Open Source Digital Ecosystems for Accelerating Global Research, Innovation and Collaboration

(Lightning Talk)

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Can We ‘Better’ Enable Scholarly Research Network Ecosystem Possibilities on Global Levels?

Is it Time to Begin Thinking ‘Systematically’ About Empowering a Global Research University Community?
Research University Statistics

• ~266-300 Research Institutions US & Canada
  Carnegie R1 & R2, Very High or High Research Activity with associated Research library infrastructures

• ~Estimated 1000-1250 Research Intensive Universities Worldwide
  QS Rankings and Times Higher Education Supplement. (40% Europe, 26.5% Asia Pacific, US/Canada 18%, Latin America 10.8% and Middle East/Africa 7%.

Is it possible to Enable Top 2-3% Research Institutions Globally, ~ 1000 Institutions with Open Digital Research Ecosystems
(Institutions beyond the few universities who already possess these)
How do We Define an Open Digital Scholarship Research Ecosystem?

Network of Several Software Components to Enable Research Faculty and Graduate Students to Accelerate Research, Innovation and Global Collaboration
General Software Characteristics of an Open Digital Scholarship Ecosystem

Texas State University Research Ecosystem

- **Customizable Components** (Easy Configurability, Connectivity)
- **Active Developer Communities**
- **Open Source Software**

- **The Dataverse Project**
- **Identity Management System**
- **D SPACE**
- **Electronic Theses and Dissertation (ETD) Management System**
- **OJS**
- **Online Research Data Repository**
- **Online Institutional Digital Collections Repository**
- **ORCID iD Display**
- **VIREO**
What Classes of Open Source Software Components are needed to create a digital scholarship ecosystem?

**TWO PRIMARY**
- Research Data Repository (Dataverse)
- Digital Collections Repository (Dspace)

**FOUR TERTIARY**
- Electronic Thesis and Dissertation Management System (VIREO)
- Identity Management System (ORCID)
- Academic Journal Software (OJS3)
- User Interface/Content Management Software (OMEKA)

Texas State University Libraries Digital Research Ecosystem (Technical/Software Overview)
Together, these Digital Ecosystem Components Enable the Academic Research Cycle

The academic research cycle

i. Identification of knowledge
   e.g. undertaking literature review using peer reviewed sources

ii. Creation of knowledge
   by professional researchers usually behind closed doors

iii. Quality assurance of knowledge
   e.g. peer review, filtering the best for publication

iv. Dissemination of knowledge
   e.g. publication, presentation at conference

Pragmatic Levels

Think & Plan

Discover

Gather & Analyse

Abstract Levels

Social media: A guide for researchers (2011), p15
Collocating Open-Source Digital Components in a Networked Research Environment Enables Larger Connections and/or Network Effects, Accelerating Research, Collaboration and Innovation

(Further Contextualization)
Quantitative and Qualitative Assessment, 2014-2020
This Digital Research Ecosystem Shows Very Strong and Continued Potential for Growth

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Annual Usage, Downloads, Number of Items, ORCID ID’s and Online Academic Journals Added

LibQual Biannual Survey 2013-2019, Faculty and Student System Perceptions, Comments

Making electronic resources accessible from my home or office

- Perceived 2019
- Perceived 2017
- Perceived 2015
- Perceived 2013
Many Beneficial Internal and External Effects of Such a System

Internally, these digital components significantly raise and optimize search engine rankings (SEO) for researchers and their research.

Externally, this ecosystem enables collaborative opportunities among Researchers and Research Institutions.
Pragmatically, how do you enable a larger set of research institutions globally?

(Top 2-3% Research Institutions, ~1000 Institutions and Research Libraries, ~90% of Research Universities Globally)

This is from a Larger Set of 26,000-40,000 Universities Globally. Research Universities 2.7% - 4.2% of all universities worldwide. Highest by Country: US 156, UK 76, Germany 45, Japan 44.
One Server Per Research University Initiative
2021-2025, V 1.0

Vision

Give ~ 1000 Research Universities/Academic Libraries Globally:

- 1 Configured Research Ecosystem Server with 6 Open-Source Research Ecosystem Software Components < $1000.00 US/Server or set up Fractional Server Space in the Cloud with Mirror Sites Globally (SAAS)
- Hold Weeklong trainings over 6 continents
- Create a global help network to get the institutions and academic libraries started
- After Five Years, Gage Effects for Global Research!
Summary Statements

Placing Open-Source Research Software Components within a Global Digital Ecosystem:

1) Accelerates Global Collaboration, Research Impact and Possibilities for New insights and Innovation
2) Opens a New Paradigm For Research Accessibility, Retrieval and Sharing
3) Creates Evolutionary Milestones for Research Ecosystems Development
4) Enables a New Global Roadmap For the Forward Progress of Knowledge in the 21st Century.

