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Open Source Tools for a Digital Research Ecosystem

Does research at your institution have the visibility and impact it could? A new class of open source tools can be used to create a modernized, 21st century 'digital research ecosystem' that will help faculty and graduate researchers advance their research objectives and gain. C-Level View | Feature

A Q&A with Ray Uzwyshyn

- By Mary Grush
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At colleges and universities today, we rely on a host of digital materials, processes, and services for instruction and administration. While most courses aren't conducted fully online, you would be hard pressed to find any that don't include digital elements. We simply do things differently now than we did decades ago in education. Academic institutions have successfully moved to digital infrastructures that support expectations for teaching and learning in a digital age.

But has there been a similar or parallel shift in the arena of scholarly research? We asked Ray Uzwyshyn, director of collections and digital services at Texas State University, to help us examine the trends and explore how institutions might use a new class of open source tools to create a modernized 'digital research ecosystem' that supports faculty and graduate research in the 21st century.

We need a global digital research infrastructure ecosystem that responds to the possibilities networked communication allows." — Ray Uzwyshyn

Mary Grush: Teaching and learning in higher education has moved into the digital age. But what about research?

Ray Uzwyshyn: Our researchers have certainly witnessed the paradigm shift that has occurred in instruction. They have also experienced the move to online modalities for research. Scholars now accomplish much of their work in a networked environment, but too often, good research still lingers unknown in those same online infrastructures.

Grush: Why is that?

Uzwyshyn: The academic research cycle traditionally occurs through the peer review processes of academic journals and conferences. These familiar older structures were set up more than a century ago. Back then, these were the leading communications infrastructures, but currently, new possibilities have opened.

Grush: At the Texas State University Libraries, you've worked on these challenges through your ongoing project to create a Digital Scholarship Research Ecosystem. How does this project offer faculty and graduate students a modern digital research infrastructure at your own institution and beyond?

Uzwyshyn: Our project offers a best practices model for placing an institution's vast and differentiated bodies of research and intellectual capital into coherent online frameworks — a digital research infrastructure ecosystem.

Grush: How are other higher education institutions responding to the challenge of building such infrastructures?

Uzwyshyn: Institutions are largely in opening stages. To create these types of digital research infrastructures, a few leading research institutions have realized the potential of certain applications to enable their researchers online; to aggregate, collect, and share the impact of their institution's research; and to aid in discovering, gathering, and analyzing related research.

Grush: Is it only the R1s and elite institutions that have the means to address this? Would you say, maybe ten percent of U.S. colleges and universities are the leading institutions you mentioned?

Uzwyshyn: Ten percent have realized the potential and are early adopters or developers. The remaining 90 percent have not yet fully enabled their researchers with the range of current possibilities. And this is for a variety of reasons. Many are primarily teaching institutions, and they simply don't have that research focus at this time.

Grush: And what about research faculty working at those "90 percent" institutions?

Uzwyshyn: Many of those faculty are independently placing their work online and publishing, archiving, and sharing it in various digital forms. But they aren't supported by a robust, digital infrastructure that aggregates their institution's intellectual capital. That is often done by outside vendor databases that buy and/or aggregate disciplinary journal content and society research publications — research content they then sell back to the faculty or institution.

Grush: You mentioned that some leading institutions have created useful tools that support various components of a larger digital research ecosystem. How does open source figure into this? Does open source contribute to helping institutions create more complete digital research infrastructures for their own communities?

Uzwyshyn: Yes, and there have been several open source initiatives in higher education that each address these new paradigm possibilities — Harvard University's Dataverse; MIT's original digital collections repository, DSpace; and the Texas Digital Library and Texas State's Vireo project are examples. These separate and largely open source endeavors are now being placed together into coherent ecosystems with compatible components and APIs that support interoperability.

Grush: So, do institutions need a range of interoperable components that enable them to create a complete digital research infrastructure to serve their faculty and students who may be engaged in research?

Uzwyshyn: Yes. They do. We need a global digital research infrastructure ecosystem that responds to the possibilities networked communication allows. I like to highlight this "ecosystem" metaphor because of the extensive network effects potential with regards to academic research.

