



ORCID

Open Science Monitor Case Study

Jonathan Dudek, Josephine Bergmans, Rodrigo Costas
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ORCID - Open Science Monitor Case Study

European Commission
Directorate-General for Research and Innovation
Directorate G — Research and Innovation Outreach
Unit G.4 — Open Science
E-mail Rene.VonSchomberg@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

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ORCID

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Authors

Jonathan Dudek – Centre for Science and Technology Studies (CWTS)

Josephine Bergmans – Centre for Science and Technology Studies (CWTS)

Rodrigo Costas – Centre for Science and Technology Studies (CWTS)

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1 Introduction

Opening up research processes and making the research cycle transparent are essential requirements of Open Science. This does not only involve an interoperable research infrastructure, which centres around researchers, their works and their respective affiliations, but also those institutions that have to maintain an overview of research output: libraries, research evaluators, and funding organisations. This leads to two central challenges: firstly, to have reliable means at hand for connecting researchers with their work (and potentially also other elements such as their affiliations, academic activities [that do not end up in tangible outputs], societal activities, etc.); secondly, to ensure sustainable ways of showcasing linkages between researchers and works.

Research organisations, universities and research libraries, as well as funding organisations, have to connect researchers to their contributions to science. Identifying researchers in an unambiguous way is thus a priority, for example in those cases where two different researchers bear the same name. This is important for knowing exactly who has produced what. Universities and research organizations need to know about the total output of all the researchers that are affiliated with them; funding organisations want to have an overview of the actual production of the researchers who have received funding. This need for a reliable means for identifying researchers does not stop with organisations, though: for researchers themselves it is of interest that their work is attributed to them and not – mistakenly – to someone else with the same or a similar name, and that they count with a centralised point in which their research can be found.

Providing unique identifiers is a potential solution in this situation. However, such identification needs to be as accessible and globally usable as possible if it is expected to have a broad benefit for the scientific community. Different unique identifiers were designed in order to solve this problem, as for example the Researcher ID used in the Web of Science, or the Author ID used in Scopus. A downside of these solutions, though, is that they are platform-bound, proprietary identifiers. Hence, the information connected with them cannot be used as a universal, independent point of reference for researchers and their works.

To solve the above-mentioned issues, ORCID (short for 'Open Researcher and Contributor Id') set out to provide linkages across different platforms and across different types of published work. It was devised as an essential tool in the academic working cycle, acting as an enabler of such processes (Haak et al., 2012). ORCID is a registry that, in its core functionality, provides a unique identification number, the so-called ORCID ID. ORCID IDs are available for anyone who contributes to research, scholarship, and innovation; individuals sign up by creating a personal ORCID record. ORCID IDs are person-based identifiers, serving as consistent, unchangeable means of identification. They are 16-digit numbers that are assigned at random in the process of creating an ORCID record and do not contain any characteristic that might link to the individual in question. Once a unique identifier is created, it can be linked to a researcher's works and affiliations by listing those in the related ORCID record. Since the initial launch of the ORCID registry in 2012, the number of ORCID IDs assigned has constantly been on the rise (see Figure 1), with 6,424,438 ids as of May 2019 ("ORCID Statistics", 2019).