Open Source Global Digital Research Ecosystems are needed, innovative and pragmatically possible to implement on global levels today.
Further References

Papers
Presentations
& Working Examples


Working Ecosystem Examples
Texas State University Libraries Digital Scholarship Ecosystem.
Texas State Digital Collections Repository
Texas State Data Research Repository
Texas State Online Research Identity Management System (ORCID)
Texas State Electronic Thesis and Dissertation Management (VIREO)
Open Journal Systems @ Texas State
Further Links to Open Source Software & Downloads Referenced

- Digital Collections Repository: Dspace
  https://duraspace.org/dspace/

- Data Repository: Dataverse
  https://dataverse.org/

- Content Management System: Omeka
  https://omeka.org/

- Academic Journal Software: Open Journal Systems 3
  https://pkp.sfu.ca/ojs/

- Identity Management Software: ORCID
  https://orcid.org/

- Electronic Thesis and Dissertation Management Software: Vireo
  https://www.tdl.org/etds/
The Systemic Value of Compatibly communicating components grows as the square of their number increases.
Future Pathways
Networked Global Scholarly Research Environment
Research Universities and Digital Research Ecosystems

• **~266-300** Research Institutions US & Canada, Carnegie R1 & R2, Very High or High Research Activity, 124 ARL Libraries

• **~1000-1250** Research Universities Worldwide
  
  QS Rankings and Times Higher Education Supplement. (40% Europe, 26.5% Asia Pacific, US/Canada 18%, Latin America 10.8% and 7% Middle East/Africa.

• **Larger Set of 26,000-40,000** Universities Globally. Research Universities 2.7% - 4.2% of all universities worldwide. Highest by Country: **US 156**, UK 76, Germany 45, Japan 44.

• Enable Top 2-3% Research Institution Academic Libraries Globally, 1500 Institutions including the US and Canada. This represents ~ 90% of Research Libraries Globally.
Together, These Research Ecosystem Components
Open Amazing Possibilities For Digital Scholarship & Collaboration

- Complex Multimedia Archives/Cognitive Cartographies
- Digital Archives/ETD Projects
- Online Exhibits/ Online Academic Journals
- Interactive Image Archives/Data Projects
- Digital Libraries, Research Documentation Projects
- Faculty Digitization Proposals/Partnerships
Network Effects
Both In and Between Individual Components and In and Among Component Networks

1) ORCID Aggregates from Several Sources and Networks and Connects to Other Networks, Internal and External
2) OMEKA can act as a middleware front end connecting several components and component networks internally.
3) Digitization Lab’s IIIF Framework can create internal or globally distributed Image Libraries.
4) Dataverse can be configured as a single Instance or as a Consortial Model (Texas 22 Individual Instances, TDL)
Research Universities and Digital Research Ecosystems

• **~266-300** Research Institutions US & Canada, Carnegie R1 & R2, Very High or High Research Activity, 124 ARL Libraries

• **~1000-1250** Research Universities Worldwide

  QS Rankings and Times Higher Education Supplement. (40% Europe, 26.5% Asia Pacific, US/Canada 18%, Latin America 9% and Middle East/Africa.

• **26,000-40,000** Universities Globally. Research Universities 2.7% - 4.2% of all universities worldwide. Highest by Country: **US 156**, UK 76, Germany 45, Japan 44.

• Other Top 2-3% Research Institution Academic Libraries Globally, 1000 Institutions beyond the US and Canada. This represents the other 90% of Research Libraries Globally
Research Universities and Digital Research Ecosystems

- **124** ARL Research Libraries (US and Canada)
- **131** US Research Universities (Carnegie R1, Very High Research Activity)
- **135** Doctoral Universities (Carnegie R2, High Research Activity, US), ~266-300 Research Institutions US & Canada
- **1011** Research Universities Worldwide (40% Europe, 26.5% Asia Pacific, US/Canada 18%, Latin America 9% and Middle East/Africa. **QS Rankings**
- **1250** Research Universities Worldwide, **Times Higher Education Supplement** (2.7% - 4.2% of all universities worldwide)
- By Country: **US 156**, UK 76, Germany 45, Japan 44
- Global Estimates of General University #’s **26,000-40,000**

**Empower Other Top 2-3% Research Institution Libraries Globally, 1000 Institutions, the other 90% of Research Libraries Globally**
One Laptop Per Child Initiative
Dreamed up mid-late 90’s, Launched 2005
Antecedent ‘Big Idea’ Model
MIT Media Lab Director Nicholas Negroponte

- **Vision:** Give each child in world access to a laptop with open source software for less than 100.00 $US/laptop

- Gage Global Effects For Education

- Why not try something similarly worthy, noble and significant for academic research institutions globally?
One Server Per Research University Initiative
2020-2025, V 1.0

- **Vision**: Give ~ 1000 Research Universities Globally One Configured Research Ecosystem Server: 6 Open Source Research Software Components, set up weeklong trainings over 5 continents and a help network < $1000.00 US/Server or set up Fractional Server Space in the Cloud with Mirror Sites Globally (SAAS)

