

Bridging the Digital Divide: How Repository Networks Are Shaping the Future of Open Science

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In our complex world, ensuring open and equitable access to scholarly research and educational resources has become more critical than ever. For the past 15 years, COAR, a leading international association representing open access repositories, has been at the forefront of efforts to create interconnected networks of digital repositories that preserve and provide access to a wide range of valuable research outputs. Its work is helping to transform how knowledge is shared and disseminated globally and has played a pivotal role in advancing the development of repository networks and enhancing their functionality. By fostering greater interoperability and cooperation between repositories worldwide, COAR is creating a truly global infrastructure for open science that transcends institutional and national boundaries.

The Rise of the Networked Repository

Digital repositories have been part of the scholarly landscape for decades, but it was only in the early 2000s that the concept of the institutional repository (IR) gained significant traction. These IRs were positioned as powerful tools that could both transform scholarly communication and showcase an institution's research output. However, COAR recognised early on that the true value of repositories lay not in their individual collections but in their potential to form part of a larger, interconnected network.

In a seminal publication on repository interoperability published in 2011, COAR argued that the real value of repositories lies in their potential to become an interconnected network that can provide unified access to an aggregated set of scholarly and related outputs that machines and researchers can work with in new ways. This vision of networked repositories promised to make research outputs more discoverable, enable connections between related content, and contribute to the development of other value-added services built on repository resources.

Despite the clear potential of repository networks, progress in realising this vision has been slower than anticipated and much of COAR's work has focused on understanding the challenges that have hindered the development of these networks and identifying strategies to overcome them.

Building the Technical Foundation

One of the key technical innovations that enabled the early networking of repositories was the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). Developed by Herbert Van de Sompel and colleagues at Los Alamos National Laboratory, OAI-PMH presents a standard protocol for the aggregation of metadata across distributed repositories and other content providers.

This protocol has been instrumental in creating several important aggregation services in the scholarly communications landscape. These include national aggregators in Europe and Latin America, as well as international services such as BASE, CORE, and OpenAIRE. These aggregators offer a variety of discovery and analysis services, creating what is known as a 'research graph' that identifies connections and relationships across records in the aggregation.

However, COAR also recognised that while OAI-PMH was a crucial first step, more advanced networking capabilities were needed to fully realise the potential of repository networks. In 2016, they launched the COAR Next Generation Repositories (NGR) Working Group, which called for new levels of web-centric interoperability.





The Next Generation of Repository Networks

The vision outlined by the NGR working group presents a more resource-centric vision for repository networking. Rather than relying on imprecise descriptive metadata to identify individual resources in a repository and the relationships between them, their vision relies on the idea inherent in the Web Architecture, where resources are accessible and identified unambiguously by URLs. In this architecture, the references are copied between systems rather than the metadata records. This shift towards a resource-oriented approach represents a significant evolution in how repository networks might function. It would allow for more direct interactions between resources in different repositories without the need for centralised services or aggregators.

To implement this vision, COAR launched the COAR Notify Project, which developed a conceptual model for a resource-oriented ecosystem using linked data notifications and activity streams as standard technologies for exchanging information across different platforms. This approach supports a wide variety of use cases but, with financial support from the Arcadia Fund, is focusing initially on connecting articles in repositories with peer reviews and endorsements undertaken by open peer review services and overlay journals, offering an innovative alternative to traditional journal publishing.

The Human Element of Networks

While the technical components of repository networks are important, successful networks are about more than just technologies. Creating a shared vision and adopting standard practices are equally important for building a successful network. Human beings are key for making this happen.

This includes agreeing on common formats for exposing metadata, adopting Permanent Identifiers (PIDs), and using common vocabularies to ensure consistency in terminology. COAR also plays a critical role in bringing together the human networks that ensure there is global interoperability in a diverse and multilingual world.

Interoperability as the Key to Global Collaboration

Since it was launched in 2009, COAR has consistently emphasised the critical importance of interoperability of repositories.



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^ COAR community members.



^ COAR Annual Meeting.



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As the academic world continues to grapple with the challenges and opportunities presented by the digital age, COAR's work in advancing repository networks stands as a beacon of progress. By fostering greater collaboration, interoperability, and openness in scholarly communication, COAR is helping to create a more open and equitable future for research and education worldwide.

They have argued that for repositories to be fully optimised, they must adopt common behaviours that expose their content and metadata in the same way, allowing them to communicate with each other, connect with other systems, and transfer information between each other. And, while different regions may have distinct requirements based on their specific user communities and jurisdictions, collaboration across networks is crucial to support the global nature of research.

To this end, COAR has been an important forum for fostering greater cooperation between repository networks by identifying common objectives and areas of collaboration. Ultimately, the aim is to ensure a basic level of interoperability while still supporting the unique functions and needs of each network.

Overcoming Future Challenges

Despite the compelling value proposition for the networking repositories, there have been some challenges to overcome. These include an initial focus on institutional role rather than networked potential, and the technical architecture of early repositories that didn't reflect the highly networked nature of the web. The challenge of software silos in the repository landscape has also impeded interoperability.

Even with these challenges, there is a very bright future on the horizon for repositories as open science becomes the norm for research communications around the world. And, as technologies and standards evolve, COAR will continue to play a critical role in ensuring platform-agnostic interoperability and the networking of repositories worldwide. Through its leadership, COAR is not only strengthening repositories around the world but actively shaping their future.





MEET THE RESEARCHER

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Kathleen Shearer has been the Executive Director of COAR (Confederation of Open Access Repositories) since 2013. With over 15 years of experience in open access, open science, scholarly communications, and research data management, she has been instrumental in advancing open science globally for more than two decades. Based in Montreal, Canada, Shearer is a prolific author and speaker, delivering presentations at international events. She was the lead author of the influential paper 'Fostering Bibliodiversity in Scholarly Communications: A Call for Action'. In addition to her role at COAR, Shearer serves as a Research Associate with the Canadian Association of Research Libraries (CARL). Her extensive expertise and contributions have significantly shaped the landscape of open science and scholarly communication worldwide.

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COAR

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ORGANISATION

COAR (Confederation of Open Access Repositories) is a global alliance of over 130 members and partners, including libraries, universities, research institutions, and government funders. Established in 2009, COAR evolved from the DRIVER project, which aimed to connect European repositories. Recognizing the need for a worldwide approach, COAR expanded its mission to create a global network of open access digital repositories.

COAR's vision is to foster a sustainable, inclusive, and trusted global knowledge commons. Its mission focuses on enhancing the visibility and application of research outputs through collaboration across the international repository community. By aligning policies and practices, building capacity, and serving as a global voice for repositories, COAR strives to make research more accessible and impactful.

From its inception with 28 members, COAR has grown significantly. In 2023, Stichting COAR (Foundation) was established to continue the organization's aims beyond 2025, ensuring the ongoing development of a truly global open access repository network.



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