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Lessons learned from ORCID DE—A project-driven initiative to promote author identification in Germany

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Key points:

- The ORCID DE project, from 2016 to 2022, promoted ORCID in Germany through a project-driven approach.
- The project promoted the dissemination of ORCID in Germany. The number of IDs registered for Germany increased from approximately 44,000 in 2016 to 300,070 in 2023.
- The linkage of ORCID with the bibliographic Gemeinsame Normdatei (GND; translated: Integrated Authority File) standard in German-speaking countries has contributed to the success of ORCID in Germany.
- The promotion of ORCID in Germany was based on six central areas: information, consortium, standardization, implementation, monitoring, and networking.
- The ORCID DE Monitor captures and analyses the development of ORCID on a national and international level.
- The ACTION principles highlight crucial measures in promoting a standard, such as ORCID. ACTION stands for Awareness, ConnectiviTy, IntegratiOn, and Networking.

Keywords: author identification, authority files, Germany, information management, open science, ORCID, persistent identifiers, scholarly publishing

INTRODUCTION

Research institutes, libraries, and publishers have grappled with the issue of unambiguously addressing researchers and the associated networks of scholars and scholarly contributions for numerous years. When the initial considerations for the development of ORCID (Open Researcher and Contributor iD) became known, we, at the Deutsche Initiative für Netzwerkinformation (DINI; translated: German Initiative for Network Information), instigated discussions about the prospects and challenges of such a standard in scholarly information management.

DINI, established in 1991 with the objective of fostering the enhancement of information and communication services, along with the requisite advancement of information infrastructures in Germany, has played a pivotal role. Since 2004, the DINI Certificate for Open Access Repositories and Publication Services (DINI

AG Elektronisches Publizieren, 2022) represents guidelines for managers of Open Access repositories, encompassing the implementation of standards for author identification. Another significant sphere of focus for DINI is the domain of Current Research Information Systems (CRIS), in which the utilization of Persistent Identifiers (PIDs) for scholars also assumes considerable importance.

Established in 2010, ORCID has been addressing significant challenges in the realm of scholarly information management since 2012 (Haak, 2012; Haak et al., 2012). ORCID is characterized as 'an international, interdisciplinary, open, non-proprietary, and not-for-profit organization' (ORCID, n.d.-c) that furnishes a persistent digital identifier, known as ORCID iD. This unique ID serves the purpose of establishing connections between individuals and their scholarly contributions. Within the academic domain, this identifier greatly streamlines workflows such as manuscript and grant submissions through automated data flows. Importantly, the control over the data lies firmly with the researchers themselves, enabling them to determine which information they wish to share under specific conditions (ORCID, n.d.-b).

Standards for author identification have long been entrenched in scholarly information management as libraries employ these standards to catalogue publications. Particularly within the realm of publication management, as a subtask of information management, at academic institutions, where capturing the publications of affiliated members is central, these standards assume significant importance. Nowadays, author IDs are also relevant for use cases such as the management of article processing charges (APCs) (Vierkant et al., 2017).

As the discussion regarding the implementation of ORCID gained prominence, the potential of this standard was swiftly recognized within the member institutions of DINI in Germany. Particularly within the domain of interoperability among information systems in academic institutions, encompassing Open Access repositories and CRIS systems, along with editorial management systems from publishers, a multitude of use cases for the ORCID iD were identified.

During the ORCID launch event hosted by Humboldt-Universität zu Berlin in 2012, DINI facilitated a workshop in Berlin with the intention of exploring the potential implications of ORCID in Germany (Deutsche Initiative für Netzwerkinformation, 2012). From this event emerged the idea of forming a consortium to apply for a grant from the Deutsche Forschungsgemeinschaft (DFG, translated: German Research Foundation) to promote ORCID in Germany. This application for the ORCID DE project was approved, allowing the first phase of the ORCID DE project to begin in 2016. After a successful initial funding phase from 2016 to 2019 (Bertelmann et al., 2015), a second round of funding was granted for the years 2020 to 2022 (Bertelmann et al., 2019). Table 1 lists the involved partner organizations. Both ORCID DE 1 and ORCID DE 2 phases were led by the Helmholtz Open Science Office. The project consortium comprised libraries, research institutions, and other service providers in the field of digital scholarly communication.

