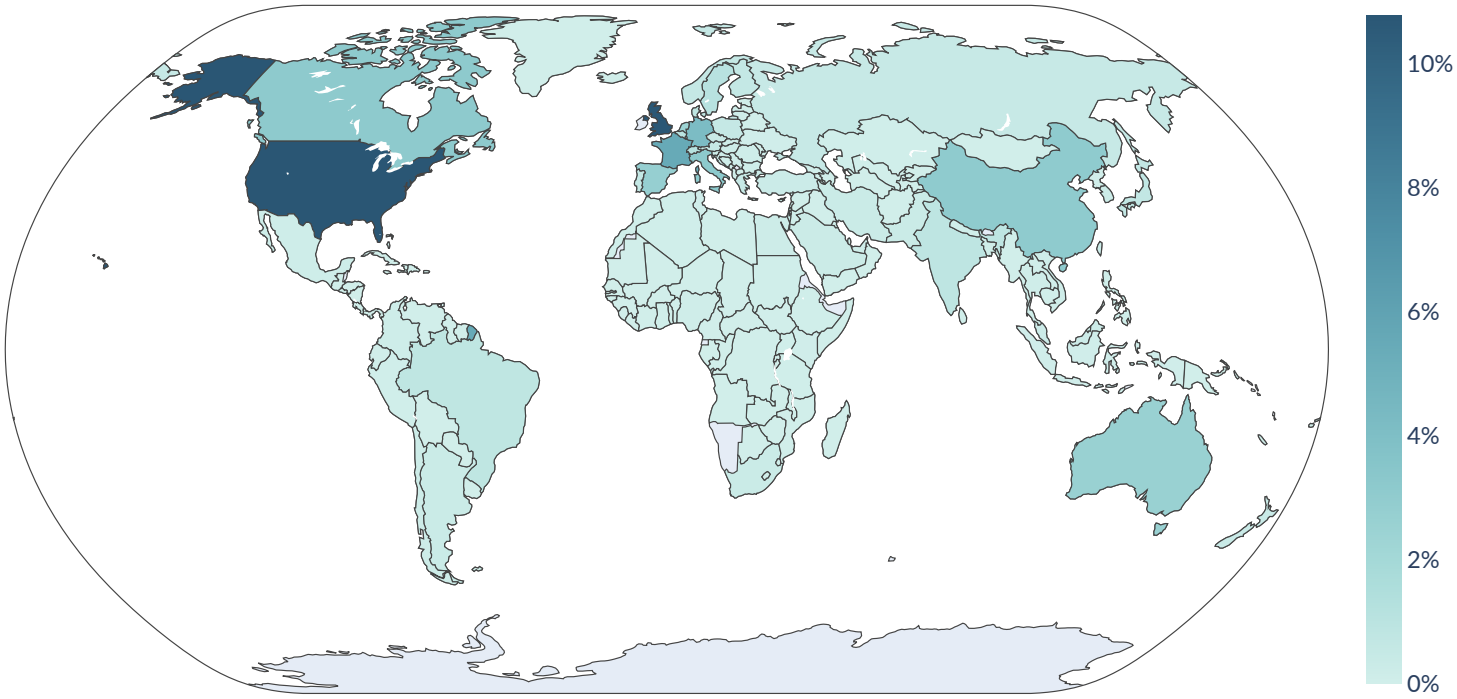


**Figure 3: The percentage of co-authors by country when at least one co-author is affiliated with an Irish institution for the three-year period, 2020-2022. Data for Ireland itself is excluded from the figure for scaling reasons.**

### 3.1.2 Research grants

Figure 4 illustrates that the number of grants awarded to Irish institutions is fairly stable over time, in contrast to the number of publications as shown in figure 2, which is steadily increasing. The data for this graph comes from the Digital Science Dimensions database, combined with data that was supplied directly by select funders[33], [34]. In more recent years, the proportion of grants without data on the awarded institution is higher. This is a common issue with grant data, generally caused by long reporting timescales. Grants were counted once for each awarded institution in Ireland, as a measure of the metadata management burden created. Based on the data available, there were an average of 1,575 institutional grant awardees per year over the period 2020-2022.

