PART TWO

Case Studies

**Research Information Management
in the United States**

OCLC

Research Information Management in the United States: Part 2—Case Studies

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INTRODUCTION

Research Information Management (RIM) is a rapidly growing area of investment in US research universities, comprised of a variety of use cases, stakeholders, and products. This growth has been characteristically decentralized, resulting in silos, multiple systems, and frequent duplication of efforts at many institutions.

The *Research Information Management in the United States* two-part report series seeks to fill a gap in the literature by documenting RIM activities to provide US research institutions with a more comprehensive and strategic view of RIM practices.

In Part 2 of this report, we provide an in-depth narrative of the RIM practices at five US research institutions:

- Penn State University
- Texas A&M University
- Virginia Tech
- UCLA
- University of Miami

Each case study includes content about the history and relevant use cases as well as significant documentation about each RIM system and its implementation, including its scope, stakeholders, and administrative leadership. It also provides an extensive description of the RIM systems themselves, detailing the data sources, processing and storage practices, and system goals and uses. The narratives conclude by documenting the metadata and sources populating each RIM system and describing future plans for the institutional RIM system(s).

Two of the case studies—Texas A&M and Virginia Tech—are relatively simple because they focus on a single institutional system. The other three case studies—Penn State, UCLA, and University of Miami—are more complex because they each document three separate RIM system implementations. In cases with multiple systems, we maintain the overall organizational structure, with subdivisions to explore each system separately. In the metadata table for each case study, we provide a comparative view of the multiple systems.

This report documents the source material and evidence that informs *Research Information Management in the United States: Part 1—Findings & Recommendations,*[1] which summarizes the findings and recommendations synthesized from these five case studies. That report provides an overview of US use cases and an introduction to the RIM System Framework that is used throughout the case study narratives referenced in this report. It also documents the methodology and limitations of the study. We encourage readers to first review *Part 1—Findings and Recommendations* and then return to this report to complete their understanding of the RIM ecosystem in the United States.

Penn State University

Introduction

The Pennsylvania State University (Penn State) is a state-related research-intensive university. Penn State enrolls nearly 75,000 undergraduates and more than 15,000 graduate and professional students across 24 campuses, including a medical school. Its flagship and largest campus, University Park, is in State College, Pennsylvania.

Penn State has three distinctive institution-level RIM systems that aggregate, curate, and use information about research activities, supporting different use cases:

- Activity Insight
- Penn State Research Portal
- Researcher Metadata Database

The first two of these systems have been in place for several years, and the third system, the recently launched Researcher Metadata Database, aggregates data from both of these systems. This new database may over time become both authoritative (the most accurate source for Penn State publication data) and comprehensive (covering all types of published research).

Penn State has three distinctive institution-level RIM systems that aggregate, curate, and use information about research activities, supporting different use cases.

The role of the Penn State University Libraries in the institution's RIM story contrasts with others in this study: Penn State Libraries is not directly involved with the researcher profile system that showcases Penn State's research (though the Health Science Library does play an important role), but Penn State Libraries is the administrative lead for the system that supports faculty activity reporting and promotion and tenure processes. Several interview participants in other case studies commented that their library consciously avoids being involved with systems that support faculty evaluation.

Origin story

ACTIVITY INSIGHT[2]

In 2009, Penn State licensed the faculty activity reporting (FAR) product Digital Measures at the initiative of the then-Vice Provost for Academic Affairs, who worked with the Dean of Libraries to pilot the system with Penn State Libraries faculty. The system was administered by the campus

Office of Information Technology, and other academic units were onboarded over time. The IT group supporting Digital Measures also supported other Penn State Libraries systems; this team was moved from central campus IT to the Libraries in late 2016.

Today, the Penn State Libraries Faculty Activity Management Services team supports the Activity Insight system, which is used by nearly all full-time faculty for annual activity reporting across all 24 Commonwealth campuses.

A few years after its initial rollout at Penn State, the Digital Measures company rebranded the software as Digital Measures Activity Insight, and the Penn State team gratefully adopted "Activity Insight" as the local brand used with campus stakeholders. By using the new name, they were able to distance themselves from the unfavorable perceptions of early users, who had some negative experiences from working with a less mature product. The product's brand changed yet again when Digital Measures was acquired by Watermark (it's now known as Digital Measures by Watermark), but for reasons of continuity, Penn State continues with the local branding of Activity Insight. To avoid confusion, we will use the name Activity Insight throughout this case study.

Today, the Penn State Libraries Faculty Activity Management Services (FAMS) team supports the Activity Insight system, which is used by nearly all full-time faculty for annual activity reporting across all 24 Commonwealth campuses. Many colleges also use it for promotion and tenure processes.

PENN STATE RESEARCH PORTAL[3]

In 2015, the Penn State Office of the Senior Vice President for Research (OSVPR) requested an evaluation of systems to support benchmarking of research activities against peer institutions, resulting in the selection of Elsevier's SciVal analytics product, in part because of the desire to more transparently access the data behind the metrics. In the case of SciVal, the metrics are based on publication metadata from Elsevier Scopus, also licensed by Penn State. Any user could examine the underlying data in the SciVal benchmarking reports by searching Scopus to review which publications were associated with the University or an individual and request corrections if necessary. Because SciVal can integrate with Elsevier's Pure product, Penn State reviewed Pure as well.

At the time, the College of Medicine (CoM) was running the open source Profiles RNS product, which had been launched in 2011 to support the CoM's Clinical and Translational Science Award (CTSA) with profiles for Penn State faculty. While CoM was satisfied with Profiles RNS, it could not be extended to cover the entire institution the way Pure could because its only automated source for publications metadata was PubMed. In contrast, Pure's companion Profile Refinement Service (PRS) provides a weekly "feed" of disambiguated publications from Scopus for Penn State authors, enabling a seamless update to researcher profiles. Pure also supports imports from other external indexes and data entry to account for research output not covered by Scopus. OSVPR and CoM saw Pure as an opportunity to build a showcase for Penn State research across disciplines, with a transparent data source that faculty could review and edit as needed. Penn State licensed Pure, and it was locally branded "Penn State Research Portal."

As with other RIM implementations in our study, launching the Research Portal took longer than anticipated. A universal challenge seems to be identifying the relevant researchers to include in the portal and situating them within the institution's hierarchy. For example, many—but not all—CoM people are included in the central Penn State human resources system, but other names, titles, and affiliations must be sourced elsewhere. The Research Portal launched as an internal-facing portal in 2017, affording researchers the opportunity to review their profiles prior to public launch and to ensure that the Research Portal could fully replace Profiles RNS for CoM. The Penn State Research Portal launched publicly about a year later in early 2018.

RESEARCHER METADATA DATABASE[4]

In 2017, the third RIM platform was seeded when Penn State's Provost and the Dean of Libraries charged an Open Access (OA) Taskforce to craft an open access policy for the institution.[5] As one subgroup of the taskforce worked on the policy itself, another subgroup worked to get ahead of a common challenge: If implemented, how could Penn State make compliance with the policy as convenient as possible for faculty members? Penn State Libraries staff were involved in both subgroups due to their traditional scholarly communications role on campus and also because of the Libraries Activity Insight team's knowledge of faculty data. Penn State Libraries developed ideas for automating the work as much as possible by using the publication information that faculty added to their activity reports in Activity Insights each year to check for OA status. They then prompt faculty members to upload files to the ScholarSphere, the Penn State institutional repository, if needed.

At the same time, the research office was preparing to implement Pure. Recognizing that the Penn State Libraries had learned many lessons as they fully implemented Activity Insight, the research office requested assistance from the Libraries in the Pure implementation process. As the implementation team and Penn State Libraries communicated about the data Pure would contain, they noted that there would be substantial—but not complete—overlap between the data stored in the two systems. Furthermore, both Pure and Activity Insight provided APIs for reusing that data. Penn State Libraries had already issued API credentials for Activity Insight to some departments so they could add publication information to department websites; they could foresee confusion as some people used Pure and others used Activity Insight for similar purposes. They could also predict that as use proliferated and the respective vendors changed their APIs, each department using a vendor's API would need to evaluate changes and potentially change their own code.

To support the envisioned OA policy, Penn State Libraries also considered purchasing a product that provided a list of institutionally authored open access publications. However, upon review, they realized that the institution was already aggregating and curating metadata that was of higher quality than what the vendor could provide. Penn State Libraries concluded that by investing in their own development work and leveraging the currently licensed products, they could work toward a solution to satisfy both current and future needs.

Their solution was the Researcher Metadata Database, or RMD, an aggregation system that contains information about faculty scholarship at Penn State and is developed and maintained by Penn State Libraries. RMD's primary sources for publication metadata are Activity Insight and Pure.

The Penn State OA policy was approved in 2019,[6] and RMD development began concurrently. When the policy went into effect on 1 January 2020, faculty could deposit their publications in ScholarSphere directly or via an Activity Insight integration. In February 2021, the Penn State Libraries began contacting PSU authors by email, providing them with a list of publications believed to be covered by the policy but not yet publicly available and prompting them to deposit to ScholarSphere, provide an OA URL, or apply for a waiver.

RIM Implementation Timeline at Penn State
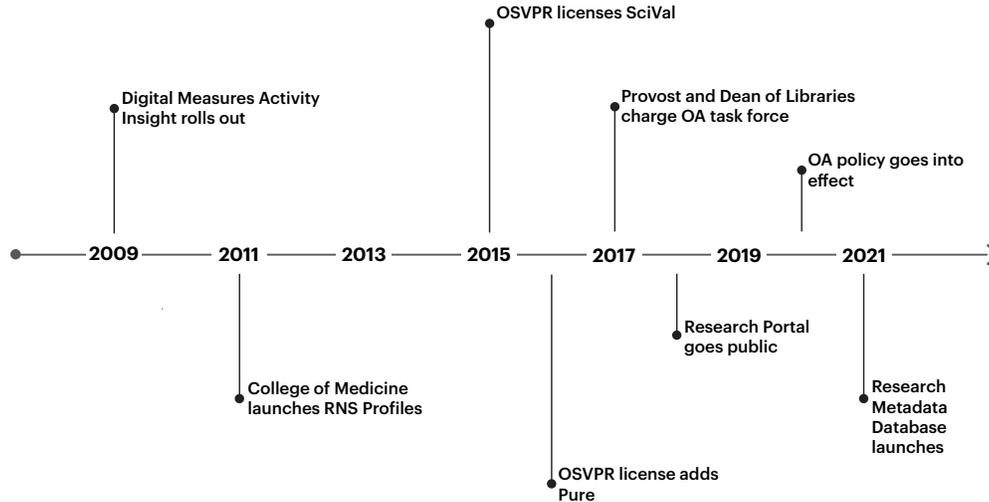
FIGURE 1. RIM Implementation Timeline at Penn State

Use cases

ACTIVITY INSIGHT

The Activity Insight system supports the following use cases:

- **Faculty activity reporting (FAR):** Activity Insight provides Penn State's full-time faculty with one place to add all information for their required annual review process. The original goal was to move away from manually edited documents while allowing each college to design a standard CV for its annual reports and for tenure and/or promotion. Activity Insight provides faculty annual reports and university dossiers.

- **Metadata reuse:** Because the Activity Insight database now contains a significant archive of faculty work, the data it contains has been reused for public websites and reporting, including accreditation reports for colleges. Now that the RMD database is part of the RIM ecosystem at Penn State, data is piped from Activity Insight to RMD to meet website and reporting use cases from that database.

PENN STATE RESEARCH PORTAL

The Penn State Research Portal primarily supports the public portal use case, but also addresses metadata reuse and strategic reporting and decision support:

- **Public portal:** For the research office, the primary goal for the public portal is to serve as a research showcase for the entire university. The information available needs to be a fair representation of Penn State research but does not need to be 100% comprehensive. OSVPR places importance on both the individual researcher profiles and the aggregated department, institute/center, and college profiles.

Faculty across all campuses (except the College of Medicine) can log in and add information to their own profiles but are not required to do so. The medical school imposes more control: in addition to showcasing research, the college values a uniform and accurate representation of CoM research. Individuals must submit additions and changes to their profiles to Pure team members rather than

making changes directly to Pure,[7] as researchers in all other Penn State units may do. The medical school only allows institutional photos for individual profiles and values consistent branding and quality control.

Additionally, both the research office and the medical school view Penn State Research Portal as a valuable tool to support expertise discovery. It promotes team science and interdisciplinary research, and it enables people both within and external to Penn State to learn about the institution's research.

- **Metadata reuse:** As with Activity Insight, data extracted from Pure populates the RMD.

- **Strategic Reporting and decision support:** The research office licenses Elsevier SciVal for strategic reporting and decision-making. Pure and SciVal are complementary, with Pure providing accurate lists of Penn State people, their Scopus Author IDs, and their internal affiliations to SciVal.

> The . . . Penn State Research Portal . . . promotes team science and interdisciplinary research, and it enables people both within and external to Penn State to learn about the institution's research.

RESEARCHER METADATA DATABASE

The RMD supports three use cases:

- **Open access (OA) workflow:** RMD powers a workflow to help authors more conveniently comply with University policy. Authors are notified of publications that are not already in an OA repository, and can deposit the appropriate version in ScholarSphere, the institutional repository, when necessary. RMD's support of the Penn State OA Policy is similar to California Digital Library's support for the University of California OA policy, addressed later in this report.[8]

- **Metadata reuse:** A Penn State Libraries-maintained API supports automatic feeds from RMD to update unit websites. The RMD API allows college and unit webmasters to add lists of publications or profile information to Penn State websites, reducing redundant data entry.

- **Strategic reporting and decision support:** Using RMD, Penn State Libraries can run reports for different units on campus through an administrative interface.

RIM systems

ACTIVITY INSIGHT

Scope
Activity Insight is used by all full-time faculty members in nearly every college throughout the multicampus Penn State system. The College of Medicine also includes part-time faculty members.

In total, Activity Insight includes records for over 7,000 individuals.

RIM System Framework
Figure 2 and table 1 provide a framework for understanding the Penn State Activity Insight system. Complementary information is also provided in table 4 about the metadata and sources.

RIM System Framework for Penn State Activity Insight

DATA SOURCES

PUBLICATION DATABASES

LOCAL DATA SOURCES
HR,
Academic History
Sponsored Projects

LOCAL KNOWLEDGE

DATA PROCESSING

ETL PROCESSES

METADATA EDITOR
Activity Insight

DATA STORE
Activity Insight

DATA TRANSFER METHODS
Activity Insight API,
Homegrown API

DATA CONSUMERS

FACULTY ACTIVITY REPORTING

METADATA REUSE
Researcher Metadata Database
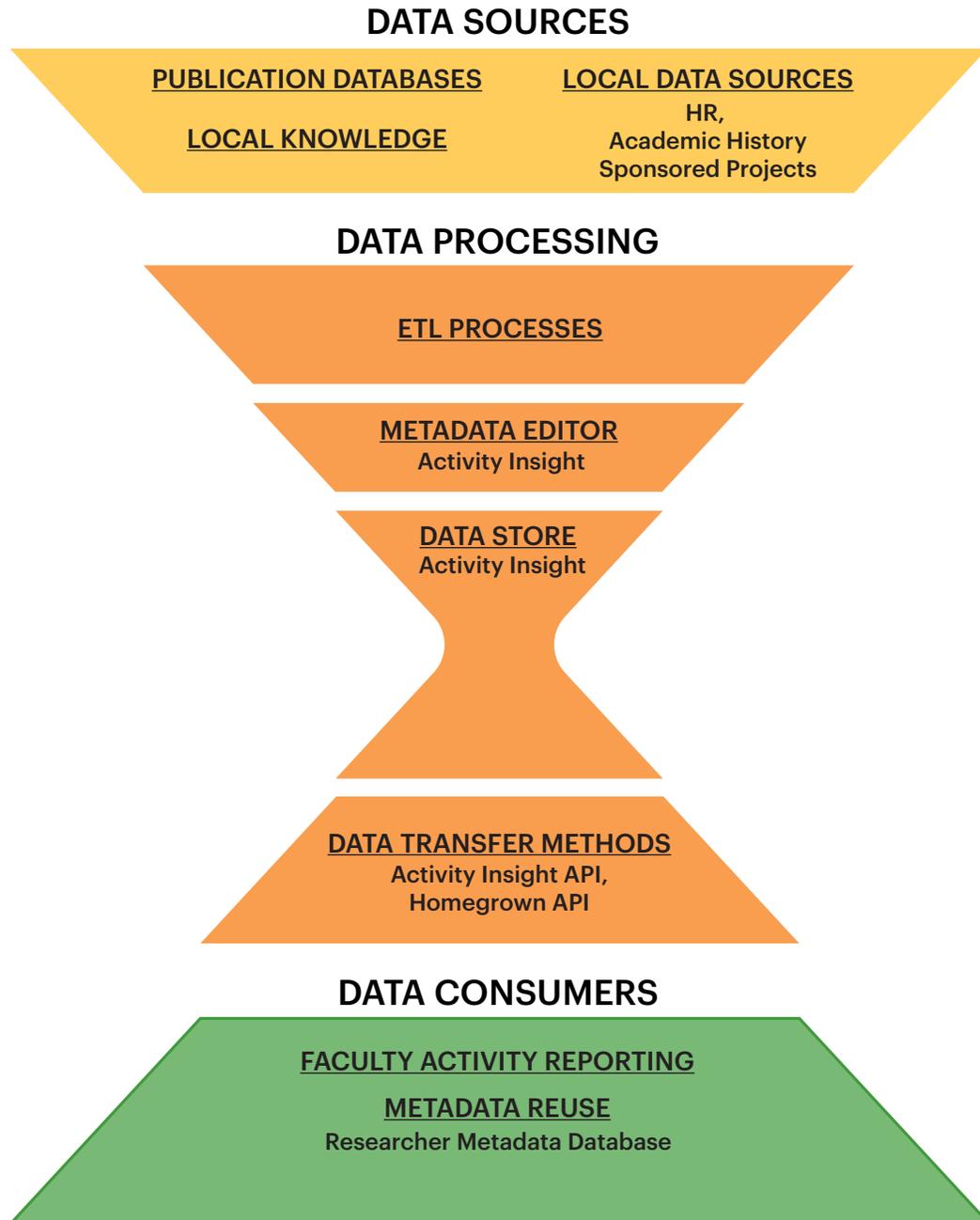
FIGURE 2. RIM System Framework for Penn State Activity Insight

TABLE 1. RIM system details for Penn State Activity Insight

Data Sources	**Publication databases**	Although there are no automated data sources for the research outputs in Activity Insight, users can expedite quality publications metadata loading by importing from Scopus, Web of Science, PubMed, and CrossRef.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	n/a
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Users can add and edit information to their activity reports through Activity Insight. The Activity Insight editor includes tools for importing publication metadata. Additionally, they can extract a BibTeX file from Google Scholar for import to Activity Insight. Where the only data source is the CV itself, the Penn State Libraries FAMS team can use an internally-developed CV Importer tool to divide the citations into a CSV format.
	Data store	Activity Insight has its own database for storage.
	Data transfer methods	The Activity Insight API provides a means of data extraction and reuse. The FAMS team also has a homegrown API that allows them to push, pull, and delete data at scale.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	Activity Insight allows administrative staff in departments and colleges to generate activity reports and CVs. The actual routing for annual activity reporting is done via email and shared folders. There is a homegrown workflow for promotion and tenure.
	Public portal	n/a
	OA workflow	n/a
	Metadata reuse	Data is extracted from Activity Insight for use in the Researcher Metadata Database. Although the Activity Insight API had been used to extract data for public websites and reporting, such use cases are now served by the Researcher Metadata Database.
	Strategic reporting	n/a
	Compliance monitoring	n/a

Administrative responsibility

The license for Activity Insight is paid for by the Office of the Vice Provost for Academic Affairs and managed by the Libraries Faculty Activity Management Services (FAMS) team. Penn State Libraries hold several training sessions annually for new faculty and their delegates as well as for people who want a refresher. Recorded training sessions are also available.[9]

For users who require extra support, the Penn State Libraries offers a CV Service for faculty members who are going up for promotion, in which a FAMS team member enters information from the faculty member's CV into Activity Insight. Even with the importer tools described in the Metadata Editor component of the RIM System Framework, the process is time-consuming: a typical 12 to 15-page CV takes about a week to complete. Mid-career faculty members seeking promotion to full professor could have CVs as long as 75 pages. The team considers the service worth the effort for two reasons: first, because this is a greatly appreciated service among faculty, and second, because the Penn State Libraries can more easily ensure the accuracy of the data, making it fit for later reuse. The service is staffed by three part-time employees plus the FAMS lead.