- Gage Global Effects for Research!
#1 Component for Open Science, Research Data Repository

https://dataverse.tdl.org/dataverse/txstate
Research Data Repository

https://dataverse.tdl.org/dataverse/txstate

CAPTURE
Project Data from Experiments, Surveys Researchers and Scientists

CATALOG
Assign Metadata Schema, Specialized and Disciplinary Taxonomies, DOI, UNF

MANAGE
Administrative Online Research Data Archives

FIND/VIEW
Retrieve, Download Relevant Data Sets Instantaneously

Synthesize Research
Verification, Insight, Discovery Visualization, Harvesting and Linked Data
Dataverse can be configured as Single Instance or as a Consortial Model

(Texas Aggregates 22 Individual Instances, through the Texas Digital Library)

https://dataverse.tdl.org/
#2 Institutional Digital Collections Repository (Dspace)

Organizes, centralizes and makes accessible research and knowledge generated by the institution’s research community (Research Faculty and Graduate Students):

- Pre-prints
- Faculty Publications
- White Papers
- Conference Presentations
- Graduate Student Theses
- and Dissertations
A Vast Majority of Publishers Allow Digital Archiving in some form. (82% from 2562 publishers)

March 2020 Sherpa/Romeo Copyright Policies

Summary: 82% of publishers on this list formally allow some form of self-archiving.
Primary Use Case Value
Application of Structured Metadata Schema for Search Engine Optimization
### Athermal annealing of low-energy boron implants in silicon

Donnelly, David W., Southwest Texas State University, Dept. of Physics; Covington, B. C., Southwest Texas State University; Grun, J., Naval Research Laboratory, Washington, DC; Fischer, R.P., Naval Research Laboratory; Peckerar, M., Naval Research Laboratory; Felix, C. L., United Industries Inc.

#### Comments:

#### Recommended Citation:

https://digital.library.txstate.edu/handle/10877/4675

### Dublin Core Metadata

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### Access Points

#### Findability

Search Engine Optimization (SEO)

https://digital.library.txstate.edu/
Percent Increase in Article Citations by Discipline with Open Access Online Availability Through Google

Range = 36%-250% Increase in Citations over 2 Year period

(Data: Stevan Harnad and Heather Joseph, 2014)
Percent Increase in Article Citations by Discipline with Open Access Online Availability Through Google

Range = 36%-250%
(Data: Stevan Harnad and Heather Joseph, 2014)
Vireo

Electronic Thesis and Dissertation Management System

- Bridges Student Thesis/Dissertation Submission with Graduate School Review,
- Connects the Collections Repository And Data Repository so graduate students can publish and link their theses/dissertations, data and research
- Addresses Intermediary steps in the ETD Process
Researcher Identity Management System

• Gives Researchers Unique Number (ORCID ID) Connecting and Disambiguate Scholars names:

Maria Hernandez, Biochemist
Maria Hernandez, M.D. or Astrophysicist

• Allows Papers in the collections repository and datasets in data repository to be associated with ORCID ID’s for aggregation of research profiles.

ORCID is a hub connecting the research landscape

Orcid can act as a Network Hub aggregating from several sources and connecting to other internal and external networks
Omeka and OJS3

Open Source User Interface Software
Provides a front end gateway for more complex research projects - linking text, image media and datasets and acting as a front end for connecting components.

Open Access Academic Journal Software for refereed journal online publishing, workflow and connections with background research and datasets etc. through Dataverse/Dspace connections.
The Digitization Lab

• Expands Possibilities for depth of Faculty/Graduate Student Research Projects

• Possibilities range from OCR, scientific slides, GIS image, manuscript & journal digitization to 3D objects, audiovisual material and visualization technologies
Human Resources

Essential

• System Administrator/Programmer
  server infrastructure set-up/maintenance/basic customization

• Digital Collections Librarian: Administration, Marketing, User Support, Collections and Data Repository, OJS/ORCID

Optional as System Expands

• Metadata Librarian: Dublin Core, Specialized Schema

• Web Developer/Programmer: OMEKA, System Integration

• Project Manager/Department Head (PMP Certification)

• Digitization Specialist

• GIS Specialist/Data Visualization Specialist

• AI Specialist/Post-Doc/CLIR Fellow
Implementation Paths For Open Science
(Many Roads To Rome for Timelines, 1-5 Year Paths)

Year 1
Data Repository and Digital Collection Repository

Year 2
User Interface Software (OMEKA), Identity Management System, ORCID

Year 3
Digitization Lab

Year 4
ETD Middleware (VIREO) and OJS Software

Year 5
Complex Digitization Projects, IIIF Server, Faculty Grant Projects etc.
Questions, Comments and Funders and Foundations with global vision and a passion for solving one of the 21st Century’s Grand Challenges for Global Research.

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