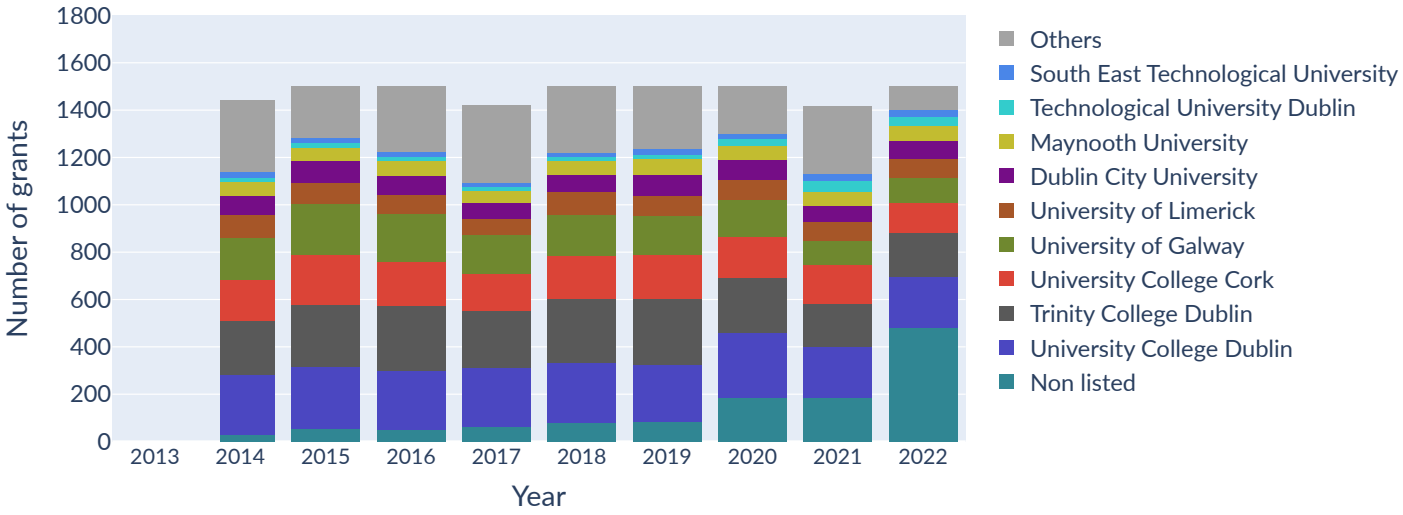


**Figure 4: The number of grants awarded to research institutions in Ireland between 2013-2022. The nine-most prolific awardees are shown, alongside grants where the awarded institution isn't known.**

