

# A tradition of open, academy-owned, and non-profit research infrastructure in Latin America

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**Abstract.** In this paper, we offer an overview of Latin America’s current scientific information infrastructure, highlighting its key role in the adoption of Open Access and Open Science in the region. Some of the most relevant open research information infrastructures are presented, and we discuss the importance of institutional, national, and regional open-access repositories, and journals’ portals on the development of a pioneering collaborative and academy-owned regional infrastructure. Although very successful and well-established, these infrastructures need to be strengthened and supported by national governmental agencies, and regional collaboration.

Keywords: Latin America, digital infrastructure, open science, open infrastructure

## 1. On the importance of open digital infrastructure for research information

Digital research infrastructure is at the core of the recently published UNESCO Recommendations on Open Science, a fundamental international standard-setting and legal instrument on Open Science, developed through a regionally-balanced, multistakeholder, inclusive and transparent consultation process. This document highlights the key role of open digital research infrastructure for a more inclusive, equitable, and diversified research information ecosystem [1].

*“An international framework for open science policy and practice that recognizes disciplinary and regional differences in open science perspectives, takes into account academic freedom, gender-transformative approaches and the specific challenges of scientists and other open science actors in different countries and in particular in developing countries, and contributes to reducing the digital, technological and knowledge divides existing between and within countries.”*

UNESCO recommends that this digital infrastructure should be governed by the scientific community and financed and sustained by governments, under the observance of the needs of the societies in which they live.

*“Open science infrastructures are often the result of community-building efforts, which are crucial for their long-term sustainability and therefore should be not-for-profit and guarantee permanent and unrestricted access to all public to the largest extent possible.”*

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The fundamental concerns addressed by the UNESCO report are focused on international inequalities in terms of digital infrastructure (financial or language barriers), and the fact that changes in research practices and scholarly evaluation systems need to be supported by infrastructures that are aligned to the definition of knowledge as a public and common good. In a recent article, “Open Research Infrastructure” was defined as the core element that enables the creation of tools and services used by researchers [2]. These tools and services are layers built on top of this foundational infrastructure, and organizations enabling open research infrastructures must endorse the fundamental principles of equity, value, trust, interoperability, sustainability, and community governance. In this frame, this foundational infrastructure is composed of different layers, referred to as SIMA: Storage (places to put material generated by research, including physical artifacts), Identifiers (means of uniquely identifying each of the objects the research process created), Metadata (information about each of these objects), and Assertions (relationships between the objects, structured as assertions that link identifiers) [3].

It is clear that, despite the globalization and the commoditization of research information and related tools and services, we are far from a truly global and interconnected research network. For instance, the wide adoption of common standards and best practices in research information management is far from being a reality. With a few exceptions, institutions and countries have developed and adopted on-demand and incompatible solutions, not necessarily thinking in a systemic way, resulting in the coexistence of systems that do not integrate information about people, projects, scientific output, datasets, and funding.

A lot is being studied, written, and implemented on Open Research Infrastructure. Some dedicated organizations, such as the Global Sustainability Coalition for Open Science Services (SCOSS) [4], and Invest in Open Science (IOI) [5] are highlighting the importance of improving funding and resourcing for open technologies and systems supporting research and scholarship. Other non-profit organizations have been doing a lot to reach out to different communities to raise awareness of the importance of persistent identifiers and standards in digital research information such as ORCID, Crossref, and DataCite for the quality, accuracy and interoperability of research data and metadata.

In Latin America, some countries and many organizations have already implemented Open Science policies, and are progressively adopting and implementing best practices in the different workflows related to the research cycle. For instance, Peru (2013), Argentina (2013), Mexico (2014) and more recently Colombia (2022) have implemented national laws of open access repositories and national plans for Open Science. Brazil, Costa Rica, Cuba, Chile, and other countries of the region have been developing different Open Science instruments, such as manifestos and declarations, action plans, and national portals of open access publications. Not to mention a large number of open institutional and national repositories and the massive use of the Public Knowledge Project (PKP)/Open Journals System (OJS) by journals of the region [6].