Parallel to the aforementioned discussions, deliberations regarding ORCID were also conducted within the international Knowledge Exchange network, in which the German Research Foundation plays an active role. In these considerations about author identification, the potential of ORCID became clear (Knowledge Exchange, 2012).

TABLE 1 Consortium partners and duration of ORCID DE.

Project Name	Partners	Duration
ORCID DE 1	German National Library, Helmholtz Open Science Office, Bielefeld University Library	01.05.2016–30.11.2019
ORCID DE 2	DataCite, German National Library, Helmholtz Open Science Office, Bielefeld University Library, TIB – Leibniz Information Centre for Science and Technology	01.01.2020–30.11.2022

Today, ORCID is the predominant standard for author identification in scholarly communication. The importance of ORCID was especially highlighted during the Covid-19 pandemic, during which there was a significant increase in publications related to Covid-19. The European Commission, in its Covid-19 funding program, has recommended the use of ORCID and ROR (European Commission, 2020). ROR stands for the Research Organization Registry, an international initiative aimed at creating a persistent identifier for academic institutions (Meadows, 2019). Within the ORCID DE project, we have contributed to ROR's establishment through our collaboration with our project partner, DataCite. Furthermore, the international Confederation of Open Access Repositories (COAR), in which several ORCID DE project partners are active, emphasized the use of ORCID in their guidelines for identifying resources related to Covid-19 research during the pandemic (Confederation of Open Access Repositories, 2020).

OBJECTIVES

In both project phases, ORCID DE prioritized the following six objectives for academic institutions in Germany:

1. Information: Provision of details about ORCID.
2. Consortium: Formation of a national ORCID consortium.
3. Standardization: Integration of the ORCID iD in national standards in scholarly information management.
4. Implementation: Incorporation of ORCID into core information systems in Germany.
5. Monitoring: Analysis of the dissemination of ORCID iDs and other PID standards concerning the unique identification of scholars and research institutions.
6. Networking: Advancement of dialogue with ORCID and other partners in the PID sector.

Throughout both project periods these six key objectives were aimed mainly at the German information infrastructure.

OUTCOMES

In the following sections, we outline our approach to the six key objectives of ORCID DE.

Information

At the start of the ORCID DE project, a nationwide needs assessment was undertaken. This survey saw participation from representatives of 228 academic institutions in Germany (Fuchs et al., 2017) providing insights on their requirements concerning ORCID and other aspects of persistently referring to information objects and resources. The insights gained helped shape the measures to promote ORCID within Germany.

To raise awareness and foster the discussion around ORCID, a dialogue platform targeted at German research institutions was created, providing comprehensive information about ORCID in Germany. This platform encompassed a website, a blog, a mailing list, and a blend of digital and on-site events around ORCID implementation in Germany. Throughout the project's tenure, the website underwent continuous updates and was gradually enhanced to incorporate elements such as FAQs, best practices, and a collection of informational resources. Throughout the project period, over 150 blog posts around ORCID in Germany were published. In addition, several articles have been written about ORCID DE (Dreyer et al., 2019; Glagla-Dietz & Habermann, 2020; Pampel & Fenner, 2016; Schrader et al., 2021). Six workshops on ORCID were hosted over the course of the project. All workshops—both virtual or in-person—proved the growing interest in ORCID with participant numbers ranging from 80 up to 340 participants. Additionally, the project was present at various national and international conferences (Fenner et al., 2016).