Stakeholders and users

Activity Insight stakeholders include:

- Faculty members who use Activity Insight
- University Libraries, which administers Activity Insight for the entire Penn State community
- Vice Provost for Academic Affairs, who funds the Activity Insight license
- Leaders and staff in colleges and departments who support the annual review and promotion and tenure processes

It has been a priority for both the former Vice Provost who initiated the effort and the current Vice Provost to meet regularly for in-depth conversations with the team, underlining the importance of the system to Academic Affairs.

The FAMS team has developed a robust community of practice through an active oversight committee composed of representatives from each college that meets every two months to discuss annual review and P&T processes, present upcoming changes, and review change requests. The committee approach promotes transparency, helps prioritize and manage change requests, and continuously improves the system for all users. All changes are subject to final approval by the Vice Provost.

With the exception of training and support when needed, the team does not take extra steps to encourage faculty engagement with Activity Insight. Contrary to systems where engagement by faculty is a goal, the team believes that a more reliable measure of success would be at least one but no more than two logins per year per faculty member. They reason that if Activity Insight is reliably populating faculty records with accurate information from other internal and external sources, faculty shouldn't need to spend much time in the system to accomplish what they need to do.

PENN STATE RESEARCH PORTAL

Scope

Penn State Research Portal covers all Penn State full-time tenured and tenure-track faculty, research faculty, and nonfaculty researchers in all campuses and colleges. For the College of Medicine, the Research Portal also includes faculty at the rank of assistant professor or higher. The Research Portal includes profiles for about 5,500 persons.[10]

Figure 3 and table 2 provide a framework for conceptualizing the Penn State Research Portal system. Complementary information is also provided in table 4 about the Metadata and sources.

RIM System Framework for Penn State Research Portal

DATA SOURCES

PUBLICATION DATABASES
Scopus

LOCAL DATA SOURCES
HR (Central and Med. School),
NIH Grants

LOCAL KNOWLEDGE

DATA PROCESSING

PUBLICATION HARVESTER **ETL PROCESSES**
Profile Refinement
Service

METADATA EDITOR
Pure

DATA STORE
Pure

DATA TRANSFER METHODS
Pure Web Services,
Pure Reporting Module

DATA CONSUMERS

PUBLIC PORTAL
Pure Portal

METADATA REUSE
Researcher Metadata Database,
Scival
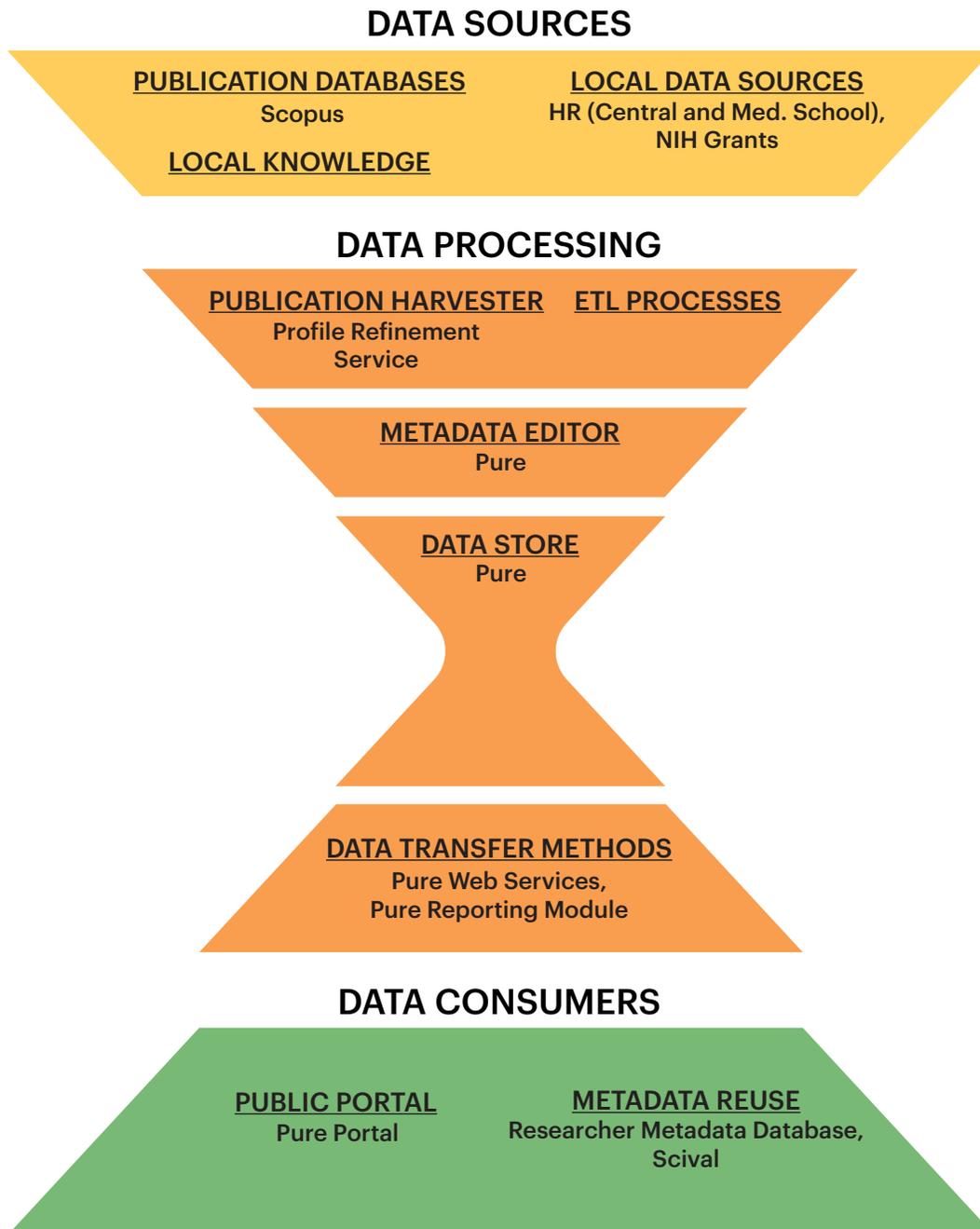
FIGURE 3. RIM System Framework for Penn State Research Portal

TABLE 2. RIM system details for Penn State Research Portal

Data Sources	**Publication databases**	Most publications in the Research Portal are from the Scopus database, but individuals and their delegates can import from other publication databases as well.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	Pure's companion service, the Profile Refinement Service (PRS), provides a weekly "feed" of disambiguated publications from Scopus for Penn State authors.
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Pure includes an editor for reviewing and editing profile information and importing from other sources. Administrators can assign roles that allow editing of organization-level information.
	Data store	Pure has its own database for storage.
	Data transfer methods	Pure provides web services and allows exports of data in various formats using its reporting module.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	Pure includes a public portal module.
	OA workflow	n/a
	Metadata reuse	Data is extracted from Pure for use in the Researcher Metadata Database. SciVal uses the organizational hierarchy and author lists defined in Pure.
	Strategic reporting	The research office licenses SciVal for strategic reporting and decision support. The organizational hierarchies, author lists, and Scopus Author IDs support reporting in SciVal.
	Compliance monitoring	n/a

Administrative responsibility

The two funding entities, the OSVPR and the CoM, are major stakeholders and jointly administer Pure. Their support for the stakeholders with profiles in Penn State Research Portal differs, however.

For CoM personnel, a team of four staff from three different units maintains the CoM profiles for about 1,500 researchers:

- Harrell Health Sciences Library, for knowledge about research outputs

- Research Development, for knowledge about the institution and collaboration

- Marketing and Communication, for knowledge about brand, editorial, and compliance standards

Everyone else in the Research Portal—about 4,000 researchers—receives support as needed from just two research office staff members. The pair are primarily engaged in loading and maintaining data—implementing and maintaining the organizational hierarchy has proved especially challenging—and ensuring that Pure is running smoothly. The lead spends more time in SciVal— also an Elsevier product—than in Pure, leveraging the organizational structure and the persons as defined in Pure to produce better reports than could be produced with either SciVal or Pure alone.

Stakeholders and users
The primary stakeholders for the Research Portal include the two funding entities:

- Office of the Senior Vice President for Research

- College of Medicine

In addition, there are numerous other users of the Research Portal for expertise discovery and institutional reputation management:

- Corporate Engagement Center

- Foundation Relations

- Centers, interdisciplinary institutes, and shared facilities

- Global Programs

- Colleges and departments

- Faculty members and researchers

There are several stakeholders who make use of the Pure API to reuse the data in Pure. They include:

- Penn State Libraries, for Activity Insight and the Research Metadata Database

- Penn State Cancer Institute, for its website

- Huck Life Sciences Institute, for the auto-generated concept "Fingerprints" for individuals based on text analysis of their research output titles and abstracts

RESEARCHER METADATA DATABASE

Scope
RMD includes persons who are in either Activity Insight or Pure. If a researcher is included in at least one of those systems, they will be in RMD, regardless of job type or affiliation.

RIM System Framework

Figure 4 and table 3 provide a framework for conceptualizing the Penn State Researcher Metadata Database system. Complementary information is also provided in table 4 about the Metadata and sources.

RIM System Framework for Penn State Researcher Metadata Database

DATA SOURCES

PUBLICATION DATABASES

LOCAL DATA SOURCES
Pure,
Activity Insight,
Penn State News

DATA PROCESSING

ETL PROCESSES

METADATA EDITOR
Admin. Front End,
OA Workflow Front End

DATA STORE
Researcher
Metadata
Database

DATA TRANSFER METHODS
Homegrown API

DATA CONSUMERS

Websites

STRATEGIC REPORTING
Report on Request

OA WORKFLOW
Institutional Repository
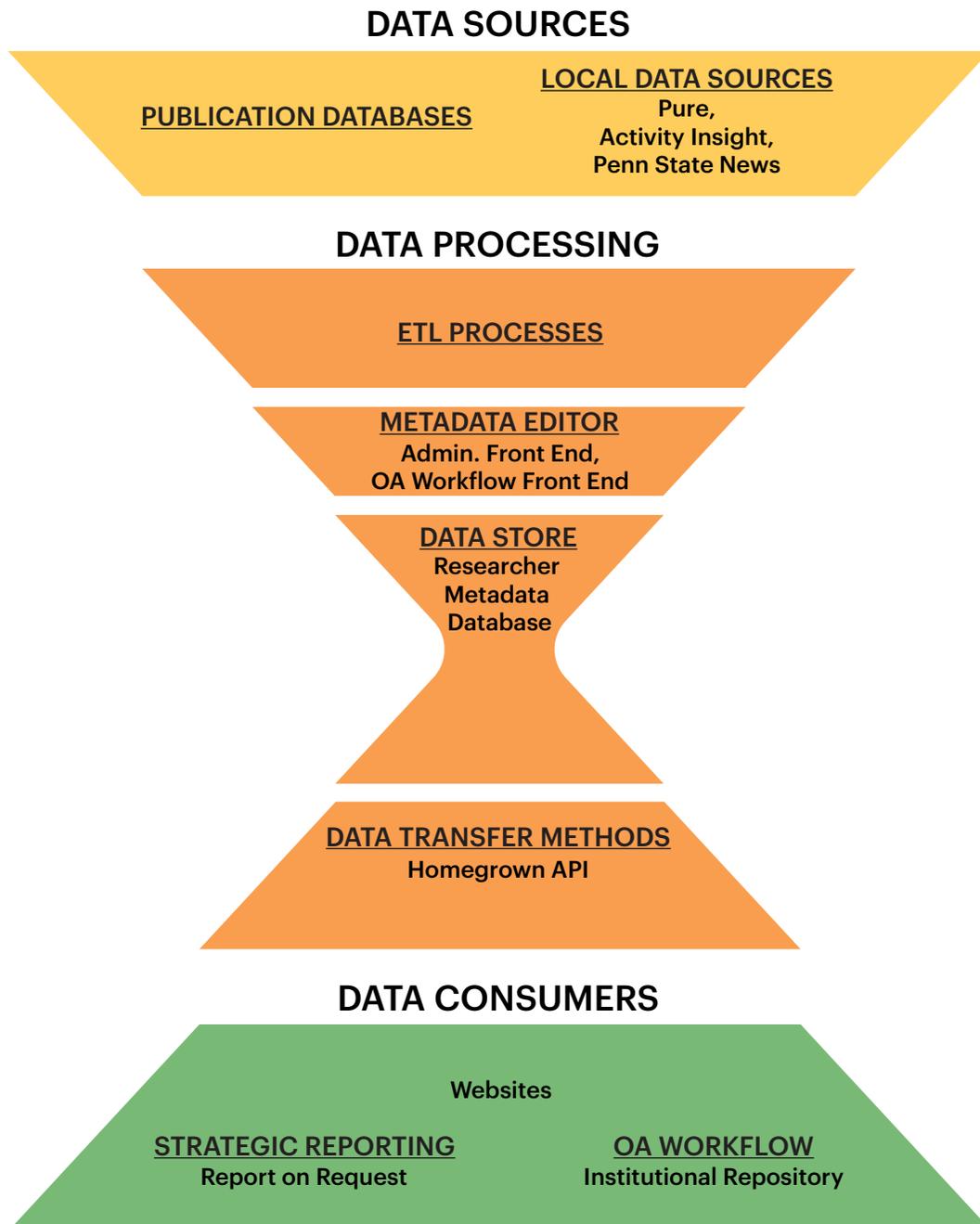
FIGURE 4. RIM System Framework for Penn State Researcher Metadata Database

TABLE 3. RIM system details for Penn State Researcher Metadata Database

Data Sources	**Publication databases**	Most publication data for RMD is drawn from Activity Insight and the Research Portal. Occasionally, records are imported from Web of Science and other publication databases.
	Local knowledge	n/a
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	n/a
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Users can interact with RMD in two ways: • An administrative front end allows users to request and schedule reports. • An open access workflow front end allows researchers to submit an open access URL for their publications, an accepted manuscript for deposit, or a waiver.[11] Both front ends were developed locally in Ruby on Rails.
	Data store	The Researcher Metadata Database is a homegrown relational database.
	Data transfer methods	RMD includes a homegrown API.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	n/a
	OA workflow	RMD supports a workflow to help authors more conveniently comply with Penn State University policy and interoperates with the ScholarSphere repository.[12]
	Metadata reuse	The RMD API allows college and unit webmasters to add lists of publications or profile information to Penn State University websites.
	Strategic reporting	Reports for different units on campus can be run through an administrative interface.
	Compliance monitoring	n/a

Administrative responsibility

RMD was developed by and is maintained by Penn State Libraries staff, including a contract developer who did the initial development work and continues to help support the system. The Faculty Activity Management Services team—the same team that supports Activity Insight—handles data curation, including resolving duplicate research outputs that occur when the same publication is added from multiple systems or for multiple authors.

Integrating Activity Insight into RMD as well as ScholarSphere has been a team approach with the developer, a metadata expert (the FAMS lead), the ScholarSphere product owner, and the scholarly communications librarian.

Stakeholders and users

Because it supports three use cases, the RMD caters to several different sets of stakeholders:

- The Provost, who requested the OA workflow solution

- The Faculty Senate, which enacted the OA policy

- Faculty members who use the OA workflow

- Penn State Libraries, which administers RMD for the entire Penn State community

- College or department staff who are tasked with assembling information for planning, impact analysis, and accreditation

- Marketing and communications staff who maintain the websites and ensure that they comply with Penn State University branding and standards

Metadata and sources

Table 4 provides a detailed overview of the metadata and sources used in the three Penn State RIM systems: Activity Insight, Penn State Research Portal, and Researcher Metadata Database (RMD).

Activity Insight contains a number of content types that are appropriate for annual activity reporting but not currently imported to the Research Portal or RMD. These include things like student advising, peer mentoring, and professional development.

Note that although Activity Insight includes *all* grant records from the Office of Sponsored Programs for the persons it covers, none of those grant records are used in either of the other systems. Like the other institutions we spoke with, Penn State researchers sometimes receive grants that involve nondisclosure agreements. While these grants are added to and stored in the internal-facing Activity Insight, they are not included in either of the other systems, which provide content for public websites.

The Pure product used for the Research Portal supports aggregating people, research outputs, and other content types within organizations. Nearly every interviewee at every institution in the study commented on the difficulty of determining a "source of truth" for their institution's organizational structure. Centers, interdisciplinary institutes, and shared facilities and their affiliates tend to be documented only informally at most institutions, including Penn State, so adding these types of organizations and maintaining them over time is especially difficult. In fact, the HR systems at Penn State and other institutions record only primary appointments, making any dual- or multi-appointment situation difficult to capture in an automated way.