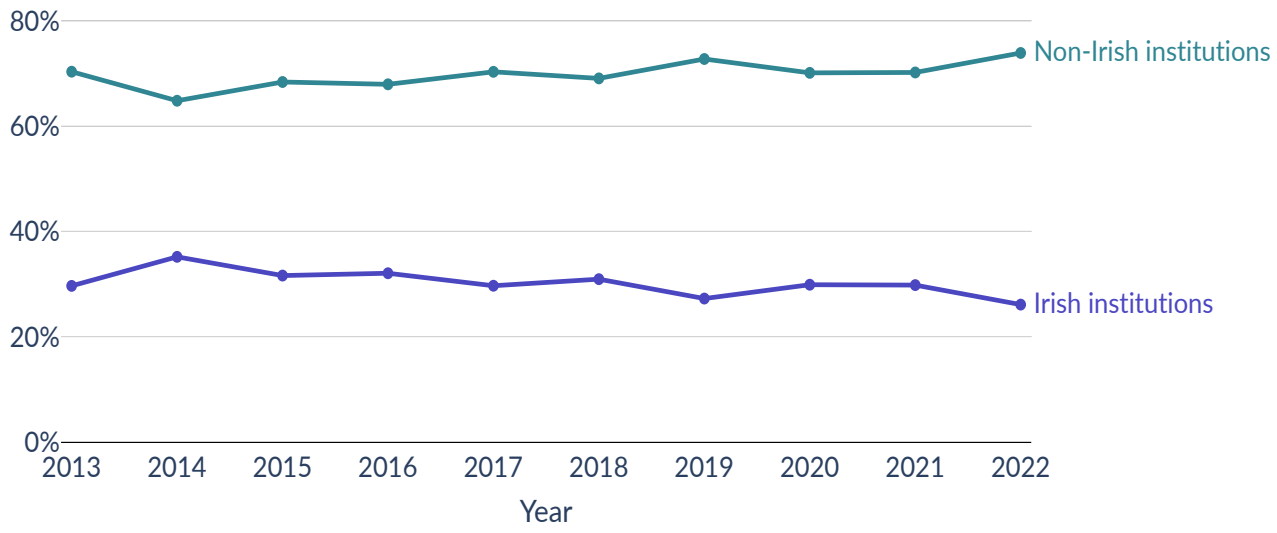


**Figure 5: Number of research grants per year with at least one Irish institution. The data shows that significant numbers of grants are awarded to Irish institutions from non-Irish funders**

Figure 5 shows the number of grants per year, broken down by funder. In this case, each grant is only counted once but, in order to be counted, each grant must have at least one institution in Ireland. The graph legend shows that the range of funders is geographically diverse, reflecting Irish researchers' high levels of global collaboration. Further analysis using Dimensions shows that, for grants with at least one Irish institution, around 70% of collaborating institutions are from outside of Ireland (figure 6), and steadily increasing over time.

### 3.1.3 Projects

Projects are a vital component of research management, representing the programmes of work carried out within research institutions. However, there is little consensus on how projects should be defined, described, or counted, and this is further compounded by misunderstandings between stakeholders. For example, funders often refer to awarded grants as projects, however, institutional research management systems, such as Current Research Information Systems (CRIS)[35], enable multiple grants to be assigned to a single project, which in turn can be linked to multiple research outputs. For our analysis, we have used the second definition as this is most relevant to institutional research activity and aligns with use cases and architecture of the RAiD Research Activity Identifier.[8]

While individual research institutions often keep records of their own project activities through a CRIS system, there are currently no aggregated databases of projects. Work on RAiD includes a central metadata registry for projects, analogous to the Crossref registry for publications, which will be very valuable for research tracking and assessment in future[36]. For the purposes of this analysis, we assumed that project numbers scale with levels of research funding. Previous estimates of the number of active projects in the UK[7] were scaled using published numbers for levels of research funding from OECD[37]. Based on this formula, we estimate that approximately 3,370 projects are ongoing in Ireland at any given time.

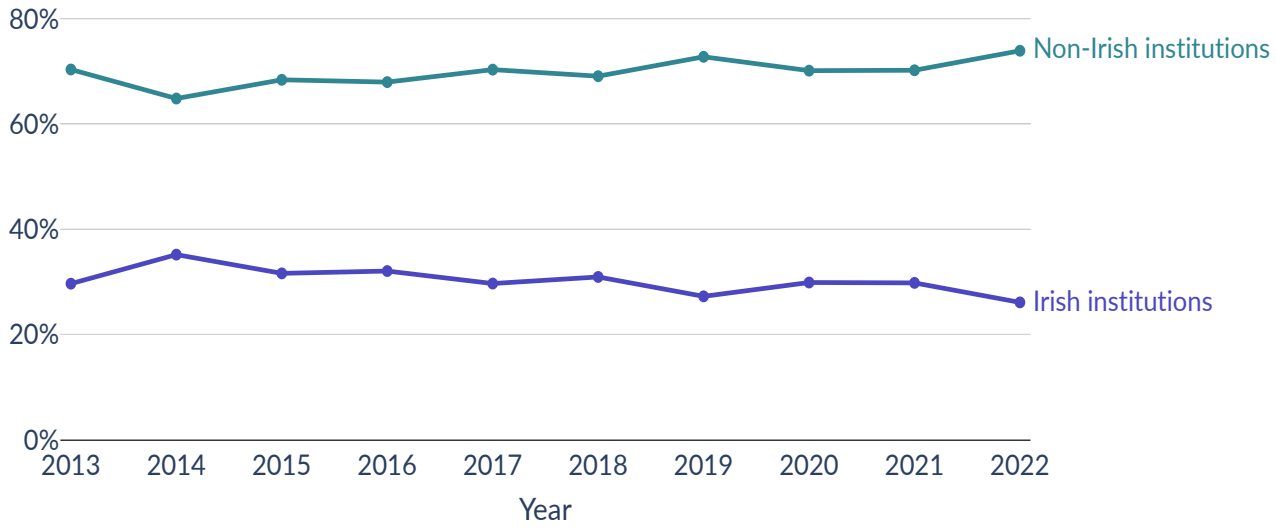


**Figure 6: Percentage of institutions in Ireland and internationally that are co-awardees on grants with at least one Irish institution.**