While public outreach was a cornerstone of the project, the emphasis lay on facilitating institutions in their ORCID implementation journey. This entailed offering bespoke consultations to academic entities and funding bodies while also delving into broader concerns. One significant endeavour was commissioning a legal review of ORCID's service centred on data protection (Schallaboeck & Von Grafenstein, 2017). This exploration scrutinized ORCID's stance on data protection within Germany, lauding its adherence to privacy laws. This document subsequently became a touchstone in myriad dialogues around data protection and ORCID, offering indispensable guidance to institutions navigating the topic. In joint discussions with ORCID the challenges ensuing from the evolution of European data protection regulations arose.

The information and communication strategy of the ORCID DE project, along with the associated outreach activities, focused on academic institutions. One advantage was the strong networking of project partners within the landscape of information infrastructure in Germany. The project pursued active communication efforts with libraries and data centres in Germany, as well as with individuals involved in scientific information management at universities and laboratories. This approach through multipliers proved effective during the project. The aim was to address individual researchers' questions about ORCID always in collaboration with the identified ORCID contact person at an academic institution (also see: 'Networking' section). This approach also encouraged a dialogue on the topic within these institutions. In practice, specific questions that reached the project via email were mostly answered with the involvement of local libraries and other information management experts. Very specific questions about the functioning of ORCID were also forwarded to the ORCID helpdesk.

Consortium

In 2015, when the proposal for the ORCID DE project was drafted, only one academic institution in Germany was an ORCID member, working on integrating ORCID into its internal systems. However, by January 2023, there were 83 institutions represented in the ORCID Germany Consortium and 104 ORCID implementations in Germany making the ORCID Germany Consortium one of the largest ORCID consortia globally.

The consortium was established as part of the project and is administered by TIB Hannover, a project partner. Annual meetings of consortium members facilitate discussions on current issues related to ORCID. In 2018, we received the ORCID Consortia Award from ORCID. In the commendation, particular emphasis was placed on addressing the important data protection aspects within the ORCID Germany Consortium (Haak, 2018).

The growth of the consortium followed a corresponding increase in the dissemination of ORCID iDs in Germany. According to ORCID, the number rose from about 44,000 in May 2016 to 300,700 in January 2023. Table 2 shows the growth of ORCID iDs during the working phases of ORCID DE 1 and ORCID DE 2. Until April 2022, ORCID collected the number of ORCID iDs monthly based on the intersection of ORCID records associated with an email address with the top-level domain '.de' and the number of ORCID records containing the country code 'DE' (according to ISO-3166 ALPHA-2; IDs connected with mail domain and/or country code). As of April 2022, that number was moved to the consortium report on a daily synchronization but wasn't offered on their statistics page. ORCID encountered several difficulties when gathering the domain-based data due to the different ways of counting subdomains depending on the database. The figure was therefore no longer considered accurate to measure uptake in a country. Since then, the number of ORCID iDs in Germany has been collected and publicly displayed on their statistics page according to 'Researchers with country code or affiliation'. The count by 'Affiliation' refers to the current affiliation information under 'Employment' in the ORCID record and the information there about where the institution is located (ORCID, n.d.-a; ORCID DE, 2022).

Standardization

In recognizing ORCID's potential for facilitating automated data flows, the ORCID DE project prioritized its integration with established standards. Of particular note is our endeavour to

TABLE 2 Key figures of the ORCID DE project.

Metric	January 2020	January 2021	January 2022	January 2023
Number of ORCID iDs with .de email address or country designation Germany	152,181	200,401	250,396	300,070
Number of ORCID iDs in the GND	56,785	100,744	148,113	186,339
Number of publications linked with ORCID iDs in BASE	157,551	229,223	312,960	381,883
Claiming users in BASE	14,753	20,775	27,858	32,417
Claiming users in the German National Bibliography	2,699	7,819	12,388	16,149
Number of publications in the German National Bibliography linked to GND by ORCID users	13,574	41,803	70,190	96,328
Number of machine-assisted GND–ORCID linkings in the German National Bibliography	-	48,678	96,843	176,416
Number of ORCID Implementations at institutions in Germany	29	43	63	89