However, the benefits can be worth the effort. Most centers and institutes have specific research goals and many need to report their impact to funders. The Research Portal can provide a place to showcase the organization's affiliated people and publications, and the linked structure of the metadata schema can ease the reporting burden for administrative staff. OSVPR and CoM hope to add more Penn State centers and institutes to the Research Portal: they have 68 in Pure as of this writing, but there are more than 300 Penn State centers and institutes to potentially include.

Including Core Facilities in the Research Portal offers another potential benefit. Facilities and equipment such as the Siemens 3T Magnetom Prisma Fit, a whole-body MRI scanner,[13] represent a significant investment for the institution and can be underutilized. The Research Portal is another way to advertise the existence of the facility or equipment, and linking it to the research outputs resulting from its use provides additional evidence of its value.

What's next?

ACTIVITY INSIGHT

The FAMS team will continue to work toward reducing faculty data entry through automation. The CV Service continues to be widely successful and in high demand, so the team is considering adding part-time staff to support this need.

PENN STATE RESEARCH PORTAL

The Pure team is expanding centers and institutes and linking more research outputs to equipment, while working with Elsevier to improve the accuracy of NIH and NSF grant integration.

RESEARCHER METADATA DATABASE

With RMD successfully integrated with ScholarSphere, faculty members can more easily comply with the OA policy with less data entry. To date, RMD has accumulated nearly 70,000 links to items that are open access through the publisher or in another repository. The team is considering whether they want to download any of those open access items to ScholarSphere.

At the time of the interviews for this report, Penn State Libraries had just begun direct outreach to faculty members, requesting deposits of OA information for eligible publications. Going forward, the team would like to investigate other data sources for input. They are also planning reports and analytics on the success of the open access initiative, and they will continue to work with units on campus to provide access to the data they need.

TABLE 4. Metadata and sources used in Penn State RIM systems
(Table continues on next page)

Content type	Activity Insight	Research Portal	RMD
Persons	Imported from Human Resources	Imported from Human Resources and College of Medicine records	Imported from Activity Insight and Pure (duplicates merged)
Publications	Imported or entered by individual authors or FAMS team member	• Harvested automatically from Scopus for authors whose profiles are part of the Pure Profile Refinement Service to which Penn State subscribes • Imported from various sources or entered directly by individual authors	• Imported from Activity Insight (published works, not in process or submitted works) and Research Portal (duplicates merged) • Publication records imported occasionally from Web of Science and other publication databases
Other scholarly outputs (presentations, posters, artistic works, etc.)	Manually entered by individual authors and their delegates	Manually entered by individual authors and their delegates	Not included
Grants	Imported from sponsored projects records	Imported from National Institutes of Health (NIH) and National Science Foundation (NSF) grants via integration with NIH and NSF built by Pure vendor	National Science Foundation (NSF) grants imported via NSF
Clinical trials	Not included	Not included	Not included
News stories	Not included	Not included	Imported from Penn State News
Honors and Awards	Manually entered by individuals and their delegates	Manually entered by individuals and their delegates	Imported from Activity Insight
Courses taught	Imported from academic history records	Not included	Not included

Content type	Activity Insight	Research Portal	RMD
Core facilities and equipment	Not included	Imported from Office of the Vice President for Research records	Not included
Organizations and hierarchy	Departments are included for individuals as found in Human Resources records	Includes imported institutional records (for researcher appointments) and information gathered from stakeholders (for center/institute affiliations)	Research Portal
Graduate committee service	Manually entered by individuals and their delegates	Not included	Data from Electronic Theses and Dissertation Archive
Teaching evaluations	Student reviews of teaching effectiveness	Not included	Not included
Academic service	Manually entered by individuals and their delegates	Not included	Not included
Technologies available for licensing	Not included	Not included	Not included

Texas A&M University

Introduction

Texas A&M University is a public land-grant research university in College Station, Texas. It enrolls over 56,000 undergraduates and nearly 16,000 graduate and professional students across 17 colleges and schools, including a medical school.

Texas A&M's RIM system[14] is arguably the most complex of the systems discussed in this report. While it is all one system with one administrative team, it is composed of many interrelated parts. Therefore, this case study refers to the overall system as "Scholars." When referring to the public-facing portal, we use the term "Scholars@TAMU."

RIM origin story

In 2013, a Texas A&M librarian returned from a conference inspired to experiment with an open source product, VIVO. And try it out they did. In a short time, they had loaded around 4,000 persons and 37,000 publications. VIVO offered a practical linked data application in an open source package, but despite all the data, this pilot effort had only three or four working profiles. As one interview participant stated, "When linked data works, it's beautiful. But when it's data that's not linked, it ends up being this ginormous black box of information. You have no idea what's in it and how to get anything out of it."

> "When linked data works, it's beautiful. But when it's data that's not linked, it ends up being this ginormous black box of information."

Staff turnover in 2015 prompted a serious discussion of strategic goals, and the Texas A&M University Libraries took down the system for several months as they evaluated possibilities and matched those possibilities with the data they knew was available. Their perspective changed from an experimental "whatever data we can find" to a pragmatic "data that will illustrate the work Texas A&M faculty do."

A new team was formed under the Texas A&M Libraries Office of Scholarly Communications and worked with Libraries IT to rebuild the VIVO instance. In addition, the Texas A&M Libraries licensed Symplectic Elements to support publications metadata harvesting at scale for selected faculty members. With data about people from Human Resources combined with publications metadata from Elements, the team curated profiles for faculty in the College of Medicine (CoM) and relaunched VIVO as Scholars@TAMU in 2016.[15]

Today, Scholars includes a university-wide public portal containing faculty profiles as well as a data source for strategic planning, accreditation, and other use cases that require a complete and accurate set of publication data.

The project team deliberately rolled out Scholars to two contrasting units, the School of Medicine and the English department, which facilitated an early understanding of disciplinary differences, and the team adapted the system to allow for the content types needed in all the disciplines encountered. According to one interview participant, success over time has been "gradual but palpable." As part of implementation, the Scholarly Communication Director met with faculty members to review curated profiles and learn from their perceptions. For example, the initial negative reaction of teaching faculty to the publication-heavy profiles of their researcher peers led the team to add lists of courses taught to profiles, along with any teaching materials housed in the institutional repository.

Today, Scholars includes a university-wide public portal containing faculty profiles as well as a data source for strategic planning, accreditation, and other use cases that require a complete and accurate set of publication data.

## RIM Implementation Timeline at Texas A&M
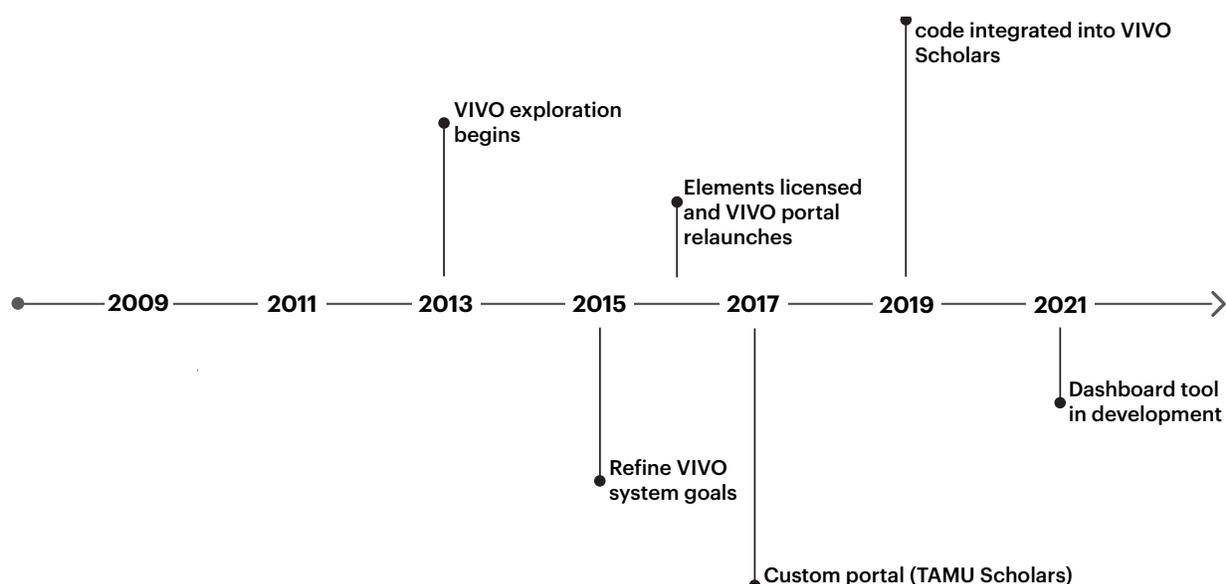
FIGURE 5. RIM Implementation Timeline at Texas A&M

Use cases

Texas A&M Scholars supports the following use cases:

Public portal: Scholars serves as a research showcase for Texas A&M faculty members and organization units to maximize the reputation of both individual faculty and the University.[16] The Scholars@TAMU portal includes pages for campus units with lists of affiliates and courses taught as well as visualizations of work by affiliates. In addition, the system supports expertise discovery in order to catalyze interdisciplinary collaboration. Faculty work should be presented across disciplines and career tracks in ways that embrace and champion those differences.

Metadata reuse: The Scholars API is used to populate a department website with publications by faculty so that neither faculty members nor the department need to update publications lists in multiple places.

Strategic reporting and decision support: Texas A&M has worked to develop an authoritative data store for frequently requested information about faculty contributions to the University and assist leaders in making strategic decisions.

The Texas A&M Libraries team also reported some specific examples of delivering on the strategic reporting and decision support use case, where the Libraries team:

- Works with other units to create reports for accreditation and strategic planning. To scale the service, they have developed a template to respond quickly.

- Supported a recent successful NIH proposal by creating network visualizations illustrating past collaborations among the proposed research team.

- Is now working with the Division of Research and Institute of Data Science to develop a research dashboard that characterizes and visualizes emerging, interdisciplinary research at Texas A&M to understand the institution's capacity and strengths and to support strategic decision-making. An alpha version is anticipated in late 2021.

RIM system

Scope
Scholars includes all faculty in all Texas A&M colleges, as well as programs at branch campuses, with a total of about 6,000 current profiles. Scholars does not include graduate students, postdoctoral researchers, or other research staff positions.

RIM System Framework

Figure 6 and table 5 provide a framework for understanding the Texas A&M RIM system. Complementary information is also provided in table 6 about the metadata and sources.

RIM System Framework for Texas A&M

DATA SOURCES

PUBLICATION DATABASES

LOCAL KNOWLEDGE

LOCAL DATA SOURCES
HR, Sponsored Projects, Academic History, Institution Repository

DATA PROCESSING

PUBLICATION HARVESTER
Elements

ETL PROCESSES

METADATA EDITOR
Custom Profile Editor

DATA STORE
MySQL
Database

DATA TRANSFER METHODS
Scholars Middleware,
SQL Queries

DATA CONSUMERS

PUBLIC PORTAL
VIVO

METADATA REUSE

STRATEGIC REPORTING
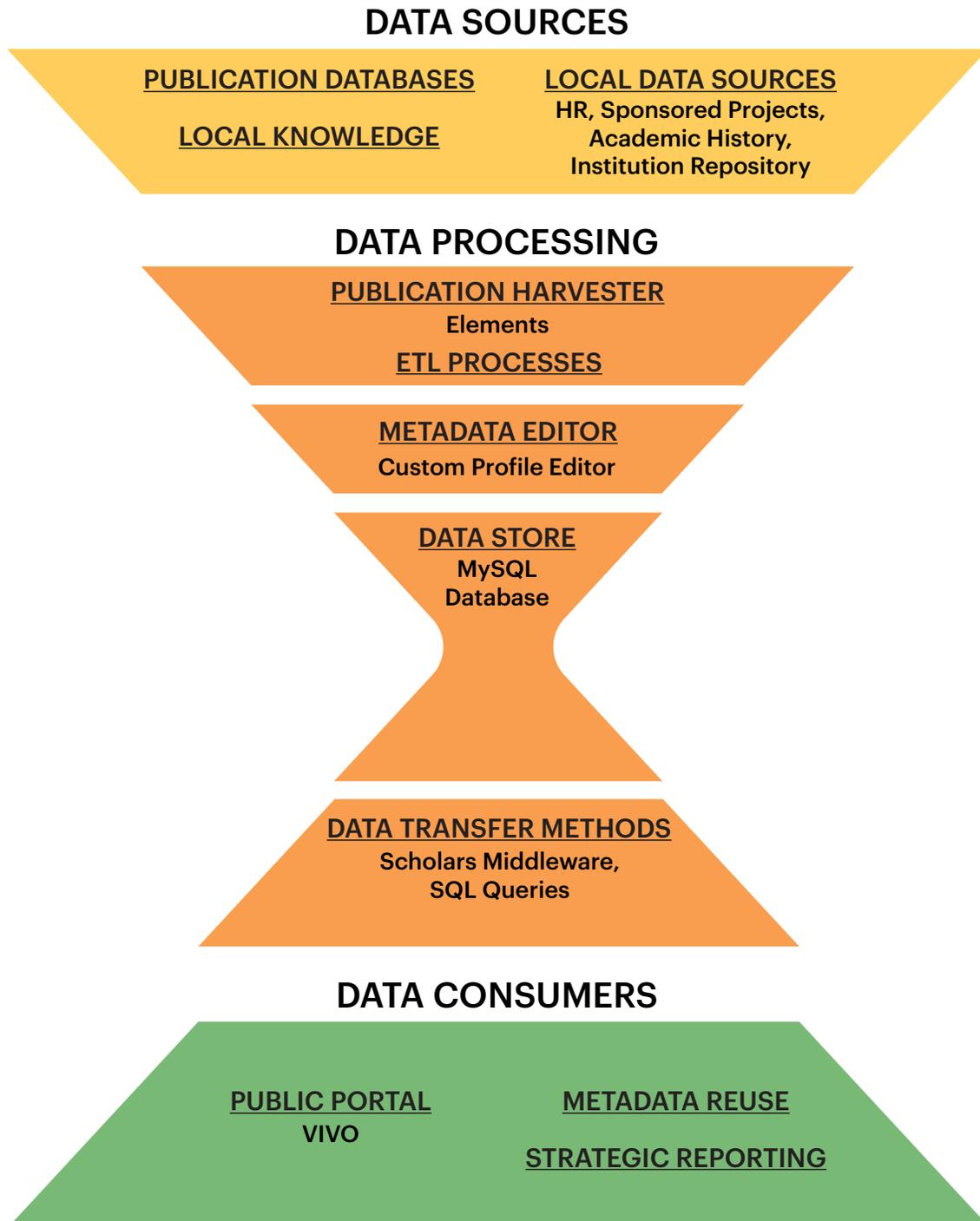
FIGURE 6. RIM System Framework for Texas A&M

TABLE 5. RIM system details for Texas A&M

Data Sources	**Publication databases**	Publication information can be added to Scholars through any of several licensed databases and freely available sources.	
	Local knowledge	Refer to the [Metadata section](#) for details.	
	Local data sources	Refer to the Metadata section for details.	
Data Processing	**Publication harvester**	Elements is licensed from Digital Science for use primarily as a publication harvester instead of as a database. Only a few Texas A&M staff have access to Elements; the Libraries Scholarly Communications staff review and claim or disclaim the harvested metadata on the authors' behalf and send the data to the MySQL database for further review.	
	ETL processes	Refer to the Metadata section for details.	
	Metadata editor	Texas A&M developed a custom editor for faculty members and their delegates to use when editing information in their profiles. Also, faculty claim/reject their pending publications (from Elements) though this editor.	
	Data store	Texas A&M stores its RIM data in a locally-hosted MySQL database where the data is carefully curated by the Texas A&M Libraries team and approved by faculty members themselves (or their proxies). In addition to its role as the data source for VIVO and Scholars@TAMU, the MySQL database is the source for reports, visualizations, and future dashboards.	
	Data transfer methods	Scholars incorporates a custom middleware and API solution known internally as Scholars Discovery. Those with access to the MySQL database can query it directly.	
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a	
	Public portal	Texas A&M hosts a local instance of VIVO as its public portal.[17] VIVO and the MySQL database contain similar data, but the MySQL database includes data only available to internal users. This separation protects Texas A&M research information data from unauthorized access. The VIVO portal, branded Scholars@TAMU,[18] was created by Texas A&M Libraries developers, and much of the code was later incorporated into VIVO Scholars, an open source component of VIVO itself.	
	OA workflow	n/a.	
	Metadata reuse	The Scholars API is used to populate a department website with publications.	
	Strategic reporting	Reports are generated from the data store upon request. Texas A&M plans to roll out a research information dashboard in the near future.	
	Compliance monitoring	n/a	

Combining open source and a vended solution

The question of whether to license a software product from a vendor or to pay developers to either create a custom solution or adapt an open source solution arises frequently in library discussions. For Texas A&M Libraries, the choice of VIVO as an important component of the RIM ecosystem is consistent with their history of choosing open source software whenever possible. Further examples of Texas A&M's open source commitment include its partnership with the Texas Digital Library to release the Vireo ETD (Electronic Thesis and Dissertation) Submission and Management System under an open source license in 2010,[19] as well as its ongoing partnership in the FOLIO project for open source library management applications.[20]

Paired with this historical commitment to open source, Texas A&M Libraries has the large staff necessary to support a system like VIVO: they have about 10 developers in the library, as well as about 10 different system administrators. This allows them to devote more human resources to their RIM system than is typical of other institutions. More details on Texas A&M's staffing is provided in the "Administrative responsibilities" section below. Note that while Texas A&M Libraries' open source preference does not extend to all of the university, institutional leadership also does not oppose the Libraries' preference. Aside from Texas A&M Libraries' open source philosophy, VIVO was particularly appealing for intellectual reasons: they were interested in linked data and in Research Graph[21] as a way of managing data for VIVO.

Privacy and security were other contributing factors. Like many universities, Texas A&M has reasons to be careful about how its data is protected and shared. Senior administration insisted that any RIM system be locally hosted, and the data in Scholars never leaves Texas A&M servers.

Finally, when interviewed, Texas A&M Libraries leadership spoke forcefully about the need for libraries to take a stand against commercial interests. This stance may be partially influenced by Texas A&M impressions of the University of Texas system's aborted attempt at a state-wide RIM system, branded Influuent.[22] More likely, Texas A&M Libraries leadership's stance is influenced by the Influuent system's vendor, Elsevier. Mistrust of publishers in the RIM space, and most especially Elsevier, is endemic in the library community. As Elsevier shifts its business model from publisher to "a global leader in information and analytics,"[23] that mistrust has grown.

