Leading FAIR Adoption Across the Institution: A Collaboration Between an Academic Library and a Technology Provider

DANUTA A. NITECKI (iD)

ADI ALTER

Author affiliations can be found in the back matter of this article

ABSTRACT

Universities strive to foster knowledge sharing and greater research productivity. Some recognize that this requires research output to be findable, accessible, interoperable and reusable. But current tools do not yet allow a comprehensive adoption of these FAIR principles for making research openly and globally accessible to generate new knowledge. To address this gap, diverse stakeholders are collaborating to build effective research data management [RDM] solutions for institutional research output [publications and data] that benefit researchers, institutions, and developers. This paper illustrates a university-industry collaboration between a private U.S. university (Drexel University) and a global commercial vendor (Ex Libris, a ProQuest company). The authors examine how an emerging technology infrastructure for Research Data Management will enable librarians to help institutions adopt the FAIR principles at scale. They highlight an approach for collaborative product development that aims not to change researcher habits or add to librarians' workloads. Their first year working together confirms factors recognized as contributing to successful collaborations, such as aligning goals, building understanding of each other's organizations, and sustaining honest engagement. Though FAIR offers a simple articulation to help build campus infrastructure and change culture, its implementation will vary between different groups of researchers. Libraries and technology providers have a mutual interest in collaborating to address RDM challenges, but must recognize that collaboration takes time, perseverance, and flexibility to effect change. Librarians, researchers, and administrators from such campus offices as Research, Compliance, IT, Legal, and Graduate Studies will benefit from key lessons raised by this case study.

INTRODUCTION

The FAIR principles for research output—to be findable, accessible, interoperable, and reusable—offer a vision to guide research universities in meeting their core mission to create and disseminate knowledge [GO FAIR]. FAIR's vision challenges librarians to consider how they can apply their information management expertise to support the development of an institutional culture that values research data management (RDM), while guiding and encouraging individuals to handle *all* research assets—including publications and research data—in a systematic manner that fosters knowledge sharing and greater research productivity. Although there are more than 30 years of literature promoting urgency of RDM (Borgman 2012; Zhang and Eichmann-Kalwara 2019) and research universities employ various mechanisms to manage and distribute research publications, the authors believe that current tools do not yet allow a comprehensive adoption of the FAIR vision.

To address this gap, practitioners are recognizing that integrating change processes and engaging with diverse stakeholders may benefit researchers, institutions, and developers alike. Numerous collaborations have formed across units within an academic organization and across information associations (Cousijn et al. 2019; Savage and Cadwallader 2019; Schirrwagen et al. 2019). However, collaborations between a university and a business to address the challenge of managing research output guided by FAIR principles appear to be scarce (Cope et al. 2018; Levine-Clark 2016, Russell et al. 2016; Sherman et al. 2018). This paper shares the insights of two stakeholders who share a commitment for such a collaboration.[1] The results of this case study will be of interest to librarians, research administrators, compliance officers, educators, researchers, and students, and possibly those involved with inquiry into the emerging interdisciplinary topics around RDM as well as university-industry collaboration.

METHODOLOGY

The authors chose to follow standard methodology of an illustrative case study to share their insights from examining and analyzing practices of a university and business collaboration to design a solution that will help multiple academic stakeholders manage research output based on FAIR principles. The real-life setting fits this qualitative methodology to identify in-depth, practices, and find future research questions and factors for evaluation of the impact of the collaboration approach. Alternative methodologies were rejected as premature and not possible to implement at this time. Key participants in the collaboration gathered data, reviewed insights from the literature, and through reflection and discussion, offer recommendations and realistic strategies to help address RDM challenges.

BACKGROUND

For decades, academic libraries have been central to advancing their institution's research mission through the management of scholarly publications and archival records. They establish partnerships with researchers and faculty, acquire data sets and digital documents, and provide training in methods of locating information. Libraries champion open access and offer faculty alternative scholarly publishing options to address increased costs of journals and article fees charged by publishers (Chiware et al. 2018; Ogungbeni et al. 2018). Reflecting a growing literature pertinent to RDM, librarians are assuming more "transformative" roles by developing research data services for the application of text and data mining, artificial intelligence, biblio-metrics, and assessment of research impact (Cox 2019; Ogungbeni et al. 2018). Other library-specific services link with support of FAIR principles, such as highlighting research output through the development of institutional repositories, championing policies to guard privacy, and guiding the use of metadata and deposit procedures (Ogungbeni et al. 2018).

The literature suggests that libraries cannot single-handedly motivate the self-reliant culture of academic departments and research teams to follow FAIR guidelines for ensuring accessibility of research output. Nor has funding agency requirements for planning data management yet succeeded to do so. Neither can a powerful software system that simplifies complexity or

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[1]   This paper expands on a presentation the authors made at FAIR and Responsible Research Data Management Workshop. Drexel University-CODATA, Philadelphia, PA, USA. April 1, 2019.

mandated certification training in ethical research habits. There is no simple button to press to reap the benefits of a FAIR-driven vision for making research openly and globally accessible to generate new knowledge.