associate the ORCID iD with the Gemeinsame Normdatei (GND; translated: Integrated Authority File). The GND serves as an international authority in library systems, organizing personal names, subject headings, and corporate bodies from catalogues. Managed by the Deutsche Nationalbibliothek (DNB; translated: German National Library) within the German-speaking regions, the GND ID is widely adopted. In the ORCID DE project, we achieved both conceptual and practical linkage between ORCID iD and GND ID (Hartmann & Pampel, 2017), incorporating ORCID within the GND system as detailed in the 'Implementation' section.

Our standardization activities went beyond mere system integration. We fostered dialogue with key stakeholders, ensuring ORCID's integration into additional standards pertinent to libraries and research information. These integrations include, among others, the DINI certificate for Open Access publication services (DINI AG Elektronisches Publizieren, 2022) and the Kerndatensatz Forschung (KDSF; translated: Core Data Set for Research). The latter is an established standard for exchanging research information within the German academic framework (Kerndatensatz Forschung, n.d.). Serving as a voluntary blueprint, the KDSF streamlines research reporting across universities and academic institutions, receiving endorsement from the Wissenschaftsrat (WR; translated: German Council of Science and Humanities) in January 2016 (Wissenschaftsrat, 2016).

Furthermore, to delve into ORCID's applicability across libraries, research offices, computing centres, and data centres, we orchestrated an extensive dialogue on ORCID within Germany as part of the ORCID DE project. The culmination of these discussions was captured in a position paper by DINI, highlighting the multifaceted applications of ORCID in the realm of scientific information management (Vierkant et al., 2018).

Implementation

Central to ORCID's anchorage in key standards is its integration into nationally and internationally significant information systems. To bolster the previously highlighted linkage with the GND, ORCID was incorporated into the DNB systems.

Enhancements were also made to the GND system to simplify the incorporation of the ORCID iD. From 2018 on, the ORCID iD became visible in the Online GND (OGND), in 2022 in the new GND visualization GND Explorer (https://explore.gnd.network), and the ORCID iD was also made available in various machine-readable GND formats. Furthermore, ORCID iDs were integrated into the DNB's linked data service, DNB Entity Facts, making them accessible and functional in the Deutsche Digitale Bibliothek (DDB; translated: German Digital Library), for example.

In 2019, we added the DNB to the list of platforms supporting the 'Search & Link' functionality of ORCID. This feature enables researchers to associate their German National Bibliography-recorded publications with their ORCID iD. We have launched a second claiming service in 2022, with which the title metadata of all German library networks can be claimed. Within the ORCID DE framework, we instated machine-assisted processes for correlating GND ID with ORCID iD, by using the public ORCID data dump. Together with claimings and intellectually recorded ORCID iDs, we achieved a total number of 186,000 ORCID iDs in the GND at the end of the project period. Moreover, 1.4 million titles in the German National Bibliography already contain at least one creator with ORCID iD. Machine-assisted linking has already enabled a total of 220,000 GND to title links.

Another notable integration of ORCID is its inclusion in the Bielefeld Academic Search Engine (BASE)—the world's foremost search engine for Open Access publications, managed by our ORCID DE project partner, the Bielefeld University Library. As of January 2023, 32,417 ORCID users claimed their publications via BASE. Throughout the project's various events, we disseminated insights about the feasibility of ORCID's integration, especially within academic institutions' identity management systems. According to our research, 89 institutions have integrated ORCID into their information systems by January 2023. Table 2 offers an overview of ORCID DE's pivotal metrics.