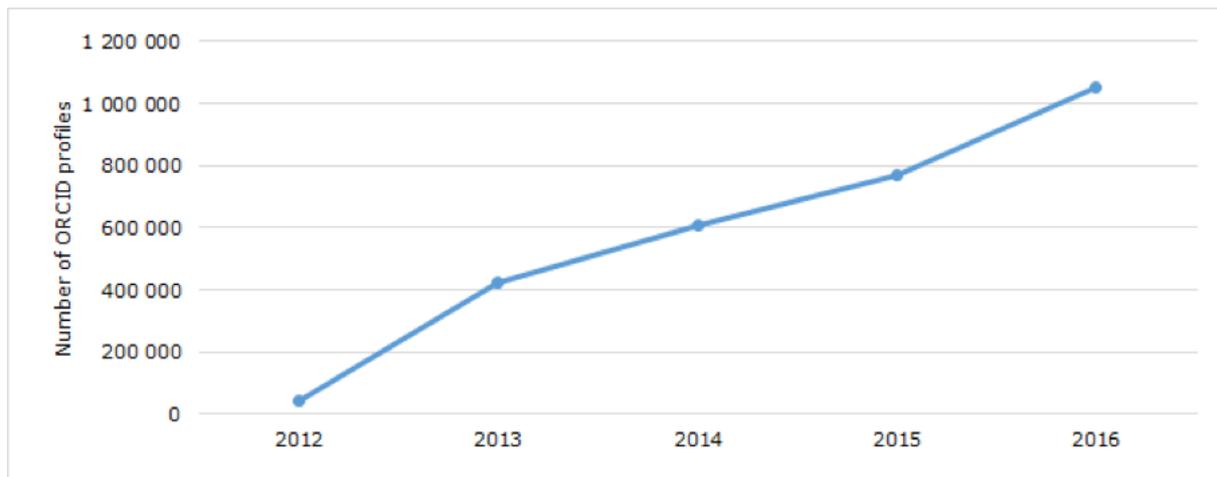


Figure 1. Number of ORCID records added per year since launch in 2012 until 2016. Includes publicly available records only (n=2,897,768)

Linking contributions to their originators in this standardised way and preserving these connected records does not only enhance the visibility of research, but is also a major support service for research infrastructures in general. ORCID strives for becoming a generally applicable solution to the disambiguation and attribution challenge that can be embedded into existing record systems. Alongside the endeavour of expanding the number of individuals and their contributions and affiliations in its registry, ORCID envisions “a world where all who participate in research, scholarship, and innovation are uniquely identified and connected to their contributions across disciplines, borders, and time.” (“Our mission”, n.d.) Accordingly, the desired, central contribution of ORCID is to make possible the connection of researchers, their works, and affiliated organisations in a consistent, unique way. In this sense, ORCID is part of the infrastructure that supports the (digital) sharing of information in science in reliable and accessible ways.

2 Background

Although central in what ORCID offers, disambiguation, i.e. the correct identification of researchers, is only part of the solution. Of likewise importance is that the unique identifiers ORCID provides are connected with other kinds of entities: research works, grants, or research organisations. It is only then that the full benefit of using ORCID IDs unfolds and when an identification system like ORCID yields positive benefits for the scientific community and society-at-large. Once individual identifiers are connected to those other entities, giving credit, recognising a researcher for his work in a reliable way, it is possible to count with a reliable source of scholarly information relevant not only for scholarly actors, but also for anyone interested in discovering and knowing who are the individuals and institutions behind knowledge production (e.g. citizens, journalists, companies, etc.).

To be assigned an ORCID ID, one has to register by providing at least a first name and an email address. Consequently, the 16-digit ORCID ID is generated and henceforth displayed on the individual record. While the ORCID ID is always visible for searches in the ORCID registry, any further information may remain hidden. Such information could be e.g., name variants, a researcher’s country, keywords linking to a researcher’s field of activity, personal websites or social media accounts, other personal identification numbers, or additional email addresses.

Beyond that, a broad range of additional personal information can be listed – up to a complete academic CV. This includes past and current employments, education and qualifications, invited positions and distinctions, memberships and service contributions, funding received, and, most importantly, research output. The latter in particular fulfils one of the central ideas behind ORCID: to connect researchers with their work.

A researcher may decide what information to add to their record, but they may also give other member organisations permission to do so; they will not be able to remove or edit such externally added information, but still, they can decide whether or not to make a certain record publicly available. Hence, the extent of information provided and made openly accessible is up to the individual user. Except of the ORCID ID, any user information can be set invisible to the public. In fact, the owner of a record may choose between public visibility, openness for trusted parties (those are the ORCID member organisations, which we will introduce later), or keeping the information in question completely private. The different levels of visibility can be selected for different parts of a record, meaning that it is possible to select e.g., for each single publication listed for whom it should be visible. In this, ORCID follows a central principle of giving the researchers all control: whoever created an ORCID record does also manage it. While settings can be changed at any point, 87% of those who register with ORCID (initially) opt for making their information public ("Register for an ORCID ID", n.d.).

Keeping the records in ORCID up-to-date is essential for the ORCID system to function in the way designed, especially in the case of updating a researcher's list of works. A researcher may add records of works himself; the second, more convenient way of doing so is by permitting the so-called trusted organisations to update one's record. A trusted organisation may be the organisation an individual is affiliated with, but it may also be a registry like Crossref or DataCite. In any case, it has to be an ORCID member organisation, which is an organisation that has decided to support ORCID through membership fees and to integrate the ORCID ID into their workflow. Some trusted organisations have enabled the automatic update function, in which case a researcher's record will be updated automatically whenever a new record, as for example a dataset or a publication, is detected bearing this researcher's ORCID ID. In the exemplary case of Crossref, this means that whenever a researcher publishes a publication using their ORCID ID, and the publisher submits the ORCID ID alongside the metadata they provide to Crossref, then – with the researcher's one-time permission given – Crossref automatically updates their record with the DOI of their publications.