8 For more information about RAiD, see the website here: https://raid.org/

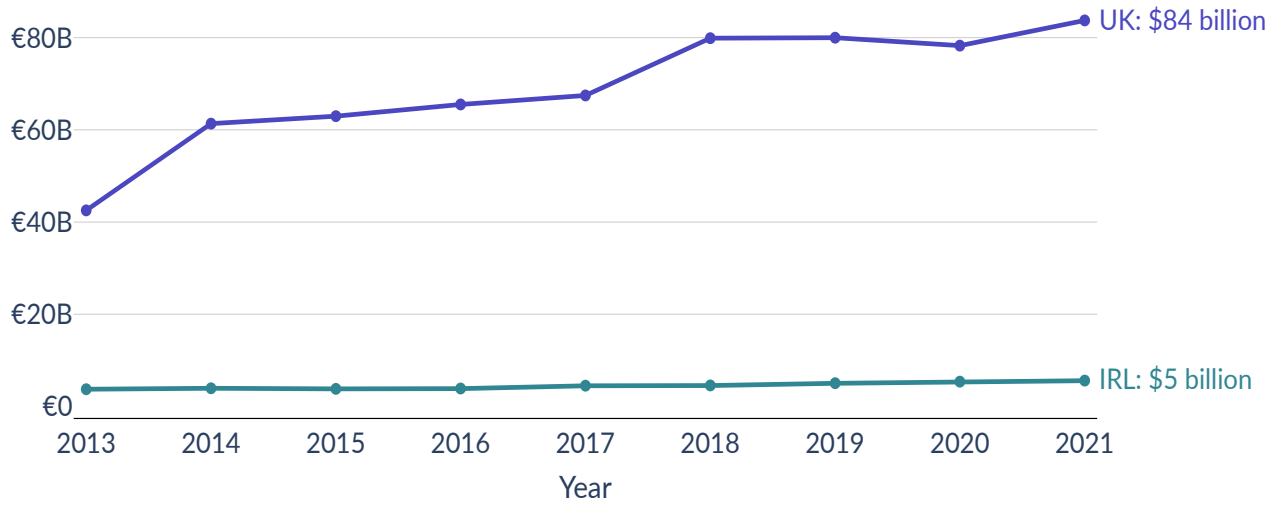


**Figure 7: Gross domestic spending in the United Kingdom and Ireland. This data was used as a relative measure of the size of the research environment to generate a scaling factor to estimate the number of projects.**

## 3.2 Levels of PID adoption and awareness

In November 2023, we carried out a community survey of key stakeholders, to help gauge current levels of awareness and usage of PIDs in Ireland, and to gain insights into how they view the opportunities and challenges of widespread national PID adoption. A total of 68 responses were received from individuals at 45 organisations — mostly higher education institutions (HEIs)/universities and/or research performing organisations (RPOs), funding organisations, research infrastructure, government/ policy making organisations, and libraries.

The questions about awareness and usage focused primarily on the four PIDs in the National Action Plan for Open Research: digital object identifiers (DOIs) for outputs and for grants; Open Researcher and Contributor Identifiers (ORCIDs) for researchers; Research Activity Identifiers (RAiDs) for projects; and Research Organization Registry (ROR) identifiers for organisations. With more than 80% of respondents familiar or very familiar, awareness is highest for ORCIDs and DOIs for outputs, both of which are well established; ROR IDs (38% familiar or very familiar), DOIs for grants (25%), and RAIDs (13%) are less well known. Current and planned usage of these PIDs mostly follows the same pattern (>80% for ORCID and DOIs for outputs), however, more than half of the respondents indicated that their organisations are, or are planning to use RORs. Satisfaction levels are also, unsurprisingly, highest (around 80%) for ORCIDs and DOIs for outputs.