We also engaged with the implementation of ORCID at academic institutions in Germany. The various repository software solutions relevant for ORCID integration presented a special challenge in Germany in comparison with other countries, e.g. Netherlands and Italy. A survey conducted in 2016 revealed that in addition to in-house developments, a total of 21 different software solutions were relevant for the implementation of ORCID, including OPUS, DSpace, Fedora, VIVO, and EPrints (Fuchs et al., 2017). Via the ORCID DE website, institutions could express their interest in joining the consortium. We correlated this data with the data on implementation. Our 2019 survey revealed that institutions joined the consortium a median of 68 days after expressing their interest. Following this, the completion of the implementation took a median of just under 12 months (Vierkant et al., 2019).

Monitoring

During the second phase of the project, to more effectively track the progression of ORCID, we developed the ORCID DE Monitor at the University of Bielefeld. This dashboard enables the analysis of the adoption and distribution of ORCID iDs at an international scale (Summann et al., 2020). The interface is available in both English and German. Figure 1 shows a screenshot of the ORCID DE Monitor. We showcased the ORCID DE Monitor at various conferences and workshops to gather feedback for its enhancement (Summann et al., 2021a; Summann et al., 2021b; Summann et al., 2021c).

By introducing the ORCID DE Monitor, we have facilitated an international observational tool for monitoring the dissemination of ORCID. Consequently, our project contributed significantly to global endeavours promoting the evolution of ORCID. Accessible reports through the monitor include:

- BASE data provider (various evaluations on the occurrence of ORCID iDs in the BASE index since 2020)
- BASE claiming (various evaluations on BASE claiming based on ORCID since 2018)
- DNB claiming service (various evaluations of claimings in the German National Bibliography since 2019)
- DNB publications (various evaluations of DNB publications linked to GND records with machine support through ORCID iDs since 2020)
- GND with ORCID (evaluation of ORCID iDs in the GND since 2016)
- ORCID Consortium Germany (Membership development in the ORCID Consortium Germany)
- Number of ORCID iDs in Crossref (various evaluations on the occurrence of ORCID iDs in Crossref metadata since 2016)