Consequently, the automatic updating of ORCID records furthers the completeness of researchers' records, leading to updated, relevant, accessible and trustable records. It does not work for publications only, though: Any kind of research activity, like peer reviews, or funding received, information about affiliations, or even biographical information can be added in this way.

The integration of ORCID records in existing infrastructures helps organisations of different kinds in managing the information of the researchers they are connected to - be it research organisations, funders, or publishers. Research organisations may use ORCID records for monitoring and assessing their researchers' output; with the help of ORCID IDs, they can keep track of research activities of their affiliated researchers across the entirety of the research process. In the case of funding organisations, ORCID IDs help in reliably connecting grant receivers, respective funding programs, and consequent research outputs. Finally, publishers can benefit from implementing ORCID IDs in their workflows by generating more valuable publication information on the basis of reliable connections of researchers and their works. In order for organisations to actually reap those benefits, ORCID offers an Application Programming Interface (API) that supports the integration of ORCID records with third-party systems. This allows for setting up automated processes of reading, searching, and updating researcher records.

3 Drivers

ORCID is a non-profit organization that was founded in 2010. The initial board of directors included representatives of various libraries and research institutes, but publishers as well, as for example the Nature Publishing Group, Thomson Reuters, or Wiley-Blackwell ("Certificate of Incorporation", 2010). The eventual launch of the registry in 2012 ([Press release], 2012) thus was preceded by the collaboration of a variety of organisations.

The funding of ORCID depends on membership fees (with several grants having supported the initial development until 2018 as well). Organisations from all over the world, such as research institutions, publishers, funders, professional associations, and other stakeholders in the research system are supporting ORCID as members. As of July 2019, ORCID counts 1,044 member organisations. The majority of those, i.e. almost 80% are research institutions, for example universities. Publishers follow next in prevalence at 7%. Among those, there are publishing houses like Cambridge University Press, Elsevier, Sage Publications, Springer Nature, or Wiley. Government-related organisations are present as well, such as CINECA from Italy, Deutsche Luft und Raumfahrt (DLR) from Germany, or the Institute for Health and Welfare (THL) from Finland. Among the 46 countries the member organisations originate from, the United States (21%) and the United Kingdom (13%) are represented the strongest, followed by Norway (9%) and Italy (8%). ("ORCID Member Organizations", 2019)

20 members serve in an additional role as ORCID consortia lead organisations. ORCID consortia are groups of five or more non-profit organisations which build national or regional communities of ORCID services and resources that support a global open research infrastructure. Every consortium has one lead organisation which helps support the uptake of ORCID in their community.

Success case of ORCID implementation: the Brazilian case

Benefits, and thus, incentives for implementing ORCID IDs in research infrastructures can have very concrete dimensions. We would like to demonstrate this with the case of the Brazilian research system, based on an interview conducted with an official working for CAPES. CAPES is a Brazilian agency in charge of evaluating research and graduate education in Brazil.

As background information it is good to know that in Brazil most of the research is done within graduate education as a result of a public policy introduced in the 1950s. The professionalisation of Brazilian science was a bottom-up process led by private scientific associations in Brazil. The Brazilian Society for the Progress of Science (SBPC) played an active role in the professionalisation process of Brazilian scientists in the 1950s. The SBPC was the first organisation in Brazil to advocate the interests of scientists and science as a main objective (Botelho, 1990). In more practical terms, from the 1950s onwards the interests of scientists are almost entirely reflected in the public policy agenda of Brazil, since the research community is the predominant actor in the decision-making process in charge of the national Science and Technology policy agenda. Basically, this policy agenda has been a policy that is shaped by and for scientists (Dias & Serafim, 2011).

As an academic working in Brazil, from master students to full professors, you are obliged to have your CV uploaded on the so-called 'Lattes' platform. This is an electronic platform maintained by the National Council for Research on which one can freely access standardised and complete CVs of Brazilian researchers. The introduction of ORCID IDs in Brazil was one consequence of this requirement of maintaining one's academic CV. More importantly, the possibility of using ORCID IDs across existing databases saves the researchers time they formerly had to spend on the task of keeping CVs up-to-date. This works because the ORCID IDs are used to make the different information systems in different Brazilian research organisations communicate with each other. As a consequence, academics have to fill in information only once, in one system, and several other systems will automatically be updated accordingly.