Symplectic Elements: A practical solution, for now

Commitment to open source is a key value at Texas A&M Libraries, but practicality is at the root of decision-making. When it came to software for harvesting and aggregating publications from external databases, developers estimated that a custom solution would require at least two full-time developers, possibly on an ongoing basis since the solution would require testing and possibly changes anytime a target data source changed. That led Texas A&M Libraries to license Symplectic Elements, Digital Science's solution for harvesting and aggregating research information, even though Digital Science is a subsidiary of another publisher well known to libraries, Holtzbrinck Publishing Group.

Funds to support the licensing of Elements is part of an annual request, with no guarantee of ongoing support. Therefore, while Texas A&M Libraries use Elements for its business logic, all data resides in the MySQL database and most data cleanup occurs in MySQL as well. If financial support for licensing Elements were discontinued, Texas A&M Libraries would seek to shift to a different solution, including homegrown or open source software.

Administrative responsibility

Scholars is, and has always been, a project of Texas A&M Libraries, though other organizations within the University have provided support in different ways. Financially, Texas A&M Libraries contributes $20,000 per year to LYRASIS for VIVO membership and provides the people who comprise the team:

- 1 FTE data analyst

- 1 FTE librarian

- One developer at ~ 0.25 FTE

- One Director of Scholarly Communications at ~ 0.25 FTE

- Student employees who help with data curation, as needed

The data analyst and the librarian both dedicate all their time on Scholars-related work. The data analyst is heavily engaged in curation of faculty profiles, especially as new faculty members join Texas A&M. The developer's time on Scholars varies, but averages about 25% of full time. The director of Scholarly Communications spends about 25% of their time on outreach related to Scholars, including developing use cases based on information gathered from faculty and Texas A&M administrators and offering consulting services for faculty preparing their dossiers for promotion and tenure. Liaison librarians also provide instruction as needed.

The Symplectic Elements license is paid through central funds, requested by Texas A&M Libraries annually.

Stakeholders and users

Scholars stakeholders include:

- Faculty members with profiles

- Texas A&M Libraries, which provides the leadership, technical expertise, and staff support for Scholars

- Division of Research for strategic planning data

- Office of the Provost and academic units for program accreditation. Additionally, these units will also benefit as they implement Interfolio Faculty Activity Reporting and reuse Scholars data

- Members of the public, especially Texas residents, for the public portal's information on Texas A&M's contributions to the state

The Scholars team views the faculty members as the most important stakeholder. As much as any RIM system automates its data collection, the individual faculty member is always the final authority on their own work. The team knew that any goal or use case would not be successful if the faculty did not see a reason to check and make use of their own profiles. Once enough faculty members are on board, other stakeholders emerge, as one interview participated described:

> When you start from *how do we best serve faculty*, like we did here, then by extension, by aggregating faculty work, you serve departments and colleges because they're just collections of faculty.

With aggregated data, the Office of the Vice President for Research can use the data for strategic planning. Additionally, those working on program accreditation can use the data for reporting to "prove worth and value."

The public is also a stakeholder, but on a different scale. Any member of the public can learn more about Texas A&M's work by using the public portal. However, the team has worked with internal stakeholders to ensure that the system only publicizes information that benefits the University. Information related to controversial topics, or funders that require nondisclosure, or faculty with specific privacy needs is never sent to VIVO. One interview participant stated that "one of the surprises for me was the extent to which [protecting sensitive information] became an issue in our implementation."

Metadata and sources

Table 6 offers a detailed overview of the metadata and sources used in the Texas A&M RIM system Scholars.

What's next?

The faculty-first strategy employed since Scholars launched has continued as the Scholars system and its uses expand. The mandated adoption and use of the Interfolio FAR product across the Texas A&M system was announced in 2019, and as faculty groups were briefed on the upcoming project, the College Station campus faculty senate expressed interest in having data pushed from Scholars into Interfolio. Since then, the library has worked with the Office of the Provost to begin the transfer publications and other data into Interfolio in order to prepopulate faculty annual evaluations. However, one interview participant made clear that Texas A&M Libraries will not be involved with FAR beyond providing data, saying, "I'm not here to evaluate them. I'm here to support them."

This "firewall" between the Texas A&M Libraries and FAR is a frequently heard philosophy among libraries that play a role in RIM systems, but this stands in stark contrast to the approach we observed at Penn State.

Integrating two RIM systems designed for different use cases across the university enterprise is a challenging goal, and Texas A&M seems poised to achieve it. If successful, Texas A&M can add FAR to its list of uses.

TABLE 6. Metadata and sources used at Texas A&M

Content type	Scholars
Persons	Imported from human resources
Publications	• Harvested by Elements or entered by the Texas A&M Libraries team • Elements draws upon several databases: Scopus, Web of Science, and PubMed • Elements ingests records from Texas A&M's OAKTrust Digital Repository and the Law School's Digital Commons repository
Other scholarly outputs (presentations, posters, artistic works, etc.)	Harvested through OAKTrust Digital Repository harvest (above) or entered manually by Scholars team
Grants	Awarded grants are imported from sponsored projects records
Clinical trials	Not included
News stories	Not included
Honors and Awards	Not included
Courses taught	Imported from academic history records
Core facilities and equipment	Not included
Organizations and hierarchy	• Departments included for individuals as found in Human Resources records • Institutes, centers, branch campuses, and affiliated agencies also included
Graduate committee service	Metadata for thesis and dissertation committees imported from OAKTrust Digital Repository
Teaching evaluations	Not included
Academic Service	Not included
Technologies available for licensing	Not included

Virginia Tech

Introduction

Virginia Polytechnic Institute and State University (Virginia Tech) is a public research university located in Blacksburg, Virginia. It enrolls nearly 30,000 undergraduates and over 7,000 graduate and professional students across eight undergraduate academic colleges, an honors college, a medical college, and a veterinary medicine college.

The Virginia Tech example serves as a strong exemplar of social interoperability in research support through trusted, sustained collaboration across campus units. The Office of Faculty Affairs and the Office of Analytics and Institutional Effectiveness joined forces with Virginia Tech University Libraries to build one cohesive solution that meets the diverse needs of faculty activity reporting (FAR), centrally managed storage and access to institutional data, and increasing visibility of and open access to the scholarship of the University.

Virginia Tech has mostly avoided the redundant systems seen at many institutions, but at the cost of rapid progress on any single goal. Virginia Tech's RIM ecosystem has evolved over a decade, beginning with the launch of the VTechWorks institutional repository by Virginia Tech Libraries in 2011. Since then, different goals and associated stakeholders have taken precedence over others at different times. Case in point: Virginia Tech Libraries expressed interest in linking faculty activity reporting to the institutional repository in 2013 as a way of promoting open access deposits to faculty members. The systems were first connected three years later, and faculty members could deposit items in VTechWorks while working on their activity reports. In another three years, a two-way connection enabled claiming of items in VTechWorks.[24]

Perhaps because stakeholders with interests in different objectives worked together from the start, Virginia Tech's case study also features something rarely seen in US RIM ecosystems: Virginia Tech considers publications metadata to be a university asset. The data is stored centrally, and access is facilitated and controlled just like human resources or student data.

Origin story

The Virginia Tech origin story is a series of intertwined stories, roughly aligned with the interrelated goals of the stakeholders. Sometimes progress was made toward one goal alone; at other times one action led to progress on multiple goals. Figure 7 identifies key milestones in a single timeline.

RIM Implementation Timeline at Virginia Tech
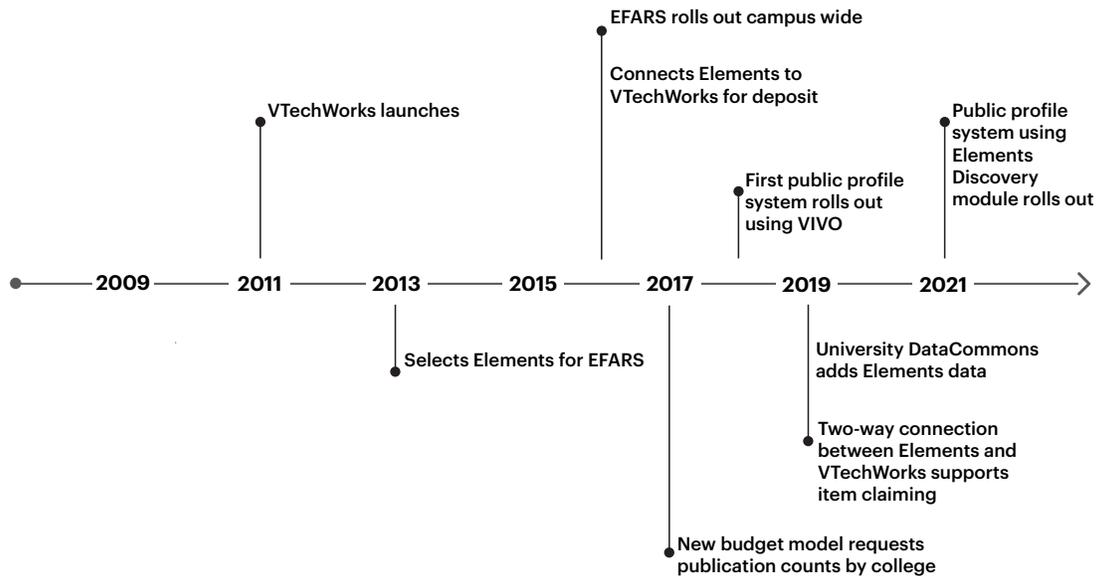
FIGURE 7. RIM implementation Timeline at Virginia Tech

OPEN ACCESS ADVOCACY

In 2013, Virginia Tech Libraries was included in a university-wide conversation about sharing and disseminating products of Virginia Tech research and scholarship. The discussants considered how to support open access at scale and, like the University of California, concluded that the first step in any workflow would be to learn about new research outputs as soon as possible. They explored leveraging existing FAR processes to accomplish that first step.

When they contacted the Office of the Provost about piloting a process that connected an instance of one of the FAR systems in use to the VTechWorks institutional repository, they learned that the provost's office was beginning a search for an electronic FAR system for use across the university. The parties recognized that the two efforts were complementary since both hinged on institutional knowledge of faculty publications. Virginia Tech Libraries staff attended vendor presentations and provided feedback, and the provost's office ultimately selected the Symplectic Elements product.

FACULTY ACTIVITY REPORTING

Initially, the Elements system was locally branded as the Electronic Faculty Reporting System (EFARS)[25] and was intended from the start to support the entire university. EFARS wasn't the first electronic FAR system on campus, though. Among them, the College of Agriculture and Life Sciences (CALS) used a homegrown system. Elements made the work easier by automating much of the publication entry for CALS's STEM-based faculty members, incentivizing the migration from their local system to EFARS. The College of Business soon followed, encouraged by a dedicated liaison librarian who ensured that Business faculty members' profiles were populated. However, departments and colleges have never been required to use EFARS, so progress to complete campus-wide adoption has been slow.

Virginia Tech Libraries' involvement with EFARS grew as their staff helped determine what metadata the system would need, and the Libraries initially provided hosting services for the Elements instance. As they focused on EFARS, earlier plans for using Elements to support open access and the public portal were postponed.

OPEN ACCESS + FACULTY ACTIVITY REPORTING

As EFARS became more established, though not universally adopted, Virginia Tech Libraries was able to test the theory that EFARS could support a path to open access for Virginia Tech scholarship by connecting Elements and VTechWorks. Faculty have been able to deposit to VTechWorks directly from Elements since 2016, and about 2,300 faculty deposits have been made into VTechWorks through Elements since then.[26] Beginning in 2019, researchers could also claim publications in Elements that source from VTechWorks.[27]

INCENTIVE-BASED BUDGETING

The RIM ecosystem received another boost in 2017 when Virginia Tech adopted a new budget model dubbed the "Partnership for an Incentive-Based Budget" (PIBB). With the PIBB model, funding allocations are based in part on scorecard metrics tied to the university's strategic plan and shared publicly via the Strategic Planning Dashboard.[28] Since some of these metrics may relate to faculty publications and other research outputs, administrative interest in aggregating research outputs from across the university grew. Because EFARS was supported by the provost's office and several large colleges were using it already, EFARS was the natural choice as a data source. It's also notable that the Virginia Tech strategic planning effort included a Metrics and Rankings Subcommittee that issued a metrics white paper in June 2019 to serve as a guide for the selection of responsible metrics to assess the institutional strategic plan.[29]

With PIBB as a strategic reporting and decision support use case, colleges have a new incentive to adopt EFARS. The EFARS brand is quietly being retired, and today the system is most often referred to as Elements, an acknowledgment that the system does more than support FAR workflows. Colleges can still opt out of using Elements for faculty activity reporting, but failure to use Elements now may result in less accurate PIBB data (if the faculty affairs office extracts publication information from an external database) and potentially more time needed for manual review by colleges (if the college chooses to manually identify and count publications).

INCENTIVE-BASED BUDGETING + DATA GOVERNANCE

To support this and other use cases, the idea of the University DataCommons (UDC) emerged. With the UDC, data could be collected from different sources around the university with the Office of Analytics & Institutional Effectiveness, a subunit of the provost's office, maintaining the infrastructure, onboarding new data sources, and controlling and facilitating access to the data. Data from Elements was added to the regular updates to the University DataCommons in 2019. The UDC provides strategic decision support for senior academic and administrative decision makers through an online application.[30]

PUBLIC PORTAL

In 2016, Virginia Tech Libraries began to develop a public portal sourced from Elements. One system considered and briefly piloted with one college was the open source VIVO, which was "in development" over several years. The Virginia Tech Libraries team found that while VIVO is powerful, maintaining the system and its metadata consumes more developer time than the university could commit.

When Digital Science added a public profiles module to Elements (known as Elements Discovery), the Virginia Tech Libraries evaluated the cost of the license versus the effort involved in maintaining the VIVO instance and decided to switch to the licensed product. The Libraries is in

the process of implementing the Elements Discovery portal, branded as Virginia Tech Experts, and has launched an internal pilot available within Virginia Tech IP ranges in 2021, with a public rollout expected in late 2021.[31]

Use cases

The Elements system at Virginia Tech supports several use cases:

Faculty Activity Reporting: Elements and the UDC each provide a database of information that can be used to complete faculty annual reports and generate related documents, including promotion and tenure dossier materials and college or program-level accreditation reports.

Public portal (in development): Implementation of the new Elements Discovery portal, branded "Virginia Tech Experts," will provide a searchable public profile system sharing research, scholarship, creative, teaching, and professional activities; and indicate availability to collaborate, supervise graduate students, speak on a panel or with media, and more.

Strategic reporting and decision support: The Elements system aggregates Virginia Tech faculty scholarship, research, and creative works (accounting for different disciplines and types of scholarly products, teaching; grants, and professional activities). This content is then exported into the University DataCommons, as the primary source for access and reporting. One key purpose at present is to support the PIBB budget model. This system also supports strategic planning metrics data, accreditation reporting for one college, and federal reporting requirements for another college. The RIM system populated by Elements and embodied by the UDC assists colleges in goal setting.

Open access workflow (in development): This system will now also support Virginia Tech authors (faculty, staff, students) in sharing their work as part of the recently approved (March 2021) university-wide OA policy.[32] Faculty and graduate students can deposit OA versions of the accepted manuscript of their publications in VTechWorks directly from Elements, while staff and undergraduate students can submit accepted manuscripts directly to VTechWorks or via other methods. Virginia Tech is currently finalizing support documentation and in July 2021 will begin piloting use of the OA Monitor tool within Elements and conduct broad outreach to encourage OA deposits.

RIM system

Scope
As a FAR system, Elements initially included tenure-line and continuing-appointment faculty who need a system for annual reporting and/or promotion and tenure. As the goals for the system expanded to include OA workflows, strategic reporting and decision support, and a public portal, the range of persons covered broadened as well. Elements now includes faculty, graduate students, and anyone with a research-related or scholarly job title.

Roughly 3,000 people are represented in Elements, including all tenured and tenure-track faculty. The percent of faculty actively using the system varies by college, as some have not fully adopted Elements as a data reporting system. Starting in 2021, university leadership has requested that all faculty begin using Elements to report scholarship activity so active usage is expected to increase significantly.

RIM System Framework

Figure 8 and table 7 provide a framework for conceptualizing the Elements system at Virginia Tech. Complementary information is also provided in table 8 about the metadata and sources.

RIM System Framework for Virginia Tech

DATA SOURCES

PUBLICATION DATABASES

LOCAL KNOWLEDGE

LOCAL DATA SOURCES
HR, Sponsored Research, Academic History

DATA PROCESSING

PUBLICATION HARVESTER
Elements

ETL PROCESSES

METADATA EDITOR
Elements

DATA STORE
Elements,

University Data Commons

DATA TRANSFER METHODS
Elements API,
SQL Queries

DATA CONSUMERS

OA WORKFLOW
DSpace

STRATEGIC REPORTING
Strategic Planning,
Accreditation

FACULTY ACTIVITY REPORTING
Elements, UDC

PUBLIC PORTAL
Elements Discovery

FIGURE 8. RIM System Framework for Virginia Tech

Symplectic Elements and the Elements Discovery module are licensed from Digital Science.[33]

TABLE 7. RIM system details for Virginia Tech

Data Sources	Publication databases	Elements harvests from several licensed and open publications databases; users can import from publication databases as needed.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	Publication harvester	Elements harvests and aggregates publications from databases selected by the administrators.
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	The Elements editor can modify information needed for their activity reports. They can also deposit publications to the institutional repository.
	Data store	The Virginia Tech system includes two distinct data stores: • Elements: data extracted from this database populates the University DataCommons, which also includes data from additional sources. • University DataCommons (UDC): the analytic insights platform for strategic planning, annual reports at various institutional levels, and the FAR use case. The system is a database and web-based application. Data access is controlled by the Office of Analytics and Institutional Effectiveness.[34]
	Data transfer methods	Elements includes an API. The UDC can be queried using SQL.
Data Consumers (RIM Use Cases)	Faculty activity reporting	Elements and the UDC are both used to populate faculty activity reports.
	Public portal	Elements Discovery is a module that extracts selected data into a public portal. Virginia Tech will launch the Virginia Tech Experts in 2021.
	OA workflow	Virginia Tech's institutional repository, VTechWorks, is based on the DSpace open source software.[35] Elements users can claim their research output items from VTechWorks to Elements and deposit open access versions of their work plus associated high-quality metadata from Elements into VTechWorks.
	Metadata reuse	n/a
	Strategic reporting	Although some reports are run from Elements, they are being migrated to the UDC.
	Compliance monitoring	n/a

Administrative responsibility

Administration is shared among three entities: Office for Faculty Affairs, Virginia Tech Libraries, and Office of Office of Analytics and Institutional Effectiveness.

Office for Faculty Affairs pays for the Elements license and employs a faculty member at half-time to serve as a liaison between the Office and the other administrative stakeholders.