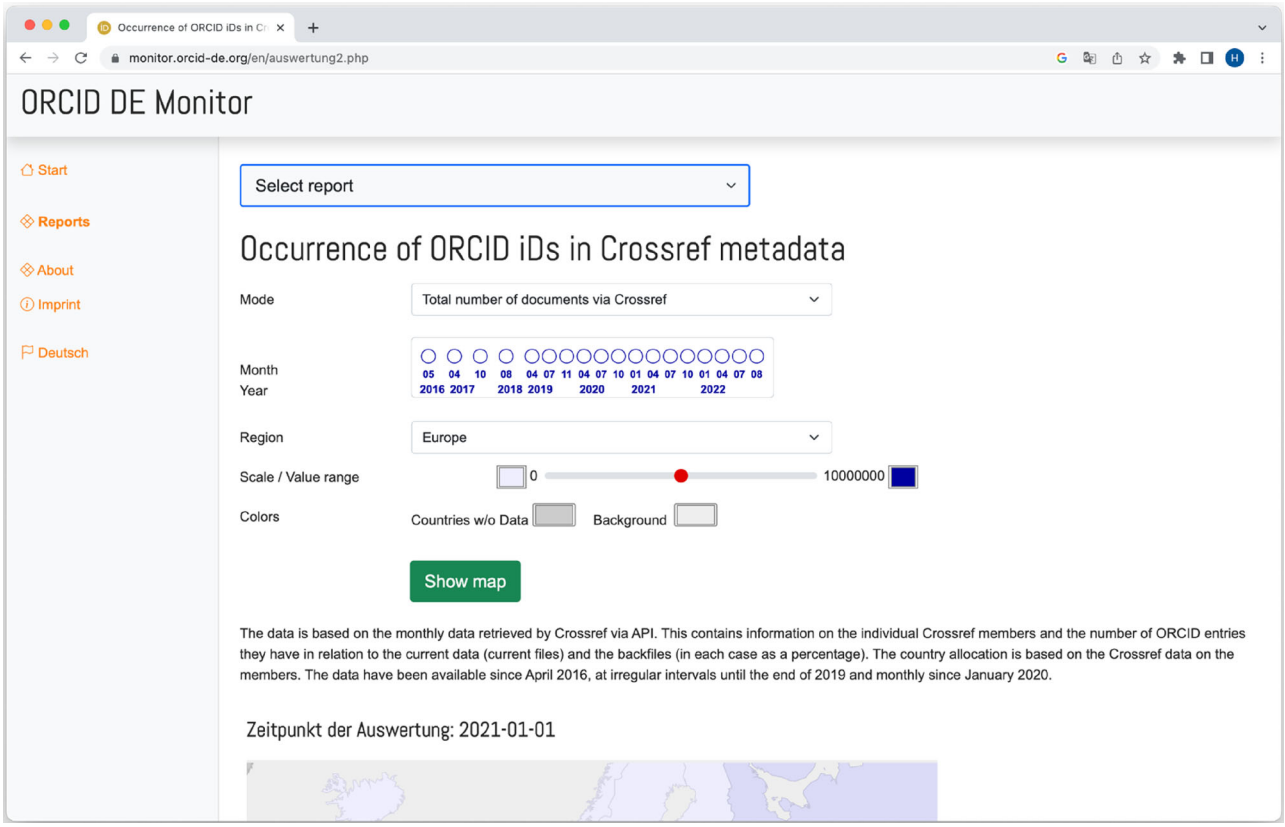

FIGURE 1 Screenshot of the ORCID DE Monitor.

- Number of ORCID records (various evaluations of ORCID users since 2013)
- Repositories (various evaluations on the occurrence of ORCID iDs in repository environments since 2016)

Furthermore, in November 2023, we are testing the following metrics as beta versions:

- Academic institutions (ORCID iDs at academic institutions in Germany; beta)
- Open Access Status in Crossref (occurrence of OA Status in Crossref metadata; beta)
- ORCID iDs in repositories (occurrence of ORCID iDs in repositories; beta)

Networking

Integration with ORCID and other related initiatives stood as a pivotal aspect of the ORCID DE project. Throughout the second project phase, we held monthly consultations with ORCID, fostering an ongoing discourse about ORCID's development and implementation. These discussions facilitated a mutual exchange, where we shared our experiences of ORCID implementations within the German landscape. This close collaboration was very helpful, as it allowed us to keep up to date with the latest ORCID developments and to share this knowledge with the German academic community interested in ORCID. Via our ORCID DE mailing list, we engaged with over 550 professionals working across academic institutions, libraries, and research support departments, all united in their interest in ORCID. Additionally, we encouraged and supported networking among the members of the ORCID consortium in order to share their implementation experiences and to form user communities around the various repository software solutions. Furthermore, we liaised with ORCID consortia globally, drawing valuable insights into the promotion and adoption of ORCID. In an effort to extend our outreach, we initiated dialogues with small to medium-sized publishers to explore potential avenues for ORCID implementation. A highlight during the project's duration was the adoption of ORCID by several funding bodies in Germany, with the DFG, our project's primary funder, leading the charge (Deutsche Forschungsgemeinschaft, 2019).

LESSONS LEARNED

Since our first collaboration with ORCID in 2015, ORCID has established itself as the international *de facto* standard for researcher identification. Through our collaborative and nationwide strategy, we significantly propelled the adoption of ORCID in Germany. However, challenges still persist. A large number of stakeholders, especially in the field of information infrastructures, have an incomplete picture of the goals and functions of ORCID. There is a tendency to erroneously view ORCID merely as a publication listing service. Furthermore, there exists an ongoing apprehension regarding the metadata quality of ORCID records. It is essential to grasp the mechanics of ORCID, understanding that bibliographic data frequently traverse through automated data streams, sourced directly from publishers or open access repositories. The quality of this data is beyond the purview of ORCID's influence.