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Grush: It sounds like the tide is turning when it comes to support for digital research scholarship. What's the best way to move forward, for most institutions — especially those in that 90 percent you speak of? How should they approach all this?

Uzwyshyn: Institutions should start thinking about academic research in terms of ecosystems, using an environmental metaphor: a digital research ecosystem that will aggregate, access, and archive research and data, helping faculty and graduate students place their research online and raise their own as well as their institution's profile.

Grush: The metaphor you're suggesting, then, would be a global digital research infrastructure ecosystem?

Uzwyshyn: Yes, and it's currently very useful.

Grush: What are a few of the components of a digital research infrastructure ecosystem? Maybe you could mention examples from your work at Texas State.

Texas State University Libraries
Digital Scholarship Research Ecosystem
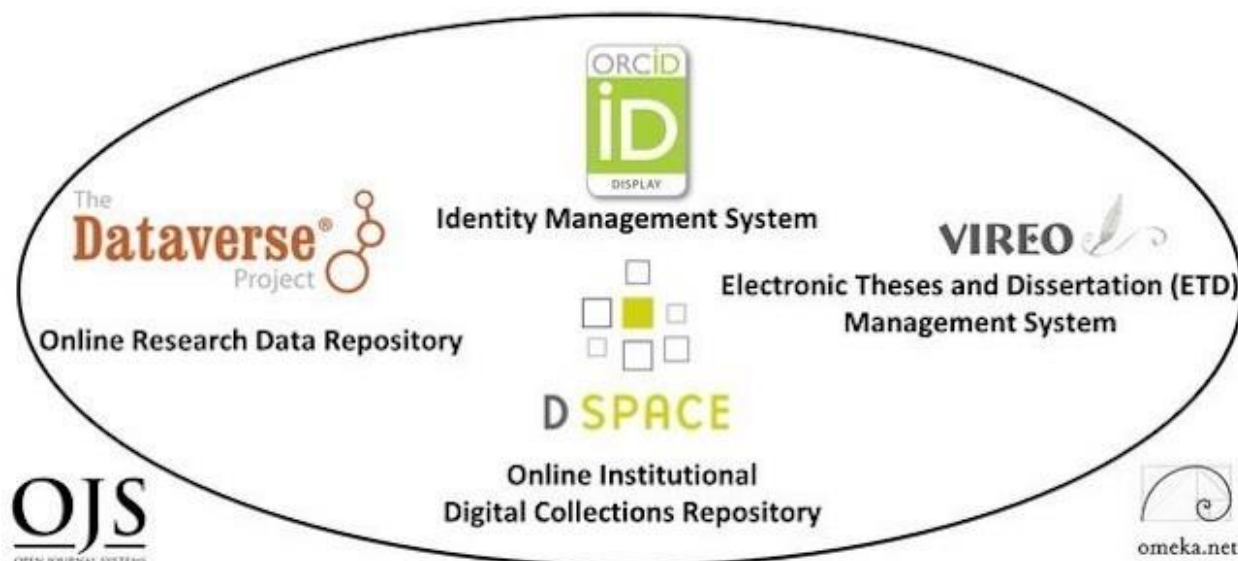
Digital research infrastructure ecosystem components (Image courtesy Texas State University Libraries)

Uzwyshyn: Any digital research infrastructure has two central components: *an online institutional digital collections repository* and *an online institutional research data repository.* At Texas State we use DSpace for the first and Harvard University's Dataverse for the second. DSpace is a digital repository for academic research, focused on text-based material such as research articles, paper preprints, and even field notes. The online research data repository we use, Dataverse, is an integral component that allows researchers to aggregate, organize, and archive their data, and put it out there for sharing in an online framework. These two central components open the doors for collaboration and provide avenues for verification of data and research results through a connection to the larger expertise of a networked academic community.

You're "mixing and matching" pieces for your particular institution. Each institution will have its own set of needs and priorities when it comes to creating such digital research infrastructures.

Beyond that, there are a few other components worth highlighting. One would be a researcher *identity management system*. We use ORCiD to disambiguate academic researchers' names primarily but also to help organize and access the research corpus of either beginning graduate students' work or the larger corpus of senior faculty members. ORCiD vastly improves authority control along with findability and access.