Virginia Tech Libraries supports the RIM ecosystem in several ways:

- Providing metadata expertise

- Hiring and training student employees to assist with CV entry projects

- Advocating for the system through liaison librarians

- Leading outreach and engagement activities

- Maintaining VTechWorks, mapping metadata between Elements and VTechWorks, implementing the OA Monitor tool, and assisting faculty members and staff in depositing their works

- Launching and maintaining the public portal, Virginia Tech Experts

- Hosting Elements for many years, but that responsibility has shifted to OAIE; however, Virginia Tech Libraries continue to contribute a portion of the hosting fee

Office of Analytics and Institutional Effectiveness (OAIE) maintains the UDC, facilitates access to the data, and hosts a development instance and a quality assurance instance of Elements. (Note that the main production and development instances of Elements are now cloud hosted by Symplectic.)

Stakeholders and users

Primary stakeholders include:

- Faculty members, graduate students, and others who use Elements for activity reporting, depositing works into institutional repositories, or creating public profiles

- The three primary partners (Office of the Executive Vice President and Provost and Faculty Affairs, Virginia Tech Libraries, and the Office of Analytics and Institutional Effectiveness)

- University administrators who use Elements information for PIBB, strategic planning metrics, and additional reporting and decision-making

- College deans, department heads, and others who make use of the data contained in the UDC for reporting and decision-making

To encourage stakeholder engagement and promote the use of Elements by all colleges, the provost's office has asked each college to provide support staff for Elements to form a university-wide user community. The project team expects that the extra support for a community of practice will help the institution reach the goal of a comprehensive database that can be reused in many ways.

Metadata and sources

Table 8 details the metadata and sources used in the Virginia Tech's RIM system Elements.

What's next?

Virginia Tech adopted an institution-wide OA policy in March 2021, just as interviews for this study concluded.[36] Virginia Tech Libraries hopes to devise a workflow for Virginia Tech authors similar to those described in the Penn State and UCLA case studies.

The public portal, Virginia Tech Experts,[37] has launched internally and is slated to launch publicly soon. The medical school is a particular priority since it currently uses the Digital Measures product for FAR and for its portal; it cannot completely transition to Elements until the Elements-based portal is public.

Virginia Tech Libraries hopes to devise a workflow for Virginia Tech authors similar to those described in the Penn State and UCLA case studies.

TABLE 8. RIM system metadata and sources for Virginia Tech

Content type	Elements
Persons	Imported from Human Resources
Publications	Harvested by Elements from several sources (including VTechWorks) or manually entered by individual authors and their delegates
Other scholarly outputs (presentations, posters, artistic works, etc.)	• Manually entered by individual authors and their delegates • May be imported from VTechWorks through Elements
Grants	• Imported from sponsored projects records or added by individual researchers and their delegates • Proposed grant data is included in Elements for annual review • Only awarded grant data is included in the UDC due to security concerns • Not included in public portal
Clinical trials	Not included
News stories	Not included
Honors and Awards	Manually entered by individuals and their delegates
Courses taught	Imported from academic history records or added by individuals and their delegates
Core facilities and equipment	Not included
Organizations and hierarchy	Departments are included for individuals as found in Human Resources records
Graduate committee service	Manually entered by individual authors and their delegates
Teaching evaluations	Imported into UDC from the Student Perceptions of Teaching (SPOT) database
Academic Service	Manually entered by individuals and their delegates
Technologies available for licensing	Not included

UCLA

Introduction

The University of California, Los Angeles (UCLA) is a public land-grant research institution. It enrolls over 31,000 undergraduates and approximately 13,000 graduate students in more than 300 degree programs. It also includes a medical school. UCLA is one of 10 campuses in the immense University of California (UC) system, the largest higher education system in the United States, comprising 10 research universities with more than 250,000 students, 22,000 faculty members, and 150,000 staff. The California Digital Library (CDL), organizationally housed through the University of California Office of the President, serves as the nexus for collaboration and scale for libraries across the UC system.

The UCLA case study is comprised of multiple RIM systems addressing different use cases:

- Opus and Interfolio
- UC Publication Management System (UCPMS)
- UCLA Profiles

UCLA is an interesting example both because of its variety of systems and use cases, and also because it has RIM practices that include part of a campus, all of the UCLA campus, and the entire UC system. It's also distinctive in that while RIM practices in the United States are largely driven by reputation management, uniting public profiles for units and researchers across campus into a single portal, reputation management activities are still largely decentralized at UCLA.[38]

Origin story

OPUS AND INTERFOLIO FACULTY INFORMATION SYSTEM[39]

The UCLA campus has been discussing the development of an "electronic dossier system" since the 1980s, but it wasn't until 2013 that the campus dedicated funds to address the "tapestry of non-standard data that prevented campus from having a contextual view of our faculty."[40] Prior to this, information about faculty activities and outputs was distributed in both digital and analog formats across campus units, with the content organized in dozens of locally-determined ways, making campus-level review difficult without similar information or formats.

Led by the UCLA Academic Personnel Office (APO), the campus began development in 2013 of a homegrown faculty information system, locally branded as "Opus." By 2016, the Opus database had been developed and was being used to aggregate information about UCLA faculty from an array of separate campus systems.

While the Opus team initially considered developing their own workflow and documentation components, the complexity of that undertaking led UCLA to license the Interfolio Review, Promotion, and Tenure (RPT) product in 2016.[41] Interfolio RPT was rolled out to all academic units at UCLA in 2017, and its use is now required for all academic personnel reviews. Opus continues to

grow as the system of record for reporting on academic appointments, reviews, and advancements, while Interfolio RPT provides the actual review workflow and houses the documentation supporting the review. The systems are integrated, and final outcomes are entered into Opus.

In 2018, UCLA licensed a second Interfolio product, Faculty Activity Reporting (formerly branded as Faculty 180), to support creation of data summaries for the faculty reviews and workflow management, and it is currently rolling out to all units. It's interesting to note that while UCLA had initially planned to develop the promotion and tenure and annual review functionality in-house, this expectation changed with the availability of a vendor solution that met most of their needs, which facilitated much faster and more cost-effective implementation than local development would have allowed.

UC PUBLICATION MANAGEMENT SYSTEM (UCPMS)[42]

In July 2013, the University of California's Academic Senate adopted an OA policy (informally called the Senate policy), with the goal of making research articles published at all of the 10 UC campuses widely and freely available. This policy made national news because of its immense scope, covering 10 campuses, more than 8,000 tenure-line faculty, and as many as 40,000 research papers annually. It's estimated that, collectively, the University of California produces 2 percent to 3 percent of peer-reviewed scholarly articles published annually worldwide.[43]

This OA policy applies to all faculty at the University of California and to all scholarly articles they author or coauthor as a member of the faculty. The policy states that each faculty member will grant a nonexclusive license to make their scholarly content publicly available by providing a digital copy of the final version of their article to the University of California by the date of publication for inclusion in the multi-institutional eScholarship OA repository. Alternatively, if the article is published open access or is freely available in another repository, authors need only provide a link to the open version to comply. An important component of the policy was that faculty could opt out for a particular article or embargo publication for a defined time period. Acknowledging the potential to add administrative burden to faculty members, the policy requested that the University of California and the Academic Senate "develop and monitor mechanisms that would render implementation and compliance with the policy as convenient for the Faculty as possible."[44]

It's estimated that, collectively, the University of California produces 2 percent to 3 percent of peer-reviewed scholarly articles published annually worldwide.

Expectation of manual article deposit went into effect on 1 November 2013 for three pilot campuses: UCLA, UCSF, and UC Irvine.[45] The stopgap process was cumbersome, as faculty were expected to complete and submit a form for each publication they wished to include in eScholarship.[46] Because of the immense amount of the research output produced by thousands of researchers, the UC system needed to find a way to implement its open access policy at scale. While other institutions like MIT or Harvard added staff to directly support faculty with OA deposits,[47] the University of California instead sought a way to automate and streamline as much of the metadata creation and

deposit processes as possible. Following the adoption of the policy, the California Digital Library (CDL) immediately began the development of resources and tools to support faculty participation in the policy, which was scoped to include:

- A publication management system that would enable CDL to identify UC-affiliated publications, communicate with faculty, and enable self-deposit into the eScholarship repository

- A more streamlined and user-friendly workflow for depositing articles into eScholarship

- A tool to support, manage, and track author-requested embargo, waiver, and addendum forms[48]

Following an RFP process, CDL began licensing Symplectic Elements in December 2013, with the goal of using Elements to support metadata harvesting at scale for publication records of California faculty as well as to provide a system to store and manage this data.[49] The system was piloted at three campuses in late 2014, including at UCLA, and it was rolled out at UCLA in 2015 and on all 10 campuses by January 2016.[50] While never formally branded, the Elements system was locally called the UC Publication Management System, or UCPMS.

This Senate policy applied to faculty at California, but not to clinical researchers, postdocs, or graduate students. In October 2015, a second policy was enacted by then UC President Janet Napolitano (called the Presidential OA Policy) to extend the OA requirements to all UC employees, applying to as many as 50,000 researchers across the system authoring scholarly articles.[51] Implementing the Presidential OA Policy for so many researchers is an immense task and is still underway.

By the middle of 2017, the implementation of the UC Publication Management System had "resulted in a dramatic increase in faculty participation in the Senate OA policies,"[52] which continued to grow, with faculty depositing nearly 30,000 articles in 2020 alone.[53] Although the Senate policy was enacted *by* faculty *for* faculty through the actions of shared faculty governance by the Academic Senate, and even as the PMS system has made compliance with the policy less burdensome for authors, the effort is far from full participation. The numbers above, as a percentage of all UC publications, are a fraction of the approximately 40,000 or more articles published annually by UC researchers,[54] and not a single UCLA department is fully compliant with the OA policy yet. Author engagement remains limited as barriers remain, such as opposition/indifference to OA, lack of time, few meaningful incentives, and no penalties for noncompliance.

UCLA PROFILES[55]

Following the establishment of the UCLA Clinical and Translational Science Institute (CTSI) in 2011, the CTSI unit developed its web site into an information hub, including locally-managed profiles for CTSI affiliates.[56] This was soon seen as too exclusive so the CTSI tapped into the faculty database maintained by the school of medicine, which was reused to produce public profiles displayed on the CTSI web site. But without a heavy stick requiring researchers to update their profiles, the content quickly grew stale.

Today users can search for experts by a single campus or across the entire UC Health system.

However, following the successful implementation of the open source Profiles RNS product at the University of California San Francisco (UCSF) in 2010 to support expertise discovery,[57] there was interest in expanding its public researcher profiles system to other University of California campuses with Clinical and Translational Science Awards (CTSAs). Follow-up NIH CTSA grant support, as well as funding from the UC Biomedical Research Acceleration, Integration, and Development (UC BRAID) network, supported the addition of other campus profiles. First, UCSD Profiles was added, followed by the other medical centers at UC Irvine, UC Davis, as well as the University of Southern California, beginning in 2017. In 2020, UCLA was the last campus to launch Profiles. Today users can search for experts by a single campus or across the entire UC Health system.

RIM Implementation Timeline at UCLA
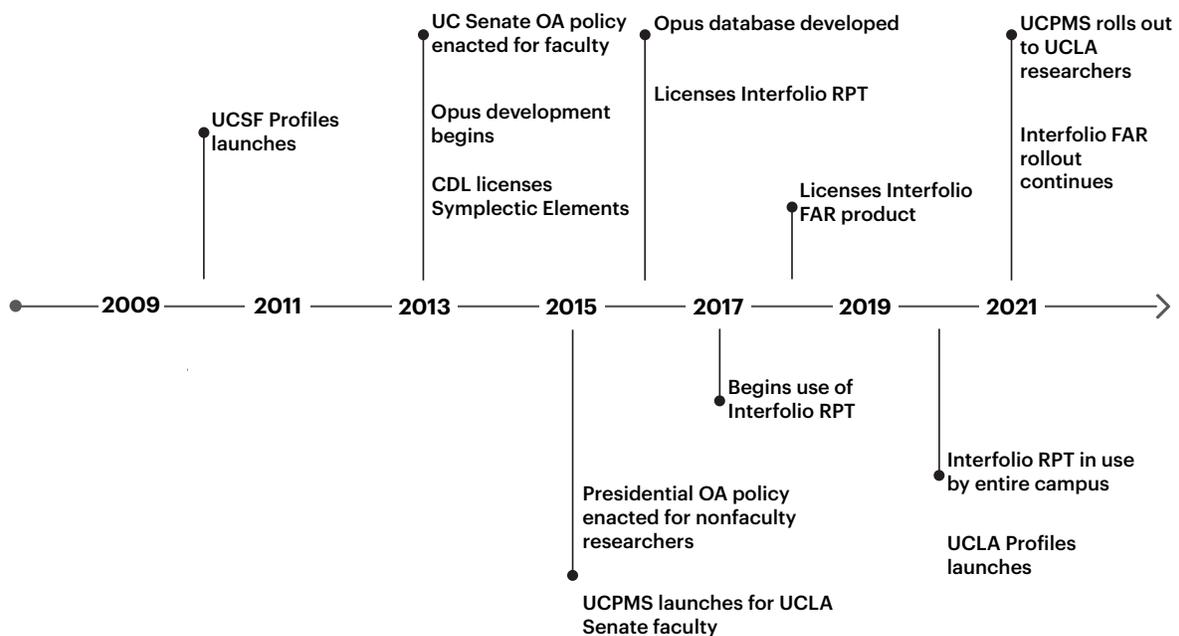
FIGURE 9. RIM Implementation Timeline at UCLA

Use cases

OPUS AND INTERFOLIO

UCLA's primary goals for Opus and Interfolio are:

- **Faculty Activity Reporting:** These systems provide a database and electronic workflows to support annual academic progress reviews as well as tenure and promotion dossiers.

- **Metadata reuse:** Human resources information in Opus is used in the UCPMS and UCLA Profiles systems, described below.

- **Strategic reporting and decision support:** Opus serves as a data store with information about faculty activities that is standardized in format and content. It supports simple reporting requests like eligibility tracking, salary comparisons, and equity studies.

Note that Opus data is limited to internal use as a personnel system; it has no associated public profile system.

UC PUBLICATION MANAGEMENT SYSTEM

The primary use of the UC Publication Management System is:

- **Open access workflow:** To support UC's overlapping institutional open access policies, specifically by softening some of the barriers authors face with green OA self-depositing through direct communications, prepopulation of metadata, and a simplified deposit workflow.

The Elements system supports a few other uses at UC:

- **Strategic reporting and decision support:** The Lawrence Berkeley National Laboratory (LBNL) uses the grants module of Elements to support required reporting to the federal government.

- **Metadata reuse:** Publication records confirmed by authors in UCPMS are updated monthly in the Opus system at UCLA and also for UCLA Profiles.

- **Compliance monitoring:** Funders, specific grants, and governments may have their own OA mandates, and LBNL and the UC Research Grants Program Office (RGPO) use Elements to track compliance with relevant policies.[58]

UCLA PROFILES

The primary use case of UCLA Profiles is to serve as a:

- **Public portal:** UCLA Profiles supports expertise discovery, helping users "identify investigators with particular areas of expertise, affiliations, interest, resources, or other characteristics that would make them potential collaborators."[59]

RIM systems

OPUS AND INTERFOLIO

Scope
- The Opus database includes all academic appointees at UCLA, including tenure line faculty as well as those on other types of appointments, such as lecturers and clinical faculty, academic research professionals, and academic service professionals such as librarians, advisers, and cooperative extension specialists. The number of appointees with active appointments varies but may be as high as 10,000 at any given time.[60]

- The Interfolio RPT module is used by all eligible faculty and academic appointees for all reviews and advancements.

- The Interfolio FAR module is currently in use by part of campus, with the goal of all academic appointees using it for their annual review processes by 2023.

RIM System Framework

Figure 10 and table 9 provide a framework for understanding the UCLA Opus and Interfolio systems. Complementary information is also provided in table 12 about the metadata and sources.

RIM System Framework for UCLA Opus and Interfolio Systems

DATA SOURCES

PUBLICATION DATABASES
UCPMS

LOCAL DATA SOURCES
HR, Internal/External Grants,
Academic History,
Committee Service

LOCAL KNOWLEDGE

DATA PROCESSING

ETL PROCESSES

METADATA EDITOR
Interfolio FAR

DATA STORE
Opus

DATA TRANSFER METHODS
Interfolio API,
Database Connection,
CSV

DATA CONSUMERS

FACULTY ACTIVITY REPORTING
Interfolio RPT

STRATEGIC REPORTING

METADATA REUSE

FIGURE 10. RIM System Framework for UCLA Opus and Interfolio systems

TABLE 9. RIM system details for UCLA Opus and Interfolio

Data Sources	Publication databases	Publications are extracted from the UC Publication Management System for use in Opus. Individuals can also import publications from other databases such as Web of Science or upload citations as a BibTeX file.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	Publication harvester	n/a
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Interfolio FAR is the metadata viewer/editor for faculty members.
	Data store	Opus is a data store for a diversity of information sourced from multiple campus systems about faculty and their activities and is considered the authoritative system for faculty information at UCLA.[61]
	Data transfer methods	Metadata is transferred to: • Interfolio RPT via the Interfolio API • Interfolio FAR via secure transfer of CSV files
Data Consumers (RIM Use Cases)	Faculty activity reporting	UCLA licenses the Interfolio Review, Promotion, and Tenure (RPT) product,[62] which assembles individual dossier materials and manages workflows associated with it, such as the submission, access and routing, review, messaging, and progress to completion. RPT is tightly integrated with Opus.
	Public portal	n/a
	OA workflow	n/a
	Metadata reuse	HR information in Opus is used in the UCPMS and UCLA Profiles systems.
	Strategic reporting	Reporting requests like eligibility tracking, salary comparisons, and equity studies.
	Compliance monitoring	n/a

Administrative responsibility
The Opus project is staffed by two full-time project managers in the Academic Personnel Office who work closely with UCLA IT Services for custom development, data transfers and integration, and other technical requirements.[63]

Stakeholders and users
Opus/Interfolio stakeholders include:

- Faculty members and academic appointees who use RPT for their promotion and tenure reviews and Faculty Activity Reporting for annual academic progress reviews.

- Academic deans and other administrators such as the Executive Vice Chancellor/Provost benefit from the aggregation of information about their departments, colleges, and research units.

- Deans and department heads are also users of RPT.

- Departmental support staff assists with data entry and workflow processes in RPT and FAR.

- The UCLA Academic Personnel Office (APO) maintains the platform, and the primary executive sponsor for the project is the Vice Chancellor for Academic Personnel. Professional staff also work closely with the Opus Oversight Committee on issues of policy, with representatives from academic personnel, campus IT, and the faculty.[64]

- UCLA Library is not yet a data consumer of FAR data, although this is under discussion. In the future, the library may be able to glean greater insights about faculty activities, grants, and projects, information that the library can better tailor its support to users.