The integration of ORCID IDs in Brazil was designed in a way that researchers will not receive any funding if they do not have an ORCID ID. Furthermore, due to the fact that records of research output are consistently linked to the provision of ORCID IDs, in extreme cases it can happen that if you do not have or use an ORCID ID your publications will not count towards the evaluation of one's department or university.

The example from Brazil shows that at times, strong reasons and benefits for having an ORCID ID exist for the individual researcher. Otherwise, it is not granted that everyone

will register with ORCID and consequently, will also use this identifier. A user survey conducted by ORCID in 2017 revealed that indeed, being required to have an ORCID ID is one of the strongest reasons for why people register: Usually, a publisher or funder will require them to provide their ORCID ID at some point (Meadows et al., 2017). Consequently, the requirements of a given infrastructure might constitute the most relevant reason for getting an ORCID ID; merely considering the benefits of having and using such an ID does not necessarily constitute a major driving force.

4 Barriers

Embedding ORCID records in an existing system, or for a researcher to create and also, to maintain and update an ORCID record is subject to certain factors hampering such development. Technology can constitute a barrier, as the integration of ORCID requires an existing technical infrastructure and respective resources at least to some extent. On the other hand, the integration of ORCID is an upfront investment as well, with the eventual benefit for the organisation in question depending on how many affiliated researchers will make use of their ORCID ID. Concerning the researchers, a similar problem, but from a different perspective exists: operating an ORCID record might seem futile if there are not many possibilities where this identifier can be used. This shows that in order for the ORCID registry to be implemented, a certain, upfront credit of trust is necessary - at least as long as network effects due to growing numbers of users are not visible yet, or as long as benefits are not immediately visible either. Overcoming these barriers requires a technically facilitated implementation, and purposeful communication on the side of ORCID respectively its proponents.

As of May 2019, the ORCID registry counted 6,424,438 ORCID IDs. However, this represents the number of IDs listed only. Regarding additional information provided, shares are lower than that, with only 41.27% of those IDs augmented by any other identifier outside ORCID (e.g., DOIs, Researcher IDs, affiliation IDs, links to funding organisations). Only 28.27% of ORCID IDs list an educational affiliation, 26.40% an employment affiliation, and only 2.80% list funding activities. ("ORCID Statistics", 2019) These numbers reveal a considerable problem with ORCID records. While the number of IDs created may be growing constantly, this does not necessarily mean that researchers are providing more information as well and have made this information publicly visible. As a consequence, at least for searches in the public records, the transparency ORCID aims to provide cannot be obtained in a comprehensive manner.

The problem behind is that having an ORCID ID does not necessarily mean that records are being updated on a regular basis from that point on, if at all. Researchers might just have been obliged by e.g., their university to get an ORCID ID, but then see consequent updates more as a nuisance, without realizing the benefits or even being concerned about the extent to which they provide information. This problem is not restricted to manually updating one's record, but applies in the case of updating records automatically (by member organisations) as well: Not all users are allowing automatic updates to happen. As a consequence, records remain empty. On the other hand, even in cases where researchers have a complete record, those may not always be publicly visible, as ORCID leaves it to the responsibility of the individual researcher to either make their information publicly visible, or not. Users opting for non-public visibility of their record constitute a minority, though. Still, for a broadly used service, the desired situation is to have as many records with open information as possible.

5 Impact

5.1 For Science

For individual researchers, one of the central touch points with ORCID IDs are publication submissions to journals. This is because more and more journals require an ORCID ID when submitting a publication; on the other hand, adding publication information is a straightforward way of making use of one's ORCID record. This said, impact for researchers

arises mostly from having a place that bundles publication information. This means that researchers can, for example, use their record as an up-to-date, verified version of their CV. Most importantly, though, consistently using ORCID IDs helps in receiving credit for one's work. This goes well beyond just publications: ORCID is putting functions in place that help to get credit for activities like peer-reviews, or services as for example being a board member.

Referring to the example of the Brazilian science system again, positive impact from using ORCID is generated for researchers because they have to spend less time on managerial issues such as filling different databases with their personal and publication information. They only have to fill in their information once and have to validate information in only one system.

A benefit of a special kind is generated for non-Brazilian researchers working in Brazil. As far as they do not have a personal, Brazilian identification number, ORCID IDs can be used instead of this citizen service number. In addition to that, collaboration with foreign researchers can easily be monitored due to the fact that CVs of anyone related to research in Brazil (on a mandatory basis) have to be provided.