We also have, within this system, a *graduate research component* for which we use Vireo. From the beginning of a graduate student's academic work life, there needs to be dissemination and a trajectory for their work. Junior faculty and graduate students in particular, encounter often-vociferous competition. It's important for these beginning researchers to get their dissertations, theses, and first published papers "out there" and noticed.

There are other components, but certainly, the ones I just mentioned — the *online institutional digital collections repository,* the *online institutional research data repository,* an *identity management system,* and the *graduate research component* — are the most important for establishing a digital research infrastructure strategy for an institution. The growth of our system has also been phenomenal during this implementation (see Table 1).

System	2015	2016	2017	2018	2019
Downloads					
DSpace	318,742	385,163	341,224	972,359	1,010,349
ETDs	158,240	200,373	328,420	470,437	505,658
Dataverse	n/a	n/a	455	3,451	2,043
Items					
DSpace	1,437	1,546	1,660	2,135	2,720
ETDs	1,174	1,326	1,581	1,789	2,218
Dataverse	n/a	n/a	28	33	53
ORCID IDs					
ORCID	190	316	438	545	669
Hosted Journals					
OJS	1	2	2	3	4

Table 1: Texas State University Digital Scholarship Ecosystem Annual Growth

Grush: It seems that some of these components already exist in some form on our campuses. Or they may be available as open source.

Uzwyshyn: Yes, you usually wouldn't build this type of infrastructure from scratch. Different institutions will be on different levels when it comes to utilizing existing and available or open source resources. You're "mixing and matching" pieces for your particular institution. Each institution will have its own set of needs and priorities when it comes to creating such digital research infrastructures.

Given existing open source tools, institutions globally should consider opportunities to enable their faculty and graduate students on these new paradigm research ecosystem levels.

And with open source, institutions can customize solutions using the APIs from interoperable software components, opening the potential for networked effects such as collaboration and data sharing.

Grush: So suddenly, many researchers in that 90 percent we were talking about are no longer hidden in the shadows; instead, they are collaborating with other researchers on a global stage. That's likely where the real power of this strategy will ultimately be.

Uzwyshyn: Yes.

Grush: Given the networked effects, what are the possibilities for consortial research infrastructure efforts that can improve opportunities for their members?

Uzwyshyn: The possibilities are rich. Digital research infrastructure projects will ultimately result in interdisciplinary research collaborations that have far-reaching benefits and can move the 21st century forward with regards to medical, humanities, social science, technological, and social justice research. Given existing open source tools, institutions globally should consider opportunities to enable their faculty and graduate students on these new paradigm research ecosystem levels.
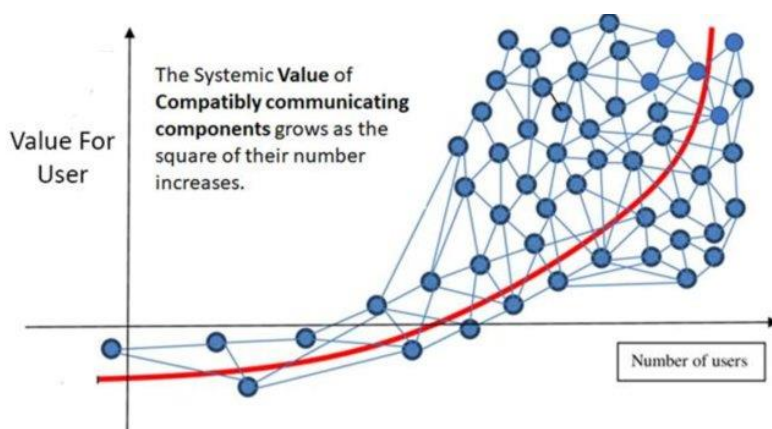
Figure 2 Digital Scholarly Ecosystem Growth with Compatibly Communication Components

About the Author: Mary Grush is Editor and Conference Program Director, Campus Technology.

Ray Uzwyshyn, Ph.D. MBA MLIS is currently Director of Collections and Digital Services for Texas State University Libraries. More information based on some of the ideas discussed in this interview is available in this article here and presentation here.