UC PUBLICATION MANAGEMENT SYSTEM

Scope
To date, the Publication Management System supports:

- All faculty at all 10 UC campuses (approximately 22,000 persons)

- Researchers at Lawrence Berkeley Laboratory

- Non-UC recipients of Research Grants Program Office grants

- Nonfaculty researchers from two UC campuses (UC Riverside and UC Irvine) (under the Presidential policy); UCLA researchers are expected to be included in 2021, with other campuses to follow incrementally

RIM System Framework

Figure 11 and table 10 provide a framework for understanding the University of California Publication Management System. Complementary information is also provided in table 12 about the metadata and sources.

## RIM System Framework for UC Publication Management System

DATA SOURCES

PUBLICATION DATABASES

LOCAL DATA SOURCES
HR from 10 Campuses,
Sponsored Research

DATA PROCESSING

PUBLICATION HARVESTER
Elements

ETL PROCESSES

METADATA EDITOR
Elements

DATA STORE
Elements

Waiver Mgmt System

DATA TRANSFER METHODS
Elements API

DATA CONSUMERS

METADATA REUSE
Opus,
OA Comm. System

OA WORKFLOW
Institutional
Repository

COMPLIANCE MONITORING
LBNL,
UC Research Grants Program Office

FIGURE 11. RIM System Framework for UC Publication Management System

TABLE 10. RIM system details for UC Publications Management System

Data Sources	**Publication databases**	Elements harvests publication data from multiple databases such as Web of Science Lite, RePEc, and PubMed Central. Individuals can also import publications that are not harvested.
	Local knowledge	n/a
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	Elements is used as a metadata harvester to identify and aggregate articles for UC authors who fall under institutional OA policies.
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	While Elements serves as the primary data store, data about waivers and embargos is currently stored in the locally developed Waiver Management Systems and mirrored in Elements.
	Data store	Data is stored primarily in Elements. Information about waivers and embargos provided by authors is stored in a locally developed Waiver Management System and also mirrored in Elements. The Elements product now supports waiver management, so CDL may retire its custom system in the future.
	Data transfer methods	Elements API
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	n/a
	OA workflow	eScholarship is an integrated institutional repository and OA publishing platform for the entire University of California system, developed and maintained by CDL.[65]
	Metadata reuse	CDL has locally developed a communications system used in conjunction with Elements. Following the identification of relevant publications eligible for self-deposit through Elements metadata harvesting, the communication system notifies authors via email, inviting them to deposit through a simplified workflow. Publication data from the UC Publication Management System is also extracted for use in Opus.
	Strategic reporting	n/a
	Compliance monitoring	CDL does not use Elements for compliance monitoring, but Berkeley Lab and the UC Research Grants Program Office use it for monitoring compliance with funder, grant, and governmental OA mandates.

Administrative responsibility

CDL has administrative responsibility for interpreting the OA policies on behalf of the university as well as maintaining the technical infrastructure to support and simplify researcher compliance with the institutional OA policies.

Today both the UC Office of the President (UCOP) and CDL provide financial support for the OA policy. UCOP contributes funding to cover a portion of the Elements licensing cost and one FTE program manager, while CDL absorbs the remaining costs, including approximately 1.5 FTE technical staff.

Each campus, including UCLA, has liaison librarians supporting the effort to the extent they can, but there is no estimated calculation of that effort or cost. At UCLA, the scholarly communications education librarian is engaged as the primary point of contact about UCPMS, responding to questions and concerns by faculty, supporting the appointment of delegates, and explaining the policy. They work with other scholarly communication librarians across the 10 institutions, meeting monthly to share practices, outreach materials, challenges, and innovations.

Stakeholders and users

- Faculty are primary stakeholders, as their policy requested efforts to make faculty compliance with the OA policy as convenient as possible.

- The UC Office of the President provides oversight to CDL as well as partial financial support for the Publication Management System.

- California Digital Library, which takes the lead role in development, maintenance, and funding for the UCPMS system.

- The UCLA Library, and particularly the scholarly communication librarians, are important stakeholders, as they are eager to advance OA initiatives and support efforts like ORCID adoption.

- Following enactment of the Presidential OA Policy, all researchers—graduate students, postdocs, and research staff—also became stakeholders.

UCLA PROFILES

Scope

UCLA Profiles is the only public researcher profile system on the UCLA campus, and it is scoped for only part of the institution. It includes profiles for approximately 1,000 UCLA biomedical faculty members, researchers with academic leadership appointments, and nonfaculty academic researchers. Profiles are created for eligible biomedical researchers and updated on an opt-out basis.

RIM System Framework

Figure 12 and table 11 provide a framework for understanding the UCLA Profiles system. Complementary information is also provided in table 12 about the metadata and sources.

RIM System Framework for UCLA Profiles

DATA SOURCES

PUBLICATION DATABASES
PubMed, UCPMS

LOCAL KNOWLEDGE

LOCAL DATA SOURCES
Opus,
NIH Reporter,
ClinicalTrials.gov

DATA PROCESSING

PUBLICATION HARVESTER
Profiles RNS
Disambiguation Engine

ETL PROCESSES

METADATA EDITOR
Profiles RNS

DATA STORE
Profiles RNS

DATA TRANSFER METHODS
Profiles RNS API

DATA CONSUMERS

PUBLIC PORTAL
Profiles RNS

METADATA REUSE
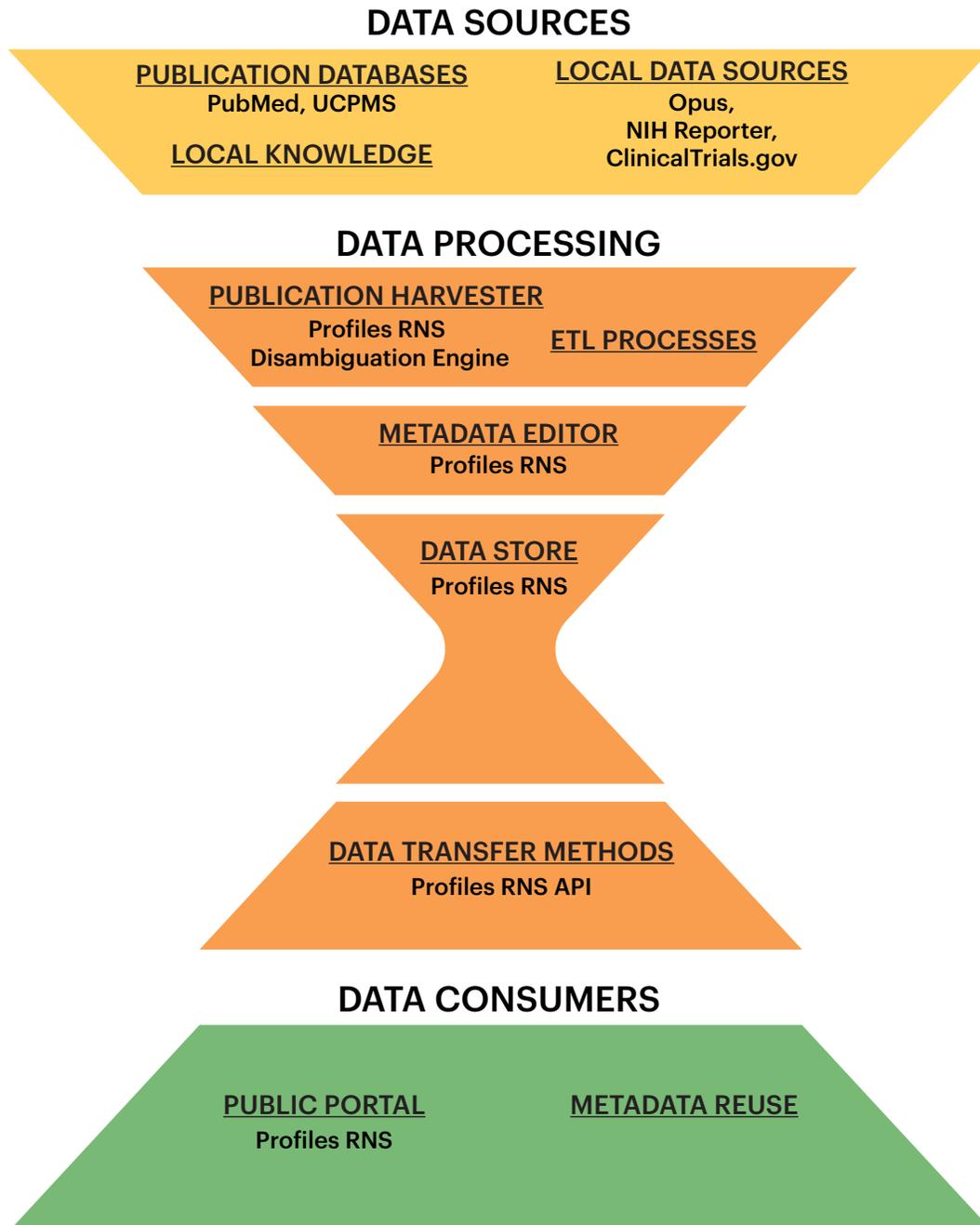
FIGURE 12. RIM System Framework for UCLA Profiles

TABLE 11. RIM system details for UCLA Profiles

Data Sources	**Publication databases**	By default, Profiles RNS extracts publication metadata only from PubMed. The UCLA Profiles instance also extracts metadata from the UC Publication Management System.
	Local knowledge	Refer to the [Metadata section](#) for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	Profiles RNS harvests metadata from PubMed and also includes an Author Disambiguation Engine.
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Profiles RNS includes a metadata editor for adding and removing PubMed articles from a person's page or manually adding/editing articles.
	Data store	Profiles RNS includes a data store.
	Data transfer methods	Profiles RNS has an API for extracting data.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	Profiles RNS provides a public portal.
	OA workflow	n/a
	Metadata reuse	Some UC institutions (notably UCSF) use data from Profiles RNS on other campus websites; UCLA does not extract UCLA Profiles data for other sites at this time.
	Strategic reporting	n/a
	Compliance monitoring	n/a

The Clinical and Translational Science Institute (CTSI) on the UCSF campus provides the core technical support for UCLA Profiles, along with the other Profiles RNS systems also supported across the California system. In total, about five CTSA staff members provide some level of support for all of these systems (and not just UCLA), for a total estimate of about 2.0 FTE annually. The Profiles RNS system for UCLA is cloud-hosted by the UC Berkeley data center.

The UCLA CTSI unit also provides administrative support to maintain profiles. They have worked to manually enrich information on a few "exemplar" profiles of senior faculty who are supportive of the effort to demonstrate the full functionality, encourage others to update their own profiles, and to further secure buy-in. They are also working with other campus units to enable additional technical interoperability, such as the self-service assignment of proxies by researchers.

Stakeholders and users
UCLA Profiles stakeholders include:

- Biomedical researchers, who use Profiles to identify possible collaborators and relevant expertise. Profile holders also benefit from a tool to support their personal reputation management. Early career researchers particularly use it to identify potential mentors.

- The UCLA CTSI, which promotes UCLA Profiles and finds it extremely useful for identifying potential investigators for grant applications, calling it a "game changer."

- Members of the public, who use the portal's information to learn more about clinicians they may be seeking care from.

- The Biomedical Library, which is a user of UCLA Profiles and supports the CTSI through report generation and OA compliance monitoring.

Metadata and sources

See table 12 for a detailed overview of the metadata and sources used in UCLA's RIM systems: Opus, Interfolio, UC Publication Management System (UCPMS), and UCLA Profiles.

What's next?

The RIM ecosystem at UCLA is complex and changing—and also under scrutiny. Following a 2019 memo to the Office of the President expressing concerns regarding the use of research information management systems, a Research Information Management Systems (RIMS) Work Group was convened by the provost in January 2020 to conduct a "systemwide review of all RIMS currently being employed by the Academic unit and elsewhere across the UC," where RIMS are described as being used to "aggregate data and generate metrics and statistics for universities and other institutions," and are an object of Academic Senate concern because "most are owned by third parties and use UC data."[66] In the meantime, the three systems documented in this report will continue to expand their work:

OPUS AND INTERFOLIO

The Opus team will continue to expand all workflows for all faculty. By 2023 it's expected that all faculty at UCLA will be using Interfolio FAR to support their annual review documentation and workflows.

UC PUBLICATION MANAGEMENT SYSTEM

The California Digital Library will continue the immense task of implementing the Presidential OA Policy across the entire University of California system.

UCLA PROFILES

There is interest in adding profiles for more researchers—residents, trainees, postdocs, and graduate students—but as nonfaculty members, their information isn't in the Opus system, so the CTSI is exploring if the payroll system may help with person identification. There is also interest in potential expansion to nonmedical school faculty members as well.

Content type	Opus and Interfolio[67]	UCPMS	UCLA Profiles[68]
Persons	Imported from campus PeopleSoft system and UC Recruit	Imported from HR sources, including Opus at UCLA, on 10 different campuses	Imported from Opus
Publications	• Publications loaded monthly from UCPMS if faculty claim their works in that system • All other outputs manually entered or imported from other sources	• Harvested by Elements from multiple sources • Authors can manually enter content and sync with ORCID profile • The system also maintains information about article OA status	• Harvested from PubMed • Claimed publications loaded from UCPMS • Additional publications can be manually entered
Other scholarly outputs (presentations, posters, artistic works, etc.)	Manually entered	• Researchers must enter manually • Monographs and other nonarticle content types are not included in OA policy	Manually entered
Grants	• Funded external grants updated monthly from sponsored projects records • Funded internal grants are loaded monthly from Academic Senate records	Used only for compliance tracking with external OA mandates by LBNL, UC Research Grants Program Office only	Funded grants from sources like NIH RePORTER
Clinical trials	Not included at this time	Not applicable	Imported from clinicaltrials.gov
News stories	• "Media mentions category" being added • Manually entered	Not included	Manually entered
Honors and Awards	Manually entered	Not included	Manually entered
Courses taught	Imported quarterly from academic history records	Not included	Not included

Content type	Opus and Interfolio[67]	UCPMS	UCLA Profiles[68]
Core facilities and equipment	Not included	Not included	Not included
Organizations and hierarchy	Opus academic hierarchy is source for Interfolio and other downstream systems	Imported from HR sources, including Opus at UCLA, on 10 different campuses	Imported from Opus
Graduate committee service	Updated monthly with data from the Graduate Division	Not included	Manually entered by researcher
Teaching evaluations	Pulled quarterly from Center for Advancement of Teaching	Not included	Not included
Academic Service	• Academic Senate committee participation updated monthly • Other academic service manually entered	Not included	Not included
Technologies available for licensing	Not included	Not included	Not included

University of Miami

Introduction

The University of Miami is a private research university located in Coral Gables, Florida. Miami enrolls approximately 11,000 undergraduates and 6,500 graduate and professional students in 12 colleges, including a medical school.

The Miami case study comprises three different RIM systems at different states of adoption:

- Florida ExpertNet

- University of Miami Research Profiles

- Scholarship@Miami

This case study offers a valuable snapshot of an institution early in a transition between two different RIM products: Pure and Esploro. One system uses a well-established product that has not been fully leveraged by the institution due to sustainability concerns. The other system is a new market entrant that is still very much under development.

In addition, Miami is one of two private universities included in Florida ExpertNet, a statewide portal of research expertise across Florida's universities. Although there is currently no direct connection between Florida ExpertNet and either RIM system at Miami, its status as a highly regarded statewide expert finder system is important to consider as part of the overall RIM landscape at Miami. For many years, ExpertNet was Miami's only public portal.

Origin story

FLORIDA EXPERTNET[69]

Florida ExpertNet was first conceived in 1998 as part of state legislation in reaction to the discovery of valuable government contracts going out of state when the talent existed in Florida's universities. Legislators charged Florida State University (FSU) to "develop a statewide portal of applied research expertise within the state university system."[70]

FSU partnered with the State University System Board of Governors to create the Florida ExpertNet portal in 1999. The responsibility for building and maintaining the system, along with the funding, was assigned to FSU's Center for Information Management and Educational Services (CIMES), which worked with the research offices at each institution to secure buy-in and collect data. Ten of the 12 Florida public universities voluntarily participate, as well as two private institutions (University of Miami and Florida Institute of Technology). The University of Miami joined ExpertNet in 2011.

Florida ExpertNet has evolved over the past 20 years, adding portal features and enriching the data it receives from institutions, and it is the oldest and most well-established system in this report. However, it is different from all the other systems in one important aspect: its core data is based on awarded grants rather than publications. Publications are listed for many of the records in Florida ExpertNet, but as information to enrich a profile rather than data to analyze.

The project team made an early assumption that the university researchers most likely to want to be contacted by government and industry were those who had previously received research support from an external source. The following data is provided by the human resource and research offices from each of the 12 participating institutions:

- **Persons:** Names, titles, institutional affiliation(s), and contact information
- **Projects (i.e., awarded grants):** Title, principal and co-principal investigators, sponsoring agency, award amount, and start/end dates

A research term is automatically added from a controlled taxonomy to each profile based on the academic department. Faculty researchers may also provide additional information to enrich their profiles, including photos and videos, ORCID iD, social media links, degrees, honors, memberships, research keywords, peer reviews, publications, and other professional activities. Faculty researchers are also invited to join a speakers' bureau.

The ExpertNet team also collects data on technologies that can be licensed by scraping institutional websites and maintains information on centers and institutes within each institution. ExpertNet is not intended to be a comprehensive database of all funding, but instead to support expertise discovery and increase the potential for industry-academic partnerships when feasible. Universities choose which projects to send, suppressing those with nondisclosure agreements or other privacy concerns.

Individual researchers have always been able to add publications to their ExpertNet profile, and the system was initially designed to collect publication information as fielded bibliographic metadata. However, authors resisted the extra work required to manually enter this information, and the team changed the system to accept text copied and pasted from a CV instead. While the current structure limits how the publication data can be used—it's not possible to count publications by year or visualize author collaborations—the text is sufficient for ExpertNet's intended purpose: exposing researcher expertise to potentially seed collaborations.

UNIVERSITY OF MIAMI RESEARCH PROFILES[71]

In 2014, the University of Miami Office of the Vice Provost for Research licensed Elsevier's SciVal Experts product to organize and share information about Miami research in a consistent way, creating a "one-stop shop" for discovering researchers and their expertise. The medical school was prioritized from the beginning: all medical school faculty were included, along with faculty in other STEM disciplines. However, vendor pricing for SciVal Experts was based on the number of researchers covered, and Miami chose not to extend coverage to the entire institution.