Due to its interoperability and design as an open tool, ORCID is particularly apt as a generally useable unique identifier and does not limit the user to one platform provider. This makes it a convenient solution for both individual researchers, but for organisations that consider establishing the use of a universal unique identifier as well.

Funding organisations, on the other hand, may refer to ORCID records in order to assess information on researchers. Next to, for example, publishers, librarians in particular may benefit from ORCID as far as it helps to solve disambiguation or assigning authorship attributions (Akers et al., 2016). ORCID thus acts as a fundamental part of the research infrastructure, providing an integral element for building tools and services. In this, the major impact generated is based on ORCID's design as a service that – due to that it is open source – can easily be integrated for tapping on the open data provided. Accordingly, ORCID functions as an enabler in an open research infrastructure. At the same time, ORCID records represent a central point of reference for whenever it is necessary to connect individual researchers with their work.

5.2 For Industry

ORCID is not only beneficial to researchers and their immediate affiliations. Different types of organisations related to research are using it: libraries, (commercial) publishers, governmental organisations and funders, (private) research institutes, or laboratories. Hence, the benefits of an identifier system are not bound to a certain type of organisation. Moreover, not every organisation can operate its own such system, while at the same time, gathering information about researchers' activities outside an organisation usually is limited. In this situation, a standardised, universal way for identifying researchers provides an advantage and can even turn existing internal organisational identifier systems redundant.

5.3 For Society

Beyond research organisations and corporations related to research, society in general benefits from ORCID as far as organisations like governments and other, non-profit organisations are involved. Indeed, ORCID has a number of e.g., government related member organisations.

Providing information on research production, and on research activity in general in an open, transparent way makes science more accountable to society as well. Speaking of research products alone, an analysis of ORCID records with public ORCID data from 2017 shows that the share of Open Access publications in ORCID has consistently been above the shares of Open Access publications in registries like the Web of Science, or Scopus (see

Figure 2). This means that ORCID records are more prone to showcasing research beyond the usual boundaries scientific works are subject to.

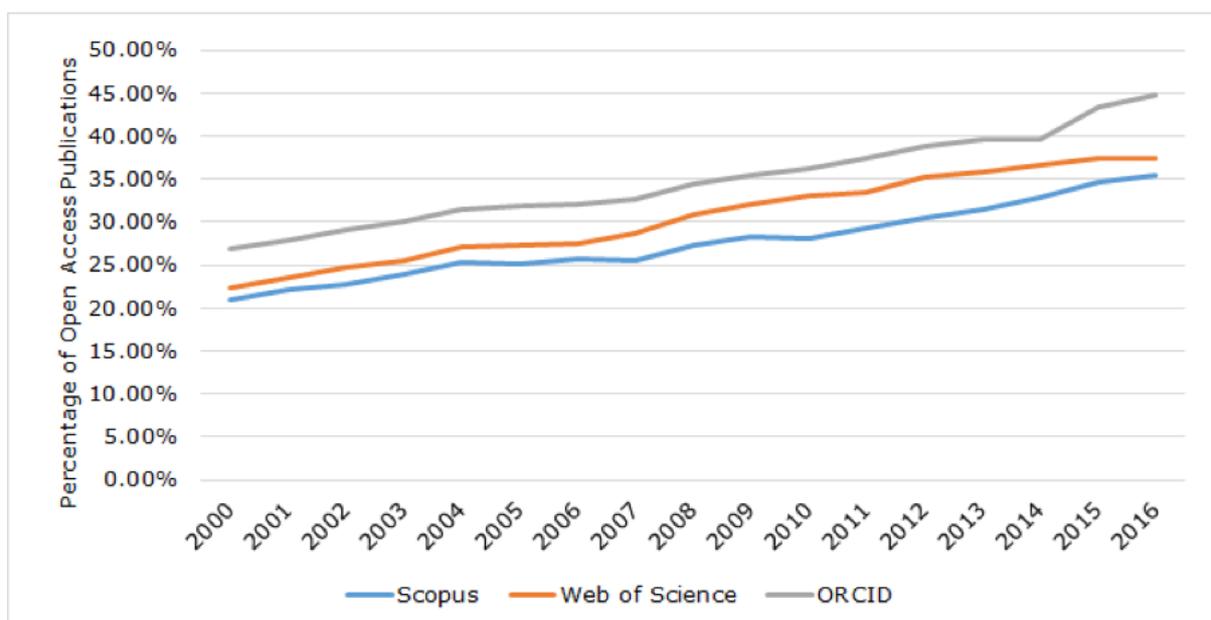


Figure 2. Shares of Open Access publications in different scientific publication databases and in ORCID records

6 Lessons learnt

The case presented provides several learnings in regard to unique identifier systems. However, the challenges and circumstances ORCID has faced and still faces do not only testify about the case of introducing identifiers for researchers. They may be exemplary for similar endeavours to enhance research infrastructures that depend on the participation of the whole research community.