As noted in the section 2.3, respondents view the main benefits of widespread PID adoption as improved reporting, interoperability with external systems, reduction in errors, and interoperability between internal systems (rated one or two by 82-94% of respondents, on a scale where one is the highest potential benefit and five the lowest). Cost savings on time and money were ranked lower (70% and 33% respectively).

However, respondents see three main barriers to widespread PID adoption: the cost of implementation (64% of respondents rated this four or five on a scale of one to five where one is the lowest and five the highest); the lack of user buy-in (60%); and the lack of leadership buy-in (44%). Cost of access to PID services (36%), privacy concerns (22%), and the lack of a clear value proposition (17%) were seen as lesser barriers.

In consultation with NORF and the PID Task Force, we have developed an engagement plan to help ensure that Irish research community is aware of the PID roadmap, have a voice in its development, understands the value of PID adoption, and are bought into the success of this project. Based on the survey responses, this includes:

- Identifying groups and organisations that are underrepresented or unrepresented in the survey.
- Planning and implementing a series of community engagement events (webinars, workshops, focus groups, etc.).
- Developing a suite of outreach materials, with clear, consistent messaging.
- Building on existing expertise in and support for PIDs within the Irish research community.

# 4 Cost-Benefit Analysis

The methodology we developed for our analysis has already been used to assess the level of incentives and programme sustainability required to encourage PID adoption for Jisc in the UK[38], as well the Australian Research Data Commons (ARDC) and Australian Access Federation (AAF) in Australia[6] (see those reports for more information about the methodology). The calculations used in this analysis are presented in detail in the workbook in Appendix A.

We present two scenarios in our analysis. In the first, the direct cost savings created by PID implementations are offset by the cost of sector-wide adoption, if the 25 institutions that we considered in Ireland each independently implemented the four priority PIDs (section 2.1.3) highlighted in the National Action Plan for Open Research. In the second scenario, we consider how the creation of a central support service as mentioned in section 1, would affect the cost-benefit balance.

## 4.1 Total potential cost savings

The estimates from section 3.1 were used for the total number of publication authorships, grant awards, and numbers of projects. We used authorship numbers rather than publications because reporting of research activity is often manually and separately done by each individual researcher. The total number of entities of each type was multiplied by the number of times information is re-entered into the many systems used by research institutions, including CRIS, reporting, repository, financial, and other systems. The number of re-entry events was estimated based on the survey described in 3.2.

The total opportunity cost of all of these metadata re-entry events was calculated by multiplying them by the amount of time they take[39], [40] and fully costed salary and overhead, averaged across junior researcher, senior researcher, and a research administrator (at payscale 'Administrative 2') from Irish university pay scales[41], [42].

**Table 1: Total potential savings in both time and money if all publication, grant and project metadata were synchronised automatically into institutional information systems at research performing organisations in Ireland**

| Potential total sector savings | | | | | | |
|---|---|---|---|---|---|---|
| | **Number** | **# rekey events** | **# minutes events** | **Time savings per year (person days)** | **cost / author / minute Year 4** | **Financial savings per year** |
| Publication metadata | 72,389 | 3.1 | 6.73 | **3,472** | €0.97 - if Admin | €1,470,368 |
| | | | | | €0.80 - if Junior Researcher | €1,211,681 |
| | | | | | €1.27 - if Senior Researcher | €1,916,904 |
| | | | | | **Average** | **€1,532,985** |
| Grant metadata | 1,575 | 3.25 | 10 | **118** | €0.97 - if Admin | €49,836 |
| | | | | | €1.27 - if Senior Researcher | €64,970 |
| | | | | | **Average** | **€57,403** |
| Project descriptions | 3,367 | 6 | 10 | **464** | €0.97 - if Admin | €196,689 |
| | | | | | €0.80 - if Junior Researcher | €162,085 |
| | | | | | €1.27 - if Senior Researcher | €256,422 |
| | | | | | **Average** | **€205,065** |
| **Total predicted annual savings:** | | | | **4,054** | | **€1,795,453** |

## 4.2 Institutional implementation costs

For PID implementations to be financially sustainable at an institutional level, it's important to consider their time and cost impact. An analysis by Johnson et al[39] estimated the time cost of an ORCID implementation at 40 person-days, so we have used this as the basis for the cost of a single PID implementation.