## **2. Collaborative open infrastructure in Latin America**

In Latin America, both scientific research and the communication of its results are activities mainly financed with public funds and conducted at universities, and state participation is key for research activities in all countries. Scholarly journals are published in universities, and more than anywhere in the world, scholarly journals are using diamond [7] open access publishing models, which originate both from the public mission of the Latin American universities, and from a consensus in academia around the willingness to share knowledge. Moreover, the different modalities of Open Access are mainly funded by research public budgets.

In the Latin American ecosystem, national research systems have created, at different times, many databases on people, research output, institutions, and projects, under different criteria and managed by organizations not necessarily coordinated amongst them. Examples are cv systems, which in the majority of countries are not unified, the institutional repositories, which grew thanks to librarians who indexed and made openly-available the universities and research institutions output in institutional repositories, the open data repositories and indexing databases of Latin American journals.

These are huge efforts of infrastructure and data processing aiming at making the information digitally available. But these systems are siloed in their institutions or countries, and lack an important piece - persistent unique identifiers and permanent links - which are key to promoting a more inclusive science. In this scenario, it is key to generate national systems of scientific information that include, interoperate, and articulate with different researchers' profiles, open datasets, different forms of production and circulation of knowledge, citizen science projects, and consider the plurality of languages used in the region.

### 2.1. Open research information infrastructure: Latindex, SciELO and Redalyc

To promote the management of scientific information as a key element for development, intergovernmental organizations, cooperation agencies, and foundations build up for the emergence of a pioneering regional infrastructure supporting digital journals and indexing web services. SciELO (Scientific Electronic Library Online) [8], the regional open access journal platform was created in 1998, and Redalyc (Red de Revistas Científicas de América Latina y el Caribe, España y Portugal) [9] was born in 2005. Together with Latindex (Sistema Regional de Información en línea para Revistas Científicas de América Latina, el Caribe, España y Portugal, 1995) [10], these organizations are fostering the dissemination of locally produced scientific knowledge.

More recently, the OLIVA project (Latin American Observatory of Evaluation Indicators) emerged to give “visibility to the richness of the scientific publications of the region (indexed in SciELO and Redalyc) and to develop indicators to recognize the value of these journals for the assessment of individual careers and academic institutions” [11].

### 2.2. Institutional, national and regional open access repositories

Institutional repositories play a crucial role in the dissemination of scientific knowledge and equal access to scientific content. Very often outside of the international top scientific landscape, institutional, national, and regional repositories play a crucial role in disseminating the science produced in the region. There are currently six hundred and eighty-eight Latin American repositories in the Open Access Repositories International Registry (OpenDOAR) [12].

LA Referencia [13] is a remarkable cooperative initiative that articulates national repositories of 12 countries of the region. LA Referencia (2012) plays a key role regionally, as it supports the national strategies of open access repositories, by offering a platform with interoperability standards, sharing and making visible the scientific production from higher education and research institutions. From the national nodes, LA Referencia harvest scientific papers, MSc and PhD theses from universities and research institutes, and makes them visible outside the regional frontiers, through the collaboration with OpenAiRE (Open Access Infrastructure for Research in Europe) [14] and COAR (Confederation of Open Access Repositories) [15], and other international agreements.

### 2.3. *The strategic role of Current Research Information Systems (CRIS) in managing national research information*

One of the highlights of the UNESCO Recommendations on Open Science is that CRIS systems (or Research Information Management Systems - RIM) are key elements of open science, as they allow for the capture and interoperability of data from multiple sources, and most importantly, sources outside of the international indexing universe which, amongst other benefits, would allow for the building of more accurate and adequate indicators to evaluate science in its context, beyond mainstream journals.

Many universities and a few countries in the region are adopting or considering adopting a Current Research Information System (CRIS) [16] at the institutional or national levels. Currently, there are thirty-five operational or under-construction CRIS [17]. An interesting and important aspect of this tendency is whether institutions and governments are choosing commercial or non-commercial systems. Six of these implementations are at governmental institutions, and one of them is a commercial solution. At the institutional level, thirteen of the twenty-nine implementations are commercial solutions and sixteen are non-commercial. There are some shared concerns in the community about the sustainability of some solutions or the level of (local language) support. Regarding commercial solutions, the main concerns are interoperability with other in-house national systems, depositing public (and sometimes strategic) research information under a commercial system, and the availability of funds to maintain a long-term solution subscription with providers. Moreover, only public domain infrastructures can support the consolidation of non-commercial open access, which is the brand of the region [18].