Adoption is facilitated due to benefits arising for a broad range of actors.

With ORCID, there are clear benefits involved for both the individual researchers as well as the institutional entities. This means that neither the adoption of ORCID from the institutional perspective nor the active use as an individual is connected to disproportionate efforts. Especially regarding the individual researcher, the ease of use – once implemented in the way intended – makes the ORCID ID a low-threshold addition to scholarly work.

This is relevant as far as a registry system becomes more beneficial the more entities are involved. Thus, with ORCID IDs used actively by a growing number of users, its impact increases and turns the investment of both, the institutions involved, and the ORCID infrastructure itself into a success.

The implementation of an identifier system can be approached from different angles.

There is no one single way to implement a universal system like ORCID. Instead, support from different actors like individuals, the organisations involved, or even nationwide processes as in the Brazilian example, is necessary. Implementation strategies should take this into account and try to find a balance in involving different kinds of actors. Connected to that, an important question is: should users be required to use a unique identifier, eventually forcing them to adopt it, or should emphasis rather be placed on persuasive communication, relying on prospective users to just become convinced? Or just both?

The right kind of communication is necessary for introducing a solution like ORCID.

Although an understanding of ORCID and its functionalities is important, users also need to believe in the benefits associated. Otherwise, a simple introduction of ORCID might fall short of the continuous, consistent participation of researchers. Such communicative persuasion is a crucial task for the institutions involved as well as for ORCID itself. For the latter, this means persuasion at two fronts. The institutions involved not only need to be guided in the implementation, but need to be urged to communicate the functioning of the services in the right way to their affiliated researchers. At the same time, the community of researchers using ORCID needs to be addressed and guided as well.

Finally, a transparent, universal identifier system like ORCID contributes to Open Science in several ways.

On the operational level, ORCID is designed as an open source system that can be adopted and accessed by third party solutions. In the same vein, ORCID aggregates and provides open data in that it makes record data accessible (via web-based solutions, and via API-access).

On the conceptual level, the endeavours behind ORCID are directed towards "Open Research" as it works towards providing transparent, reliable information on who can be connected to which research activity. Hence, research processes become more open, transparent, and accountable. Finally, as far as ORCID-data reflects research activity in a more or less comprehensive manner, the data records provided can even be indicative of patterns of Open Access use among researchers.

7 Policy conclusions

A system of persistent, unique identifiers provides a number of benefits, not least in the context of Open Science. Correctly identifying individual contributors and elucidating their connections with research output makes the origins of research clear, augments collaboration and exchange in science, and helps organisations to monitor scientific production. Given such a more transparent, connected, and open research ecosystem, efforts towards further implementation are worth considering.

The case of ORCID shows that introducing an identification system that is intended to yield impact across the boundaries of fields of research, research organisations, and even nations requires concerted action. On the other hand, the coexistence of sizeable benefits for both the implementing entities as well as the individual users is decisive. In particular the presence of individual benefits is crucial and should receive adequate attention when anticipating the growth of a service for the scientific community.

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Opening up research processes and making the research cycle transparent are essential requirements of Open Science. This does not only involve an interoperable research infrastructure, which centres around researchers, their works and their respective affiliations, but also those institutions that have to maintain an overview of research output: libraries, research evaluators, and funding organisations. This leads to two central challenges: firstly, to have reliable means at hand for connecting researchers with their work (and with some other elements such as their affiliations, academic activities, societal activities, etc.); secondly, to ensure sustainable ways of showcasing linkages between researchers and works. Providing unique identifiers is a potential solution in this situation. ORCID is a registry that, in its core functionality, provides a unique identification number, the so-called ORCID ID. ORCID IDs are available for anyone who contributes to research, scholarship, and innovation; individuals sign up by creating a personal ORCID record. This case study has a look at the drivers, barriers, and impact of (using) ORCID.

Studies and reports