Specifically, the paper illustrates a university-industry collaboration between a mid-sized, private U.S. university (Drexel University) and a global commercial vendor (Ex Libris, a ProQuest company), both working across multiple academic and corporate units. The authors examine how they expect an emerging technology infrastructure for RDM (*Ex Libris Esploro*) to help libraries build social infrastructure that will enable institutions to adopt the FAIR principles at scale, with less effort than current processes and systems allow. From their first year working together, they confirm factors that contribute to a successful collaboration, without claiming a completed process or endorsing a specific product.

HOW THE DREXEL-EX LIBRIS COLLABORATION EMERGED

Library and information science professionals from these two organizations with diverse missions and norms have come together with a common interest to support the curation and sharing of university-generated research output to advance knowledge, learning, and innovation.

DREXEL LIBRARIES BRINGS A DISCOVERY VISION AND SEEKS DEVELOPMENT HELP

Nearly a decade ago, Drexel's president challenged the University to become a comprehensive research institution. In late 2018, Drexel achieved R1 designation, placing it within a community of "very high research active" institutions in the United States.[2] Drexel has an annual research revenue of nearly $124 million[3] and in 2018 awarded over 315 research and professional Ph.D. degrees. The focus on advancing Drexel's research extends the University's 127-year legacy of providing experiential education in STEM fields as well as business, medicine, health professions, media and digital creative fields, and computing and informatics, among other disciplines.

Despite its current growth in research, Drexel continues its emphasis on education and heavy dependency on tuition revenue. As yet, campus culture lacks a shared commitment to open-access dissemination of scholarship, an awareness of the institutional and scholarly value in making research output accessible, and recognition of the diverse campus stakeholders involved in managing institutional risks related to inadequate RDM. Many persons who generate and handle research data interpret the challenge to strengthen campus infrastructure for RDM as primarily a technological system design problem to facilitate research teams' work with active data. The challenge of managing research output to be findable, accessible, interoperable, and reusable is not a high priority beyond advice to prepare Data Management Plans (DMPs) for grant proposals and the Libraries' interest to extend its strategic directions around information management.

A Provost-appointed committee report in 2015[4] affirmed that Drexel-generated research output, including data, is an institutional asset. The report further suggested that research output is thus subject to proper records management. It recommended the establishment of a shared governance structure to coordinate the diverse interests in minimizing institutional risks.

During this same period, the Drexel Libraries leadership advocated for applying professional expertise, resources, and flexible organizational structure to address some of the issues of

2   Carnegie Classification of Institutions of Higher Education. Retrieved 07/21/2019 *http://carnegieclassifications.iu.edu/classification_descriptions/basic.php*.

3   Falcone, Alissa (2019). "Drexel Research Enterprise Achieves National Recognition" *Drexel Now*, January 9. Retrieved online 07/21/2019 *https://drexel.edu/now/archive/2019/January/Drexel-Research-Enterprise-Achieves-National-Recognition/*.

4   Formation of University Data Management and Intelligence Infrastructure: A proposal toward changing Drexel's culture for innovation, competitiveness, risk reduction, observance of privacy & security, and cost savings. Prepared by the Data Stewardship Committee. D. Nitecki and K. Matuch, co-chairs; Edited by P. Sankar February 20, 2015. [Internal document submitted to Provost].

managing research output, particularly digital publications and data sets. However, amidst budget cuts and personnel turnover among campus leadership, no high-level champion arose to support RDM.

With no top-down authority to establish a campus-wide governance structure, the Libraries sought collaborators to help meet its self-assumed responsibility to build support and guidance for preserving research output, ensuring the global discovery and accessibility of this output to advance the university's research ambitions. Unexpected interest came from the Compliance Officer and the General Counsel Office. Together, these three groups informally created a Data Stewardship Forum of stakeholders interested in managing research data as an institutional asset. The voluntary group expanded to include leaders from the Office of Research, campus IT, Chief Security and Privacy Officers, the Graduate School, and a few faculty members who provided research administrative support in their departments.

The Forum has organized its shared work around updating policies and workflows, building technology systems and support services, and embedding information in campus communications and educational programs. In fall 2018, the group's senior administrators—the Senior Vice-Provost for Research and the Dean of Libraries—helped raise awareness of the importance of RDM and FAIR principles when invited to present to the campus Risk Management Committee, accountable to the Board of Trustees.

The Libraries redefined positions and recruited for vacancies to add new or second-generation experts in areas of metadata, digital preservation, records management, archives, data research services, electronic collections acquisitions, data analytics, and integrated systems management. However, with 55 FTE total employees and annual budget of $10 million, Drexel University Libraries is not equipped to be a development shop.