Although CRIS systems are at the core of many conversations at the moment, their implementation at a national level is at its earliest stages in Latin America. Amongst the more advanced ones, are the PeruCRIS [19], and the BRIS [20] projects led by the national governmental/funding agencies of both countries, aiming at connecting the different systems already in use (cv systems, data and publications repositories, and other information systems).

In Peru, CONCYTEC (Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica) manages a national CV platform, a national aggregator for Open Access repositories and other applications for storing information about researchers and innovators, evaluators, institutions, publications, and projects. PeruCRIS is funded by the World Bank, under an agreement with the 4Science-Semicol Consortium. The PeruCRIS platform (open-source D-Space CRIS software) offers five directories: human talent, scientific output, projects, institutions, and infrastructure. It will offer information services and allow the implementation of tools to follow up and evaluate the National System of Science and Technology, as there is an articulation between Information Technology (IT) (software and infrastructure), information management (universities and libraries) and scientific policy [21].

In Brazil, the BRIS project involves governmental funding agencies, and key players of the Brazilian research ecosystem, and is led by the Brazilian Institute of Science and Technology Information – IBICT/MCTI (Instituto Brasileiro de Informação em Ciência e Tecnologia/Ministerio de Ciência, Tecnologia e Inovação). It aims at building a national platform integrating education, science, technology, and innovation data to rationalize national information systems and make information available according to international best practices. Also, it aims at creating a research information ecosystem, integrating state and national systems, and optimizing knowledge management.

The BRIS project (based on open source VIVO software) will integrate all these platforms and databases and is working on an open science infrastructure based on the LA Referencia software platform. This initiative is articulated with OpenAIRE Research Graph and the main goal is to repatriate Brazilian data that are in repositories and databases around the world. Among other components, this project is

nourished by other initiatives, such as the extensive and growing use of ORCID for researchers, DOIs for articles and datasets, and ROR for organizations.

A recent document, published by FOLEC (Foro Latinoamericano Sobre Evaluación Científica from the Consejo Latinoamericano de Ciencias Sociales -CLACSO) in 2021, proposes and promotes the discussion about the creation of a Latin American CRIS, building upon the infrastructure, articulation, and technical expertise developed by LA Referencia. To consolidate this open science regional tradition, a Latin America CRIS would serve as a horizon for all the institutional and national initiatives that are in progress. For this to happen, the commitment and engagement of different actors and the construction of a regional collaborative space are crucial.

### **3. Final considerations**

The Latin American region has a long tradition of bibliographic cataloguing that was professionalized with the support of intergovernmental organizations and agencies that promoted scientific information management as a key element to development. This allowed for the emergence of bibliographic indexes and databases, regional repositories and libraries that favor the scientific exchange between universities and regional institutions [21].

The existing research information infrastructure is rather fragmented and there are important gaps in the use of persistent identifiers in publishers, institutional repositories, journal portals and funding agencies' workflows. Nevertheless, non-profit organizations such as ORCID, Crossref, and DataCite are playing an important role in educating stakeholders about the importance of a common framework for science being truly open, diverse, and inclusive.

On the other hand, the current collaborative and community-led pioneer initiatives such as Redalyc, LA Referencia and SciELO set an excellent foundation to strengthen the development of regional infrastructures that build on previous efforts and offer a public domain ecosystem for the open science in the region.

The dreamed interoperability, with the wide adoption of global standards in research information management in the region, depends on parameters such as the digital gap, countries' unequal development, and the language (English as the unique code for interoperability). Moreover, the vision and opportunities of individual stakeholders at the head of key institutions seem to play a major role in the effective and long-lasting implementation of those interoperability standards at institutional or national levels.

There is a growing space of discussion, awareness, and adoption of these standards, following best practices and experiences in other countries. Notably, experiences in Europe - EuroCRIS [22] implementations and PTCRIS [23], in particular, are leading the way to more interoperability for Latin America research.

NISO (National Information Standards Organization) and sister organizations in other countries have a crucial role to play in supporting the interoperability that open science needs, by setting standards that allow for a representation of all types of research outputs and elements, all languages, and are visible to and accessible by Society.

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