In 2015, after Elsevier acquired the Pure product and launched it in the United States, Miami transitioned from SciVal Experts to Pure, using the local branding University of Miami Research Profiles.

Although licensed by the research office, SciVal Experts was managed by the IT department within the University of Miami Health System (UHealth IT). This group, Research Intelligence and Data Infrastructure, was moved to the research office following the hiring of a new Vice Provost for Research and Scholarship in June of 2020. There has been little time in the turmoil of the pandemic to ensure that Research Profiles is being used to its full potential and has the support needed to maintain current data. Publications for persons listed in Research Profiles are automatically harvested each week from Scopus through Pure's Profile Refinement Service (PRS), but the list of

persons has not been updated from human resources records since 2018. Even so, the research office has found Research Profiles to be useful for the purposes they had in mind when the product was licensed.

SCHOLARSHIP@MIAMI[72]

In 2017, Ex Libris, a subsidiary of ProQuest, approached the University of Miami Libraries about becoming an early development partner for their new entry into the RIM marketplace, Esploro. Miami Libraries was motivated to consider Esploro for several reasons.

- The attraction of being directly involved—along with others in the University's research enterprise—in identifying the functional requirements for a new research information management system.

- The desire to replace the platform for their institutional repository, bepress Digital Commons, following its acquisition by Elsevier.

- To further promote openness and scholarly communication by linking institutional profiles with OA content in the repository.

- To help increase operational efficiencies for the university by decreasing the number of systems containing researcher profiles. Although Research Profiles would seem to fulfill this use case, the per-researcher cost of the Pure license has deterred Miami from including all its researchers in the portal.

- To reduce—if not eliminate—the burden for faculty in manually entering their publications into Research Profiles, instead using an Automated Intelligence (AI) approach to populating the Profiles from diverse bibliographic databases linked to widely-used scholarly identity records.

- To provide a more inclusive picture of Miami research, especially for monograph-driven humanities disciplines. Ex Libris has promised to deliver by leveraging its 4 billion record Central Discovery Index to automatically add publications of all types from all disciplines to researcher profiles. Although Pure provides import tools for other sources, its only fully automated source is Scopus, which focuses on articles in peer-reviewed journals and book chapters.

- To ensure an approach that allows the repository and faculty profiles systems to interoperate with related systems such as grant funding sources, FAR systems, and human resource management systems.

Miami Libraries was very familiar with Ex Libris because they already licensed two of its products: Alma (library services platform) and Primo (discovery platform). The successful migration of three separate library management systems into a single Alma instance with Ex Libris support in May 2016 gave Miami Libraries confidence in a beneficial development partner relationship.

In January 2019, Miami Libraries signed an early adopter license agreement with Ex Libris, and the Libraries implementation team spent 2019 working with Ex Libris to migrate all content from the legacy bepress repository to Esploro, now locally branded as Scholarship@Miami. At the time of this writing, the repository functionality is complete, but individual researcher profiles have not been activated because the profile information collected so far is incomplete due to the complexities surrounding the development of the harvesting via artificial intelligence.

The creation of representative profiles requires accurate publication metadata harvesting at scale. Ex Libris intends to accurately harvest, disambiguate, and deduplicate publications for each Miami researcher using its Central Discovery Index as the primary source. Persistent author identifiers are

essential for connecting the right works to the right people, and, as one Miami interview participant noted, "there's prework that needs to happen before Smart Harvesting is going to be smart." In particular, this means leveraging persistent identifiers whenever possible. Over the past year, the team has been enriching Scholarship@Miami person profiles with additional author IDs: ORCID iD, Scopus Author ID, ResearcherID, Pivot ID, etc. The team sees author IDs as a key element for Smart Harvesting's success and already plans to make education about author IDs, especially ORCIDs, part of onboarding for new faculty and researchers.

The team has also been pulling metadata for their researchers from Web of Science to "train" the Smart Harvesting algorithms. They are likely to follow the same process with other metadata sources. Note that this manually harvested metadata is meant only to train the algorithm and not to populate the database.

Miami Libraries is planning for a soft launch during the 2021-22 academic year that will include public-facing researcher profiles, perhaps launched one department at a time. The team is confident that development is moving in the right direction, but it is proceeding more slowly than either client or vendor had hoped. When asked what they would change with a magic wand, one team member shared, "We would have had a longer development partnership period in order to ensure that we had a longer term control of their development agenda."

Rim Implementation Timeline at University of Miami
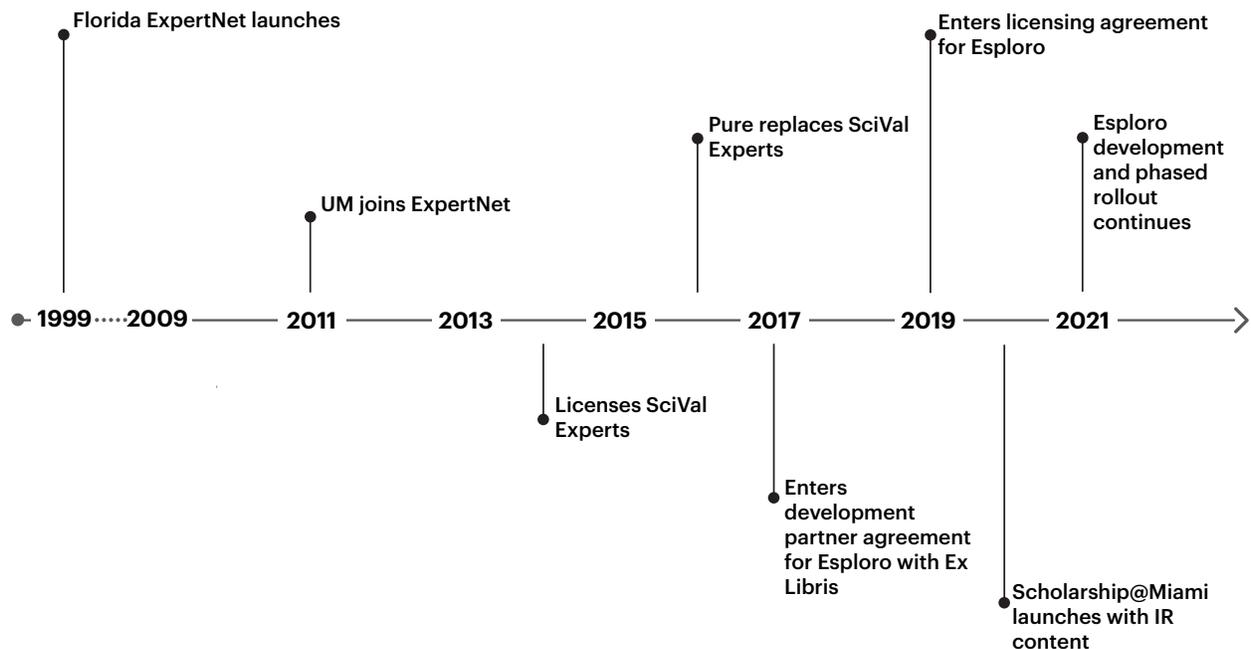
FIGURE 13. RIM Implementation Timeline at University of Miami

Use cases

FLORIDA EXPERTNET

Florida ExpertNet supports the following use case:

Public portal: Florida ExpertNet's primary goal is to connect university talent and resources with government and industry. Its stated vision is to "assist in transforming Florida's intellectual capital into its economic future."[73] The team refers to Florida ExpertNet as an Expert Finder System, and sometimes as a "matchmaker."

ExpertNet also serves as a research showcase in various ways. The website automatically features a randomly generated marquee of experts, centers, speakers, and technologies. ExpertNet also has a very active social media Twitter and Facebook presence showcasing current research featured in the news. Also, ExpertNet features Florida's high priority research areas in the "Leading Edge" section on its' home page.

ExpertNet staff enrich the data received from each university by applying a standard research taxonomy across modules (people, projects, technologies, and centers/institutes).[74] The ExpertNet portal includes a multisearch feature that provides results from all the modules in the system. The interface also allows the user to browse by institution, STEM, and subject. The structured research taxonomy allows the team to optimize the portal to lead people to the set of researchers known to be working in a particular area.

UNIVERSITY OF MIAMI RESEARCH PROFILES

Research Profiles also primarily supports a single use case:

Public portal: Research Profiles serves as a research showcase for much of the University of Miami's faculty. However, because the number of profiles allowed under Miami's Pure license is limited, Research Profiles does not cover all faculty and researchers, limiting the impact and scope of the portal.

It also provides a portal for expertise discovery for users wishing to discover and connect with University of Miami faculty members. In interviews, the research office cited numerous examples of using Research Profiles to identify the appropriate person or people for a purpose. These include identifying:

- Collaborators when applying for seed funding in interdisciplinary programs

- Possible candidates for prestigious awards

- Potential reviewers to serve on internal candidate review panels; those reviewers with potential conflicts of interest can be identified and discarded by reviewing coauthorships on publications

- Emerging research areas that may benefit from additional investment or organization

Strategic reporting and decision support: Use of Research Profiles for strategic reporting is less defined at Miami than in the other case studies we conducted; no one is actively using the reporting module available in the Pure product or extracting data for analysis in other tools. Still, the research office described the potential for Research Profiles to support several strategic use cases.

- For initiatives like U-Link,[75] Research Profiles could be used for getting a sense of how

scholars are collaborating before participating in a U-Link project and comparing the baseline to collaboration patterns several years later. Furthermore, Research Profiles could track publications and successful sponsored grants that resulted from the initiative.

- Administrators could review the level of research output and impact in key areas where the university may want to make strategic hires.

- Research deans could use publications data for the annual benchmarking of publication counts and citation patterns for annual reporting and strategic assessment of college activities.

SCHOLARSHIP@MIAMI

The Scholarship@Miami system supports the following use cases. Note that as the system is in development, we are documenting planned uses:

Public portal (in development): Similar to the original goals for Research Profiles, the Miami Libraries team intends for Scholarship@Miami to be a "one-stop shop" for profiles of University of Miami researchers. Unlike Research Profiles/Pure, the Esploro pricing structure has no upper limit on the number of profiles, so the team expects Scholarship@Miami to become the central portal for displaying Miami scholars and their achievements across all disciplines. At the time of writing, Miami Libraries is preparing for the rollout of public profiles.

Strategic reporting and decision support (in development): When fully implemented, Scholarship@Miami will support all the strategic use cases identified for Research Profiles. The implementation team also intends for it to provide analytics and benchmarking, but those goals will need to wait until the software development by Ex Libris reaches greater maturity.

Metadata reuse (in development): In keeping with the desire to coordinate all of the RIM-related products on campus, Miami Libraries also hopes that publication metadata stored in Scholarship@Miami can be used to prepopulate the various faculty activity reporting (FAR) systems on campus with publications metadata. However, there is no desire for Scholarship@Miami to fulfill the teaching and service reporting requirements of a FAR system.

Miami Libraries intends for Scholarship@Miami to provide a robust institutional repository for open access to scholarly work. However, there is no institutional OA policy at the University of Miami, and Miami's implementation of Esploro is too nascent to support an OA workflow similar to those observed in the University of California and Penn State use cases. Therefore, we are not including "OA workflow" as a use case for Scholarship@Miami at this time.

RIM system

FLORIDA EXPERTNET

Scope

Florida ExpertNet includes actively employed researchers with grant funding at 12 Florida universities. Today, 10 of the 12 public universities are active members along with two private universities, University of Miami and Florida Institute of Technology (by their request). The private universities are included because they are major research institutions with strong industry partnerships.

Currently, ExpertNet includes 912 faculty expert profiles, 3,633 research projects, and seven centers and institutes from the University of Miami.

RIM System Framework

Figure 14 and table 13 provide a framework for understanding the Florida ExpertNet system. Complementary information is also provided in table 16 about the metadata and sources.

RIM System Framework for Florida ExpertNet

DATA SOURCES

LOCAL KNOWLEDGE

LOCAL DATA SOURCES
HR,
12 Research Offices

DATA PROCESSING

ETL PROCESSES

METADATA EDITOR
Knowledge Management System

DATA STORE
SQL Server Database

DATA TRANSFER METHODS
Adobe ColdFusion

DATA CONSUMERS

PUBLIC PORTAL
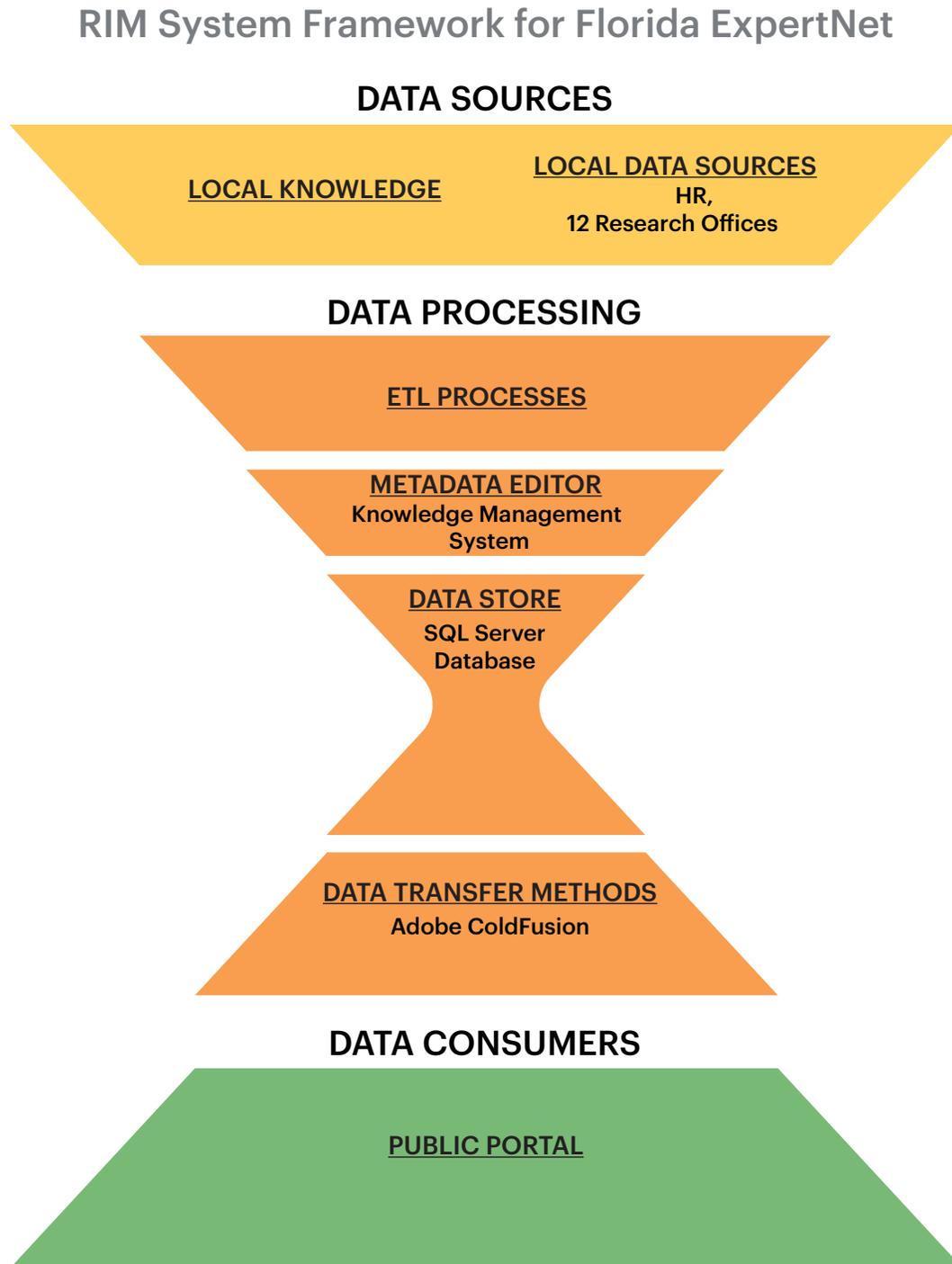
FIGURE 14. RIM System Framework for Florida ExpertNet

TABLE 13. RIM system details for Florida ExpertNet

Data Sources	**Publication databases**	n/a
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	n/a
	ETL processes	Data is collected locally from each institution using feeds, files, and spiders. The data is then processed, imported, and published to the public portal using custom applications.
	Metadata editor	A Knowledge Management System (KMS) allows experts to manage their profiles. There are also a variety of custom-built tools to allow administrators to edit and enhance profiles. A number of terminology crosswalks are employed to translate local terminology into a taxonomy to improve standardization throughout the system.
	Data store	All applications and data is stored at CIMES/FSU in a Microsoft SQL Server database.
	Data transfer methods	Adobe ColdFusion is used to extract and manipulate data for the public portal.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	The Florida ExpertNet website is locally developed and maintained.
	OA workflow	n/a
	Metadata reuse	n/a
	Strategic reporting	n/a
	Compliance monitoring	n/a

Administrative responsibility

Florida ExpertNet is funded by the state of Florida as part of overall funding for Florida State University and supported by a 1.5 FTE funding allocation from the FSU Center for Information Management and Educational Services. This allocation covers parts of several individuals' jobs:

- Director
- Executive Director
- Web Application Assistant Director
- Web Application Developer
- Visual Designer
- Business Analyst
- Writer/Social Media Specialist
- Student Assistants

In addition to collecting metadata from each institution and supporting the web site, the team enriches content from the institutions and aligns industry and state priorities with terms from the research taxonomy to provide more consistent search results.

Stakeholders and users

Stakeholders include:

- State of Florida government organizations and Florida businesses looking for university expertise and collaboration
- University offices within the 12 participating Florida institutions that seek to connect researchers with government and industry needs. This particularly includes offices engaging in business development, research, commercialization, incubators, industry engagement
- Research faculty who are included in Florida ExpertNet

The Florida ExpertNet team knows of other users, such as undergraduate students seeking advisors or research projects.

UNIVERSITY OF MIAMI RESEARCH PROFILES

Scope

The original desire for Research Profiles was that it cover all Miami faculty, but the Pure license covers only 1,700 profiles, far fewer than the 2,600 full time faculty members at Miami in 2019.[76] The research office has explored adding more "seats" to the Pure license, but deemed it too expensive.

RIM System Framework

Figure 15 and table 14 provide a framework for understanding the University of Miami Research Profiles system. Complementary information is also provided in table 16 about the metadata and sources.

Research Profiles is an instance of Elsevier Pure.