To calculate the cost of implementing the four priority PIDs (section 2.1.3) highlighted in the National Action Plan for Open Research implementation at each institution individually, we multiplied the 40 person-day cost by four, and then by the fully costed salary of a senior technical officer at an Irish university[42]. This amount was then multiplied by 25, to give the sector-wide cost of implementing all four PIDs at each institution.

A national PID support service would reduce implementation costs at the institutional level, by combining education and outreach efforts, and by sharing technical solutions, learnings, and best practice. To account for this reduction in effort, we assumed that, with support from a national service, integrating all four PIDs would take half as long, i.e., twice (rather than four times) the 40 person-day effort needed for a single ORCID integration.

## 4.3 Central support service

Providing enough support to reduce effort and costs and alleviate strain on technical capacity at an institutional level will require the central support service to be adequately staffed and resourced. In consultation with NORF and the PID Task Force, we agreed that a total of three FTE would be needed:

- Coordinator: Oversees operations, develops documentation, and advises on technical strategy and integrations.
- Technical community manager: Convenes the network of institutions, develops documentation, and advises on technical strategy and integrations.
- Engagement and outreach manager: Leads communications and outreach efforts, and develops messaging in collaboration with PID providers and other relevant stakeholders.

The coordinator and technical manager would need to have the technical and domain knowledge and expertise to support PID implementations, API integrations, and institutional technology strategy.

The cost of conferences, training events, workshops, and travel are included in the cost projections. It is assumed that the central support team would be hosted by an existing organisation that would provide the infrastructure needed for these employees (human resources, premises, etc.). It should ideally be large enough to provide hosting and office space as either a contribution in kind, or at a reduced cost, due to economies of scale.

## 4.4 Financial projections

Final financial projections were created by comparing the cost savings achievable by reducing the level of manual metadata re-entry with the cost of sector-wide implementation of four priority PIDs, modelled both with and without a central support service (as described in section 1).

Levels and rates of PID adoption were important considerations in both models. PIDs are network entities that are subject to network effects — because they facilitate information sharing, the more organisations that make use of PID integrations, the more valuable those integrations are to each organisation. The creation of a central support network would accelerate PID adoption by enabling 25 Irish institutions to work together to maximise benefit. To model the benefit as PID adoption increases, we applied a logistic function, which is a common method used to model such effects[43]. Starting values for PID adoption levels were based on results of the PID awareness and adoption survey (section 3.2) and data obtained from staff at DataCite

and Crossref via private communication.[9]

As can be seen from table 2, even if each university in Ireland were to independently implement all four priority PIDs, the cost of the integrations would pay for themselves in approximately three years, with an increasing benefit over time. The introduction of a centrally funded support service, with three members of staff as described above, would accelerate the pace of adoption and create cost savings at the institutional level, reducing the time to breakeven to two years and resulting in a net benefit of over €1.6 million over five years.

In this analysis, we have only considered direct cost savings from reducing the bureaucratic burden on researchers and institutions. As discussed in section 1, the benefits of PID adoption go well beyond these direct cost savings, including improved alignment with FAIR principles, more accurate and timely data for research evaluation, improved longitudinal research analysis, and greater strategic policy insight.

**Table 2: Financial projects showing 5-year savings as a result of improved PID adoption. Two projections are shown, one in which the 25 institutions that we considered in Ireland independently implement the four priority PIDs, and the other in which a centrally funded support service creates economies of scale through shared services and accelerates PID adoption.**

| | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---|---|---|---|---|---|---|---|
| Potential savings for sector provided by not re-entry grant, article and project metadata | | €1,795,453 | €1,795,453 | €1,795,453 | €1,795,453 | €1,795,453 | **€8,977,264** |
| **Without a central support service** | | | | | | | |
| Adoption level target | 21% | 22% | 25% | 30% | 50% | 70% | |
| Calculated % benefits based on adoption levels | 11.6% | 12.1% | 14% | 17% | 40% | 76% | |
| Adjusted savings per sector provided by not re-entry grant, article and project metadata | | €216,801 | €247,198 | €307,394 | €714,069 | €1,360,699 | **€2,846,161** |
| Sector-wide costs for implementation | | (€362,241) | (€362,241) | (€362,241) | (€362,241) | (€362,241) | (€1,811,204) |
| Sector-wide net savings (or cost) (unsupported) | | **(€145,440)** | **(€115,043)** | **(€54,846)** | **€351,828** | **€998,458** | **€1,034,957** |
| **With a central support service** | | | | | | | |
| Adoption level target | 21% | 25% | 30% | 50% | 70% | 85% | |
| Calculated % benefits based on adoption levels | 11.6% | 13.8% | 17% | 40% | 76% | 93% | |
| Adjusted savings per sector provided by not re-entry grant, article and project metadata | | €247,198 | €307,394 | €714,069 | €1,360,699 | €1,673,618 | €4,302,977 |
| Costs for the central support services | | (€334,445) | (€344,478) | (€354,812) | (€365,457) | (€376,420) | (€1,775,612) |
| Sector-wide costs for implementation | | (€181,120) | (€181,120) | (€181,120) | (€181,120) | (€181,120) | (€905,602) |
| Sector-wide net savings (or cost) (supported) | | **(€268,367)** | **(€218,204)** | **€178,136** | **€814,122** | **€1,116,077** | **€1,621,763** |

9 Thanks to Xiaoli Chen of DataCite and Ginny Hendricks of Crossref

# 5 Conclusions

Potential savings that would be generated by reusing the metadata associated with PIDs for publications, grants, and projects across the Irish academic sector would equate to more than 4,000 days of staff time each year, equivalent to nearly €1.8M. These savings are more than sufficient to cover the costs of implementation at institutions in Ireland as well as the creation of a central support service that will support and accelerate implementations. Financial breakeven for these investments would occur in under three years, with a five-year projected financial benefit of over €1.6M.

The analysis is deliberately conservative, insomuch that it is restricted to the direct and immediate savings that would be made by freeing up researcher and university staff time from the toil of manual re-entry of information into various computer systems. In this way, we demonstrate that a combination of PID implementations for the four priority PIDs sector-wide, and a centrally funded PID support service is financially sustainable and more than pays for itself.

Beyond the immediate cost savings, there will be significant secondary benefits, which are out of scope of this analysis. As mentioned in section 1, research spending drives innovation in the private sector and, therefore, economic growth. Freeing up researchers' time so that they can spend it more productively will increase the economic impact of spending on public research. There are also other benefits that are more difficult to quantify. Opportunities for improved automation of processes by, for example, triggering an action when a particular kind of PID is detected or is added to a record will emerge as PID adoption grows in ways that are difficult to predict but will likely be very significant. On a policy level and perhaps most impactfully of all in the long term, more timely and accurate reporting will enhance data quality, enabling funders and the Irish government to make more informed strategic decisions about research spending and industrial strategy.

Investment will be required within institutions to integrate PIDs in the systems they use. Technical and training resources will need to be allocated to PID integrations and ensuring that researchers and professional services staff are equipped to use PIDs effectively.

At the national level, based on our analysis, we recommend investment in a central support service that would operate alongside the existing PID consortia to maximise their ROI and shorten the pathway to breakeven, as well as reducing the implementation burden and strain on technical capacity for institutions. In partnership with NORF and the PID Task Force, we have assessed central support needs as equivalent to three FTEs in order to ensure the scale and reach of the service is sufficient to reduce costs. While additional funding will be required while the service is in operation, this investment will accelerate adoption, ensuring faster and more equitable access to the benefits of PIDs.

Unlocking this support at governmental, funder, and institutional levels will require high-level leadership to keep the agenda live and in focus — a champion, operating at a policy-setting level and ensuring alignment across current and emerging policy priorities, to secure the benefits of PIDs for the Irish research community consistently, reliably, and fairly. These potential benefits, as we have shown in this analysis, are substantial and worthy of investment.

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