Like many small academic libraries, Drexel Libraries staff are innovative, collaborative, and not hesitant to leverage their limited resources to outsource what does not require their unique expertise. In 2017, they explored upgrading or replacing the Libraries' management system to help with RDM. They were observing (through surveys and consultations) that researchers typically stored their data outside professionally managed repositories, if at all, and a few expected to add their output to discipline-based repositories when funders would so require.

The Libraries sought to leverage the library management system to provide a more robust discovery layer to identify and locate institutional assets—including data and other digital formats—held not only in bibliographically controlled collections, but also in repositories and archives beyond the Libraries' nascent institutional repository. The Libraries leadership also sought to find a reputable partner to help raise awareness of global and international efforts to advance open science and to strategically position locally generated research output to shape future research. With assistance from the Procurement Office, Drexel Libraries invited key library system vendors and others in the field to help the University find a partner to implement the Libraries' vision.

EX LIBRIS BRINGS DOMAIN EXPERTISE AND SEEKS ENGAGEMENT TO CREATE A SOLUTION

Although a few vendors complemented this vision, none had a solution to offer. Then the Ex Libris development strategy team reached out and invited Drexel to participate in their efforts to design a research services platform to support what they held as a similar—though far more developed—vision of the future needs for RDM. Today, Drexel is among a cohort of universities that as Esploro Early Adopters are field-testing the Esploro platform built on Ex Libris' *Alma library management system*.

Ex Libris works closely with academic libraries to enrich its product development initiatives, share knowledge with community members, and obtain inputs for driving improvements. Collaboration is done through international, national and local user groups, community events, webinars, as well as regular Ex Libris product team discussions with customers to identify needs, product plans, and ongoing updates.

EX LIBRIS' APPROACH FOR A SUCCESSFUL COLLABORATIVE PRODUCT DEVELOPMENT

Together with the Esploro development partners[5] and early-adopter institutions such as Drexel, Ex Libris defined a set of principles to guide the development of a next-generation research repository and data management platform.

- **Do not change researchers' habits:** An RDM system should be a seamless part of the researcher's workflow and should not impose new processes for submitting and managing data. Furthermore, the system should provide value to the institution and to researchers themselves, even if researchers do not fully engage with the system.

- **Do not create more work for librarians:** An RDM system should aim to eliminate redundant and manual processes, enabling libraries to scale up their support for research activities. To do so, the system should provide rule-based workflows and automate processes wherever possible.

- **Do not create yet another point solution:** To eliminate the formation of additional siloes, a new system should be built as an open, interoperable system, easily integrated with other systems. It should be intuitive to use out-of-the-box, yet highly configurable for each institution.

HOW UNIVERSITY-INDUSTRY COLLABORATION SUPPORTS THE FAIR IDEALS

To realize the vision for making research output findable, accessible, interoperable, and reusable, while adhering to these guiding principles, Ex Libris and its university development partners have adopted the following approaches.

USE OF RICH METADATA TO IMPROVE THE DISCOVERABILITY OF RESEARCH DATA

By applying rich metadata and persistent identifiers to research output and data, institutions can improve the discoverability of their research assets. Furthermore, the use of researcher identifiers such as ORCID helps identify and track researchers' work wherever the data are managed. The combination of robust metadata and persistent identifiers significantly reduces issues of author disambiguation for accurate author matching. What's more, strong search engine optimization (SEO) support makes it easier to find data through search engines.

USE OF TRUSTED, OPEN REPOSITORIES TO MAKE OUTPUT MORE EASILY ACCESSIBLE

To make data accessible, the data and their associated metadata should be understandable to humans and machines. Data should be deposited in trusted repositories based on open standards that can be accessed by other systems.

USE OF STANDARD FORMATS AND OPEN APIS TO SUPPORT INTEROPERABILITY

To ensure that data are interoperable, metadata should be in a standard format that other systems broadly recognize. The use of open APIs and export mechanisms enables data to be reused and transferred across systems.

USE OF CLEAR USAGE LICENSES TO FACILITATE REUSE OF DATA

For data to be reusable, all data and collections should have clear, machine-readable usage licenses and should provide accurate information on data provenance.

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5   Five Partners Join Ex Libris in Developing Esploro Research Services Platform *https://www.exlibrisgroup.com/press-release/new-ex-libris-research-services-platform-esploro-five-development-partners/*.

USE OF CONSISTENT AND AUTOMATED WORKFLOWS TO SIMPLIFY RESEARCHER AND LIBRARIAN ACTIVITIES

To allow effective administration of research output and enable libraries to apply FAIR principles at scale, for all researchers, institutions should employ automatic and semi-automatic processes for capturing of research assets from internal and external sources.