Moreover, concerns in terms of the different aspects of data protection are very strong in Germany. Even though our commissioned study confirms ORCID's compliance with legal standards, the topic remains a frequent subject of discussion. We experienced that a good understanding of the ORCID functionalities and integration workflows as well as basic knowledge of the data protection aspects is essential for overcoming the challenges to convincingly communicate the value of ORCID integration to internal stakeholders, e.g. management and IT.

Based on our lessons learned, we frame our efforts around the ACTION principles in promoting PID systems and apply them to the specific case of ORCID promotion within a national project. ACTION, an acronym for 'Awareness, ConnectiviTy IntegratiOn, and Networking' was defined by Vierkant et al., 2022, within the ORCID DE 2 project (Vierkant et al., 2022). These four measures outline aspects that have proven effective in promoting ORCID in Germany.

In line with the ACTION principles, we offer the following suggestions for similar initiatives.

Awareness

- Objective: Increase the understanding and recognition of ORCID among researchers, institutions, publishers, and other stakeholders.
- Strategy: Identify relevant stakeholders and host workshops, webinars, and training sessions tailored to different audience groups. Distribute informational materials and emphasize the benefits of having an ORCID iD for designated stakeholders. Always focus on the pertinent use case for the target group and highlight the advantages. Operate openly and transparently, addressing both challenges and unresolved questions. Document your work and make it readily available to others, allowing them to benefit from the experiences gained.

Connectivity

- Objective: Ensure that ORCID connects seamlessly with information systems to facilitate automated data flows.
- Strategy: Implement ORCID in local, national, and international information systems that are relevant to the audience groups. Foster the reuse of data, as openly as possible, through APIs, and support automated data flows. Encourage data usage with accompanying communication activities, such as webinars. Collaborate with the operators of the respective information systems to engage their communities, allowing them to share and contribute their experiences. Ensure connections to other standards relevant to the user group, so that, for example,

other open infrastructures that provide PIDs like DataCite and ROR can be integrated.

Integration

- Objective: Embed ORCID into the broader research infrastructure, from publication submission systems to university databases, and anchor ORCID in associated standards to facilitate its utilization.
- Strategy: Partner with universities, research institutions, and publishers to incorporate ORCID into their workflows. Highlight success stories to motivate more institutions to adopt similar practices. Identify relevant standards and collaborate with standardization initiatives to anchor ORCID within these standards. Educate stakeholders about the benefits and potential of integration and promote best practices.

Networking

- Objective: Foster a community around ORCID that collaborates and shares best practices.
- Strategy: Facilitate networking events, conferences, and online forums where stakeholders can discuss challenges and successes related to ORCID implementation. Encourage collaboration among institutions to share techniques for integration and promotional strategies. Operate on both national and international levels and promote engagement with relevant expert communities. Approach these efforts with openness and transparency, addressing challenges head-on.

FUTURE DEVELOPMENTS

After the ORCID DE projects, the promotion of ORCID will be pursued by the members of the project consortium within the framework of the DFG project 'PID Network Germany' (Bertelmann et al., 2023). This project aims to establish a network of both existing and currently emerging entities focused on the persistent identification of individuals, organizations, publications, resources, and infrastructures in the domain of digital communication in science and culture. The initiative not only seeks to enhance the dissemination and integration of PID systems in Germany but also their incorporation into international infrastructures, such as knowledge graphs. Insights from the project will be incorporated into recommendations presented in a national PID roadmap for Germany. The project will build upon the successful endeavours of ORCID DE.

AUTHOR CONTRIBUTIONS

H.P., A.C.S., P.V., and B.D. wrote the first draft. S.G.D, J.S., and F.S. provided critical feedback and helped shape the manuscript. H.P., A.C.S., P.V., B.D., S.G.D, J.S., and F.S contributed to the final writing and revision of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The ORCID DE Monitor uses open data. See Summann et al. (2021a) for a documentation of the data sources. The source code of the ORCID DE Monitor is not publicly released.

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