RIM System Framework for University of Miami Research Profiles

DATA SOURCES

PUBLICATION DATABASES
Scopus

LOCAL DATA SOURCES
HR

LOCAL KNOWLEDGE

DATA PROCESSING

PUBLICATION HARVESTER
Profile Refinement Service
ETL PROCESSES

METADATA EDITOR
Pure

DATA STORE
Pure

DATA TRANSFER METHODS
Pure Web Services

DATA CONSUMERS

PUBLIC PORTAL

STRATEGIC REPORTING
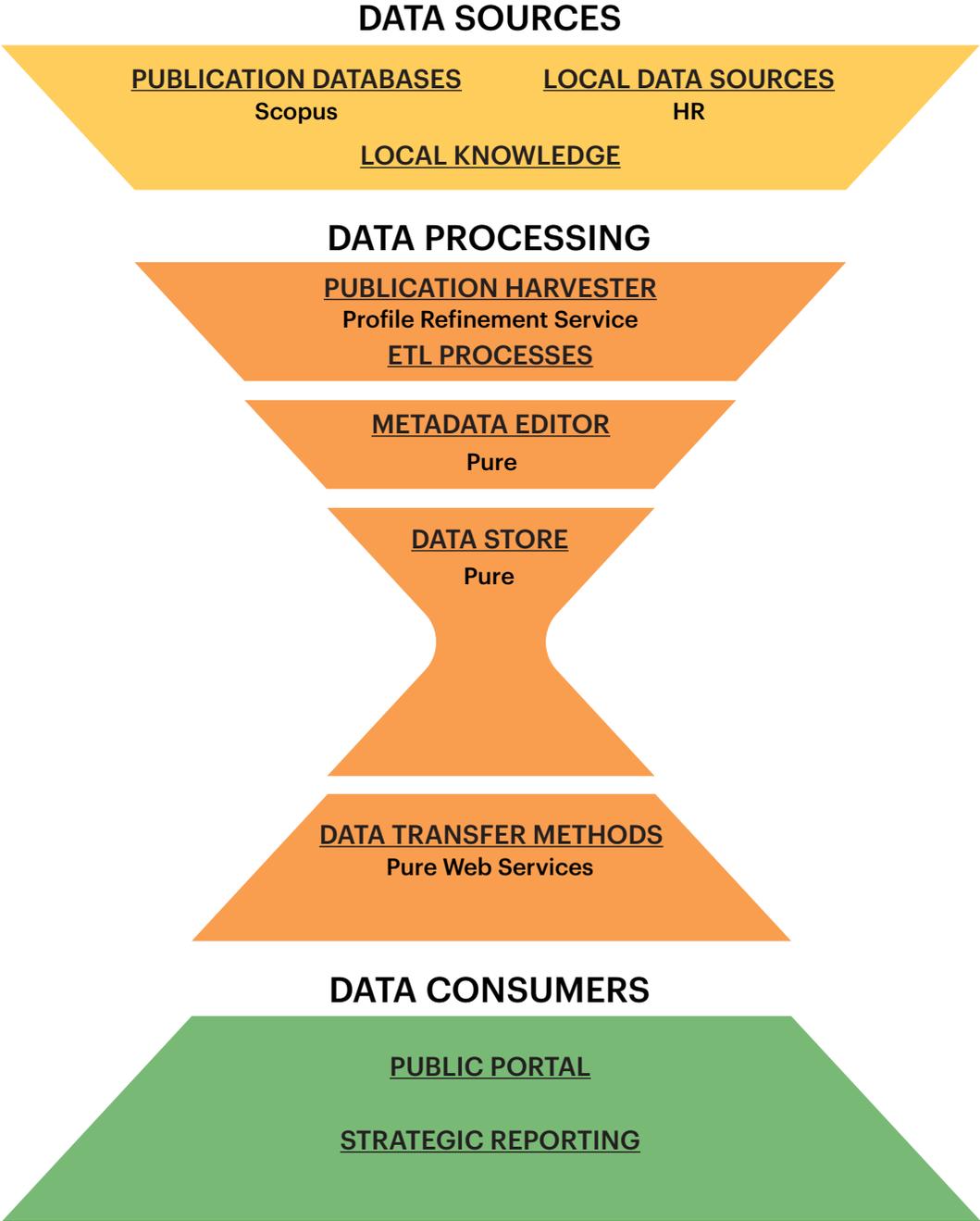
FIGURE 15. RIM System Framework for University of Miami Research profiles

TABLE 14. RIM system details for University of Miami Research Profiles

Data Sources	Publication databases	Scopus is the primary source for publication metadata in Research Profiles, but individuals and their delegates can import from other publication databases as well.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	Publication harvester	Pure's companion service, the Profile Refinement Service (PRS), provides a weekly "feed" of disambiguated publications from Scopus for Miami authors.
	ETL processes	Refer to the Metadata section for details.
	Metadata editor	Pure includes its own editor for reviewing and editing profile information and importing from other sources. The administrator can edit organization-level information.
	Data store	Pure includes its own database for storage.
	Data transfer methods	Pure provides web services, which are not used independently by Miami. Pure web services acts as a mechanism for populating the Pure Portal.
Data Consumers (RIM Use Cases)	Faculty activity reporting	n/a
	Public portal	Pure includes a public portal module.
	OA workflow	n/a
	Metadata reuse	n/a
	Strategic reporting	The reporting potential in Pure is largely unused but informs future plans for the Scholarship@Miami system.
	Compliance monitoring	n/a

Administrative responsibility

The Pure license is paid for by the Office of the Vice Provost for Research and Scholarship and managed by the IT unit within OVPRS. Pure is only one part of the portfolio of research-related applications managed by a single individual in the unit who updates Pure with human resources data, fielding user questions, and communicating with the vendor when something goes awry. Outreach and education are out of the scope of their position, and with no one prioritizing updates to the system even the HR data is two years out of date.

In the past, Miami Libraries has provided support in the form of training sessions, but with Scholarship@Miami on the horizon, Miami Libraries is now dedicating time and attention to that project instead of Research Profiles. Pure Research Profiles is expected to be sunsetted once the Scholarship@Miami faculty profiles are live.

Stakeholders and users

Stakeholders include:

- Office of the Vice Provost for Research and Scholarship, which licenses Pure and uses Research Profiles for expertise discovery as well as strategic reporting and decision support

- Associate Deans for Research and Miami Libraries, which direct researchers to Research Profiles to find collaborators

- Faculty members with profiles

We heard accounts directly from the research office about their use of Research Profiles, but the IT team is not tracking use by others. No one is currently charged with the responsibility for promoting Research Profiles to either faculty members with profiles or potential users.

SCHOLARSHIP@MIAMI

Scope

Scholarship@Miami includes all 2,600 full-time faculty as well as other employees engaged in research, across all disciplines.

RIM System Framework

Figure 16 and table 15 provide a framework for understanding the University of Miami Scholarship@Miami system. Complementary information is also provided in table 16 about the metadata and sources.

RIM System Framework for Scholarship@Miami

DATA SOURCES

PUBLICATION DATABASES   LOCAL DATA SOURCES

LOCAL KNOWLEDGE

DATA PROCESSING

PUBLICATION HARVESTER   ETL PROCESSES
Smart Harvesting   *(planned)*

METADATA EDITOR
Alma

DATA STORE
Alma

DATA TRANSFER METHODS
(planned)

DATA CONSUMERS

PUBLIC PORTAL
(planned)

METADATA REUSE   STRATEGIC REPORTING
(planned)   *(planned)*
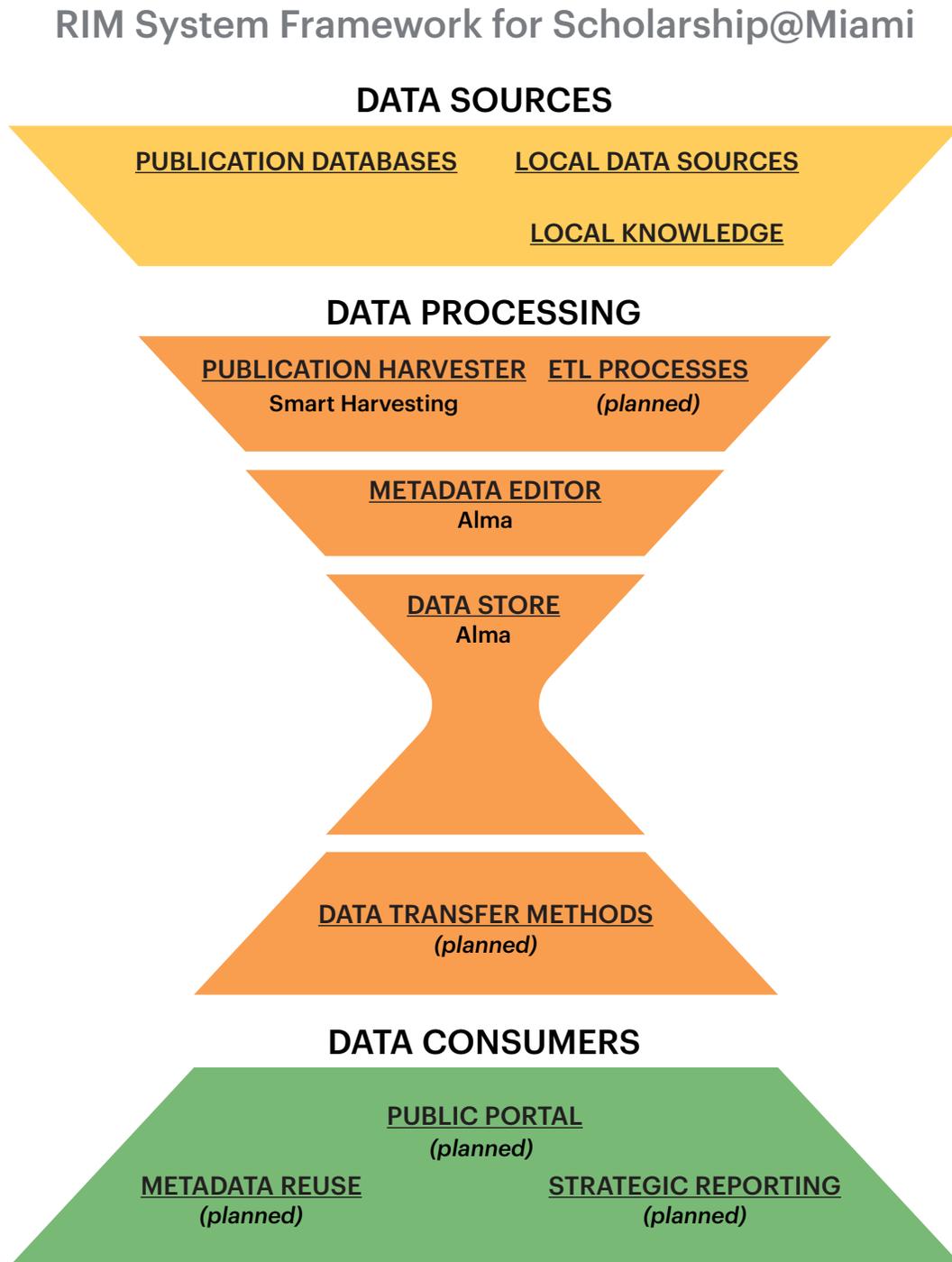
FIGURE 16. RIM System Framework for Scholarship@Miami

TABLE 15. RIM system details for Scholarship@Miami

Data Sources	**Publication databases**	Ex Libris's Central Discovery Index[77] will be the metadata source upon implementation.
	Local knowledge	Refer to the Metadata section for details.
	Local data sources	Refer to the Metadata section for details.
Data Processing	**Publication harvester**	Ex Libris is developing a publication harvester called Smart Harvesting. At the time of this writing, it is not yet implemented at Miami.
	ETL processes	Planned. Refer to the Metadata section for details.
	Metadata editor	Metadata can be edited using Ex Libris's Alma product, which is already used for metadata management and storage as part of Miami's library management system.
	Data store	Alma includes its own storage database.
	Data transfer methods	Planned, but not implemented at the time of this writing.
Data Consumers (RIM Use Cases)	**Faculty activity reporting**	n/a
	Public portal	Esploro includes its own public portal. At the time this report went to press, the repository functionality was live, but the person profiles were still in development.
	OA workflow	No specific workflow supporting OA deposit is planned at this time.
	Metadata reuse	Planned
	Strategic reporting	Planned
	Compliance monitoring	n/a

Administrative Responsibility

At this time, all administrative responsibility is with Miami Libraries. The implementation team is comprised of eight people, each contributing a small percentage of their time.

Stakeholders and users

Stakeholders include:

- Miami Libraries, which licenses Esploro and its supporting components and provides staff

- Office of the Vice Provost for Research and Scholarship staff and Associate Deans for Research, who intend to use Scholarship@Miami how they currently use Research Profiles

- Faculty (including librarians) and researchers who will have profiles

Metadata and sources

Table 16 provides an overview of the University of Miami RIM systems: Florida ExpertNet, Research Profiles, and Scholarship@Miami.

What's next?

FLORIDA EXPERTNET

Today, the Florida ExpertNet team is exploring opportunities to import publications directly from RIM systems at individual institutions, which could allow them to gather more detailed, accurate, and current metadata without requiring authors to maintain yet another profile. They are also starting to collect ORCID iDs in anticipation of harvesting publication data. Revising the system to accommodate fielded bibliographic metadata will enable ExpertNet to take advantage of new data sources and provide visualization tools. This may represent a future use case for Scholarship@Miami. The team is also looking at establishing a cooperative among the universities to standardize and share data as well as resources and technology, and they are also exploring how to expand the researchers included in the system beyond faculty with external research projects.

MIAMI RIM SYSTEMS

Miami maintains several additional systems in addition that could be classified as research information products. Before introducing yet another product to the mix, the Dean of Libraries worked with the Vice Provost for Research to form a stakeholder group to review the Ex Libris opportunity. In 2020, a reorganization brought the offices of Research Administration, Research IT, and Medical Research into a reorganized university-wide Office of Research and Scholarship.

The informal group of distributed RIMS stakeholders that had been meeting since 2017 has recently been formalized as a task force to "review the current state of University of Miami's RIMS environment, identify product owners and stakeholders, and make recommendations regarding current needs and preferred investments." The purpose is to create a stakeholder group to facilitate conversations "that needed to happen among parties that weren't having them," according to an interview participant. The task force includes the VP for Research and Scholarship, the Dean of Libraries, the Associate Provost for Data Governance and Institutional Research, and representatives for university IT. The conveners are hopeful that the group will help develop a sustainable strategy for collecting and organizing research information and using that information in ways that benefit the institution and its researchers.

TABLE 16. Metadata and sources used at University of Miami and Florida ExpertNet
(Table continues on next page)

Content type	Florida ExpertNet[78]	Research Profiles	Scholarship@Miami
Persons	Human Resources information from each of 12 institutions	Human Resources	Human Resources
Publications	• Imported from a campus VIVO instance • Can also be manually entered	• Harvested from Scopus • Can also be manually entered or imported from other sources	• Harvested by Ex Libris Central Discovery Index (when live) • Can also be manually entered
Other scholarly outputs (presentations, posters, artistic works, etc.)	Manually entered	Manually entered	Manually entered
Grants	Sponsored projects records at 12 institutions	National Institutes of Health (NIH)	Planned
Clinical trials	Not included	Not included	Not included
News stories	Collect by reviewing each university's media relations office and the Twitter and Facebook feeds from other university offices	Not included	Planned
Honors and Awards	Can be manually entered by individuals using KMS	Not included	Planned
Courses taught	Beginning to pilot the collection of this information from some universities	Not included	Not included
Core facilities and equipment	Planned	Not included	Planned

Content type	Florida ExpertNet[78]	Research Profiles	Scholarship@Miami
Organizations and hierarchy	• Departments and colleges, as fed by each institution • Centers and institutes manually entered for each institution	Units are included for individuals as found in Human Resources records	Units are included for individuals as found in Human Resources records
Graduate committee service	Not included	Not included	Not included
Teaching evaluations	Not included	Not included	Not included
Academic Service	Manually entered using KMS	Not included	Not included
Technologies available for licensing	Scraped from university commercialization websites	Not included	Not included

CONCLUSION

The two reports constituting the *Research Information Management in the United States* report series document the RIM practices at five US research institutions, examining the goals, uses, stakeholders, and system components and provide a first-of-its-kind view of RIM practices at US institutions. The case studies documented here in Part 2 and the summary findings and recommendations documented in Part 1 of the series are intended to provide a frame of reference for all stakeholders—institutional leaders, library leaders, and practitioners—to better understand the complex landscape, ultimately providing a steadier footing for informed decision-making.

We expect RIM to continue to be an area of rapidly growing investment in the United States. We hope that these reports contribute to a more unified and inclusive understanding of diverse RIM practices that, while serving disparate functions, rely upon the collection and curation of the same institutional data. Through a more nuanced and unified understanding of this space, we can not only align efforts and responsibly steward our investments internally, but we can also better work between our institutions, to develop a collaborative, cross-functional, and vendor-agnostic community of practice.

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APPENDIX: SEMI-STRUCTURED INTERVIEW PROTOCOL

OCLC Research project on Research Information Management at US Institutions 2020-2021

1. **Please introduce yourself,** your job title, and the work that you do at your institution. (5 min)

2. **WHAT and WHEN** Tell us about your RIM system—what it does/offers as well as its scope, users, and origin. (Note: we'll get to the scope of the (meta)data in the system in the next question). (20 min)

    Question purpose: to understand WHAT they do and WHEN they started doing it. We want to know about what scale (below, at, or above the institution) they are operating at, how they source their service (open source, proprietary, home grown), and also the resources dedicated to supporting the system. This is an open-ended question, and we may have several related follow-up questions.

3. **WHAT** Tell us (generally) about the (meta)data included in the system. (10 min)

    Question purpose: to help us further understand the scope of the system, as well as the metadata sources and use of PIDs. We are also interested in the challenges, gaps, and future plans. This is an open-ended question, and we may have several related follow-up questions.

4. **WHY** What are the problems(s) or goal(s) your institution is trying to solve with this effort? Why? (15 min)

    Question purpose: to understand their main goals and how these align with institutional goals. It should also help us under their use case(s). This question should also help us understand the drivers, although the follow-up questions may be necessary to get there. This is an open-ended question, and we may have several related follow-up questions.

5. **HOW** did you decide to implement your RIM in this way? How are vendor decisions or scoping decisions made? (10 min)

    Question purpose: to understand how decisions were made. This may also help us to focus on the use case some more.

6. **WHO** are the stakeholders and users for your RIM system? Do you have executive support from one or more parts of the institution? (10 min)

    Question purpose: to understand who wants and invests in the RIM capacity at the institution. If collaboration is taking place and who those units are. We also are interested in who the creators and consumers are, and we are particularly keen to know what the role of the library might be.

7. **If you could wave a magic wand**, what would you change or fix? (5 min)

    Question purpose: to understand their pain points and possibly what's on the roadmap for the future.

8. **Is there anything else** you want us to know? (5 min)

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