PUTTING THESE GOALS INTO PRACTICE

In collaboration with its development partners, Ex Libris designed and *launched* the Esploro software solution to support these goals. Ex Libris developers prepared a sandbox for each Early Adopter institution to experiment with Esploro, exploring its impact on local workflows and identifying ideas for improvement. A Drexel team of librarians, system managers, and Library Faculty Fellows began this work in spring 2019.

Drexel Libraries will be leveraging Ex Libris Esploro to help capture the University's research output and add rich metadata to these assets. The platform includes automated processes to save time and simplify data capture for researchers and librarians.

For example, by integrating with Ex Libris' discovery index as well as national and discipline-specific repositories, Esploro can automatically identify research published by faculty, capture the relevant metadata associated with a source, create a record within Esploro for that research asset, and add it to the authors' profile page. This saves librarians and researchers from having to manually enter all of this information for themselves.

Esploro also broadens the scope of research assets that can be stored in a research repository. The platform's flexible data model supports a wide variety of research assets, including data sets, code, and creative work. Each type of asset has its own unique schema for capturing metadata, with data fields that are relevant to that particular asset type. Having unique schemata for each asset type helps institutions add these various research assets to the repository easily, while also capturing rich, high-quality metadata to ensure discoverability.

HOW WE ARE MAKING COLLABORATION SUCCESSFUL

A rich literature documents university-industry collaboration through guides (Pertuze et al. 2010; Stanford University ICO), case studies, and research (Bjursell and Engstrom 2019; Rybnicek and Konigsgruber 2019; Sandberg et al. 2011; Sherman et al. 2018; Yamaguchi et al. 2018). Many uncovered characteristics of such collaborations allude to both advantages and barriers. Several factors resonate with us in reflecting on the Drexel-Ex Libris collaboration to lead FAIR adoption.

ALIGN GOALS

Drexel Libraries sought a partner to improve its capacity to advance the University's research reputation and impact through strengthening connections to scholarship. Ex Libris sought a collaborator to further its competitive advantage in the higher-educational marketplace through designing a responsive software for RDM and more. From the vendor's initiation through contract negotiations and current engagement in development, both parties respect each other's reasons for participation. Implementing FAIR principles reflects shared goals around the availability of knowledge, though each party approaches these goals from different perspectives.

BUILD UNDERSTANDING OF ORGANIZATIONS

Ex Libris has evolved through in-house product developments and outside acquisitions into a large, globally dispersed organization. Drexel collaborators work in a relatively small academic library that supports a university that is restructuring to build capacity for more active research. Both collaborators benefit from understanding organizational challenges and resource capacity needs to adopt FAIR for improved research output management.

SUSTAIN HONEST ENGAGEMENT

Successful collaborations require agility, willingness to change, and commitment to shared goals. Communication is critical to build the necessary trust. Drexel team members forward

their questions and insights to Ex Libris; in turn, Ex Libris schedules routine discussions, shares recordings of webinar meetings, develops informative marketing materials, and responds to queries quickly through email and its Basecamp collaboration space for Early Adopters. Drexel has learned to target campus champions for the project and adjust expectations for how long integration of multiple systems takes, while Ex Libris has gained understanding of the University's limited repository-curated research content and its uneven interests in research output management.

CONCLUSIONS

The authors analyzed their field observations and review of the literature with staff of their organizations, and then together, suggest the following principles and underlying strategies toward finding solutions for RDM through collaboration within a university-business partnership.

1. Research output is not easily recognized as an institutional asset that requires effective management.

2. Strengthening infrastructure for RDM requires addressing multiple interests and changing culture.

3. FAIR offers a simple articulation to help build campus infrastructure and change culture.

4. However, FAIR is not a strict standard—and actual implementation (and needs) will vary between different institutions.

5. A system should offer enough functions out-of-the-box to make the commonality a commodity but be flexible and extendible enough to cater to these different needs.

6. Libraries and technology providers have a mutual interest in partnering to develop tools and design processes that address RDM challenges, and must recognize that collaboration takes time, perseverance, and flexibility to learn and effect change.

The authors offer these conclusions with a cautionary note, characteristic of the case study methodology. The insights describe a practice, in one setting, through evidence subjectively gathered and analyzed, and are not generalizable to other settings. They enable however identification of conditions, motivations, and contributions of these academic and business institutions, committed to a common goal of implementing FAIR principles to improve systems and guidance for researchers and academic institutions to manage research output. With more case studies of different collaborations, clustering of evidence around these preliminary variables may help to develop and implement successful practical solutions.

ACKNOWLEDGEMENTS

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR AFFILIATIONS

Danuta A. Nitecki [iD] *orcid.org/0000-0002-6232-7784*
Drexel University, US
Adi Alter
Ex Libris, IL

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